Final General Stakeholder Workgroup Meeting – Day 1
(January 5, 2026)

Date: January 5, 2026

Time: 9:00 AM

Location: 4224 Cox Rd, Glen Allen, VA 23060 - Virginia Housing Center

AGENDA

I. Welcome
II. Introductions
III. Code Change Proposals (see list below)

VPMC Proposals

1. PM104.4-24
2. PM106.8-24
3. PM107.5-24
4. PM606.1-24

SFPC Proposals

5. FP105.3.1-24
6. FP107.11-24
7. FP107.12-24
8. FP107.12.1-24
9. FP112.1-24
10. FP112.5(1)-24
11. FP307.2-24
12. FP501.5-24
13. FP904.2.2.1-24
14. FP1208(1)-24
15. FP4106.1.3-24
16. FP6112-24

Trades Proposals

17. E2701.1.1-24
18. E2701.1.1(1)-24
19. RE3601.8-24
20. RE3702.14-24

21. RE3901.4.2(1)-24
22. M507.1-24
23. M1103.1(1)-24
24. M1109.3.2-24
25. M15-24
26. RM-FG2442.3-24
27. P306.2.5-24
28. P306.3.1-24
29. RP2903.10.1-24

Energy Proposals

30. EC-1301-24
31. EC-C402.1.6(1)-24
32. EC-C403.7.4.1-24
33. EC-C405.15-24
34. EC-C405.17(1)-24
35. EC-C409-24
36. REC-R402.1.2-24
37. REC-R402.1.2(1)-24
38. REC-R402.1.2(2)-24
39. REC-R402.1.2(4)-24
40. REC-R402.1.3-24
41. REC-R402.4.1.2-24
42. REC-R402.4.1.2(1)-24
43. REC-R403.14-24
44. REC-R404.1-24
45. REC-R404.2-24
46. REC-R404.5-24
47. REC-R405.2-24
48. REC-R405.2(2)-24
49. REC-R408.2.9-24

VCS & VADR Proposals

50. CS10-24
51. CS51-24
52. AD40-24
~~53. AD40(1)-24~~ Withdrawn by proponent.
54. AD75-24

Note: See January 6, 2026, “General Stakeholder Workgroup Meeting – Day 2” agenda (page 156 of this document) for VCC, VEBC and VRC proposals that will be discussed on January 6th.

2024 cdpVA Proposal Subject Matter Designations

(cdpVA Proposal Name "Agenda Number" Prefixes)

The following prefixes will be utilized as part of each proposal name to assist in identifying the subject matter of the proposal. DHCD staff assign proposal names after they have been submitted, reviewed and before they are placed in "Ready for Public Comment" status.

B = Virginia Construction Code
EB = Virginia Existing Building Code
PM = Virginia Property Maintenance Code
FP = Statewide Fire Prevention Code
BF = Virginia Construction Code - IFC
EC = Virginia Energy Conservation Code
M = Virginia Mechanical Code
M-FG = Virginia Fuel Gas Code
P = Virginia Plumbing Code
E = VCC Electrical
RB = Virginia Residential Code
REC = Virginia Residential Code - Energy
RE = Virginia Residential Code - Electric
RM = Virginia Residential Code - Mechanical
RM-FG = Virginia Residential Code - Fuel Gas
RP = Virginia Residential Code - Plumbing
IB = Industrialized Building Safety Regulations
MH = Manufactured Home Safety Regulations
AD = Virginia Amusement Device Regulations
CS = Virginia Certification Standards

Example: cdpVA Proposal Agenda Number "**RM-FG**2415.7-24" indicates a proposal to the fuel gas provisions (VRC Section G2415.7) of the 2024 Virginia Residential Code.

PM104.4-24

VPMC: 104.4

Proponents: DHCD Staff, representing DHCD (sbco@dhcd.virginia.gov)

2021 Virginia Property Maintenance Code

Revise as follows:

104.4 Local enforcing agency. In jurisdictions enforcing this code, the local governing body shall designate the agency within the local government responsible for such enforcement and appoint a *code official*. The local governing body may also utilize technical assistants to assist the *code official* in the enforcement of this code. A permanently appointed *code official* shall not be removed from office except for cause after having been afforded a full opportunity to be heard on specific and relevant charges by and before the appointing authority. DHCD shall be notified by the appointing authority within 30 days of the appointment or release of a permanent or acting *code official*. ~~and~~ DHCD shall be notified by the *code official* or their designee within 60 days ~~after retaining or terminating~~ of the separation of a technical assistant.

> **Note:** *Code officials* and technical assistants are subject to sanctions in accordance with the VCS.

Reason Statement:

The requirement for localities/Property Maintenance Officials to notify DHCD when they hire a new technical assistant is no longer necessary, as actions required for new technical assistants (creating a DHCD registration system profile and requesting a Learning Center account) can and should be completed by the new employee. There is no special action required on the part of DHCD.

It remains important for localities to notify DHCD when a technical assistant leaves a locality so that the DHCD profile can be updated accordingly. The word "termination" is changed to "separation" to be inclusive or more inclusive of any situation where the employee leaves the locality, including resignation, termination, or retirement. “or their designee” is added to recognize that this notification does not need to come from the Property Maintenance Official directly.

Cost Impact: The code change proposal will not increase or decrease the cost

The proposal will not increase or decrease cost.

PM106.8-24

VPMC: 106.8

Proponents: Michele Throckmorton, City of Chesapeake, representing City of Chesapeake, Virginia (mdthrockmorton@cityofchesapeake.net)

2021 Virginia Property Maintenance Code

Revise as follows:

106.8 Emergency repairs and demolition. To the extent permitted by the locality, the *code official* may authorize emergency repairs or demolition to unsafe *structures* when it is determined that there is an imminent danger of any portion of the *unsafe structure* collapsing or falling and when life is endangered. Emergency repairs or demolition may also be authorized where there is a code violation resulting in the immediate serious and imminent threat to the life and safety of the occupants. The *code official* shall be permitted to authorize the necessary work to make the *structure* temporarily safe whether or not legal action to compel compliance has been instituted. In addition, whenever an *owner* of an *unsafe structure* fails to comply with a notice to demolish under non-emergency conditions issued under Section 106.3 in the time period stipulated, the *code official* shall be permitted to cause the structure to be demolished. In accordance with §§ 15.2-906 and 15.2-1115 of the Code of Virginia, the legal counsel of the locality may be requested to institute appropriate action against the property *owner* to recover the costs associated with any such emergency repairs~~,~~ emergency demolition or non-emergency demolition and every such charge that remains unpaid shall constitute a lien against the property on which the emergency repairs or demolition were made and shall be enforceable in the same manner as provided in Articles 3 (§ 58.1-3940 et seq.) and 4 (§ 58.1-3965 et seq.) of Chapter 39 of Title 58.1 of the Code of Virginia.

> **Note:** *Code officials* and local governing bodies should be aware that other statutes and court decisions may impact on matters relating to demolition, in particular whether newspaper publication is required if the *owner* cannot be located and whether the demolition order must be delayed until the *owner* has been given the opportunity for a hearing. In addition, *historic building* demolition may be prevented by authority granted to local historic review boards in accordance with § 15.2-2306 of the Code of Virginia unless determined necessary by the *code official*.

Reason Statement:

This amendment clarifies the language in the code regarding emergency demolitions and emergency repairs. The previous code did not clearly indicate that emergency demolition is an available remedy in situations where a catastrophic weather event, geological incident, or man-made disaster causes damage so severe that the structure becomes unsafe and cannot be made secure through emergency repairs alone.

Cost Impact: The code change proposal will not increase or decrease the cost

Clarification to the language should not increase or decrease the cost.

PM107.5-24

VPMC: 107.5

Proponents: Eric Mays, representing Prince William County (emays@pwcgov.org)

2021 Virginia Property Maintenance Code

Revise as follows:

107.5 Right of appeal; filing of appeal application. Any person aggrieved by the local enforcing agency's application of this code or the refusal to grant a modification to the provisions of this code may appeal to the LBBCA. The applicant shall submit a written request for appeal to the LBBCA within 14 calendar days of the receipt of the decision being appealed. When the local governing body has established a fee for the filing of an appeal, the building department shall establish a written policy for the process and methods of payments. The written request for appeal is not considered to be complete and filed until the fee is paid. The application shall contain the name and address of the *owner* of the *building* or *structure* and, in addition, the name and address of the person appealing, when the applicant is not the owner. A copy of the *code official's* decision shall be submitted along with the application for appeal and maintained as part of the record. The application shall be marked by the LBBCA to indicate the date received. Failure to submit an application for appeal within the time limit established by this section shall constitute acceptance of a *code official's* decision.

Reason Statement:

The Code Change Proposal is to clarify the requirements related to the timely filing of an appeal. The Virginia Construction Code requires appeals to be submitted within 30 days of the code official's decision and to be heard by the local appeals board within 30 days. The State Technical Review Board recently held a preliminary hearing to determine if an appeal was submitted in a timely manner. The appeal application fee was not paid until approximately 3 months after the filing of the written request to appeal; thereby delaying the appeal process. The current Code does not address any linkage between the appeal application and the payment of an appeal application fee. For consistency, the Code Change Proposal address the VCC, VRC, VMC and SFPC.

DHCD Staff Note: This code change proposal was initially submitted as part of proposal B119.5(1)-24. DHCD Staff split proposal B119.5(1)-24 into three separate proposals:

B119.5(1)-24: VCC portion of original proposal
FP112.1-24: SFPC portion of original proposal
PM107.5-24: VPMC portion of original proposal (this proposal)

Cost Impact: The code change proposal will not increase or decrease the cost
The code change provides an administrative clarification and does not impact cost.

PM606.1-24

VPMC: 606.1

Proponents: Shahriar Amiri, representing Arlington County, VA (samiri@arlingtonva.us)

2021 Virginia Property Maintenance Code

Revise as follows:

606.1 General. Elevators, dumbwaiters, platform lifts, wheelchair lifts, moving walks and escalators shall be *maintained* in compliance with ASME A17.1 and ASME A18.1. An annual periodic inspection is required of all elevators, lifts, walks and escalators.A locality shall be permitted to require a 6-month periodic inspection. Periodic tests are required of all elevators, lifts, walks and escalators at the intervals listed in ASME A17.1 Appendix N and ASME A18.1 Appendix D. Periodic tests shall be witnessed by the *code official*. The *code official* may provide for such inspections and test witnessing by an *approved* agency or through agreement with other local certified elevator inspectors. An *approved* agency includes any individual, partnership or corporation who has met the certification requirements established in the VCS. The most current certificate of inspection shall be on display at all times within the elevator or attached to the escalator, be available for public inspection in the office of the *building operator*, or be posted in a publicly conspicuous location *approved* by the *code official*. Where not displayed in the elevator or attached to the escalator, there shall be a notice of where the certificate of inspection is available for inspection.

Reason Statement:

Platform lifts, wheelchair lifts and moving walkways are already included within the scope of the Virginia inspection code and the Virginia Uniform Statewide Building Code (which adopts the International Building Code and other safety standards). The rationale for their inclusion centers primarily on ensuring public safety, standardized operation, and clear legal liability, which aligns with federal accessibility mandates like the Americans with Disabilities Act (ADA). The primary justifications for their inclusion are accessibility for individuals with disabilities and safety through standardized installation and maintenance.

Integrating platform and wheelchair lifts into the Virginia inspection code serves a dual purpose: ensuring equitable access for all citizens as required by law, while implementing rigorous safety standards and mandatory inspections to protect users and maintenance personnel alike.

Inclusion of moving walkways in the inspection code is essential for ensuring that, while providing convenience and efficiency, are held to the same high safety standards as other forms of mechanical vertical transportation in public and commercial spaces within Virginia.

Cost Impact: The code change proposal will increase the cost

While this proposal may increase the cost of annual inspections for moving walks, wheel chair lifts and escalators, most private buildings only have elevators and in rare conditions wheelchair lifts for ADA compliance. Escalators and moving walks are generally found in covered mall building and regional airport authorities that already conduct annual inspections because of potential liability.

FP105.3.1-24

SFPC: 105.3.1

Proponents: DHCD Staff, representing DHCD (sbco@dhcd.virginia.gov)

2021 Virginia Statewide Fire Prevention Code

Revise as follows:

105.3.1 Notification. The fire official or their designee shall notify ~~the~~ *DHCD* within 60 days of the ~~employment, contract or termination~~ separation of ~~all~~ a *technical ~~assistants~~ assistant* ~~for enforcement of the SFPC~~.

Reason Statement:

The requirement for localities/Fire Officials to notify DHCD when they hire a new technical assistant is no longer necessary, as actions required for new technical assistants (creating a DHCD registration system profile and requesting a Learning Center account) can and should be completed by the new employee. There is no special action required on the part of DHCD.

It remains important for localities to notify DHCD when a technical assistant leaves a locality so that the DHCD profile can be updated accordingly. The word "termination" is changed to "separation" to be inclusive or more inclusive of any situation where the employee leaves the locality, including resignation, termination, or retirement. “or their designee” is added to recognize that this notification does not need to come from the Building Official directly. The phrase "for enforcement of the SFPC" is removed because the definition of technical assistant covers this and removal increases consistency with the DHCD notification sections in the VCC and VPMC.

Cost Impact: The code change proposal will not increase or decrease the cost

This proposal will not increase or decrease cost.

FP107.11-24

SFPC: 107.11, 107.12

Proponents: Greg Cavalli, representing Virginia Department of Fire Programs (gregory.cavalli@vdfp.virginia.gov); Billy Hux, representing Virginia Department of Fire Programs (billy.hux@vdfp.virginia.gov)

2021 Virginia Statewide Fire Prevention Code

Revise as follows:

107.11 State Fire Marshal's office permit fees for explosives, blasting agents, theatrical flame effects, and fireworks. Complete permit applications shall be submitted to and received by the State Fire Marshal's Office not less than 15 days prior to the planned use or event. A $~~500~~ *$750* expedited handling fee will be assessed on all permit applications submitted less than 15 days prior to the planned use or event. Inspection fees will be assessed at a rate of $~~60~~ *$90* per staff member per hour during normal business hours (Monday through Friday, 8:30 a.m. to 4:30 p.m.) and at a rate of $~~90~~ *$135* per hour at all other times (nights, weekends, holidays). State Fire Marshal's Office permit fees shall be as follows:

1. Storage of explosives and *blasting agents*, 12-month *permit* $~~250~~ *$375* first magazine, plus $~~150~~ *$225* per each additional magazine on the same site.
2. Use of explosives and *blasting agents*, nonfixed site, 6-month *permit* $~~250~~ *$375* per site, plus inspection fees.
3. Use of explosives and blasting agents, fixed site, 12-month permit $~~250~~ *$375* per site.
4. Sale of explosives and *blasting agents*, 12-month *permit* $~~250~~ *$375* per site.
5. Manufacture explosives (unrestricted), *blasting agents*, and fireworks, 12-month *permit* $~~250~~ *$375* per site.
6. Manufacture explosives (restricted), 12-month *permit* $~~20~~ *$30* per site.
7. Fireworks display in or on state-owned property $~~300~~ *$450* plus inspection fees.
8. Pyrotechnics or proximate audience displays in or on state-owned property $~~300~~ *$450* plus inspection fees.
9. Flame effects in or on state-owned property $~~300~~ *$450* plus inspection fees.
10. Flame effects incidental to a permitted pyrotechnics display $~~150~~ *$225* (flame effects must be individual or group effects that are attended and manually controlled).

Exception: Permit fees shall not be required for the storage of explosives or *blasting agents* by state and local law enforcement and fire agencies.

107.12 State annual compliance inspection fees. Fees for compliance inspections performed by the State Fire Marshal's office shall be as follows:

1. Nightclubs.
   - 1.1. $~~350~~ *$525* for occupant load of 100 or less.
   - 1.2. $~~450~~ *$675* for occupant load of 101 to 200.
   - 1.3. $~~500~~ *$750* for occupant load of 201 to 300
   - 1.4. $~~500~~ *$750* plus $~~50~~ *$75* for each 100 occupants where occupant loads exceed 300.

2. Private college dormitories with or without assembly areas. If containing assembly areas, such assembly areas are not included in the computation of square footage.
   2.1. $~~150~~ *$225* for 3,500 square feet (325 m^2) or less.
   2.2. $~~200~~ *$300* for greater than 3,500 square feet (325 m^2) up to 7,000 square feet (650 m^2).
   2.3. $~~250~~ *$375* for greater than 7,000 square feet (650 m^2) up to 10,000 square feet (929 m^2).
   2.4. $~~250~~ *$375* plus $~~50~~ *$75* for each additional 3,000 square feet (279 m^2) where square footage exceeds 10,000 square feet (929 m^2).

3. Assembly areas that are part of private college dormitories.
   3.1. $~~50~~ *$75* for 10,000 square feet (929 m^2) or less provided the assembly area is within or attached to a dormitory *building*.
   3.2. $~~100~~ *$150* for greater than 10,000 square feet (929 m^2) up to 25,000 square feet (2323 m^2) provided the assembly area is within or attached to a dormitory *building*, such as gymnasiums, auditoriums or cafeterias.
   3.3. $~~100~~ *$150* for up to 25,000 square feet (2323 m^2) provided the assembly area is in a separate or separate *buildings* such as gymnasiums, auditoriums or cafeterias.
   3.4. $~~150~~ *$225* for greater than 25,000 square feet (2323 m^2) for assembly areas within or attached to a dormitory *building* or in a separate or separate *buildings* such as gymnasiums, auditoriums or cafeterias.

4. Hospitals.
   4.1. $~~300~~ *$450* for 1 to 50 beds.
   4.2. $~~400~~ *$600* for 51 to 100 beds.
   4.3. $~~500~~ *$750* for 101 to 150 beds.
   4.4. $~~600~~ *$900* for 151 to 200 beds.
   4.5. $~~600~~ *$900* plus $~~100~~ *$150* for each additional 100 beds where the number of beds exceeds 200.

5. *State-Regulated Care Facilities*:

   5.1 Facilities licensed by the Virginia Department of Social Services based on licensed capacity as follows:

   5.1.1. $~~50~~ *$75* for 1 to 8.

   5.1.2. $~~75~~ *$110* for 9 to 20.

   5.1.3. $~~100~~ *$150* for 21 to 50.

   5.1.4. $~~200~~ *$300* for 51 to 100.

   5.1.5. $~~300~~ *$450* for 101 to 150.

   5.1.6. $~~400~~ *$600* for 151 to 200.

   5.1.7. $~~500~~ *$750* for 201 or more.

   Exception: Annual compliance inspection fees for any *building* or groups of *buildings* on the same site may not exceed $2500.

   5.2 Family Day Homes licensed by the Department of Education based on licensed capacity as follows:

   5.2.1. $~~50~~ *$75* for 1 to 8.

   5.2.2. $~~75~~ *$110* for 9 to 20.

   5.2.3. $~~100~~ *$150* for 21 to 50.

   5.2.4. $~~200~~ *$300* for 51 to 100.

   5.2.5. $~~300~~ *$450* for 101 to 150.

   5.2.6. $~~400~~ *$600* for 151 to 200.

   5.2.7. $~~500~~ *$750* for 201 or more.

   Exception: Annual compliance inspection fees for any *building* or groups of *buildings* on the same site may not exceed $2500.

6. Registered complaints.

   6.1. No charge for first visit (initial complaint), and if violations are found.

   6.2. $~~51~~ *$75* per hour for each State Fire Marshal's office staff for all subsequent visits.

7. *Bonfires* (small and large) on state-owned property.

   7.1. For a small *bonfire* pile with a total fuel area more than 3 feet (914 mm) in diameter and more than 2 feet (610 mm) in height, but not more than 9 feet (2743 mm) in diameter and not more than 6 feet (1829 mm) in height, the *permit* fee is $ ~~50~~ *$75*. If an application for a *bonfire permit* is received by the State Fire Marshal's office less than 15 days prior to the planned event, the *permit* fee shall be $~~100.~~ *$150.* If an application for a *bonfire permit* is received by the State Fire Marshal's office less than seven days prior to the planned event, the *permit* fee shall be $~~150.~~ *$300.*

   7.2. For a large *bonfire* pile with a total fuel area more than 9 feet (2743 mm) in diameter and more than 6 feet (1829 mm) in height, the *permit* fee is $~~150.~~ *$300.* If an application for a *bonfire permit* is received by the State Fire Marshal's office less than 15 days prior to the planned event, the *permit* fee shall be $~~300~~ *$450*. If an application for a *bonfire permit* is received by the State Fire Marshal's office less than seven days prior to the planned event, the *permit* fee shall be $~~450.~~ *$600.*

Reason Statement:

While conducting research on fee revenue for the State Fire Marshal's Office, which was mandated by the Virginia General Assembly via the 2025 state budget, Virginia Department of Fire Programs (VDFP) staff identified a significant deficit in the SFMO inspection program.

This report will be publicly released soon and should include joint recommendations between the Board of Housing and Community Development and the Virginia Fire Services Board. This deficit has forced the SFMO to operate with vacant positions in order to stay within its operating budget. The fees provided in 107.12 have remained unchanged since 2009, which is a major factor in creating this deficit. While the hourly fees for fireworks, blasting agents, and explosives were not directly addressed by the research, they likewise have not been updated since 2009 and are subject to the same inflationary forces as the fees the research did examine. The cumulative rate of inflation per the Consumer Price Index (CPI) for that time period, for example, is 50.58% according to the United States Department of Labor. Additionally, since 2009, several factors have led to increased costs by SFMO. These costs include vehicle costs, salaries, and technological costs. Inflation has increased cost of living adjustments to salaries and prices paid for services such as software subscriptions. Continuous supply-side shocks in the past few years have kept vehicle costs high on top of inflationary pressures. All of these factors contribute to the deficit. This proposal would adjust fees from their current 2009-era levels in accordance with the CPI to help alleviate this deficit.

The proposed fees are based on current fees adjusted for the cumulative CPI increase from 2009 to present. These increases would reduce the SFMO inspection program deficit and allow the office to fill vacant positions, increasing fire safety in the localities in which the SFMO serves as the authority for enforcing the SFPC. Currently, the SFMO holds liability for all provisions of the Statewide Fire Prevention Code on all state property, 63 counties, 130 towns, and 6 cities in the Commonwealth.

Cost Impact: The code change proposal will increase the cost

The code change proposal will result in cost increases. It should be noted that local fire marshals, who have the ability to adjust their fees on an annual basis, already may charge more for these inspections than the SFMO currently does. For example, the base rate for fireworks/pyrotechnics/flame effects permits are $1000 for Stafford County and $450 for the City of Virginia Beach.

FP107.12-24

SFPC: 107.12

Proponents: Greg Cavalli, representing Virginia Department of Fire Programs (gregory.cavalli@vdfp.virginia.gov); Billy Hux, representing Virginia Department of Fire Programs (billy.hux@vdfp.virginia.gov)

2021 Virginia Statewide Fire Prevention Code

Revise as follows:

107.12 State annual compliance inspection fees. Fees for compliance inspections performed by the State Fire Marshal's office shall be as follows:

1. Nightclubs.
   1.1. $350 for occupant load of 100 or less.
   1.2. $450 for occupant load of 101 to 200.
   1.3. $500 for occupant load of 201 to 300.
   1.4. $500 plus $50 for each 100 occupants where occupant loads exceed 300.
2. Private college dormitories with or without assembly areas. If containing assembly areas, such assembly areas are not included in the computation of square footage.
   2.1. $150 for 3,500 square feet (325 m^2) or less.
   2.2. $200 for greater than 3,500 square feet (325 m^2) up to 7,000 square feet (650 m^2).
   2.3. $250 for greater than 7,000 square feet (650 m^2) up to 10,000 square feet (929 m^2).
   2.4. $250 plus $50 for each additional 3,000 square feet (279 m^2) where square footage exceeds 10,000 square feet (929 m^2).
3. Assembly areas that are part of private college dormitories.
   3.1. $50 for 10,000 square feet (929 m^2) or less provided the assembly area is within or attached to a dormitory *building*.
   3.2. $100 for greater than 10,000 square feet (929 m^2) up to 25,000 square feet (2323 m^2) provided the assembly area is within or attached to a dormitory *building*, such as gymnasiums, auditoriums or cafeterias.
   3.3. $100 for up to 25,000 square feet (2323 m^2) provided the assembly area is in a separate or separate *buildings* such as gymnasiums, auditoriums or cafeterias.
   3.4. $150 for greater than 25,000 square feet (2323 m^2) for assembly areas within or attached to a dormitory *building* or in a separate or separate *buildings* such as gymnasiums, auditoriums or cafeterias.
4. Hospitals.
   4.1. $300 for 1 to 50 beds.
   4.2. $400 for 51 to 100 beds.
   4.3. $500 for 101 to 150 beds.
   4.4. $600 for 151 to 200 beds.
   4.5. $600 plus $100 for each additional 100 beds where the number of beds exceeds 200.

5. *State-Regulated Care Facilities*:

5.1 Facilities licensed by the Virginia Department of Social Services based on licensed capacity as follows:

5.1.1. $50 for 1 to 8.

5.1.2. $75 for 9 to 20.

5.1.3. $100 for 21 to 50.

5.1.4. $200 for 51 to 100.

5.1.5. $300 for 101 to 150.

5.1.6. $400 for 151 to 200.

5.1.7. $500 for 201 or more.

Exception: Annual compliance inspection fees for any *building* or groups of *buildings* on the same site may not exceed $2500.

5.2 Family Day Homes licensed by the Department of Education based on licensed capacity as follows:

5.2.1. $50 for 1 to 8.

5.2.2. $75 for 9 to 20.

5.2.3. $100 for 21 to 50.

5.2.4. $200 for 51 to 100.

5.2.5. $300 for 101 to 150.

5.2.6. $400 for 151 to 200.

5.2.7. $500 for 201 or more.

Exception: Annual compliance inspection fees for any *building* or groups of *buildings* on the same site may not exceed $2500.

6. Registered complaints.

6.1. No charge for first visit (initial complaint), and if violations are found.

6.2. $51 per hour for each State Fire Marshal's office staff for all subsequent visits.

7. *Bonfires* (small and large) on state-owned property.

7.1. For a small *bonfire* pile with a total fuel area more than 3 feet (914 mm) in diameter and more than 2 feet (610 mm) in height, but not more than 9 feet (2743 mm) in diameter and not more than 6 feet (1829 mm) in height, the *permit* fee is $50. If an application for a *bonfire permit* is received by the State Fire Marshal's office less than 15 days prior to the planned event, the *permit* fee shall be $100. If an application for a *bonfire permit* is received by the State Fire Marshal's office less than seven days prior to the planned event, the *permit* fee shall be $150.

7.2. For a large *bonfire* pile with a total fuel area more than 9 feet (2743 mm) in diameter and more than 6 feet (1829 mm) in height, the *permit* fee is $150. If an application for a *bonfire permit* is received by the State Fire Marshal's office less than 15 days prior to the planned event, the *permit* fee shall be $300. If an application for a *bonfire permit* is received by the State Fire Marshal's office less than seven days prior to the planned event, the *permit* fee shall be $450.

8. General fire code inspection: $250.

9. Re-inspection: $200.

10. Retail sale of 1.4G Virginia Permissible Fireworks - permanent and temporary facilities:

    10.1. 45-day permit: $350.

    10.2. 365-day permit: $750.

11. Mobile food preparation vehicle: $200.

Reason Statement:

While conducting research on fee revenue for the State Fire Marshal's Office, which was mandated by the Virginia General Assembly via the 2025 state budget, Virginia Department of Fire Programs (VDFP) staff identified a significant deficit in the SFMO inspection program. This report will be publicly released soon and should include joint recommendations between the Board of Housing and Community Development and the Virginia Fire Services Board. This deficit has forced the SFMO to operate with vacant positions in order to stay within its operating budget. Three categories of inspections account for over 95% of the deficit: general fire code inspections, re-inspections, and fireworks retailer inspections. Additionally, the SFMO has been tasked with the inspection of an increasing number of Mobile Food Preparation Vehicles as specified in Section 319 of the SFPC, an inspection type for which no fee exists under 107.12.

Since 2009, when the SFMO moved from the Department of Housing and Community Development to VDFP, several factors have led to increased costs by SFMO. These costs include vehicle costs, salaries, and technological costs. Inflation has increased cost of living adjustments to salaries and prices paid for services such as software subscriptions. Continuous supply-side shocks in recent years have kept vehicle costs high on top of inflationary pressures. The cumulative rate of inflation for that time period, per the Consumer Price Index, is 50.58% according to the United State Department of Labor.

Under 13VAC5-52-40 Section 104.2, the SFMO is responsible for enforcing the SFPC for all localities that choose not to adopt and enforce the code. Based on information collected for the report, the current fee schedule only allows the SFMO to conduct roughly two-thirds of its inspection duties, largely due to positions being held vacant in order to allow the office to operate within its budget. As the SFMO currently holds liability for all provisions of the Statewide Fire Prevention Code on all state property, in 63 counties, 130 towns, and 6 cities in the Commonwealth, the ability to fill vacant deputy fire marshal positions will increase fire safety in those localities. However, unlike those localities that do enforce the code locally, the SFMO is not able to charge fees in these common inspection categories. Adopting the proposed fees for these inspections would help address much of the deficit, allowing the office to fill vacant positions and better protect citizens of the Commonwealth.

Cost Impact: The code change proposal will increase the cost

The code change proposal will produce cost increases for these four inspection categories as the code currently does not allow the SFMO to charge fees in these areas. However, these fees are already being charged in some localities that enforce the SFPC and are not uncommon.

FP107.12.1-24

SFPC: 107.12.1 (New)

Proponents: Greg Cavalli, representing Virginia Department of Fire Programs (gregory.cavalli@vdfp.virginia.gov); Billy Hux, representing Virginia Department of Fire Programs (billy.hux@vdfp.virginia.gov)

2021 Virginia Statewide Fire Prevention Code

Add new text as follows:

107.12.1 Market based fee adjustment. Prior to the start of the code development cycle, the State Fire Marshal shall submit a report to the Board of Housing and Community Development. This report shall detail the number of inspections, by category, conducted in the period since the previous code development cycle, the revenues collected by the State Fire Marshal's Office through fees, and the costs of conducting the inspections. The Board shall consider the report and decide if a fee adjustment should be made based on the market costs of conducting the inspections. Should the Board decide not to adjust the fees, it will provide a written explanation to the State Fire Marshal's Office and the Virginia Fire Services Board that provides the reasons why it has decided against adjustment.

Reason Statement:

While conducting research on fee revenue for the State Fire Marshal's Office, which was mandated by the Virginia General Assembly via the 2025 state budget, Virginia Department of Fire Programs (VDFP) staff identified a significant deficit in the SFMO inspection program. This report will be publicly released soon and should include joint recommendations between the Board of Housing and Community Development and the Virginia Fire Services Board. This deficit has forced the SFMO to operate with vacant positions in order to stay within its operating budget. The fees provided in 107.12 have remained unchanged since 2009, which is a major factor in creating this deficit. Since 2009, several factors have led to increased costs by SFMO. These costs include vehicle costs, salaries, and technological costs. Inflation has increased cost of living adjustments to salaries and prices paid for services such as software subscriptions. Continuous supply-side shocks in the past few years have kept vehicle costs high on top of inflationary pressures. The cumulative rate of inflation for that time period, per the Consumer Price Index, is 50.58% according to the United State Department of Labor. This change would provide a needed mechanism for adjusting fees as the costs associated with providing inspections fluctuate.

The current fee schedule only allows the SFMO to conduct roughly two-thirds of its inspection duties, largely due to positions being held vacant in order to allow the office to operate within its budget. By generating more revenue from the inspection program, the SFMO would be able to fill at least some of the positions that are currently vacant. As the SFMO currently holds liability for all provisions of the Statewide Fire Prevention Code on all state property, 63 counties, 130 towns, and 6 cities in the Commonwealth, the ability to fill vacant deputy fire marshal positions will increase fire safety in those localities.

Cost Impact:

The code change proposal may cause cost increases down the line or possibly cost decreases, depending on the market and the costs of conducting inspections. Any cost increases would reflect the diminished purchasing power of the dollar as driven by increases in the Consumer Price Index. Fees in localities that appoint a local fire marshal may already be adjusted, as local fire marshals have the ability to request such adjustments from their local governing body on an annual basis. It should be noted that this will *not* resolve the deficit SFMO faces, as it only creates a mechanism for regular reporting to the Board of Housing and Community Development.

FP112.1-24

SFPC: 112.1, 112.5

Proponents: Eric Mays, representing Prince William County (emays@pwcgov.org)

2021 Virginia Statewide Fire Prevention Code

Revise as follows:

112.1 Local Board of Fire Prevention Code Appeals (LBFPCA). Each *local governing body* which enforces the SFPC shall have a *LBFPCA* to hear appeals as authorized herein or it shall enter into an agreement with the governing body of another county or municipality, with some other agency, or with a state agency approved by the *DHCD* to act on appeals. An appeal case decided by some other approved agency shall constitute an appeal in accordance with this section and shall be final unless appealed to the State Review Board. ~~Fees may be levied by the local governing body in order to defray the cost of such appeals.~~

112.5 Application for appeal. The *owner* of a structure, the owner's agent or any other person involved in the maintenance of the structure, or activity, may appeal a decision of the fire official concerning the application of the SFPC or the fire official's refusal to grant modification under Section 106.5 to the provisions of the SFPC. The appeal shall first lie to the *LBFPCA* and then to the State Review Board except that appeals concerning the application of the SFPC or refusal to grant modifications by the *State Fire Marshal* shall be made directly to the State Review Board. The appeal shall be submitted to the *LBFPCA* within 14 calendar days of the application of the SFPC. When the local governing body has established a fee for the filing of an appeal, the local enforcing agency shall establish a written policy for the process and methods of payments. The written request for appeal is not considered to be complete and filed until the fee is paid. The application shall contain the name and address of the *owner* of the structure and the person appealing if not the *owner*. A copy of the written decision of the fire official shall be submitted along with the application for appeal and maintained as part of the record. The application shall be stamped or otherwise marked by the *LBFPCA* to indicate the date received. Failure to submit an application for appeal within the time limit established by this section shall constitute acceptance of the fire official's decision.

> **Note:** In accordance with § 27-98 of the Code of Virginia, any local fire code may provide for an appeal to a local board of appeals. If no local board of appeals exists, the State Review Board shall hear appeals of any local fire code violation.

Reason Statement:

The Code Change Proposal is to clarify the requirements related to the timely filing of an appeal. The Virginia Construction Code requires appeals to be submitted within 30 days of the code official's decision and to be heard by the local appeals board within 30 days. The State Technical Review Board recently held a preliminary hearing to determine if an appeal was submitted in a timely manner. The appeal application fee was not paid until approximately 3 months after the filing of the written request to appeal; thereby delaying the appeal process. The current Code does not address any linkage between the appeal application and the payment of an appeal application fee. For consistency, the Code Change Proposal address the VCC, VRC, VMC and SFPC.

DHCD Staff Note: This code change proposal was initially submitted as part of proposal B119.5(1)-24. DHCD Staff split proposal B119.5(1)-24 into three separate proposals:

B119.5(1)-24: VCC portion of original proposal
FP112.1-24: SFPC portion of original proposal (this proposal)
PM107.5-24: VPMC portion of original proposal

Cost Impact: The code change proposal will not increase or decrease the cost
The code change provides an administrative clarification and does not impact cost.

FP112.5(1)-24

SFPC: 112.5

Proponents: DHCD staff on behalf of the State Building Code Technical Review Board (TRB); (sbco@dhcd.virginia.gov)

2021 Virginia Statewide Fire Prevention Code

Revise as follows:

112.5 Application for appeal. ~~The *owner* of a structure, the owner's agent or any other person involved in the maintenance of the structure, or activity, may appeal a decision of the fire official concerning the application of the SFPC or the fire official's refusal to grant modification under Section 106.5 to the provisions of the SFPC.~~ Any person aggrieved by the local enforcing agency's application of the SFPC or the refusal to grant a modification to the provisions of the SFPC may appeal to the LBFPCA. The appeal shall first lie to the *LBFPCA* and then to the State Review Board except that appeals concerning the application of the SFPC or refusal to grant modifications by the *State Fire Marshal* shall be made directly to the State Review Board. The appeal shall be submitted to the *LBFPCA* within 14 calendar days of the application of the SFPC. The application shall contain the name and address of the *owner* of the structure and the person appealing if not the *owner*. A copy of the written decision of the fire official shall be submitted along with the application for appeal and maintained as part of the record. The application shall be stamped or otherwise marked by the *LBFPCA* to indicate the date received. Failure to submit an application for appeal within the time limit established by this section shall constitute acceptance of the fire official's decision.
Exception: Any summons issued in accordance with 111.5 of this code are not eligible for appeal.

> **Note:** In accordance with § 27-98 of the Code of Virginia, any local fire code may provide for an appeal to a local board of appeals. If no local board of appeals exists, the State Review Board shall hear appeals of any local fire code violation.

Reason Statement: This proposal was submitted by DHCD staff on behalf of the State Building Code Technical Review Board (TRB). The purpose of the proposal is to have the language in the SFPC align with the language for similar provisions in the VCC and VPMC. The addition of the exception is consistent with the NOV notice of appeal in Section 111.5.

Cost Impact: The code change proposal will not increase or decrease the cost

This code change proposal will not increase or decrease the cost.

FP307.2-24

SFPC: 307.2

Proponents: John Miller, representing Virginia Department of Forestry (john.miller@dof.virginia.gov)

2021 Virginia Statewide Fire Prevention Code

Revise as follows:

307.2 Permit required. A permit shall be obtained from the *fire code official* in accordance with Section 107.2 prior to kindling a fire for recognized ~~silvicultural~~ or range or wildlife management practices, prevention or control of disease or pests, or a bonfire. Application for such approval shall only be presented by and permits issued to the *owner* of the land upon which the fire is to be kindled.

Reason Statement:

Deletes the word "Silvicultural" from section 307.2 thereby removing the requirement to obtain a permit prior to kindling a fire for recognized silvicultural purposes. Silvicultural fires are already extensively regulated under Virginia Code of Law 10.1-1142, and the added permit requirement here creates an undue burden on practitioners.

Additionally, the Commonwealth of Virginia provides additional regulations and guidance around the use of silvicultural or prescribed burns being accomplished by Certified Prescribed Burn Managers, as defined under Virginia Code of Law 10.1-1150.1. Again, the 307.2 permitting requirements add an additional unnecessary administrative step to the very extensive silvicultural fire planning requirements expected of Virginia Certified Prescribed Bun Managers.

Finally, there is a concern that in lieu of a consistent statewide permitting process, Virginia localities left to enforce this permitting requirement on their own will create a wide diversity of requirements and expectations across the Commonwealth, creating their own special challenges for silvicultural practitioners working to meet these requirements on an annual basis. Removal of the word "silviculture" from the section 307.2 code will eliminate the related challenges, while keeping the essence of the 307.2 permitting requirements intact.

The Virginia Department of Forestry reports that there is an average of 410 prescribed silvicultural burns annually, totaling more than 18,500 acres.

Cost Impact: The code change proposal will decrease the cost

The proposed code change significantly reduces the staff time and costs associated with administering a permit process for silvicultural fires. The proposed code change also reduces the time and costs incurred by the practitioners of silvicultural burning who must work to meet the new permitting requirements.

FP501.5-24

SFPC: 501.5 (New)

Proponents: Andrew Milliken, representing Stafford County Fire Marshal's Office (amilliken@staffordcountyva.gov)

2021 Virginia Statewide Fire Prevention Code

Add new text as follows:

501.5 Approval. It shall be unlawful to occupy or operate any portion of a building, structure, or premises unless the installation of the fire service features required by this chapter have been approved by the fire code official.

Reason Statement: Currently, Chapter 5 of the Virginia Statewide Fire Prevention Code requires a number of Fire Service Features (such as fire department access, water supply, etc.) to be provided as part of a new building, structure or premises. Although the plans for such features are required to be approved by the Fire Code Official (VSFPC 501.3), the installation of these features is not specifically required to be inspected or approved by the Fire Code Official prior to use or occupancy. This proposal adds a new section to clarify that the Fire Code Official must also approve the installation of required Fire Service Features.

Cost Impact: The code change proposal will not increase or decrease the cost

This code change proposal is to clarify that required Fire Service Features are to be approved by the Fire Code Official. There is no increase or decrease to the cost of construction or installation.

FP904.2.2.1-24

IFC: 904.2.2.1 (New)

Proponents: Lee Stoermer, representing Loudoun County Fire Rescue Fire Mashal Office (lee.stoermer@loudoun.gov)

2024 International Fire Code

Add new text as follows:

904.2.2.1 Approved plans commercial Type I hood. Commercial Type I hoods shall have a copy of the approved fire suppression plans from the AHJ and the approved plans shall be available at all times the commercial hood and/or cooking appliances located under the hood are in operation. Any deviation in the cook line/appliance location, under the hood, from the approved plans, or changes to the fire suppression system, may result in the suspension of cooking operations until the cook line and/or hood are restored to the approved configuration, or new plans are approved, and the system has been retested in accordance with the building code.

Reason Statement:

Justification

Restaurants and other commercial food preparation establishments often replace their cooking appliances or alter the cook line arrangement under the kitchen hood. It is imperative that the appliances remain in their approved locations, under their respective fire suppression nozzles, under the Type I hood. The Type I hood suppression systems are designed to protect specific appliances with specific nozzles, and there are requirements for nozzle angles or nozzle height over individual appliances. Altering appliance locations can easily render the fire suppression system ineffective. Having the approved plans immediately available at all times the cookline is in operation allows the fire inspector to determine if any changes were made that could adversely affect performance of the fire suppression system that creates a hazardous condition.

Cost Impact: The code change proposal will not increase or decrease the cost

COst should neither increase or decrease for those locations with an approved kitchen hood suppression system plan. THis requirement simply makes it the customers resposnbiility to maintain these records and have them availabel for review by the fire inspector when on site to collaborate the approved plan with the applicances and the hood system.

FP1208(1)-24

SFPC: 1208 (New), 1208.1 (New), 1208.2 (New), 1208.3 (New), 1208.4 (New), 1208.5 (New)

Proponents: Andrew Milliken, representing Stafford County Fire Marshal's Office (amilliken@staffordcountyva.gov)

2021 Virginia Statewide Fire Prevention Code

Add new text as follows:

1208
Electric Vehicle Charging Systems

1208.1 General. Where provided, electric vehicle charging systems shall be in accordance with this section.
Exception: Sections 1208.3 through 1208.5 shall not apply to electric vehicle charging systems located at one- and two-family dwellings.

1208.2 Operations and Maintenance. Where provided, electric vehicle charging systems shall be operated and maintained in accordance with the applicable building code, the listing and the manufacturer instructions.

1208.3 Emergency Disconnects and Shutoffs. Where provided, electric vehicle charging system electrical power disconnects, emergency disconnects and shutoffs shall be maintained in accordance with the applicable building code, the listing and the manufacturer instructions. Where electrical power disconnects, emergency disconnects or shutoffs are not provided and labeled at the electric vehicle charging system equipment, an approved sign or label shall be provided and maintained at the equipment to indicate the location of the electrical power disconnect for the electric vehicle charging system.

1208.4 Impact Protection. Where subject to motor vehicle impact or other physical damage, electric vehicle charging system equipment protection shall be provided and maintained in accordance with the applicable building code and section 312.

1208.5 Emergency Procedures. Emergency procedures shall be provided and maintained on an approved sign at an approved and conspicuous location at the charging station(s). The sign shall read:
IN CASE OF FIRE:

1.IF POSSIBLE, SHUT OFF AND UNPLUG THE VEHICLE

2.USE THE EV CHARGER EMERGENCY DISCONNECT

3.REPORT THE INCIDENT TO THE FIRE DEPARTMENT

FIRE DEPARTMENT PHONE NUMBER:__________

FACILITY ADDRESS: ________________________

Reason Statement:

This proposal builds on the consensus proposal FP1208 which provides operations and maintenance requirements for electric vehicle charging stations. Most of the sections in this proposal mirror the sections in FP1208 but this proposal is intended to provide additional clarifications and electrical power disconnect information. Section 1208.1 includes an exception to make it abundantly clear that the majority of this section does not apply to one- and two-family dwellings. Section 1208.2 adds language to ensure that requirements from the product listing or manufacturer's instructions are required to be followed. Section 1208.3 specifically addresses maintaining and identifying the location of the electrical power disconnect, emergency disconnect and any emergency shutoff when provided for this equipment. Section 1208.4 ensures that vehicle impact protection is consistent with the applicable building code and SFPC section 312. Finally, section 1208.5 provides revised wording to provide clear and consistent terminology. All of these requirements are needed to help address emerging fire safety concerns as identified in a recent Fire Protection Research Foundation reports.

https://www.nfpa.org/news-blogs-and-articles/blogs/2024/07/12/parking-garages-and-evs

Although the frequency of electric vehicle fires has not been shown to be significantly different than other vehicle fires, the impact of these fires to the fire service and ultimately the community is exponentially different. For example, where the water required to extinguish a traditional internal combustion engine vehicle fire is approximately 500 gallons typically from a single fire apparatus and concluded in about 30 minutes, the water needed for an electric vehicle fire is measured in thousands of gallons involving multiple apparatus for at least 60-90 minutes and often much more. If you haven't experienced a typical electric vehicle fire, the following video provides an excellent perspective on these types of incidents.

https://youtu.be/J0gRFIbsx1E

As the installation and use of electric vehicle charging stations continues to grow throughout Virginia, it is critical that fire safety concerns, particularly regarding identifying the location of the electrical power disconnect, be adequately addressed at the lowest possible cost.

Cost Impact: The code change proposal will increase the cost

Although minimal, this proposal does add a requirement for labeling/signage of the electrical power disconnects at electric vehicle charging stations as well as a sign for emergency procedures. The vehicle impact protection referenced, is a long-standing requirement of the National Electric Code so that is not an increased cost for this proposal. Also, except for the labeling/signage for the electrical power disconnects, all other requirements within this proposal are already consensus changes in proposal FP1208.

FP4106.1.3-24

SFPC: 4106.1.3 (New); IFC: SECTION 202 (New)

Proponents: Gerry Maiatico, County of Warren & Virginia Fire Prevention Association, representing Virginia Fire Prevention Association (gmaiatico@warrencountyfire.com)

2021 Virginia Statewide Fire Prevention Code

Add new text as follows:

4106.1.3 Mobility . Mobile food preparation vehicles shall be moveable, easily transported, or relocated without excessive effort. Mobile food preparation vehicles shall not be utilized as permanent structures by removing wheels, surrounded by decks/porches, permanently affixing to *utilities* or placing the mobile food preparation vehicle in such a manner as to prohibit the mobility of the device.
Exception: Mobile food preparation vehicles that have been modified or connected to *utilities* in accordance with the applicable building code.

2024 International Fire Code

Add new text as follows:

New Definition. Utilities. The essential services that enable a building, equipment or an appliance to function effectively.

Reason Statement:
Chapter 2 of the SFPC defines the MFPV as a "vehicles, covered trailers, carts, and enclosed trailers, **or other moveable devices"**. This provides the intent that a MFPV is intended to be moveable. Localities throughout the Commonwealth have experienced the MFPV being placed in a situation where the vehicle is no longer "movable". This has been discovered as the wheels being removed, placing the vehicle up on blocks, surrounding the vehicle with decks/porches and event attaching the vehicle to a buildings electrical system or plumbing systems in a permanent in nature arrangement.

This proposal also includes a definition of *utilities*. This mirrors a proposal submitted to the termination and reconnection of a utilities system.

This proposal provides an exception where the mobile food preparation vehicle arrangement and/or connection to utilities has been permitted and inspected in accordance with the applicable building code.

Cost Impact: The code change proposal will not increase or decrease the cost
No change

FP6112-24

SFPC: 6112 (New), 6112.1 (New), 6112.2 (New), 6112.3 (New), 6112.4 (New), 6112.4.1 (New), 6112.5 (New), 6112.6 (New), 6112.6.1 (New), 6112.6.2 (New), 6112.7 (New), 6112.7.1 (New), 6112.8 (New), 6112.9 (New), 6112.10 (New), 6112.10.1 (New), 6112.10.2 (New), 6112.11 (New), 6112.12 (New)

Proponents: Lee Stoermer, representing Loudoun County Fire Rescue Fire Mashal Office (lee.stoermer@loudoun.gov)

2021 Virginia Statewide Fire Prevention Code

Add new text as follows:

6112
LP Gas Vendor Requirements

6112.1 General. LP Gas marketers shall comply with sections 6112.1 through 6112.12

6112.2 Definition .
Uncontrolled Leak: An uncontrolled leak shall be defined as one that cannot be controlled with the closing of a valve that immediately stops the flow of product.

6112.3 Emergency Notifications - LP Gas Marketer:. Upon notification by a customer of a known or suspected gas leak, the LP Gas Marketer shall:
1.Instruct the customer to shut off propane container valve if safe to do so.

2.Instruct the customer to exit the home and move to a safe location outside or to a neighbor's home.

3.Instruct the customer to call 9-1-1 from a safe area for assistance.

4.Dispatch an appropriately qualified individual to provide skilled support to emergency services on site, as needed.

6112.4 LP Gas Marketer Onsite Responsibilities:. Upon arrival at the site of a leak, LP Gas Marketer Representative shall:
1. Meet with the incident commander and await assignment.

2. If emergency services were not notified determine if propane supply was shut off as instructed.

3. Perform an incident size up to determine if the reported leak has continued to create hazardous conditions.

4. If a leak has continued since initial notification of the marketer by the customer was not resolved by the closure of a valve on the tank or in the piping system, or an unsafe condition is identified while on site that could be immediately hazardous to life and health; call 9-1-1 for emergency services.

6112.4.1 Unsafe conditions. Unsafe conditions shall include suspicion of a flammable environment caused by the fuel gas, suspicion of concentrations of carbon monoxide or decreased levels of oxygen. Suspected leaks shall be determined by use of metering devices. *At no time shall a person's olfactory (sense of smell) be used as the measurement of a leak.*

6112.5 Notification of flaring operations. Any flaring operations that are being conducted at a location other than the LP-gas marketer's facility, shall require notification of the fire department for emergency operations, or when a non-emergent situation be approved by the Fire Code Official prior to the flaring operation.

6112.6 Customer Records. Individual records for each customer shall be maintained by the LP-gas marketer for the life of the customer's relationship plus 24 months. Records shall include records of actions taken upon report of odors or leaks communicated to the LP Gas marketer.

6112.6.1 Records Information Minimums. Records shall include at a minimum the date, time, customer's name, address of suspected leak, and the findings or resolution.

6112.6.2 Records accessibility. Records shall be made available for review upon request by the Fire Official. Records of maintenance and repairs shall be transferred to other marketers or service personnel when requested, including cathodic protection testing records.

6112.7 Notification for Unsafe Customer Owned Containers. Immediately of becoming aware of a customer owned LPG container that is no longer deemed suitable for continued service, the LP Gas marketer shall notify the Fire Official in writing if the customer refuses to remove the container from service.

6112.7.1 Notification Requirements of Unsafe Containers. Written notification shall include, at a minimum, the physical location (address) of the LPG container, type of LPG container (aboveground, underground, or mounded), size (gallonage) of LPG container, description of problem, and current volume (%) reading at time of suitability determination.

6112.8 LP-Gas Operational Status Verification. Where damage is noted to a container and/or appurtenances during inspection, further operations shall be stopped until operational status is confirmed and repairs completed. Emergency conditions (odor or leak) shall be reported using notifications as listed in 6112.3 and 6112.4, and documented as per 6112.6.

6112.9 Identification of Out-of-Service LP-Gas Containers. LP-gas containers that are deemed no longer suitable for continued service shall be clearly identified at the fill connection(s) by using out-of-service tags and/or a lock out/tag out system with hazard/danger tag; a copy of the out of-service tag shall be provided to the customer, and a copy of the out-of-service tag shall be maintained in accordance with section 6112.6. Containers deemed unsafe shall be reported in accordance with section 6112.7.

6112.10 Returning an LP-gas Container to service. All repairs shall be completed as per the applicable Code. All actions taken shall be documented and maintained in accordance with sections 6112.6 through 6112.6.2.

6112.10.1 Returning Containers to Service Documentation. When returning a container previously deemed no longer suitable for service to normal operation, actions taken shall be documented and maintained in accordance with sections 6112.6 through 6112.6.2.

6112.10.2 Returning Containers to Service Action. After returning to service, "Out of Service" tags shall be removed from the LP-gas container. Actions taken shall be documented and maintained in accordance with 6112.6 through 6112.6.2.

6112.11 Container pressure and leak testing. Following any empty LP-gas condition, no more than 5% of the tank's volume shall be filled until required leak and pressure testing is completed, per NFPA 58. Actions taken shall be documented and maintained in accordance with 6112.6 through 6112.6.2.

6112.12 LP-Gas Marketer Identification Labels. LP-Gas Marketer information shall be attached to the container, on the dome assembly or other conspicuous location. This information shall contain, at minimum, the marketer's name and a 24-hour emergency contact number. Identification labels shall be readily visible.

Reason Statement:

Reason statement:

2024 Virginia Statewide Fire Prevention Code

Chapter 61 Section 12 addition

On February 16th, 2024, in Loudoun County, Virginia, an explosion occurred as the result of a leak from a 500-gallon underground Liquified Petroleum Gas (LPG) storage tank. This explosion injured ten (10) first responders and resulted in the death of Firefighter Trevor Brown, from the Sterling Volunteer Fire Company (SVFC).

During the investigation it was identified that an LPG provider (retailer, vendor, distributor, maintenance/service provider, etc.) could become complacent with their knowledge of Fire Code requirements, to include tracking inspection, maintenance, and repair records, testing documents, and appropriately identifying an out-of-service or impaired LPG system

An independent, multijurisdictional committee completed an after-action report of this incident to identify respective education, training, and response recommendations to reduce the risk of similar types of events occurring in the future. A separate Fire Prevention Code Investigation was conducted that identified perceived gaps in existing Fire Codes, which should also be addressed to reduce associated risk to members of the community, members of the LPG industry, and first responders.

The new fire code sections presented here highlight issues identified during those investigations and are intended to reduce risk, strengthen requirements, and provide additional enforcement tools to support overall safety. While most LPG providers are already following these procedures, failure to consistently follow Fire Code requirements could result in another catastrophic explosion, injuries, or death.

These additions support a culture of safety and transparency which requires LPG providers to maintain appropriate service records and provide accurate information and documentation to customers; these actions allow access to vital information that can be shared with first responders in an emergency, and to the Fire Code Official when needed. While additional documentation may be required, respective effort and personnel costs associated with time or labor should be minimal. LPG providers should already be routinely utilizing leak detection equipment, so no additional costs should be expected; the multi-gas atmospheric monitoring requirements can be fulfilled by requesting assistance from fire and rescue resources if an LPG provider does not have access to multi-gas atmospheric monitoring equipment.

In closing, these recommendations support the promise that was made to the family of Firefighter Trevor Brown (SVFC) to identify why the explosion occurred, and to take the steps necessary to help reduce the likelihood of similar events from occurring in the future so that his loss was not in vain.

Cost Impact: The code change proposal will not increase or decrease the cost

Costs associated with these code section changes should be minimal, if any, as these are items that vendors should already be performing if currently properly following NFPA 58 standards, as well as contacting emergency services for atmospheric monitoring if required during an emergency or uncontrolled leak situation.

Attached Files

- **Silver RIdge afteraction report doc link.pdf**
  https://va.cdpaccess.com/proposal/1365/1953/files/download/937/
- **LP Gas SFPC 2024 changes.pdf**
  https://va.cdpaccess.com/proposal/1365/1953/files/download/934/

Loudoun County Combined Fire and Rescue System

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Phone 703-777-0333

For Additional Information:
Laura Rinehart, Public Information Officer
Laura.Rinehart@loudoun.gov or 571-233-1649

Annemarie Antignano, Communications Specialist
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January 14, 2025
For Immediate Release:
Significant Incident Report on February 2024 Silver Ridge Explosion Released

The Loudoun County Combined Fire and Rescue System's (LC-CFRS) Significant Incident Report (SIR) is complete for the 2024 explosion in Sterling that resulted in the line of duty death of Firefighter Trevor Brown and injured thirteen others.

On February 16, 2024, LC-CFRS units were operating on the scene of a gas leak at 347 Silver Ridge Drive where their investigation identified an underground propane tank in the rear of the structure that was leaking. Firefighters immediately upgraded the call, requesting a Hazardous Materials Team, and evacuated the residents from the home. Shortly thereafter, a catastrophic explosion occurred, leveling the home and trapping several firefighters in the burning debris. Two firefighters had to be rescued by Rapid Intervention Teams after they were unable to escape. Tragically, ten first responders were significantly injured, two civilians received minor injuries, and Firefighter Trevor Brown lost his life.

Immediately following the incident, System Chief Keith Johnson established a Significant Incident Team (SIT) led by Chief Thomas Coe of Frederick County, Maryland, Division of Fire and Rescue Services, and consisting of fourteen internal and external stakeholders and subject matter experts. The objective of the SIT was to gather and assess all available information regarding the incident, identifying both strengths and weaknesses in adherence to local and regional operational protocols. The Significant Incident Report (SIR) developed by the SIT contains a comprehensive review and analysis of factors, actions, and other items surrounding this incident and recommendations aimed at enhancing future response efforts in a safe and efficient manner.

The following concepts highlight the challenges faced by first responders in this rapidly evolving incident and the factors that contributed to the sequence of events that occurred:

- **Risk Assessment:** Key indicators were not fully understood during the initial and on-going size-ups, which compromised the safety of on-scene personnel.
- **Event Escalation:** The incident escalated from a routine outside gas leak call to a catastrophic explosion, catching responders off guard.
- **Communication Challenges:** There were delays in relaying critical information and confusion regarding mayday calls, which impacted the effectiveness of response efforts.
- **Resource Allocation:** There were issues with resource allocation and coordination, particularly ensuring an adequate water supply and managing the rescue operation of trapped personnel.

- **Command Structure:** The Command structure faced challenges in managing the complex and rapidly evolving situation, leading to difficulties in coordinating rescue efforts, patient treatment/transport, and ensuring scene accountability.

The SIT also determined key factors that favorably impacted incident outcomes. These findings include:

- **Training:** LC-CFRS requires firefighter mayday training as part of the Firefighter I and II curriculum that contributed to positive outcomes for the first responders trapped in the explosion. Prior to the incident, telecommunicators from the Loudoun County Fire and Rescue Emergency Communications Center (LCFR-ECC) participated in mayday training that helped prepare them for the intricacies of firefighter rescue operations.
- **LCFR-ECC Management and Coordination:** The LCFR-ECC staff worked diligently to manage and track radio communications throughout the incident and ensured the Incident Commander was provided with the information in a timely manner.
- **Technical Rescue Expertise:** Two technical rescue units, one from Loudoun County's Kincora Station and the other from Fairfax County's North Point Station, arrived quickly and used their extensive training to rapidly develop a victim removal plan and executed that plan in a coordinated effort.
- **Behavioral Health Response**: The emotional and mental well-being of LC-CFRS members was a high priority during and after the Silver Ridge Drive Incident. As responders were released from the scene, they were directed to a central location where peer support team members, clinicians, and canines were available for support. The LC-CFRS Behavioral Health Team remains engaged and ready to assist our personnel.

In summary, the completed SIR underscores the need for continuous improvement in emergency response protocols, training, and communication strategies to mitigate risks and enhance the safety of responders in high-pressure situations. By implementing the recommendations outlined in this report, LC-CFRS members can better prepare for, and respond to, similar incidents in the future, ultimately saving lives and safeguarding communities. In the coming months, LC-CFRS leadership will work to identify resources and opportunities utilizing recommendations from this report to develop additional training and establish priorities and focus areas for further improvements.

A criminal case remains open after charges were filed against an employee of the gas company that filled the propane tank belonging to the residents of 347 Silver Ridge Drive. On Monday, October 21, 2024, findings from the Loudoun County Fire and Rescue Fire Marshal's Office (LCFR-FMO) investigation were presented to a Loudoun County Circuit Court Grand Jury, resulting in the indictment of Roger Bentley, a former employee of Southern States Cooperative, Inc. – Leesburg – Fairfax Petroleum Service's (Southern States) on various charges related to the incident. The Loudoun County Commonwealth Attorney's Office continues working with LCFR-FMO as they prepare for the upcoming criminal trial. All previously issued press releases regarding the Silver Ridge Drive incident can be found on the official LCFR website.

The completed SIR and Recommendations Matrix are available on the Significant Incident Reviews page of our website, along with a link to the previously issued press releases regarding the Silver Ridge Drive incident.

###

Proposed by: Micah Kiger via Lee Stoermer July 2025
Loudoun County Fire Rescue Fire Marshal Office

SECTION 6112
LP-Gas Vendor Requirements

6112.1 Emergency Notifications Required.
Any report of an uncontrolled leak or undetermined source of an LPG odor that is reported directly to an LP-gas vendor shall be reported to immediately the local fire department or 911.

6112.1.1 Emergency Notifications Required
All reports of an odor or leak shall be documented and maintained within the customer's record, and shall be available for review by the Fire Official upon request. This record should include at a minimum the date, time, caller's name, address of suspected leak, phone number, and a description of the problem/complaint along with resolution. Records shall be maintained for the life of the LP-gas container.

6112.2 Notification of flaring operations.
Any flaring operations that are being conducted at a location other than at the LP-gas vendor's facility, shall be approved by the Fire Code Official prior to the flaring operation.

6112.3 Customer Records.
Individual records for each customer shall be maintained by the LP-gas vendor for the life of the customer's LP-gas container of any fixed site LPG tank. If a customer transfers LP-gas service to another vendor, customer records shall be transferred upon request to the new LP-gas vendor. This shall apply to all ASME aboveground LP-gas storage containers and ASME underground or mounded LP-gas storage containers. Records shall be maintained as hard copy or electronically. Records shall be available for review by the Fire Official upon request. **Customer files shall, at a minimum, include container data plate information, installation date, inspection records, maintenance records, testing records, and transfer history.

6112.4 Notification for Impaired or Out-of-Service LP-gas Containers.
Within 7 days of becoming aware of an impaired or out-of-service LPG container, the LPG Company shall notify the Fire Official in writing or through IROL if available in that jurisdiction. Information shall include physical location (address) of the LPG container, type of LPG container (aboveground, underground, or mounded), size (gallonage) of LPG container, description of problem, testing records, and current volume (%) reading at time of discovery.

6112.4.1 LP-Gas Operational Status Verification
Where damage is noted to a container and/or appurtenances during inspection, further operations shall be stopped until operational status is confirmed. Emergency conditions (odor or leak) shall be reported using notifications as listed in 6112.1.

6112.4.2 Identification of Out-of-Service LP-Gas Containers

LP-gas containers that are impaired or out-of-service shall be clearly identified at the fill connection(s) by using out-of-service tags and/or a lock out/tag out system with hazard/danger tag; a copy of the out-of-service tag shall be provided to the customer, and a copy of the out-of-service tag shall be placed in the customer's file.

6112.4.3 Returning an LP-gas Container to service

Any repairs shall be completed as per the applicable Building Code. When returning an out-of-service container to normal operation, the operational status shall be approved by no less than two (2) qualified personnel that agree the service is completed properly. Out of Service tags shall be removed from the LP-gas container and all repair/maintenance performed shall be documented and provided to the customer; documentation shall be completed within the customer's file after the LP-gas container is returned to normal operational status. Copies of these documents shall be forwarded to the Fire Official.

6112.5 Cathodic Testing.

Cathodic testing shall follow NFPA 58 Liquified Petroleum Gas Code. Records of cathodic protection testing shall be maintained by the LP-gas vendor and be available for review by the Fire Official upon request.

6112.6 Atmospheric Monitoring Requirements.

Anytime an LP gas vendor is investigating a gas odor or gas leak emergency involving an underground LP-gas container or an aboveground LP-gas container, atmospheric monitoring (metering) devices shall be utilized to ensure a safe working environment and for identifying a safe area for workers, emergency service personnel, and the community.

6112.6.1 Atmospheric Monitoring

Combustible gas instruments ("CGI's") may be used to help pinpoint the source of a leak, however, an atmospheric monitoring device capable of identifying the following shall also be utilized: Oxygen (%), Hydrogen Sulfide (PPM), Carbon Monoxide (PPM), and Lower Explosive Limit (LEL) of LPG (%).

6112.7 Container pressure and leak testing.

Following any empty LP-gas condition, no more than 5% of the tank's volume shall be filled until required leak and pressure testing is complete, per NFPA 58.

6112.8 LP-gas vendor identification labels.

LP-gas vendor information shall be attached to the container, on the dome assembly or other conspicuous location. This information shall contain the vendor's name and a 24-hour emergency contact number. Identification labels shall be readily visible.

E2701.1.1-24

VCC: 2701.1.1

Proponents: Eric Mays, representing Prince William County (emays@pwcgov.org)

2021 Virginia Construction Code

Revise as follows:

2701.1.1 Changes to NFPA 70. The following changes shall be made to NFPA 70 :

1. Change Sections 334.10(2) and 334.10(3) of NFPA 70 to read:

   (2) Multifamily dwellings not exceeding four floors above grade and multifamily dwellings of any height permitted to be of Types III, IV and V construction except in any case as prohibited in 334.12.

   (3) Other structures not exceeding four floors above grade and other structures of any height permitted to be of Types III, IV and V construction except in any case as prohibited in 334.12. In structures exceeding four floors above grade, cables shall be concealed within walls, floors or ceilings that provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.

   For the purpose of Items 2 and 3 above, the first floor of a *building* shall be that floor that has 50 percent or more of the exterior wall surface area level with or above finished grade. One additional level that is the first level and not designed for human habitation and used only for vehicle parking, storage or similar use shall be permitted.

2. Change Section 700.12(F)(2)(6) of NFPA 70 to read:

   (6) Where the normal power branch circuits that supply luminaires providing illumination immediately on the inside and outside of exit doors are supplied by the same service or feeder, the remote heads providing emergency illumination for the exterior of an exit door shall be permitted to be supplied by the unit *equipment* serving the area immediately inside the exit door.

3. Delete Section 210.8(F) in its entirety.

4. Change Section 210.52.(C)(2) of NFPA 70 to read:

(2) Island and Peninsular Countertops and Work Surfaces. Receptacle outlets shall be installed in accordance with 210.52(C)(3).

Reason Statement:

The core principle of the Virginia Uniform Statewide Building Code is minimum safety at minimum cost. Article 210.52(C)(2) of the 2023 National Electrical Code does not adhere to this core principle. Specifically, the 2023 NEC introduces permissive language that reduces long-term safety by inducing the use of electrical extension cords and promoting future unpermitted electrical work. Additionally, it will be significantly more expensive to install code-compliant receptacle outlets to serve island and peninsular countertops and work surfaces after the original completion of construction.

One should not minimize the historical significance of NFPA's decision. The Consumer Product Safety Act was passed in 1972, which led to the creation of the Consumer Product Safety Commission (CPSC). Amongst the CPSC's many initiatives, the CPSC started tracking injuries and fires associated with the use of electrical extension cords.

In 1990, the CPSC issued a Press Release titled, "*Limit Extension Cords To Reduce Risk Of Fire*." [https://www.cpsc.gov/Newsroom/News-Releases/1990/Limit-Extension-Cords-To-Reduce-Risk-Of-Fire] The release stated in part, "If you use a lot of extension cords in your home or apartment, government safety experts say doing away with as many cords as possible can improve the safety of your home. According to CPSC estimates, there are some 4,600 residential home fires each year associated with extension cords; these fires kill 70 persons and injure some 230 others annually. Apart from fires, another 2,200 shock-related injuries happen with extension cords every year."

Consistent with the CPSC's recommendation, the 1990 edition of the National Electrical Code (NFPA 70) was amended to include the requirements for providing receptacles for island and peninsular countertops and work surfaces to prevent the use of extension cords. The requirements were first enforced in Virginia through the 1992 edition of the CABO One and Two Family Dwelling Code.

NFPA's decision to make the installation of receptacle outlets on island and peninsular countertops and work surfaces optional is an aberration. Residential receptacle outlet spacing and GFCI and AFCI protection are not optional. Why would NFPA set aside 35 years of precedence and support the use of electrical extension cords, promote future unpermitted electrical work, and incur higher future costs for owners?

Most importantly, why would Virginia follow NFPA's current direction?

(NOTE: This Code change to the 2023 NEC is a companion change to the Code change to the 2024 VRC, titled RE3901.4.2-24.)

Cost Impact: The code change proposal will decrease the cost

The code change will decrease the cost by preventing fires and tripping hazards created by extension cords. Additionally, the code change will prevent future occupants from paying the increased cost of installing a code-compliant receptacle outlet after construction is completed. Lastly, cost will be decreased by preventing noncompliant unpermitted potentially hazardous electrical work being installed in the future (i.e., receptacle outlet below the counter edge).

E2701.1.1(1)-24

VCC: CHAPTER 27, SECTION 2701, 2701.1.1

Proponents: Andrew Clark, representing Home Builders Association of Virginia (aclark@hbav.com)

2021 Virginia Construction Code

CHAPTER 27
ELECTRICAL

SECTION 2701
GENERAL

Revise as follows:

2701.1.1 Changes to NFPA 70. The following changes shall be made to NFPA 70 :

1. Change Sections 334.10(2) and 334.10(3) of NFPA 70 to read:

   (2) Multifamily dwellings not exceeding four floors above grade and multifamily dwellings of any height permitted to be of Types III, IV and V construction except in any case as prohibited in 334.12.

   (3) Other structures not exceeding four floors above grade and other structures of any height permitted to be of Types III, IV and V construction except in any case as prohibited in 334.12. In structures exceeding four floors above grade, cables shall be concealed within walls, floors or ceilings that provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.

   For the purpose of Items 2 and 3 above, the first floor of a *building* shall be that floor that has 50 percent or more of the exterior wall surface area level with or above finished grade. One additional level that is the first level and not designed for human habitation and used only for vehicle parking, storage or similar use shall be permitted.

2. Change Section 700.12(F)(2)(6) of NFPA 70 to read:

   (6) Where the normal power branch circuits that supply luminaires providing illumination immediately on the inside and outside of exit doors are supplied by the same service or feeder, the remote heads providing emergency illumination for the exterior of an exit door shall be permitted to be supplied by the unit *equipment* serving the area immediately inside the exit door.

3. Delete Section 210.8(F) in its entirety.

4. <u>Change Section 210.8(A)(5) to read:</u>

<u>(5)</u>	<u>Unfinished portions or areas of the basement not intended as habitable rooms</u>

Reason Statement:

This amendment removes the blanket requirement for all basement receptacles to be GFCI-protected, restoring the previous limitation to unfinished portions of basements. Prior to the 2020 NEC, GFCI protection was required only in unfinished basement areas. The 2020 expansion to all basement areas was adopted without substantiation of field incidents or documented hazards in finished basements that would justify the change.

Finished basements are typically conditioned, enclosed, and protected from dampness through current building code requirements and construction practices. They do not present the same level of risk as unfinished areas where occupants may use portable equipment in contact with grounded surfaces. Extending GFCI requirements to all finished basement areas—where no plumbing fixtures, laundry facilities, or similar hazards are present—provides no demonstrated safety benefit and imposes unnecessary cost and complexity on new construction and renovation projects.

The original rationale cited by the code panel—that “basements, whether finished or unfinished, are prone to moisture including flooding”—does not reflect current building code and regulatory standards. Modern construction requirements under the International Residential Code (IRC) and National Flood Insurance Program (NFIP) prohibit or tightly restrict basements below the design flood elevation and require waterproofing systems, drain tile, and vapor barriers that significantly reduce moisture intrusion. Electrical components located below the design flood elevation must also be installed or protected to prevent water entry or accumulation. These provisions collectively mitigate the moisture hazards once associated with older basements.

For more than three decades, the NEC’s prior approach—limiting GFCI protection to unfinished basement areas—proved effective and commensurate with actual risk. The absence of data showing increased shock incidents in finished basements underscores that the expansion was unnecessary. Several jurisdictions, including Oregon and Utah, have already reverted to this approach, and South Carolina exempts finished walk-out basements from full GFCI coverage where no other provisions apply.

This amendment aligns the NEC with long-standing, evidence-based safety practice by maintaining GFCI protection where genuine hazards exist while avoiding regulatory overreach in areas where conditions do not warrant it.

Cost Impact: The code change proposal will decrease the cost

This code change proposal will result in a modest reduction in the cost of construction.

RE3601.8-24

IRC: E3601.8, E3601.6.2

Proponents: Corian Carney, York County, representing Virginia Chapter IAEI, Eastern Virginia Division IAEI (corian.carney@yorkcounty.gov); Charles Stiles, Spotsylvania County, representing VA Chapter IAEI (cstiles@spotsylvania.va.us); Ryan Celestino, City of Newport News, representing VA Chapter IAEI (celestinore@nnva.gov); Joseph Willis, Prince William County, representing Virginia Chapter IAEI (jwillis@pwcgov.org)

2024 International Residential Code

Delete without substitution:

~~**E3601.8 Emergency disconnects.** For one- and two-family *dwelling units*, all service conductors shall terminate in disconnecting means having a short-circuit current rating equal to or greater than the available fault current, installed in a readily accessible outdoor location. If more than one disconnect is provided, they shall be grouped. Each disconnect shall be one of the following:~~

1. ~~Service disconnects marked as follows: EMERGENCY DISCONNECT, SERVICE DISCONNECT.~~
2. ~~Meter disconnect switches that have a short-circuit current rating equal to or greater than the available fault current and all metal housings and service enclosures are grounded in accordance with Section E3908.7 and bonded in accordance with Section E3609. A meter disconnect switch shall be capable of interrupting the load served and shall be marked as follows: EMERGENCY DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT.~~
3. ~~Other *listed* disconnect switches or circuit breakers that are marked suitable for use as service equipment, but not marked as suitable only for use as service equipment and marked as follows: EMERGENCY DISCONNECT, NOT SERVICE EQUIPMENT.~~

~~Markings shall comply with Section E3404.12 and both of the following:~~

1. ~~The marking or labels shall be located on the outside front of the disconnect enclosure with red background and white text.~~
2. ~~The letters shall be at least $^{1}/_{2}$ inch (13mm) high. [230.82 (3), 230.85]~~

Revise as follows:

E3601.6.2 Service disconnect location. The service disconnecting means shall be installed ~~at~~ in a readily accessible ~~location either outside of a *building* or inside nearest the point of entrance of the service conductors.~~ outdoor location in accordance with one the following:

1. On the dwelling unit.
2. Within sight of the dwelling unit in accordance with E3405.8

Service disconnecting means shall not be installed in bathrooms. Each occupant shall have *access to* the disconnect serving the *dwelling unit* in which they reside. [230.70(A)(1)(2), 230.72(C)]

Reason Statement: The proposed regulations for the 2026 National Electrical Code remove the options for Emergency Disconnects from Article 230 (Services), and relocate them to Article 225 (Feeders). The language in the 2020 and 2023 National Electrical Code unintentionally contradicts intent in other code sections related to service conductors and grounding electrode system connection. Removal of this language from the 2024 Virginia Residential Code will allow Virginia to keep up with more current safety standards provided by the National Electrical Code, and eliminate confusion between contractors and building department staff.

Cost Impact: The code change proposal will decrease the cost

by eliminating potential for multiple disconnecting means being installed or from reworking of installations due to confusion or misinterpretation of the code language.

Attached Files

- **70_A2025_NEC_P10_FD_BallotFinal.pdf**
  https://va.cdpaccess.com/proposal/1259/1893/files/download/925/

First Revision No. 9155-NFPA 70-2024 [Section No. 230.70]

230.70 General.

Means shall be provided to disconnect all ungrounded conductors in a building or ~~other~~ structure from the service conductors.

(A) Service Disconnect Location.

~~The service disconnecting means~~ Service disconnects shall be installed in accordance with 230.70(A)(1), 230.70(A)(2) , 230.70(A)(3) , and 230.70(A)(4) .

(1) Readily Accessible Location.

~~The service disconnecting means~~ Service disconnects shall be installed at a readily accessible location either outside of a building or structure or inside nearest the point of entrance of the service conductors.

(2) One- and Two-Family Dwellings.

Service disconnects shall be installed in a readily accessible outdoor location on or within sight of the one- or two-family dwelling unit.

(3) Bathrooms.

Service disconnecting means shall not be installed in bathrooms.

(4) Remote Control.

~~Where a~~ If a remote- control device(s) is used to actuate the service ~~disconnecting means~~ disconnect , the service ~~disconnecting means~~ disconnect shall be located in accordance with 230.70(A)(1). Remote-control devices shall not be used as a service disconnect for one- and two-family dwellings.

(B) Service Disconnect Marking.

~~Each service disconnect shall be permanently marked to identify it as a service disconnect~~ Service disconnects shall be marked in accordance with 230.70(B)(1) and 230.70(B)(2) .

(1) Marking.

Service disconnects shall be marked as “SERVICE DISCONNECT” and the marking shall comply with 110.21(B) .

(2) One- and Two-Family Dwellings.

Service disconnects for one- and two-family dwellings shall be marked as follows:

EMERGENCY DISCONNECT, SERVICE DISCONNECT

Markings shall comply with 110.21(B) and both of the following:

(1) The markings shall be located on the outside front of the disconnect enclosure with a red background and white text.

(2) The letters shall be at least 13mm (½ in.) high.

(C) Suitable for Use.

~~Each service disconnecting means shall be suitable for the prevailing conditions.~~ Service equipment installed in hazardous (classified) locations shall comply with the hazardous location requirements.

(D) Identification of Other Source Disconnects.

Where equipment for disconnection of other energy source systems is not located adjacent to the service disconnect required by this section, a plaque or directory identifying the location of all equipment for disconnection of other energy sources shall be located adjacent to the service disconnect.

Informational Note: See 445.18 , 480.7 , 705.20 , and 706.15 for examples of other energy source system disconnection means.

(E) Replacement.

Replacement of service equipment for one- and two- family dwellings shall comply with 230.70(A) , 230.70(B) , and 230.70(C) .

Exception: If only meter sockets, service entrance conductors, or related raceways and fittings are replaced, the requirements of 230.70(A)(2) and 230.70(B)(2) shall not apply.

Supplemental Information

File Name	Description	Approved
70_NEC_CMP10_A2025NEC_230.70_FR9155.docx	For staff use only	
70_NEC_CMP10_A2025NEC_230.70_FR9155.docx	For prod use	

Submitter Information Verification

Committee: NEC-P10
Submittal Date: Thu Jan 25 15:02:03 EST 2024

Correlating Committee Actions

The correlating committee may override this FR with a First Correlating Revision or with a Committee Note

Create FCR or CN

Committee Statement

Committee Statement: Requirements related to emergency disconnects found in Section 230.85 of the NEC have caused confusion for the electrical industry since it was not clear what specific types of disconnects were allowed to meet the requirements. It was also unclear how to ensure the emergency disconnect equipment is protected from available fault current. In addition, there has been confusion when applying the requirements for grounding and bonding of Article 250 when an emergency disconnect is installed on the supply-side of a service disconnecting means. This First Revision in conjunction with other First Revisions to 230.82 and 230.85, do not delete requirements for emergency disconnects for one-and two family dwellings, rather the requirements are greatly simplified by requiring the service disconnecting means for the dwelling to be located at a readily accessible location on the outside of the dwelling. Such service disconnecting means will also serve as the emergency disconnect for one- and- two family dwellings. This change will resolve issues related to what type of equipment can be installed for the emergency disconnect, how grounding and bonding is required to be installed, and the issues related to available fault current are addressed by the fact that service equipment is required to have appropriate overcurrent protection.

The concerns of the submitter for Public Input 2191 have been addressed with the First Revision of 230.70. The specific marking is added to better align with the requirement in 230.70(B)(2).

Concerning Public Input 2512, removing the existing requirement does not change the requirements already specified in the NEC. Such existing text is unnecessary. The second sentence is retained as it’s considered to provide clarity.

Response Message: FR-9155-NFPA 70-2024

Public Input No. 2191-NFPA 70-2023 [Section No. 230.70(B)]

Public Input No. 2023-NFPA 70-2023 [Section No. 230.70(C)]

Public Input No. 2512-NFPA 70-2023 [Section No. 230.70(C)]

Public Input No. 2022-NFPA 70-2023 [Section No. 230.70(B)]

Public Input No. 2021-NFPA 70-2023 [Section No. 230.70(A)]

Public Input No. 2582-NFPA 70-2023 [Section No. 230.70(A)(1)]

Ballot Results

✔ **This item has passed ballot**

18 Eligible Voters
0 Not Returned
15 Affirmative All
3 Affirmative with Comments
0 Negative with Comments
0 Abstention

Affirmative All

Anderson, Jr., Richard P.

Arnold, Kevin S.

Blizard, Scott A.

Dawes, Anthony John

Dollar, Randy

Gomez, Adam Wesley Thomas

Hansen, Clint Lee

Lofton, II, Richard E.

Philips, Nathan

Pisani, Mark K.

Robey, Derrick

Schmidt, Alan

Sparks, III, Roy K.

Wingate, Mark W.

Zia, Danish

Affirmative with Comment

Ayer, Lawrence S.

List item (4) as presently written doesn't work. Just because a remote control device is used doesn't mean the disconnect should not be readily accessible. All service disconnects are readily accessible.

Koepke, Ed

No comment

Williams, David A.

The new requirements of 230.70(A)(2) uses the phrase "within sight". However, if the definition of "within sight" is deleted (since such definition includes requirements, which is a violation of the Style Manual) then a direct reference to 110.29 will be required for determining the maximum distance of 50 feet to still be considered within sight. For example, in 225.31(B) we added: "within sight of the building in accordance with 110.29." This section also needs the reference to 110.29.

First Revision No. 9179-NFPA 70-2024 [Section No. 230.85]

~~**230.85** Emergency Disconnects.~~

~~For one- and two-family dwelling units, an emergency disconnecting means shall be installed.~~

~~**(A)** General.~~

~~**(1)** Location.~~

~~The disconnecting means shall be installed in a readily accessible outdoor location on or within sight of the dwelling unit.~~

~~*Exception: Where the requirements of 225.41 are met, this section shall not apply.*~~

~~**(2)** Rating.~~

~~The disconnecting means shall have a short-circuit current rating equal to or greater than the available fault current.~~

~~**(3)** Grouping.~~

~~If more than one disconnecting means is provided, they shall be grouped.~~

~~**(B)** Disconnects.~~

~~Each disconnect shall be one of the following:~~

(0) ~~Service disconnect~~

(0) ~~A meter disconnect integral to the meter mounting equipment not marked as suitable only for use as service equipment installed in accordance with 230.82~~

(0) ~~Other listed disconnect switch or circuit breaker that is marked suitable for use as service equipment, but not marked as suitable only for use as service equipment, installed on the supply side of each service disconnect~~

> ~~Informational Note 1: Conductors between the emergency disconnect and the service disconnect in 230.85(2) and 230.85(3) are service conductors.~~

> ~~Informational Note 2: Equipment marked "Suitable only for use as service equipment" includes the factory marking "Service Disconnect".~~

~~**(C)** Replacement.~~

~~Where service equipment is replaced, all of the requirements of this section shall apply.~~

~~*Exception: Where only meter sockets, service entrance conductors, or related raceways and fittings are replaced, the requirements of this section shall not apply.*~~

~~**(D)** Identification of Other Isolation Disconnects.~~

~~Where equipment for isolation of other energy source systems is not located adjacent to the emergency disconnect required by this section, a plaque or directory identifying the location of all equipment for isolation of other energy sources shall be located adjacent to the disconnecting means required by this section.~~

> ~~Informational Note: See 445.18 , 480.7 , 705.20 , and 706.15 for examples of other energy source system isolation means.~~

~~**(E)** Marking.~~

~~**(1)** Marking Text.~~

~~The disconnecting means shall marked as follows:~~

(0) ~~Service disconnect~~

~~EMERGENCY DISCONNECT, SERVICE DISCONNECT~~

(0) ~~Meter disconnects installed in accordance with 230.82 (3) and marked as follows:~~

~~EMERGENCY DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT~~

(0) ~~Other listed disconnect switches or circuit breakers on the supply side of each service disconnect that are marked suitable for use as service equipment and marked as follows:~~

~~EMERGENCY DISCONNECT, NOT SERVICE EQUIPMENT~~

~~**(2)** Marking Location and Size.~~

~~Markings shall comply with 110.21(B) and both of the following:~~

(0) ~~The marking or labels shall be located on the outside front of the disconnect enclosure with red background and white text.~~

(0) ~~The letters shall be at least 13 mm (1⁄2 in.) high.~~

Submitter Information Verification

Committee: NEC-P10

Submittal Date: Thu Jan 25 16:00:42 EST 2024

Correlating Committee Actions

The correlating committee may override this FR with a First Correlating Revision or with a Committee Note

Create FCR or CN

Committee Statement

Committee Statement: In conjunction with the proposed First Revision to section 230.70, section 230.85 has been proposed to be deleted as emergency disconnects are now service disconnects.

Response Message: FR-9179-NFPA 70-2024

Public Input No. 2578-NFPA 70-2023 [Section No. 230.85]

Public Input No. 2583-NFPA 70-2023 [Section No. 230.85]

Public Input No. 3801-NFPA 70-2023 [Section No. 230.85]

Public Input No. 1925-NFPA 70-2023 [Sections 230.85, 230.85]

Public Input No. 4427-NFPA 70-2023 [Section No. 230.85(B)]

Ballot Results

✔ **This item has passed ballot**

18 Eligible Voters

0 Not Returned

17 Affirmative All

1 Affirmative with Comments
0 Negative with Comments
0 Abstention

Affirmative All

Anderson, Jr., Richard P.

Arnold, Kevin S.

Ayer, Lawrence S.

Blizard, Scott A.

Dawes, Anthony John

Dollar, Randy

Gomez, Adam Wesley Thomas

Hansen, Clint Lee

Lofton, II, Richard E.

Philips, Nathan

Pisani, Mark K.

Robey, Derrick

Schmidt, Alan

Sparks, III, Roy K.

Williams, David A.

Wingate, Mark W.

Zia, Danish

Affirmative with Comment

Koepke, Ed

No comment

RE3702.14-24

VRC: E3702.14

Proponents: Kyle Kratzer, Fairfax County, representing Fairfax County Land Development Services (kyle.kratzer@fairfaxcounty.gov)

2021 Virginia Residential Code

Revise as follows:

E3702.14 Branch-circuit requirement—summary. The requirements for circuits having two or more outlets, or receptacles, other than the receptacle circuits of Sections E3703.2, E3703.3 and E3703.4, are summarized in Table E3702.14. Branch circuits in *dwelling units* shall supply only loads within that *dwelling unit* or loads associated only with that *dwelling unit*. Branch circuits installed for the purpose of lighting, central alarm, signal, communications or other purposes for public or common areas of a two-family dwelling shall not be supplied from equipment that supplies an individual *dwelling unit*. (210.24 and 210.25)

Exception: Branch-circuits in a two-family dwelling that is constructed in accordance with Exception 3 of Section R302.3.

Reason Statement: This change clarifies that branch-circuits can be shared between a dwelling unit and its accessory dwelling unit (ADU). This change does not alter the requirement that each occupant shall have ready access to all overcurrent devices protecting the conductors supplying their dwelling unit. The revision aligns with amendments from the previous code cycle intended to reduce barriers to the creation of accessory dwelling units. By adding this exception, the provision removes ambiguity and promotes consistent interpretation and enforcement across jurisdictions.

Cost Impact: The code change proposal will decrease the cost

This change eliminates unnecessary separation requirements for dwelling units that can share common areas, means of egress, and utilities.

RE3901.4.2(1)-24

VCC: 2701.1.1; IRC: E3901.4.2, E3901.4.3

Proponents: Andrew Clark, representing Home Builders Association of Virginia (aclark@hbav.com)

2021 Virginia Construction Code

Revise as follows:

2701.1.1 Changes to NFPA 70. The following changes shall be made to NFPA 70 :

1. Change Sections 334.10(2) and 334.10(3) of NFPA 70 to read:

   (2) Multifamily dwellings not exceeding four floors above grade and multifamily dwellings of any height permitted to be of Types III, IV and V construction except in any case as prohibited in 334.12.

   (3) Other structures not exceeding four floors above grade and other structures of any height permitted to be of Types III, IV and V construction except in any case as prohibited in 334.12. In structures exceeding four floors above grade, cables shall be concealed within walls, floors or ceilings that provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.

   For the purpose of Items 2 and 3 above, the first floor of a *building* shall be that floor that has 50 percent or more of the exterior wall surface area level with or above finished grade. One additional level that is the first level and not designed for human habitation and used only for vehicle parking, storage or similar use shall be permitted.

2. Change Section 700.12(F)(2)(6) of NFPA 70 to read:

   (6) Where the normal power branch circuits that supply luminaires providing illumination immediately on the inside and outside of exit doors are supplied by the same service or feeder, the remote heads providing emergency illumination for the exterior of an exit door shall be permitted to be supplied by the unit *equipment* serving the area immediately inside the exit door.

3. Delete Section 210.8(F) in its entirety.

4. Change Section 210.52(C)(2) of NFPA 70 to read:

   Island and Peninsular Countertops and Work Surfaces. At least one receptacle shall be installed at each island and peninsular countertop space with a long dimension of 24 inches (610 mm) or greater and a short dimension of 12 inches (305 mm) or greater. A peninsular countertop is measured from the connected perpendicular wall.

5. Add exception to Section 210.52(C)(3) of NFPA 70 to read:

   Exception: To comply with the following conditions (1) and (2), receptacle outlets shall be permitted to be mounted not more than 12 inches (305 mm) below the countertop or work surface.

   (1) Construction for the physically impaired

   (2) On island and peninsular countertops or work surface where the surface is flat across its entire surface (no backsplashes, dividers, etc.) and there are no means, such as an overhead cabinet, to mount a receptacle within 20 inches (508 mm) above the countertop or work surface.

   Receptacles mounted below a countertop or work surface in accordance with this exception shall not be located where the countertop or work surface extends more than 6 inches (150 mm) beyond its support base.

2024 International Residential Code

Revise as follows:

E3901.4.2 Island and peninsular countertops and work surfaces. ~~Receptacle outlets, if installed to serve an island or peninsular countertop or work surface, shall be installed in accordance with Section E3901.4.3. If a receptacle outlet is not provided to serve an island or peninsular countertop or work surface, provisions shall be provided at the island or peninsula for future addition of a receptacle outlet to serve the island or peninsular countertop or work surface.~~ At least one receptacle shall be installed at each island and peninsular countertop space with a long dimension of 24 inches (610 mm) or greater and a short dimension of 12 inches (305 mm) or greater. A peninsular countertop is measured from the connected perpendicular wall.

E3901.4.3 Receptacle outlet location. Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks, or rangetops as covered in the exception to Section E3901.4.1, or appliances occupying assigned spaces shall not be considered as these required outlets. Required receptacle outlets shall be located in one or more of the following:

1. On or above, but not more than 20 inches (508 mm) above, the countertop or work surface.
2. In a countertop using receptacle outlet assemblies listed for the use in countertops.
3. In a work surface using receptacle outlet assemblies listed for use in work surfaces or listed for use in countertops. [210.52(C)(3)]

Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks, or rangetops as covered in E3901.4.1, Exception 1, or appliances occupying assigned spaces shall not be considered as these required outlets.

Exception: To comply with the following conditions (1) and (2), receptacle outlets shall be permitted to be mounted not more than 12 inches (305 mm) below the countertop or work surface. Receptacles mounted below a countertop or work surface in accordance with this exception shall not be located where the countertop or work surface extends more than 6 inches (150 mm) beyond its support base.

1. Construction for the physically impaired
2. On island and peninsular countertops or work surface where the surface is flat across its entire surface and there are no means to mount a receptacle within 20 inches (508 mm) above the countertop or work surface, such as an overhead cabinet

Reason Statement:

Summary of Changes: This proposal (i) removes the requirement for provisions for a future receptacle to be provided if no receptacle on the island or peninsula is installed, (ii) reinstates the 2017 Edition requirement for at least one receptacle at each island or peninsula, and (iii) restores the exception allowing receptacles to be installed below the countertop on qualifying islands and peninsulas, including those installed to meet accessibility requirements.

Reason Statement:

The proposed prohibition on receptacles below countertops on islands and peninsulas lacks sufficient justification. As a minimum code, the NEC should establish baseline requirements supported by clear evidence of necessity. While data from the U.S. Consumer Product Safety Commission was cited in support of this change, the available incident records do not specifically establish that receptacles positioned below island or peninsular countertops were the contributing factor in accidents. Additionally, there is insufficient evidence demonstrating that this proposed change will produce measurable safety benefits.User responsibility remains central to electrical appliance safety. Appliance manufacturers have implemented multiple safeguards to mitigate risks. Manufacturers of cooking appliances routinely include comprehensive warnings in instruction manuals, such as:

- "Close supervision is necessary when any appliance is used by or near children."
- "Do not let cord hang over the edge of table or counter or touch hot surfaces."
- "Use deep fryer only on a clean, dry, level, stable, and heat-resistant surface, away from countertop edge."
- "Close supervision is necessary when any appliance is used by or near children. Hot oil can cause serious and painful burns."

Beyond warnings, manufacturers have developed design innovations specifically addressing this concern. Magnetic cord connectors, which detach readily when pulled, provide effective protection across all applications, including environments with receptacles installed below countertops.

Furthermore, the proposed change carries limitations that diminish its intended effect. The provision applies only to receptacles installed "to serve" an island or peninsular countertop or work surface, as specified in 210.52(C)(4). Convenience receptacles installed at standard height (18 inches above finished floor) do not serve the work surface and therefore remain permissible. Additionally, because this requirement is located within Part III of Article 210 (Required Outlets, beginning at Section 210.50), it applies exclusively to required outlets. Supplemental outlets below countertops would continue to be permitted, further limiting the practical scope of this requirement.

The justification offered during the panel discussion—that post-construction receptacle installation in islands and peninsulas on slab-on-grade floors presents impracticable difficulties—warrants reconsideration. According to recent data, more than one-third of new single-family homes are constructed over basements or crawl spaces, providing practical access for future installation if needed. Imposing this requirement across all construction types may be unnecessarily restrictive.

Additional concerns relate to enforcement consistency. The language "provisions shall be provided" is sufficiently open-ended to generate varying interpretations among code officials, ranging from no additional requirements when subsurface access exists to the installation of complete powered circuits with electrical boxes. Requirements subject to interpretive discretion are frequently enforced more stringently than the intent suggests, potentially imposing unwarranted costs on homeowners.

The NEC undergoes frequent revisions, each introducing complexity and potential unintended consequences. Adoption of provisions that may require subsequent modification contributes to cumulative confusion among all code users and stakeholders.

Cost Impact: The code change proposal will decrease the cost

Code change proposal will decrease construction costs

M507.1-24

IMC®: 507.1

Proponents: Dennis Hart, Fairfax County, representing VPMIA/VBCOA (dennis.hart@fairfaxcounty.gov)

2024 International Mechanical Code

Revise as follows:

507.1 General. Commercial kitchen exhaust hoods shall comply with the requirements of this section. Hoods shall be Type I or II and shall be designed to capture and confine cooking vapors and residues. A Type I hood shall be installed at or above appliances in accordance with Section 507.2. A Type II hood shall be installed at or above *appliances* in accordance with Section 507.3. Where any cooking *appliance* under a single hood requires a Type I hood, a Type I hood shall be installed. Where a Type II hood is required, a Type I or Type II hood shall be installed.

Exceptions:

1. Factory-built commercial ~~cooking recirculating systems~~ exhaust hoods that are listed and *labeled* in accordance with UL 710 ~~B~~, and installed in accordance with Section 304.1, shall not be required to comply with Sections 507.1.5, 507.1.6, 507.2.3, 507.2.5, 507.2.8, 507.2.10 ~~,~~ ~~and~~ 507.3.1 <u>and 507.3.3</u>. ~~Spaces in which such systems are located shall be considered to be kitchens and shall be ventilated in accordance with Table 403.3.1.1. For the purpose of determining the floor area required to be ventilated, each individual *appliance* shall be considered as occupying not less than 100 square feet (9.3 m^2).~~

2. A hood shall not be required at or above any of the following:

   2\. 1. Factory-built commercial cooking recirculating systems *listed* and *labeled* in accordance with UL 710B, and installed in accordance with Section 304.1 . Spaces in which such systems are located shall be considered to be kitchens and shall be ventilated in accordance with Table 403.3.1.1. For the purpose of determining the floor area required to be ventilated, each individual *appliance* shall be considered as occupying not less than 100 square feet (9.3 m^2).

   2.2. Cooking *appliances* equipped with integral down-draft exhaust systems ~~are~~ *listed* and *labeled* for the application in accordance with NFPA 96.

   2.3. Smoker ovens with ~~the~~ integral exhaust systems ~~are~~ *listed* and tested for the application.

~~3.~~ <u>2.4</u> Ovens *listed* and *labeled* for use with wood fuel in accordance with UL 2162 and vented in accordance with the manufacturer's instructions.

~~4.~~ <u>2.5</u> An electric cooking *appliancelisted* and *labeled* in accordance with UL 197 for reduced grease emissions.

~~5.~~ <u>2.6</u> Commercial electric dishwashers incorporating a self-contained condensing system *listed* and *labeled* in accordance with UL 921.

~~6.~~ <u>2.7</u> Where the heat and moisture loads from dishwashers and *appliances* that produce heat or moisture and do not produce grease or smoke as a result of the cooking process are incorporated into the HVAC system design or into the design of a separate removal system. Spaces containing such cooking *appliances*that do not require Type II hoods shall be provided with exhaust at a rate of 0.70 cfm per square foot [0.00356 m^3/(s × m^2)]. For the purpose of determining the floor area required to be exhausted, each individual *appliance*that is not required to be installed under a Type II hood shall be considered as occupying not less than 100 square feet (9.3 m^2). Such additional square footage shall be provided with exhaust at a rate of 0.70 cfm per square foot [0.00356 m^3/(s × m^2)].

Reason Statement: This proposal is an editorial cleanup of code change proposals during the 2024 ICC code development cycle. It was always intended that exception 1 would remain as an exception for exhaust hoods listed labeld to UL 710, and not recirculating systems listed and labeled to UL 710B. The exception for the requirement of a type I hood in item 2 addresses UL 710B recirculating systems. This proposal corrects an oversight during the code development process and ensures that there is a path in the code to use a hood listed to UL 710. In addition, the numbering has been corrected to accuractly depict the intent of the proposal. There is identical language that has been moved to the consent agenda for the 2027 ICC code development cycle.

Cost Impact: The code change proposal will not increase or decrease the cost

This proposal is editorial in nature of codes that were approved during the 2024 ICC code development cycle. It does not add new requirements, only maintains the existing requirements in the 2021 mechanical code.

M1103.1(1)-24

IMC®: TABLE 1103.1

Proponents: Dennis Hart, Fairfax County, representing VPMIA/VBCOA (dennis.hart@fairfaxcounty.gov); Thomas Deary, representing AHRI (tdeary@ahrinet.org).

2024 International Mechanical Code

Revise as follows:

TABLE 1103.1 REFRIGERANT CLASSIFICATION, AMOUNT AND OEL

Portions of table not shown remain unchanged.

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANT SAFETY GROUP CLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE							(F) DEGREES OF HAZARD[a]
				RCL			LFL			OEL	
R-444A	zeotrope	R-32/152a/1234ze(E) (12.0/5.0/83.0)	A2L	~~5.1~~ 5.0	21,000	~~81~~ 80	19.9	82,000	~~324.8~~ 319.4	850	—
R-444B	zeotrope	R-32/152a/1234ze(E) (41.5/10.0/48.5)	A2L	4.3	23,000	~~69~~ 70	17.3	93,000	~~277.3~~ 278.1	930	—
R-445A	zeotrope	R-744/134a/1234ze(E) (6.0/9.0/85.0)	A2L	~~4.2~~ 5.4	16,000	~~67~~ 87	~~2.7~~ 21.6	63,000	347.4	930	—
R-446A	zeotrope	R-32/1234ze(E)/600 (68.0/29.0/3.0)	A2L	~~2.5~~ 3.7	~~16,000~~ 23,000	~~39~~ 59	~~13.5~~ 14.8	~~62,000~~ 93,000	~~217.4~~ 237.7	960	—
R-447A	zeotrope	R-32/125/1234ze(E) (68.0/3.5/28.5)	A2L	~~2.6~~ 5.2	~~16,000~~ 32,000	~~42~~ 83	~~18.9~~ 20.6	~~65,000~~ 128,000	~~303.5~~ 331.4	960	—
R-447B	zeotrope	R-32/125/1234ze(E) (68.0/8.0/24.0)	A2L	~~2.6~~ 4.8	~~16,000~~ 30,000	~~42~~ 78	~~20.6~~ 19.5	121,000	312.7	970	—
R-451A	zeotrope	R-1234yf/134a (89.8/10.2)	A2L	~~5.0~~ 5.3	18,000	81	~~20.3~~ 21.3	~~70,000~~ 74,000	~~326.6~~ 341.6	530	—
R-451B	zeotrope	R-1234yf/134a (88.8/11.2)	A2L	5.0	18,000	81	~~20.3~~ 21.3	~~70,000~~ 74,000	~~326.6~~ 341.6	530	—
R-454A	zeotrope	R-32/1234yf (35.0/65.0)	A2L	~~3.2~~ 4.4	~~16,000~~ 21,000	~~52~~ 70	~~18.3~~ 17.5	~~63,000~~ 84,000	~~293.9~~ 281.4	690	—
R-454B	zeotrope	R-32/1234yf (68.9/31.1)	A2L	~~3.1~~ 4.6	~~19,000~~ 29,000	~~49~~ 74	~~22.0~~ 18.5	~~77,000~~ 115,000	~~352.6~~ 296.8	850	—
R-454C	zeotrope	R-32/1234yf (21.5/78.5)	A2L	~~4.4~~ 4.6	19,000	~~71~~ 73	~~18.0~~ 18.2	~~62,000~~ 77,000	~~289.5~~ 291.7	620	—
R-455A	zeotrope	R-744/32/1234yf (3.0/21.5/75.5)	A2L	~~4.9~~ 6.8	~~22,000~~ 30,000	~~79~~ 108	26.9	118,000	432.1	650	—

For SI: 1 pound = 0.454 kg, 1 cubic foot = 0.0283 m^3.

a. Degrees of hazard are for health, fire, and reactivity, respectively, in accordance with NFPA 704.

b. Reduction to 1-0-0 is allowed if analysis satisfactory to the code official shows that the maximum concentration for a rupture or full loss of refrigerant charge would not exceed the IDLH, considering both the refrigerant quantity and room volume.

c. Class I ozone depleting substance; prohibited for new installations.

d. Occupational Exposure Limit based on the OSHA PEL, ACGIH TLV-TWA, the TERA WEEL or consistent value on a time-weighed average (TWA) basis (unless noted C for ceiling) for an 8 hr/d and 40 hr/wk.

Reason Statement:

This proposal updates Table 1103.1 in the 2024 IMC to correct errors in Refrigerant Concentration Limits (RCLs) and Lower Flammability Limits (LFLs) that were introduced from ASHRAE Standard 34-2022. These incorrect values may lead to code enforcement conflicts and create safety concerns by allowing larger refrigerant charges or improper detector settings for A2L refrigerants. As A2L refrigerants are now widely used due to the EPA's 700 GWP limit effective January 1, 2025, it is critical that the IMC reflect accurate data. The proposed changes align the IMC with updated ASHRAE standards and help ensure safe and code-compliant installations.

A proposal to update these values was approved at the CAH2 for the 2027 IMC. There is an ICC Critical Amendment that is pending to correct the values in the 2024 IMC. Please see the link to the pending ICC Critical Amendment below.

https://www.iccsafe.org/wp-content/uploads/ICC-TSG-000001_Toto_ASHRAE_2024-IMC_PublicSubmittal.pdf

Cost Impact: The code change proposal will not increase or decrease the cost

This proposal is editorial in nature and will not increase or decrease the cost of construction.

M1109.3.2-24

VMC: 1109.3.2

Proponents: Thomas Deary, representing AHRI (tdeary@ahrinet.org)

2021 Virginia Mechanical Code

Revise as follows:

1109.3.2 Shaft ventilation. Required ~~R~~refrigerant pipe shafts with systems using Group A2L or B2L refrigerant shall be naturally or mechanically ventilated. The shaft ventilation exhaust outlet shall comply with Section 501.3.1 . Naturally ventilated shafts shall have a pipe, duct or conduit not less than 4 inches (102 mm) in diameter that connects to the lowest point of the shaft and extends to the outdoors. The pipe, duct or conduit shall be level or pitched downward to the outdoors. Mechanically ventilated shafts shall have a minimum airflow velocity in accordance with Table 1109.3.2 . The mechanical ventilation shall be continuously operated or activated by a refrigerant detector. Systems utilizing a refrigerant detector shall activate the mechanical ventilation at a maximum refrigerant concentration of 25 percent of the lower flammable limit of the refrigerant. The detector, or a sampling tube that draws air to the detector, shall be located in an area where refrigerant from a leak will concentrate. The shaft shall not be required to be ventilated for double-wall refrigerant pipe where the interstitial space of the double-wall pipe is vented to the outdoors. For refrigeration systems used in residential occupancies serving only a single dwelling unit or sleeping unit, shaft ventilation shall not be required where the pipe or tube is continuous without fittings in the shaft

Reason Statement:

Due to the approval of the proposal from Mr. Greg Johnson (M1109.2.5-24), many refrigerant pipe shafts for A2L refrigerants would no longer be required because the maximum amount of refrigerant that could be released would be within the safe release limits specified by the IMC in Table 1103.1.

Where no shaft is required, A2L refrigerant piping could be run through stud cavities as permitted by Sec. 1109.2.2. (Note that Sec. 1109.3 requires that A2L piping systems comply with the provisions of Sec. 1109.3.1 for protection against physical damage).

If a shaft is not required, but the designer chooses to run A2L refrigerant piping in a shaft anyway for ease of construction, the requirements of Sec. 1109.3.2 should not apply. A refrigerant leak in a non-required shaft would be no more hazardous than a refrigerant leak in a stud cavity. If the stud cavity would not require ventilation and drainage, then a non-required shaft should not require ventilation and drainage.

Cost Impact: The code change proposal will decrease the cost

By clarifying when shafts are needed for refrigerant piping, and thus when they are not needed, this will reduce the cost of construction. Table 1103.1 identifies the parameters under which pipe shafts and ventilation are not required for A2L refrigerants.

Attached Files

- **M75-24.pdf**
  https://va.cdpaccess.com/proposal/1521/2228/files/download/1016/
- **M62-24 refrigerant piping - single unit - no joints.pdf**
  https://va.cdpaccess.com/proposal/1521/2228/files/download/1015/

M75-24

DHCD Staff Note: This is not a Virginia proposal. This is an ICC proposal referenced in the reason statement for Virginia proposal M1109.3.2-24.

IMC®: 1109.2.5

Proponents: Greg Johnson, Johnson & Associates Consulting Services, National Multifamily Housing Council (gjohnsonconsulting@gmail.com); Vladimir G. Kochkin, National Association of Home Builders - NAHB, NAHB (vkochkin@nahb.org); Andrew Klein, A S Klein Engineering, PLLC, BOMA International (andrew@asklein.com); Emily Toto, ASHRAE, ASHRAE (etoto@ashrae.org)

2024 International Mechanical Code

Revise as follows:

1109.2.5 Refrigerant pipe shafts. Refrigerant piping that penetrates two or more floor/ceiling assemblies shall be enclosed in a fire-resistance-rated shaft enclosure. The fire-resistance-rated shaft enclosure shall comply with Section 713 of the International Building Code.

Exceptions:

1. *Refrigeration* systems using R-718 refrigerant (water).
2. Piping in a direct refrigeration system ~~using Group A1 refrigerant~~ where the refrigerant quantity does not exceed the limits of Table 1103.1 for the smallest occupied space through which the piping passes.
3. Piping located on the exterior of the *building* where vented to the outdoors.

Reason: JOHNSON: This will make the IMC consistent with Section 9.12.1.5 of ASHRAE 15-2022. Note that IMC Section 1109.2.2 still requires piping protection, either within building elements or protective enclosures.

TOTO: This section was added to the IMC before the completion of the changes to ASHRAE 15. ASHRAE 15 removed the limitation in exception 2 as applying only to Group A1 refrigerants. It was determined that any refrigerant meeting the limitations of Table 1103.1 are safe to install without a shaft enclosure. This modification is consistent with ASHRAE 15-2022.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

JOHNSON: Costs are estimated to be reduced by roughly $1,000 per piping run per floor of an R-2 multifamily building.
TOTO: This may reduce the cost of construction by eliminating the shaft requirements for all refrigerants that do not exceed the safe limitations in the code. $22,400 estimated avoided total cost per mechanical room.

Estimated Immediate Cost Impact Justification (methodology and variables):

JOHNSON: Lineal feet of shaft-wall system avoided estimated to be 20 feet. Height of ceiling estimated to be 9 feet. Cost of installed shaft system estimated to be $7.00 per square foot. 20 X 9 X $7 = $960. $960 was rounded to $1,000.
TOTO: This change provides a lower cost alternative to the installation of a pipe shaft. Assumed area of avoided shaft wall system = 10 ft high X 40 lineal ft ($ sided enclosure) = 400 sf of shaft wall area. Assume shaft liner wall board is $34 per sf (kamcoboston.com), assume shaft framing materials are $8 per sf (schillings.com), assume $4 per sf labor (forbes.com), = $56 per sf for installed shaft wall without finishing. $56 per sf X 400 sf = **$22,400 estimated avoided total cost per mechanical room.**

Estimated Life Cycle Cost Impact:

JOHNSON: N/A

Estimated Life Cycle Cost Impact Justification (methodology and variables):

JOHNSON: N/A

M62-24

DHCD Staff Note: This is not a Virginia proposal. This is an ICC proposal referenced in the reason statement for Virginia proposal M1109.3.2-24.

IMC®: CHAPTER 11, SECTION 1101, 1101.1, 1101.1.1, 1107.4, 1107.5, 1109.2.7, 1109.3.2, ASHRAE Chapter 15 (New)

Proponents: Emily Toto, ASHRAE, ASHRAE (etoto@ashrae.org)

2024 International Mechanical Code

CHAPTER 11 REFRIGERATION

SECTION 1101 GENERAL

1101.1 Scope. This chapter shall govern the design, installation, construction and repair of *refrigeration systems* . Permanently installed refrigerant storage systems and other components shall be considered as part of the *refrigeration system* to which they are attached.

Revise as follows:

1101.1.1 Refrigerants other than ammonia. *Refrigeration systems* using a refrigerant other than ammonia shall comply with this chapter, <u>the International Fire Code, and either </u>ASHRAE 15 <u>or ASHRAE 15.2, as applicable</u>~~and the *International Fire Code*~~. *Refrigeration systems* containing carbon dioxide as the refrigerant shall also comply with IIAR CO2 .

1107.4 Piping materials standards. Refrigerant pipe shall conform to one or more of the standards *listed* in Table 1107.4. <u>For refrigeration systems used in residential occupancies serving only a single dwelling unit or sleeping unit, refrigerant piping and tubing shall be limited to aluminum, copper, and copper alloy. </u>The exterior of the pipe shall be protected from corrosion and degradation.

1107.5 Pipe fittings. Refrigerant pipe fittings shall be *approved* for installation with the piping materials to be installed, and shall conform to one of more of the standards listed in Table 1107.5 or shall be *listed* and *labeled* as complying with UL 207. <u>For refrigeration systems used in residential occupancies serving only a single dwelling unit or sleeping unit, refrigerant fittings shall be limited to aluminum, copper, copper alloys, stainless steel, and steel.</u>

1109.2.7 Pipe identification. Refrigerant pipe located in areas other than the room or space where the refrigerating *equipment* is located shall be identified. The pipe identification shall be located at intervals not exceeding 20 feet (6096 mm) on the refrigerant piping or pipe insulation. The minimum height of lettering of the identification label shall be $^1/_2$ inch (12.7 mm). The identification shall indicate the *refrigerant designation* and safety group classification of refrigerant used in the piping system. For Group A2L and B2L refrigerants, the identification shall also include the following statement: “WARNING—Risk of Fire. Flammable Refrigerant.” For Group A2, A3, B2 and B3 refrigerants, the identification shall also include the following statement: “DANGER—Risk of Fire or Explosion. Flammable Refrigerant.” For any Group B refrigerant, the identification shall also include the following statement: “DANGER—Toxic Refrigerant.”

> <u>**Exception:** For refrigeration systems used in residential occupancies serving only a single dwelling unit or sleeping unit pipe identification shall not be required.</u>

1109.3.2 Shaft ventilation. Refrigerant pipe shafts with systems using Group A2L or B2L refrigerant shall be naturally or mechanically ventilated. Refrigerant pipe shafts with one or more systems using any Group A2, A3, B2 or B3 refrigerant shall be continuously mechanically ventilated and shall include a refrigerant detector. The shaft ventilation exhaust outlet shall comply with Section 501.3.1. Naturally ventilated shafts shall have a pipe, duct or conduit not less than 4 inches (102 mm) in diameter that connects to the lowest point of the shaft and extends to the outdoors. The pipe, duct or conduit shall be level or pitched downward to the outdoors. Mechanically ventilated shafts shall have a minimum airflow velocity in accordance with Table 1109.3.2. The mechanical ventilation shall be continuously operated or activated by a refrigerant detector. Systems utilizing a refrigerant detector shall activate the mechanical ventilation at a maximum refrigerant concentration of 25 percent of the lower flammable limit of the refrigerant. The detector, or a sampling tube that draws air to the detector, shall be located in an area where refrigerant from a leak will concentrate. The shaft shall not be required to be ventilated for double-wall refrigerant pipe where the interstitial space of the double-wall pipe is vented to the outdoors. For refrigeration systems used in residential occupancies serving only a single dwelling unit or sleeping unit, shaft ventilation shall not be required where the pipe or tube is continuous without fittings in the shaft.

Add new standard(s) as follows:

15.2-2022	Safety Standard for Refrigeration Systems in Residential Applications

Reason: This code change proposal adds the reference to ASHRAE 15.2, the installation standard for residential air conditioning systems used for a single dwelling or sleeping unit. This addition addresses a gap created in the Code when ASHRAE 15 split its scope between standards 15 and 15.2. As some systems covered by the scope of ASHRAE 15.2 are also covered by the IMC, its inclusion within the IMC is necessary.With the separation between ASHRAE 15 and ASHRAE 15.2, there were certain changes that impact the refrigerant piping requirements. For residential systems, the piping material is limited to aluminum, copper, and copper alloy pipe or tube. The fitting requirements are similar material requirements with the addition of stainless steel and steel.

Pipe identification is not required for piping system regulated by ASHRAE 15.2. The reason for this is that the refrigerant piping is obvious not needing to be individually identified. Whereas in commercial buildings there are often multiple piping systems where the type of piping system is not obvious.

For shaft ventilation, there is an allowance in residential systems to eliminate the ventilation of the shaft when the piping system is continuous without fittings in the shaft. This provision was added to the end of the section.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The inclusion of ASHRAE 15.2 into the IMC is editorial in nature, and as such will not impact the cost of construction. Changes to piping for ASHRAE 15.2 may actually reduce the cost of construction, by not requiring shaft ventilation when no joints are present in the shaft.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASHREA 15.2 Safety Standard for Refrigeration Systems in Residential Applications, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

M15-24

VMC: ASHRAE Chapter 15, UL Chapter 15; VRC: ASHRAE Chapter 44, UL Chapter 44

Proponents: Thomas Deary, representing AHRI (tdeary@ahrinet.org)

2021 Virginia Mechanical Code

ASHRAE ,

15—~~2019:~~ 2024:	Safety Standard for Refrigeration Systems
34—~~2019:~~ 2024:	Designation and Safety Classification of Refrigerants
UL/CSA 60335-2-40—~~19:~~ 22:	Household and Similar Electrical Appliances—Safety—Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers

2021 Virginia Residential Code

ASHRAE ,

ASHRAE 34—~~2019:~~ 2024:	Designation and Safety Classification of Refrigerants
60335-2-40—2019/CAN/CSA C22.2 No.60335-2-40~~-19:~~ 22:	Standard for Household and Similar Electrical Appliances, Safety Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers

Reason Statement: This proposal updates ASHRAE 15, ASHRAE 34, and UL 60335-2-40 to their most current editions. These updates are critical to ensure that systems using A2L refrigerants, which are allowed under Virginia's codes, point to the current industry standards that contain all of the relevant requirements for such products.

Cost Impact: The code change proposal will not increase or decrease the cost

This proposal only updates previously incorporated standards to their current editions. It does not impact cost.

RM-FG2442.3-24

VRC: G2442.5 (618.5)

Proponents: Kyle Kratzer, Fairfax County, representing Fairfax County Land Development Services (kyle.kratzer@fairfaxcounty.gov)

2021 Virginia Residential Code

Revise as follows:

G2442.5 (618.5) Return-air limitation. Return air from one *dwelling unit* shall not be discharged into another *dwelling unit*.

Exception: Where a two-family dwelling is constructed in accordance with Exception 3 of Section R302.3, the return air shall be permitted to discharge into either *dwelling unit*.

Reason Statement:

This change clarifies that return air may be shared between a dwelling unit and its accessory dwelling unit (ADU). The revision aligns with amendments from the previous code cycle intended to reduce barriers to the creation of accessory dwelling units. By adding this exception, the provision removes ambiguity and promotes consistent interpretation and enforcement across jurisdictions.

Cost Impact: The code change proposal will decrease the cost

This change eliminates unnecessary separation requirements for dwelling units that can share common areas, means of egress, and utilities.

P306.2.5-24

IPC: 306.2.5 (New)

Proponents: James Walls, representing Cast Iron Soil Pipe Institute (jwalls@cispi.org)

2024 International Plumbing Code

Add new text as follows:

306.2.5 Plastic Sewer and DWV piping installation. Plastic sewer and DWV piping installed underground shall be installed in accordance with the manufacturer's installation instructions.Trench width shall be controlled to not exceed the outside pipe diameter plus 16 inches or in a trench which has a controlled width equal to the nominal diameter of the diameter of the piping multiplied by 1.25 plus 12 inches.The piping shall be bedded in 4 inches of granular fill.
Exception: Residential occupancies 75 feet in height or less.

Reason Statement:

The intent of this code change is to align the code and notify the inspector and all other parties that there are specific requirements by the manufacturers of these products for their installation. There are many methods available for enforcement of this change including: AHJ may require a Special inspection by a licensed engineer or other technically qualified individual, AHJ may elect to enforce on their own, etc. The exception is to allow for projects where geo technical expertise is not common on the project.

Cost Impact: The code change proposal will not increase or decrease the cost
There will be no additional cost with this code proposal.

P306.3.1-24

IPC: 306.3.1 (New)

Proponents: James Walls, Cast Iron Soil Pipe Institute, representing Cast Iron Soil Pipe Institute (jwalls@cispi.org)

2024 International Plumbing Code

Add new text as follows:

306.3.1 Plastic sewer and DWV piping installation. The compaction of backfill shall be to a minimum of 85 percent standard proctor density and extend to a minimum of 6 inches above the top of the pipe. Compaction testing shall be performed by an approved third-party and approved by the engineer of record. A written report of the test results shall be signed and sealed by the engineer of record and provided to the code official.
Exception: Residential occupancies 75 feet in height or less.

Reason Statement:

The intent of this code change is to align the code and notify the inspector and all other parties that there are specific requirements by the manufacturers of these products for their installation. There are many methods available for enforcement of this change including: AHJ may require a Special inspection by a licensed engineer or other technically qualified individual, AHJ may elect to enforce on their own, etc. The exception is to allow for projects where geo technical expertise is not common on the project.

Cost Impact: The code change proposal will not increase or decrease the cost

There will be no additional increase with this code proposal.

RP2903.10.1-24

IRC: P2903.10.1

Proponents: Kyle Kratzer, Fairfax County, representing Fairfax County Land Development Services (kyle.kratzer@fairfaxcounty.gov)

2024 International Residential Code

Revise as follows:

P2903.10.1 Service valve. Each *dwelling unit* shall be provided with an accessible *main* shutoff valve near the entrance of the water service. The valve shall be of a full-open type having nominal restriction to flow, with provision for drainage such as a bleed orifice or installation of a separate drain valve. Additionally, the water service shall be valved at the curb or *lot line* in accordance with local requirements.

Exception: Where a two-family dwelling is constructed in accordance with Exception 3 of Section R302.3, a single individual service valve shall be permitted to serve both the dwelling unit and accessory dwelling unit, provided that access to the service valve is available to the occupants of both dwelling units.

Reason Statement: This change clarifies that a water service shutoff valve may be shared between a dwelling unit and its accessory dwelling unit (ADU). The revision aligns with amendments from the previous code cycle intended to reduce barriers to the creation of accessory dwelling units. By adding this exception, the provision removes ambiguity and promotes consistent interpretation and enforcement across jurisdictions.

Cost Impact: The code change proposal will decrease the cost

This change eliminates unnecessary separation requirements for dwelling units that can share common areas, means of egress, and utilities.

EC-1301-24

VCC: SECTION 1301, [E] 1301.1, [E] 1301.1.1, 1301.1.1.1

Proponents: William Penniman, representing Sierra Club Virginia Chapter (wpenniman@aol.com)

2021 Virginia Construction Code

SECTION 1301
GENERAL

[E] 1301.1 Scope. This chapter governs the design and construction of buildings for energy efficiency.

[E] 1301.1.1 Criteria. Buildings shall be designed and constructed in accordance with the *International Energy Conservation Code* .

Revise as follows:

1301.1.1.1 Changes to the *International Energy Conservation Code* (IECC). The following changes shall be made to the IECC :
-Proposal Note: While some content in items 1-5, 13-20, and 22-25 is not shown or may appear unstricken, these items are proposed to be deleted entirely. Other items in the list (6-12, 21, and 26-33) that are not shown remain unchanged.

~~1.~~ ~~Add Section C402.1.6 to the IECC to read:~~

~~**C402.1.6 Groups F, S, and U.** Appendix CD may be used as an alternative to the *building thermal envelope* provisions of this code for Groups F, S, and U.~~

~~2.~~ ~~Add an exception to the first paragraph of Section C403.7.7 of the IECC to read:~~

~~**Exception:** Where a grease duct serving a Type I hood is installed in accordance with Section 506.3 of the *International Mechanical Code*, motorized or gravity dampers shall not be installed.~~

~~3.~~ ~~Add Section C403.2.2.1 to the IECC to read:~~

~~**C403.2.2.1 Dwelling unit mechanical ventilation.** Mechanical ventilation shall be provided for dwelling units in accordance with the *International Mechanical Code* .~~

~~4.~~ ~~Delete Section C403.7.5 and Table C403.7.5 of the IECC.~~

~~5.~~ ~~Delete Sections C404.5 through C404.5.2.1 of the IECC, including Tables.~~

~~13.~~ ~~Add Appendix CD to the IECC to read:~~ (DELETE ENTIRE APPENDIX CD, INCLUDING ITEMS NOT SHOWN IN APPENDIX)

~~**APPENDIX CD**~~
~~**BUILDING ENVELOPE REQUIREMENTS**~~

~~**CD101 Scope**~~

~~**CD101.1 General.** These provisions shall be permitted as an alternative to building thermal envelope requirements for *building* areas containing uses that are classified as Group F, S or U.~~

~~**CD102 Building Envelope Requirements**~~

~~**CD102.1 Insulation and fenestration criteria.** The building thermal envelope shall meet the requirements of Tables CD102.2(1) and CD102.3 based on the climate zone specified in Chapter 3CE. Buildings with a vertical fenestration area or skylight area that exceeds that allowed in Table CD102.3 shall comply with the building envelope provisions of ASHRAE/IESNA 90.1.~~

~~**CD102.2 Specific insulation requirements.** Opaque assemblies shall comply with Table CD102.2(1) .~~

~~**CD102.2.1 Roof assembly.** The minimum thermal resistance (*R*-value) of the insulating material installed either between the roof framing or continuously on the roof assembly shall be as specified in Table CD102.2(1) , based on *construction* materials used in the roof assembly.~~

~~**Exception:** Continuously insulated roof assemblies where the thickness of insulation varies 1 inch (25.4 mm) or less and where the area weighted *U*-factor is equivalent to the same assembly with the *R*-value specified in Table CD102.2(1) .~~

~~Insulation installed on a suspended ceiling with removable ceiling tiles shall not be considered part of the minimum thermal resistance of the roof insulation.~~

~~**CD102.2.2 Classification of walls.** Walls associated with the building envelope shall be classified in accordance with Section CD102.2.2.1 or CD102.2.2.2.~~

~~**TABLE CD102.2(1)OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE METHOD**~~

~~**TABLE CD102.2(2)METAL BUILDING ASSEMBLY DESCRIPTIONS**~~

~~**CD102.2.2.1 Above-grade walls.** Above-grade walls are those walls covered by Section CD102.2.3 on the exterior of the *building* and completely above grade or walls that are more than 15 percent above grade.~~

~~**CD102.2.2.2 Below-grade walls.** Below-grade walls covered by Section CD102.2.4 are basement or first-story walls associated with the exterior of the *building* that are at least 85 percent below grade.~~

~~**CD102.2.2.3 Above-grade walls.** The minimum thermal resistance (*R*-value) of the insulating material(s) installed in the wall cavity between the framing members and continuously on the walls shall be as specified in Table CD102.2(1) , based on framing type and construction materials used in the wall assembly. The *R*-value of integral insulation installed in concrete masonry units (CMU) shall not be used in determining compliance with Table CD102.2(1) . "Mass walls" shall include walls weighing at least (1) 35 pounds per square foot (170 kg/m^2) of wall surface area or (2) 25 pounds per square foot (120 kg/m^2) of wall surface area if the material weight is not more than 120 pounds per cubic foot (1,900 kg\m^3).~~

~~**CD102.2.4 Below-grade walls.** The minimum thermal resistance (*R*-value) of the insulating material installed in, or continuously on, the below-grade walls shall be as specified in Table CD102.2(1) and shall extend to a depth of 10 feet (3048 mm) below the outside finish ground level, or to the level of the floor, whichever is less.~~

~~**CD102.2.5 Floors over outdoor air or unconditioned space.** The minimum thermal resistance (*R*-value) of the insulating material installed either between the floor framing or continuously on the floor assembly shall be as specified in Table CD102.2(1) , based on construction materials used in the floor assembly. "Mass floors" shall include floors weighing at least (1) 35 pounds per square foot (170 kg/m^2) of floor surface area or (2) 25 pounds per square foot (120 kg/m^2) of floor surface area if the material weight is not more than 12 pounds per cubic foot (1900 kg/m^3).~~

~~**CD102.2.6 Slabs on grade.** The minimum thermal resistance (*R*-value) of the insulation around the perimeter of unheated or heated slab-on-grade floors shall be as specified in Table CD102.2(1) . The insulation shall be placed on the outside of the foundation or on the inside of a foundation wall. The insulation shall extend downward from the top of the slab for a minimum distance as shown in the table or to the top of the footing, whichever is less, or downward to at least the bottom of the slab and then horizontally to the interior or exterior for the total distance shown in the table.~~

~~**CD102.2.7 Opaque doors.** Opaque doors (doors having less than 50-percent glass area) shall meet the applicable requirements for doors a specified in Table CD102.2(1) and be considered as part of the gross area of above-grade walls that are part of the building envelope.~~

~~**CD102.3 Fenestration.** Fenestration shall comply with Table CD102.3 .~~

~~**TABLE CD102.3BUILDING ENVELOPE REQUIREMENTS: FENESTRATION**~~

~~**CD102.3.1 Maximum area.** The vertical fenestration area (not including opaque doors) shall not exceed the percentage of the gross wall area specified in Table CD102.3 . The skylight area shall not exceed the percentage of the gross roof area specified in Table CD102.3 .~~

~~**CD102.3.2 Maximum U-factor and SHGC.** For vertical fenestration, the maximum *U*-factor and solar heat gain coefficient (SHGC) shall be as specified in Table CD102.3 , based on the window projection factor. For skylights, the maximum *U*-factor and solar heat gain coefficient (SHGC) shall be as specified in Table CD102.3 The window projection factor shall be determined in accordance with Equation CD-1~~

~~PF=A/B~~

$$PF = A/B$$

~~where:~~ **(Equation CD-1)**

~~*PF* = Projection factor (decimal).~~

~~*A* = Distance measured horizontally from the furthest continuous extremity of any overhang, eave, or permanently attached shading device to the vertical surface of the glazing.~~

~~*B* = Distance measured vertically from the bottom of the glazing to the underside of the overhang, eave, or permanently attached shading device.~~

~~Where different windows or glass doors have different PF values, they shall each be evaluated separately, or an area-weighted PF value shall be calculated and used for all windows and glass doors.~~

~~**CD102.4 Air leakage.**~~

~~**CD102.4.1 Window and door assemblies.** The air leakage of window and sliding or swinging door assemblies that are part of the building envelope shall be determined in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 , or NFRC 400 by an accredited, independent laboratory, and labeled and certified by the manufacturer and shall not exceed the values in Section 402.4.2 of the 2006 IECC.~~

~~**Exception:** Site-constructed windows and doors that are weatherstripped or sealed in accordance with Section CD102.4.3.~~

~~**CD102.4.2 Curtain wall, storefront glazing and commercial entrance doors.** Curtain wall, storefront glazing and commercial glazed swinging entrance doors and revolving doors shall be tested for air leakage at 1.57 pounds per square foot (psf) (75 Pa) in accordance with ASTM E283 . For curtain walls and storefront glazing, the maximum air leakage rate shall be 0.3 cubic foot per minute per square foot~~ ~~(cfm/ft^2) (5.5 m^3/h × m^2) of fenestration area. For commercial glazed swinging entrance doors and revolving doors, the maximum air leakage shall be 1.00 cfm/ft2 (18.3 m^3/h × m^2) of door area when tested in accordance with ASTM E283 .~~

~~**CD102.4.3 Sealing of the building envelope.** Openings and penetrations in the building envelope shall be sealed with caulking materials or closed with gasketing systems compatible with the construction materials and location. Joints and seams shall be sealed in the same manner or taped or covered with a moisture vapor-permeable wrapping material. Sealing materials spanning joints between construction materials shall allow for expansion and contraction of the construction materials.~~

~~**CD102.4.4 Outdoor air intakes and exhaust openings.** Stair and elevator shaft vents and other outdoor air intakes and exhaust openings integral to the building envelope shall be equipped with not less than a Class I motorized, leakage-rated damper with a maximum leakage rate of 4 cfm per square foot (6.8 L/s – C m^2) at 1.0 inch water gauge (w.g.) (1250 Pa) when tested in accordance with AMCA 500D.~~

~~**Exception:** Gravity (nonmotorized) dampers are permitted to be used in *buildings* less than three stories in height above grade.~~

~~**CD102.4.5 Loading dock weather seals.** Cargo doors and loading dock doors shall be equipped with weather seals to restrict infiltration when vehicles are parked in the doorway.~~

~~**CD102.4.6 Vestibules.** A door that separates conditioned space from the exterior shall be protected with an enclosed vestibule, with all doors opening into and out of the vestibule equipped with self-closing devices. Vestibules shall be designed so that in passing through the vestibule it is not necessary for the interior and exterior doors to open at the same time.~~

~~**Exceptions:**~~

1. ~~*Buildings* in Climate Zones I and 2 as indicated in Figure C301.1 and Table C301.1 .~~
2. ~~Doors not intended to be used as a *building* entrance door, such as doors to mechanical or electrical equipment rooms.~~
3. ~~Doors opening directly from a sleeping unit or dwelling unit.~~
4. ~~Doors that open directly from a space less than 3,000 square feet (298 m^2) in area.~~
5. ~~Revolving doors.~~
6. ~~Doors used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.~~

~~**CD102.4.7 Recessed luminaires.** When installed in the building envelope, recessed luminaires shall meet one of the following requirements:~~

1. ~~Type IC rated, manufactured with no penetrations between the inside of the recessed fixture and ceiling cavity and sealed or gasketed to prevent air leakage into the unconditioned space.~~
2. ~~Type IC or non-IC rated, installed inside a sealed box constructed from a minimum 0.5-inch-thick (12.7 mm) gypsum wallboard or constructed from a preformed polymeric vapor barrier, or other airtight assembly manufactured for this purpose, while maintaining required clearances of not less than 0.5 inch (12.7 mm) from combustible material and not less than 3 inches (76 mm) from insulation material.~~
3. ~~Type IC rated, in accordance with ASTM E283 admitting no more than 2.0 cubic feet per minute (cfm) (0.944 L/s) of air movement from the conditioned space to the ceiling cavity. The luminaire shall be tested at 1.57 psf (75 Pa) pressure difference and shall be labeled.~~

~~**CD102.5 Moisture control.** All framed walls, floors and ceilings not ventilated to allow moisture to escape shall be provided with an approved vapor retarder having a permeance rating of 1 perm (5.7 × 10-11 kg/Pa· s · m^2) or less, when tested in accordance with the dessicant method using Procedure A of ASTM E96 . The vapor retarder shall be installed on the warm-in-winter side of the insulation.~~

~~**Exceptions:**~~

1. ~~*Buildings* located in Climate Zones 1 through 3 as indicated in Figure C301.1 and Table C301.1.~~
2. ~~In *construction* where moisture or its freezing will not damage the materials.~~
3. ~~Where other approved means to avoid condensation in unventilated framed wall, floor, roof and ceiling cavities are provided.~~

~~14.~~ ~~Change the wood frame wall *R*-value categories for Climate Zones 3A, 4A and 5A in Table R402.1.3 to read:~~

		~~Wood Frame Wall *R*-Value~~
		~~15 or 13+1[h]~~

~~15.~~ ~~Change the frame wall *U*-factor categories for Climate Zones 3A, 4A and 5A in Table R402.1.2 to read:~~

~~Frame Wall *U*-Factor~~
~~0.079~~

~~16.~~ ~~Add an exception to Section R401.3 of the IECC to read:~~

~~**Exception:** Where approved, certificates for multifamily dwelling units shall be permitted to be located off-site at an identified location.~~

~~17.~~ ~~Change Section R402.2.4 of the IECC to read:~~

~~**R402.2.4 Access hatches and doors.** Access doors from conditioned spaces to unconditioned spaces (e.g., attics and crawl spaces) shall be weatherstripped and insulated in accordance with the following values:~~

1. ~~Hinged vertical doors shall have a minimum overall R-5 insulation value.~~
2. ~~Hatches and scuttle hole covers shall be insulated to a level equivalent to the insulation on the surrounding surfaces.~~
3. ~~Pull down stairs shall have a minimum of 75 percent of the panel area having R-5 rigid insulation.~~

~~Access shall be provided to all equipment that prevents damaging or compressing the insulation. A wood-framed or equivalent baffle or retainer is required to be provided when loose fill insulation is installed, the purpose of which is to prevent the loose-fill insulation from spilling into the living space when the attic access is opened and to provide a permanent means of maintaining the installed R-value of the loose-fill insulation.~~

~~18.~~ ~~Change the title of the “Insulation Installation Criteria” category of Table R402.4.1.1 ; change the “Shower/tub on exterior wall” category of Table R402.4.1.1 , and add footnotes “c” and “d” to Table R402.4.1.1 to read:~~ (PROPOSAL NOTE: Delete remainder of item #18, including changes to Tables)

~~19.~~ ~~Change Section R402.4.1.2 of the IECC to read:~~

~~**R402.4.1.2 Testing.** The *building* or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). A written report of the results of the test shall be signed by the party conducting the test and provided to the building official. Testing shall be conducted by a Virginia licensed general contractor, a Virginia licensed HVAC contractor, a Virginia licensed home inspector, a Virginia *registered design professional*, a certified BPI Envelope Professional, a certified HERS rater, or a certified duct and envelope tightness rater. The party conducting the test shall have been trained on the equipment used to perform the test. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.~~

~~**Note:** Should additional sealing be required as a result of the test, consideration may be given to the issuance of a temporary certificate of occupancy in accordance with Section 116.1.1 .~~

~~**During testing:**~~

1. ~~Exterior windows and doors and fireplace and stove doors shall be closed, but not sealed beyond the intended weatherstripping or other infiltration control measures.~~
2. ~~Dampers, including exhaust, intake, makeup air, backdraft and flue dampers, shall be closed, but not sealed beyond intended infiltration control measures.~~
3. ~~Interior doors, if installed at the time of the test, shall be open.~~
4. ~~Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed.~~
5. ~~Heating and cooling systems, if installed at the time of the test, shall be turned off.~~
6. ~~Supply and return registers, if installed at the time of the test, shall be fully open.~~

~~20. Change Section R402.4.1.3 of the IECC to read:~~

~~**R402.4.1.3 Leakage rate.** When complying with Section R401.2.1 , the building or dwelling unit shall have an air leakage rate not exceeding 5.0 air changes per hour in Climate Zones 3 through 5, when tested in accordance with Section R402.4.1.2 .~~

~~22. Change the last paragraph of Section R403.3.5 of the IECC to read:~~

~~A written report of the results of the test shall be signed by the party conducting the test and provided to the code official. The licensed mechanical contractor installing the mechanical system shall be permitted to perform the duct testing. The contractor shall have been trained on the equipment used to perform the test.~~

~~23. Change Section R403.3.7 of the IECC to read:~~

~~**R403.3.7 Building cavities.** *Building* framing cavities used as ducts or plenums shall comply with VRC Section M1601.1.1 .~~

~~24. Change Section R403.7 of the IECC to read:~~

~~**R403.7 Equipment and appliance sizing.** Heating and cooling equipment and appliances shall be sized in accordance with ACCA Manual S or other approved sizing methodologies based on building loads calculated in accordance with ACCA Manual J or other approved heating and cooling calculation methodologies.~~

~~**Exception:** Heating and cooling equipment and appliance sizing shall not be limited to the capacities determined in accordance with Manual S or other approved sizing methodologies where any of the following conditions apply:~~

1. ~~The specified equipment or appliance utilizes multi-stage technology or variable refrigerant flow technology and the loads calculated in accordance with the approved heating and cooling methodology fall within the range of the manufacturer's published capacities for that equipment or appliance.~~
2. ~~The specified equipment or appliance manufacturer's published capacities cannot satisfy both the total and sensible heat gains calculated in accordance with the approved heating and cooling methodology and the next larger standard size unit is specified.~~
3. ~~The specified equipment or appliance is the lowest capacity unit available from the specified manufacturer.~~

~~25. Change Section R406.3.2 to read:~~

~~Section N1106.3.2 (R406.3.2) Onsite renewables are included. When onsite renewable energy is included for compliance using the Energy Rating Index (ERI) analysis per Section N1106.4 (R406.4), the building thermal envelope shall be greater than or equal to levels of energy efficiency and solar heat gain coefficient in Table N1102.1.2 (R402.1.2), with a ceiling U-factor of 0.026 and a frame wall U-factor of 0.060, or Table N1102.1.3 (R402.1.3), with a ceiling R-value of 49 and a wood frame wall R-value of 20 or 13+5.~~

Reason Statement:

The purpose of this proposal is to make Virginia's energy efficiency standards for new construction "at least as stringent as" the latest IECC for new commercial and residential construction. It would remove past weakening amendments to the IECC for new construction. (Efficiency standards for construction involving existing buildings are left for separate consideration.)

Virginia's residential building code has been behind the IECC's energy efficiency standards for over a decade -- since the 2012 IECC update. Virginia is even farther behind today since it failed to strengthen code standards for key building efficiency measures in the cycles that have followed. To make matters worse, in the 2021 cycle, it rolled back standards to 2006 levels for several broad categories of commercial buildings (F,S & U) which appear may include some data centers – the largest users of electricity in the state which threaten to upend rates for all Virginians. That rollback was not supported by any substantial evidence concerning the many types of buildings; nor has there been any substantial evidence for any of the other weakening amendments that would be eliminated by this proposal. Each weakening amendment is allowed to roll forward cycle after cycle, despite the IECC being reaffirmed or made even more stringent.

The IECC has repeatedly tightened energy efficiency standards over the past 20 years. Apart from a relaxation of ceiling insulation standards for some zones between the 2021 and 2024 cycles, the IECC has resisted pleas to weaken efficiency standards. Evidence of practical experience and new technologies has supported the IECC's continued enhancement of efficiency standards.

On the other hand, in the 2024 cycle the IECC introduced new levels of design and equipment flexibility to give builders a greater variety of ways to meet the overall levels of efficiency required. The increase in energy efficiency options while still improving overall efficiency strongly undercuts arguments to retain past weakening amendments. Indeed, retaining those outdated amendments would undercut the overall efficiency targets set by the IECC as weaker prescriptive standards would undermine Simulated Performance and ERI energy savings targets.

Improving energy efficiency in new buildings is important to occupants and users —whether owners or tenants or employees or producers of goods or services --, since it would help them save money and energy, increase indoor comfort, make for healthier buildings, and improve workplaces for decades. Greater energy efficiency will also serve the public by reducing pressure on utilities to raise rates in order to build and operate more energy delivery capabilities, and by reduce the air pollution that drives climate impacts and other harms to Virginia's health, property and economy.

Importantly, the U.S. Department of Energy and the Pacific Northwest National Laboratories have analyzed energy efficiency standards for residential and commercial building codes for more than 20 years. They have consistently found that full adoption of the IECC and ASHRAE updates so far this century will save energy and money. They have also found that, by reducing building energy usage, these model code updates will reduce pollution, including climate pollution.

Adoption of this proposal is vital to properly implementing Virginia law. Sections 36-99A and 36-99B of the Virginia Code states that building codes are required to "protect the health, safety and welfare of the residents of the Commonwealth" and that adjustments to reduce construction costs must nevertheless be "consistent with recognized standards of health, safety, energy efficiency and water efficiency." VIRGINIA ACTS OF ASSEMBLY – 2021 SPECIAL SESSION I, CHAPTER 425, Section 1 (referred to herein as "H2227"), which was enacted in 2021, calls for adoption of energy efficiency standards that are "at least as stringent" as the latest IECC considering factors such as consumer costs "over time" and air pollution. The accumulated evidence from DOE and PNNL leave no doubt that weakening amendments should be removed from the energy efficiency standards applicable to new residential and commercial construction.

This proposal attempts to delete only standards that are not "at least as stringent" as the latest IECC. If any of the proposed deletions are beneficial and "at least as stringent" as the latest IECC, we would discuss amending this proposal.

Cost Impact: The code change proposal will increase the cost

Fully implementing the latest IECC will add to construction costs. However, as DOE and PNNL have shown, building owners, residents and users will save money and energy for decades after the buildings are constructed. Thus, the net costs will be reduced.

Further, as discussed in the Reason section, Virginia law states that construction costs should be minimized "consistent with" the latest model codes and that cost considerations must reflect the cost savings over time, not just initial costs. Further, building codes must be designed to serve the public's health, safety and welfare, including the benefits from reducing air pollution.

EC-C402.1.6(1)-24

VECC: C402.1.6, CD101.1

Proponents: William Penniman, representing Sierra Club Virginia Chapter (wpenniman@aol.com)

2021 Virginia Energy Code

Revise as follows:

C402.1.6 Groups F, S, and U. Appendix CD may be used as an alternative to the *building thermal envelope* provisions of this code for buildings in Groups F, S, and ~~U.~~ U that are not designed or equipped to heat the interior to more than 60°F or to cool the interior other than by fans or natural ventilation.

CD101.1 General. These provisions shall be permitted as an alternative to *building thermal envelope* requirements for building areas containing uses that are classified as Group F, S or ~~U.~~ U that are not designed or equipped to be heated to a temperature above 60°F or to be cooled other than by fans or natural ventilation.

Reason Statement:
This proposal would narrow a broad, unsupported rollback of minimum envelope energy efficiency standards for commercial Categories F, S and U from complying with the IECC to a level comparable to the 2006 version of the IECC.

The modification would reasonably limit the use of Appendix CD to buildings that are not designed or equipped to heat their interiors above 60℉ or to cool them other than by fans or natural ventilation, which are the only situtations that might justifiably use the greatly weakened thermal efficiency standards in Appendix CD. This is an alternative to the proposal to delete EC-C402.1.6 and Appendix CD.

Restricting the scope of Appendix CD as proposed herein is responsive to the only substantive objection that was given in support of Appendix CD during the 2021 Cycle. The proponent of Appendix CD cited a proposed “warehouse project used for storage of materials with heat maintained at 60 degrees or less and no cooling” and, more generally, a subset of warehouses with low heating needs. In the proponent's words:

> “The current energy code requirements are over burdensome for Factory Group F, Storage Group S, and Utility and Miscellaneous Group U. These use groups do not traditionally use a lot of energy as they are not heated or cooled to normal heating and cooling temperatures and or they create their own heat, etc. The change would eliminate unneeded and extra cost to the building owner. Additional insulation, roofing materials, and wall panel materials are being required in excess for buildings that will not fully utilize them. Many storage facilities are vacant most of the time and a lot of manufacturing and utility buildings will have the drive through doors open during production.”

Nothing in the “reason statement” submitted in support of Appendix CD even plausibly attempted to justify reducing the thermal envelope requirements for the many types of buildings in Groups F, S and U which do heat their interiors above 60℉ or to cool them with mechanical air conditioning. Nor did it explain why the IECC’s concessions to buildings with little need for heating and cooling were insufficient. It said nothing whatsoever about energy and energy-cost savings from IECC implementation or about benefits to occupants or the public. Nor did it provide any evidence contradicting the many findings by the U.S. Department of Energy and the Pacific Northwest National Laboratories that each IECC (and ASHRAE) update since 2006 would save energy and money for building users, including warehouse users.

The broad rollback by Appendix CD was granted over strong objections and evidence from multiple participants in the 2021 Code Cycle, which positioned it as a non-consensus proposal. [The proposal was called Appendix CB when introduced. It also did not include some references to the “2004” ASHRAE, which the draft 2024 Base Document appears to have added.]

Modifying or eliminating the rollback is required because applicable law requires Virginia’s building code to be consistent with or at least as stringent as the IECC. Appendix CD moves the code backwards by more than 15 years overriding multiple IECC updates approved by the Board and by the IECC since 2006. Failing to eliminate or, at least, modify Section C406.1.2 and Appendix CD as proposed herein would waste energy, raise occupancy costs, potentially harm employees, increase air pollution, including climate pollution, and harm the “health, safety and welfare” of the residents of Virginia both now and for the decades these inefficient buildings are operated.

The 2021-Cycle record showed that (a) Appendix CD's decade-plus rollback for the 120+ types of buildings covered by the proposal was not supported by substantial evidence; (b) builders successfully implemented Board-approved IECC standards for 2009, 2012, 2015 and 2018, and ASHRAE standards for every update since 2006; (c) U.S. DOE had found that full implementation of the 2021 IECC standards and each update from 2009-2018 would save energy and money; (d) far from suffering under unreasonable burdens, the warehouse market was booming under the then-effective 2018 IECC; and (e) there were no findings or analysis by either the proponent or the Board to support approving the non-consensus proposal. Buildings included in Groups F, S and U include many that are heated or cooled like commercial buildings in other Groups. Buildings in F, S and U include ones involving food, active employees, and even data centers with staggering energy loads.

1. **Virginia Law Requires Consistency with Model Building Codes**

Section 36-99A requires implementation of building code standards that “protect the health, safety and welfare of the residents of the Commonwealth, and that minimize costs “consistent with” recognized national standards, which in Virginia means the IECC.

> The provisions of the Building Code and modifications thereof shall be such as to protect the health, safety and welfare of the residents of the Commonwealth, provided that buildings and structures should be permitted to be constructed, rehabilitated and maintained at the least possible cost consistent with recognized standards of health, safety, energy conservation and water conservation, including provisions necessary to prevent overcrowding, rodent or insect infestation, and garbage accumulation; and barrier-free provisions for the physically handicapped and aged.

As recognized by the 2021 NOPR, keeping the code up to date with “recognized standards of health, safety, energy conservation and water conservation” is critical. Construction costs should be reduced where possible, but only to the extent “consistent with” the IECC’s “energy conservation” standards. Backtracking to weaker, out-of-date standards is not permissible. The modification proposed here would at least keep Virginia's code nearly consistent with the IECC for buildings in Groups F, S and U.

Pursuant to 2021 legislation, VIRGINIA ACTS OF ASSEMBLY – 2021 SPECIAL SESSION I, CHAPTER 425, Section 1 (“H2227”), the Board was directed to “consider adopting Building Code standards that are at least as stringent as those contained in the new version of the IECC.” Factors to be considered are “the public health, safety, and welfare benefits of adopting standards that are at least as stringent as those contained in the IECC, including potential energy savings and air quality benefits over time compared to the cost of initial construction.” Nothing in H2227 authorized approval of less stringent standards, particularly for large groups of buildings that are heated and cooled.

In 2022, at the request of certain builders, the GA adopted HB1289, which directed the Board “to consider during the next code development cycle, revising the Uniform Statewide Building Code…to provide an exemption from any requirements in the energy efficiency … for the following use and occupancy classifications pursuant to Chapter 3 of the 2018 Virginia Construction Code: (i) Section 306, Factory Group F; (ii) section 311, Storage Group S; and (iii) Section 312, Utility and Miscellaneous Group U."

While HB1289 called for consideration of an exemption, it did not alter the statutory standards for building codes prescribed by 36-99A and H2227. Since the legislature did not change the applicable legal standards, its direction “to consider” is bound by the standards in 36-99A and H2227, which require adoption of code standards that protect the “health, safety and welfare” of Virginians, minimize costs “consistent with” national model codes, and be “at least as stringent” as the IECC. Nothing justifies the broad rollback made in the 2021 cycle.

2. No credible support was provided the rollback of code standards.

Since the 2006 IECC, the IECC adjusted and the Board repeatedly approved updated standards to recognize new industry developments and public needs. Nothing presented in the 2021 Cycle plausibly justified overturning all those decisions by the IECC and the Board. The proponent’s supporting statement for the rollback proposed in the last cycle was very brief and conclusory. Neither the proponent nor any other participant provided any reasonable basis for rolling back conservation standards for any type of building. While Appendix CD would reduce some builders’ construction costs, nothing demonstrated that the proposal would meet the relevant statutory standards of serving Virginians' "health, safety and welfare" or minimizing costs "consistent with" energy conservation standards or achieving energy efficiency "at least as stringent" as the latest IECC.

In support of cutting back standards for dozens of types of buildings within the 3 broad categories Groups F, S and U, the proposal's Reason Statement and Cost Impact statement provided (a) two, sketchy examples of hypothetical buildings' compliance costs with no information about energy or energy cost savings; (b) a few generalized statements that some builders find compliance challenging and that some the affected buildings are "not heated or cooled to normal heating and cooling temperatures" or are "vacant" some of the time or might have "open doors" part of the time (which the IECC already addresses by exempting or reducing efficiency standards for buildings with such characteristics). Apart from the suggestion that some warehouses are not heated above 60℉ or not heated or cooled at all, there are absolutely no details about the energy usage, efficiency, costs, efficiency-driven savings and characteristics of any 120+ types of buildings that are covered by the efficiency rollback.

Section 306 Factory Group F identifies over 50 types of factories; Section 311 Storage Group S lists over 60 types of storage facilities; and Section 312 Utility and Miscellaneous Group U identifies over a dozen categories. Some of the facilities store products (*e.g.*, food) that are temperature sensitive and require a great deal of energy (lessened only by energy efficiency) to achieve temperature goals. Other buildings involve manufacturing, greenhouses and other operations, which have still different energy and energy-efficiency profiles. Yet, apart scant information about two hypothetical warehouses, the proposal for the rollback provided no details or analysis of any other types of buildings or their energy footprints, available technologies, employee and customer needs, compliance costs, energy cost savings, pollution reductions or other factors relevant to the extreme, multi-group proposal.

The proposal provided no contextual information about its hypotheticals while omitting critical information. For example, it failed to disclose the huge volume of air to be heated and cooled in the two illustrations of warehouses: roughly 2.5 million cubic feet for the 100,000 Sf warehouse, and 144,000 cubic feet for the 7500 SF warehouse. Even minimal space heating or conditioning would require a large amount of energy to achieve a target of 60 degrees or more. Nor did the proponent address the huge, overall energy cost and use increases (waste) or pollution increases from rolling back established and new efficiency standards for multiple categories of buildings.
The proposal to return to 2006 standards also claimed harms that ignored the 2021 IECC's flexibility provisions which reduce requirements for unheated and low-conditioned buildings and permitted buildings to be subdivided into an exempt unheated portion and a separate heated portion if, for example, heating for an office or other work area is needed. It also ignored ASHRAE's flexibility for low energy buildings.

The proponent failed to compare the impact of its proposed standards to the many IECC standards it would override or to subsequent ASHRAE standards, which Appendix CD also undercuts.

Nor did the proponent provide data contradicting the many findings by DOE that each update would save energy and energy costs. The proponent's brief assertions about possible implementation being more difficult and possibly less attractive are too vague or irrelevant to support the extreme proposal. If the proposal was based on legitimate problems, they would have been raised in each cycle from 2009 through 2018.

The proposal did not address or explain how Virginia had successfully implemented the higher conservation standards embodied in IECC updates from 2009-2018 or explain why the 2021 standards are unreasonable.

In fact, the evidence presented showed that the warehouse business was booming in the years the 2018 IECC standards were in effect. See, for example:

- **"Need for speed: Developers race to build warehouses amid site shortage,"** https://www.virginiabusiness.com/article/need-for-speed/ (Dec. 31, 2021) ("Geoff Poston [of Hampton Roads] likens the current market for building, buying and leasing warehouses and distribution centers to the mid-1800s California Gold Rush: Everybody wants in." The problem is land, not demand or ability to construct.);
- **"Making it rain: Increased e-commerce fuels wave of distribution centers,"** https://www.virginiabusiness.com/article/making-it-rain/ (April 29, 2021) ("For Hanover County Economic Development Director Linwood Thomas, things couldn't get much better. 'It's really been a perfect storm,' Thomas says. That storm — the good type — is a deluge of distribution centers and warehouses that have opened recently or are currently in the pipeline for the county of about 108,000 residents, located about 20 miles north of Richmond.… Over the past two years or so, Hanover has added about 1.5 million square feet of new space and about 80% of that has been leased. 'Then, we've got another almost 4 million square feet proposed in the next 24 months. These are tangible products that will put us over 5.5 million

square feet of new space, which is huge,' says Thomas, noting that the new space will represent a nearly VASE% increase over the county's existing stock of 13.8 million square feet of industrial/warehouse space.");

- **"Industrial boom: Virginia continues to see more warehouses and distribution centers**," https://www.virginiabusiness.com/article/industrial-boom/ (July 27, 2018)("While Hampton and Southwest Virginia area also benefiting, …. Richmond's industrial warehouse market is currently undergoing a "golden age" in the distribution sector, according to a recent report from CBRE.")

Other considerations that require deleting Appendix CD and Section 402.1.6 which operationalizes Appendix CD, thereby returning to full compliance with the latest IECC, include:

The IECC's code provisions are built upon the hard work, expertise and negotiations of hundreds of industry and efficiency experts, architects, engineers, trade associations, environmental experts, government bodies and public review processes. They consider technological developments, costs, benefits and practicality. Nothing in the IECC standards was arbitrarily arrived at. It makes accommodations are made for different types of buildings and usage patterns, including low-energy building, through different standards, exemptions and performance alternatives.

DOE/PNNL have consistently found that ASHRAE and IECC standards save money for building users through energy savings compared to initial construction costs. https://www.energycodes.gov/sites/default/files/2021-07/Cost-effectiveness_of_ASHRAE_Standard_90-1-2019-Virginia.pdf ; The U.S. Department of Energy (DOE) and its Pacific Northwest National Laboratory (PNNL), in 2022, completed their analysisof commercial provisions of the International Code Council's 2021 International Energy Conservation Code (IECC). As stated in PNNL's report, "the 2021 edition of the IECC results in site energy savings of 12.1% at the aggregate national level compared to the 2018 IECC edition. In addition, on a national weighted average basis, the 2021 IECC is 6.5% more efficient for site energy use than Standard 90.1-2019." The 2021 IECC also provides a nationally aggregated energy cost savings of 10.6% and greenhouse gas emissions savings of 10.2% as compared to the 2018 edition. See PNNL, 2024 IECC Interim Energy Savings Analysis and Progress Indicator for Commercial Buildings (PNNL-SA-178763). See also https://www.energycodes.gov/determinations for recent and past determinations. Many of the DOE commercial determinations address ASHRAE standards which have followed an upward trajectory for efficiency stringency similar to IECC.

The proponent's supporting statement did not consider cost impacts, over time, to building users or the impacts of rising energy costs, which are likely to occur as climate change drives up ambient temperatures.

The proponent provided no evidence on how the public, including building occupants, communities and residents of the Commonwealth – would be affected by exempting these three large categories of buildings from all energy conservation requirements. DOE has found, for example, that energy use reductions, under updated IECC standards, would reduce GHG emissions impacts and climate impacts. By reducing peak and off-peak energy demands, keeping up with the latest IECC would reduce pressure on utilities to raise rates charged to all customers to cover higher priced energy resources.

Despite short-term appeals to builders of reducing construction costs, continuing implementation of the rollback would increase the risk that the buildings would become obsolete more quickly as energy operating costs go up for occupants. Lower rents and vacancies could follow just as they have for older office buildings in many areas.

In sum, while C402.1.6. and Appendix CD should be deleted from Virginia's building code as proposed elsewhere, they should at least be limited to buildings that are not heated above 60°F or cooled other than by fans or natural ventilation Such a limiting amendment would be at least generally consistent the IECC's existing standards which limit the envelope requirements for buildings that have little or no heating and cooling. No substantive information has ever been presented to support rolling back envelope efficiency standards to the 2006 level for all of Groups F, S and U, most of which were not even discussed in the 2021 cycle.

Cost Impact: The code change proposal will increase the cost

This code change proposal will increase construction costs for some, but not all, new buildings in Groups F, S and U. However, it will reduce energy costs and pollution, saving money for most building users in Groups F, S and U and protecting Virginia residents health, safety and welfare consistent with the requirements of Virginia laws governing building codes.
The DOE and PNNL have repeatedly found that the IECC's (and ASHRAE's) higher efficiency standards from 2009-2021 would result in large savings of energy and money. The evolution of the IECC, since 2006, was justified justified by changes in technology, building techniques, energy savings and energy costs, all of which have been reviewed by the IECC, DOE, and PNNL.

As discussed in the Reason Statement, Virginia warehouse builders managed to successfully and profitably construct new structures under Virginia's building code, which, prior to the 2021 cycle, had implemented all the IECC's updates after 2006. Building warehouses was a "booming" business under full compliance with IECC's commercial envelope standards, which had been adopted in full by the Board prior to the last cycle.

The scanty cost claims that were presented in support of the Section 402.1.6 and Appendix CD (then called Appendix CB) described two hypothetical warehouses (presumably in Group F) and focused on buildings that are not heated above 60 F or cooled. There was no information about (a) any of costs or benefits for the many other types of buildings covered by Appendix CD, (b) the energy and energy cost savings that would result from the higher efficiency standards in either the 2021 or 2018 IECC, (c) any justifications for the many other changes embedded in Appendix CD, (d) how the so-called complications of construction had been successfully and profitably complied with for well over a decade, (e) why ASHRAE standards should be rolled back, (f) impacts on climate and other forms of air pollution, or any other issue relevant to the rollback to 8 pages of 2006 standards. Weakening building code standards to help two isolated examples or buildings that do not heat above 60°F or cool with air conditioning would hurt future building users of the other 120+ types of buildings in Groups F, S and U, most of which have very different heating and cooling profiles, involving much greater energy use for heating and/or cooling. Once the standards are weakened, builders will be pressured to match efficiency reductions by competitors – a result that building codes are supposed to prevent. That is not consistent with either the public's health, safety and welfare or the IECC’s energy conservation standards.

Virginia law requires that these provisions of the code be restored to those of the latest IECC at least for buildings that are designed and equipped for heating and cooling. At a minimum, C402.1.6 and Appendix CD should be limited to buildings that are not designed or equipped to be heated above 60F or cooled other than with fans or natural ventilation as proposed herein.

EC-C403.7.4.1-24

VECC: C403.7.4.1

Proponents: Joseph Willis, representing Prince William County (jwillis@pwcgov.org); Eric Mays, representing Prince William County (emays@pwcgov.org); Donna Rubino, Prince William County, representing Prince William County Building (drubino@pwcgov.org)

2021 Virginia Energy Code

Revise as follows:

C403.7.4.1 Nontransient dwelling units. Nontransient dwelling units shall be provided with outdoor air energy recovery ventilation systems with an *enthalpy recovery ratio* of not less than 50 percent at cooling design condition and not less than 60 percent at heating design condition.

Exceptions:

1. Nontransient dwelling units in Climate Zone 3C.
2. Nontransient dwelling units with not more than 500 square feet (46 m^2) of *conditioned floor area* in Climate Zones 0, 1, 2, 3, 4C and 5C.
3. *Enthalpy recovery ratio* requirements at heating design condition in Climate Zones 0, 1 and 2.
4. *Enthalpy recovery ratio* requirements at cooling design condition in Climate Zones 4, 5, 6, 7 and 8.
5. Nontransient dwelling units where the ratio of required outdoor air to supply air is less than 10 percent.

Reason Statement:

Individual HVAC systems for condos and apartments tend to range from 2-3 tons cooling capacity. The required ventilation air is typically 5% or less of the supply airflow. The mechanical code permits options to achieve this through inexpensive means (connect to the return air side of the air handler or mechanical exhaust).

Prior to the 2015 Mechanical Code, natural ventilation was permitted through operable windows. Since then, only mechanical ventilation is permitted for this application.

An enthalpy recovery ratio for an ERV of 50%, means that 50% of the energy difference between the outside air and the return air is recovered and used to precondition the supply air. I'm assuming that the enthalpy recovery ratio at cooling design will be less than 50% for these types of units, so I use Exception 4. (Is that what the exception means? It's not clear.)

Cost Impact: The code change proposal will decrease the cost

Requiring these systems to use individual energy recovery is an added expense (~$600 - $1000 per unit) that doesn't seem necessary at these low airflows. There are better options available when using energy recovery for outdoor air, such as large dedicated outdoor air units with energy recovery to provide fresh air to multiple units or corridors.

EC-C405.15-24

IECC: C405.15, C405.15.1, C405.15.2, TABLE C405.15.2, C405.15.2.1, C405.15.2.2, C405.15.3, C405.15.4

Proponents: Steven Shapiro, AOBA/VAMA, representing Apartment and Office Building Association/Virginia Apartment Management Association (stevenishapiro@outlook.com)

2024 International Energy Conservation Code [CE Project]

Delete without substitution:

~~**C405.15 Renewable energy systems.** *Buildings* in Climate Zones 0 through 7 shall comply with Sections C405.15.1 through C405.15.4.~~

~~**C405.15.1 On-site renewable energy systems.** *Buildings* shall be provided with on-site renewable electricity generation systems with a direct current (DC) nameplate power rating of not less than 0.75 watts per square foot (8.1 W/m^2) multiplied by the sum of the gross *conditioned floor area* of all floors, not to exceed the combined gross *conditioned floor area* of the three largest floors.~~

~~**Exceptions:** The following *buildings* or building sites shall comply with Section C405.15.2:~~

1. ~~A *building site* located where an unshaded flat plate collector oriented toward the equator and tilted at an angle from horizontal equal to the latitude receives an annual daily average incident solar radiation less than 1.1 kBtu/ft^2 per day (3.5 kWh/m^2/day).~~
2. ~~A *building* where more than 80 percent of the roof area is covered by any combination of permanent obstructions such as, but not limited to, mechanical equipment, vegetated space, access pathways or occupied roof terrace.~~
3. ~~Any *building* where more than 50 percent of the roof area is shaded from direct-beam sunlight by natural objects or by structures that are not part of the *building* for more than 2,500 annual hours between 8:00 a.m. and 4:00 p.m.~~
4. ~~A *building* with gross *conditioned floor area* less than 5,000 square feet (465 m^2).~~

~~**C405.15.2 Off-site renewable energy.** *Buildings* that qualify for one or more of the exceptions to Section C405.15.1 or do not meet the requirements of Section C405.15.1 with an on-site renewable energy system shall procure off-site renewable electrical energy, in accordance with Sections C405.15.2.1 and C405.15.2.2, that shall be not less than the total off-site renewable electrical energy determined in accordance with Equation 4-11.~~

$$\cancel{TRE_{off} = (REN_{off} \times 0.75\ W/ft^2 \times FLRA - IRE_{on}) \times 15} \qquad \textbf{Equation 4-11}$$

~~where:~~

~~TRE_{off} = Total off-site renewable electrical energy in kilowatt-hours (kWh) to be procured in accordance with Table C405.15.2.~~
~~REN_{off} = Annual off-site renewable electrical energy from Table C405.15.2, in units of kilowatt-hours per watt of array capacity.~~
~~FLRA = The sum of the gross conditioned floor area of all floors not to exceed the combined floor area of the three largest floors.~~
~~IRE_{on} = Annual on-site renewable electrical energy generation of a new on-site renewable energy system, to be installed as part of the building project, whose rated capacity is less than the rated capacity required in Section C405.15.1.~~

~~TABLE C405.15.2 ANNUAL OFF-SITE RENEWABLE ENERGY REQUIREMENTS~~

~~CLIMATE ZONE~~	~~ANNUAL OFF-SITE RENEWABLE ELECTRICAL ENERGY (kWh/W)~~
~~1A, 2B, 3B, 3C, 4B and 5B~~	~~1.75~~
~~0A, 0B, 1B, 2A, 3A and 6B~~	~~1.55~~
~~4A, 4C, 5A, 5C, 6A and 7~~	~~1.35~~

~~**C405.15.2.1**~~ **Off-site procurement.** ~~The building *owner,* as defined in the *International Building Code* , shall procure and be credited for the total amount of off-site renewable electrical energy, not less than required in accordance with Equation 4-11, with one or more of the following:~~

1. ~~*Physical renewable energy power purchase agreement.*~~
2. ~~*Financial renewable energy power purchase agreement.*~~
3. ~~*Community renewable energy facility.*~~
4. ~~Off-site renewable energy system owned by the building property *owner.*~~
5. ~~*Renewable energy investment fund.*~~
6. ~~*Green retail tariff.*~~

~~The generation source shall be located where the energy can be delivered to the *building site* by any of the following:~~

1. ~~Direct connection to the off-site renewable energy facility.~~
2. ~~The local utility or distribution entity.~~
3. ~~An interconnected electrical network where energy delivery capacity between the generator and the *building site* is available.~~

~~**C405.15.2.2 Off-site contract.**~~ ~~The renewable energy shall be delivered or credited to the *building site* under an energy contract with a duration of not less than 10 years. The contract shall be structured to survive a partial or full transfer of ownership of the building property.~~

~~**C405.15.3**~~ **Renewable energy certificate (REC) documentation.** ~~The property *owner* or owner's authorized agent shall demonstrate that where renewable energy certificates (RECs) or energy attribute certificates (EACs) are associated with on-site and off-site renewable energy production required by Sections C405.15.1 and C405.15.2, all of the following criteria for RECs and EACs shall be met:~~

1. ~~The RECs and EACs are retained and retired by or on behalf of the property owner or tenant for a period of not less than 15 years or the duration of the contract in Section C405.15.2.2, whichever is less.~~
2. ~~The RECs and EACs are created within a 12-month period of the use of the REC.~~
3. ~~The RECs and EACs are from a generating asset placed in service not more than 5 years before the issuance of the certificate of occupancy.~~

~~**C405.15.4**~~ **Renewable energy certificate purchase.** ~~A *building* that qualifies for one or more of the exceptions to Section C405.15.1, and where it can be demonstrated to the *code official* that the requirements of Section C405.15.2 cannot be met, the building owner shall contract the purchase of renewable electricity products before the certificate of occupancy is issued. The purchase of renewable electricity products shall comply with the Green-e Energy National Standard for renewable electricity products equivalent to five times the amount of total off-site renewable energy calculated in accordance with Equation 4-11.~~

Reason Statement:

Remove Section C 405.15, requiring buildings to install on-site renewable energy systems or procure off-site renewable energy equal to 15% of the building's energy use.

This standard established by this code change is infeasible.

Even for new construction, it can be difficult to carve out contiguous space for systems representing 8-10% of the building's energy use. Depending on the size and use of the building, 5% may be a more practical standard. (The 15% threshold may be completely infeasible for smaller building types.)

This can be significantly more challenging for renovations of existing buildings where the space was not planned to accommodate renewable energy systems.

Renewable energy systems compete for limited space with cooling towers, condensing units and other systems, not to mention green rooves and amenity spaces that tenants demand. Multifamily properties may have multiple individual HVAC units with which to contend for limited space.

This code change will increase construction costs and discourage renovations.

The rough cost of a solar energy system is approximately $3 per watt for systems between 50 and 250 kilowatts in size.

- o This includes panels, wiring, batteries, and inverters.
- o This does not include extremely expensive canopy systems which may be required to achieve higher percentages of building energy use or for buildings over 80 feet in height.
  - § Many commercial buildings make use of ballast systems, which employ weights to secure equipment without the need to puncture the roof. Canopy and racking systems come with additional concerns for leaks developing over time as they require a great many roof punctures.
- o New solar and canopy systems may additionally trigger very expensive structural upgrades to support the weight of the renewable energy systems.

Section C 405.15 allows for properties which cannot meet the 15% threshold to supplement onsite generation with renewable energy credits (RECs). On the open market, such credits can be secured for approximately $3-4 per MWh. Local credits are far more costly, at around $100-$200 per MWh.

The costs of construction are ultimately passed onto Virginia businesses and renters. The Commonwealth can ill afford to absorb these costs in our current economic climate.

- o Commercial office properties across the Commonwealth currently face a vacancy rate of 13%, indicative of a struggling market sector. Urban centers like Arlington and Fairfax in Northern Virginia are facing vacancies in the range of 20-25%. Increasing the cost of commercial office construction will render Virginia less competitive with surrounding states.
- o The spike in commercial vacancy rates since the COVID-19 pandemic has led many jurisdictions to pursue converting commercial office properties to multifamily residential use. By driving up the cost of construction, this code change will serve as an impediment to substantial building renovations and conversions.
- o Virginia additionally faces a crisis of housing affordability attributable to the failure of the Commonwealth to keep place with housing demand. Driving up the cost of construction will hinder Virginia's efforts to attract new multifamily housing development.

This code change fails to consider the challenges associated with connectivity to the grid, outside of the property owner's control.

Properties installing renewable energy systems must navigate Dominion Virginia Power's net metering and permitting rules and requirements.

Example #1

This large warehouse retail space in Reston is one of the few commercial building types with ample roof space to accommodate renewable energy systems. In the illustration below, you can see that the vendor has depicted the installation of solar panels in almost every available space. Yet, even with this extremely cluttered design, the building would still only be able to achieve 12% of its energy consumption from renewable energy. And this would be at a cost of roughly $1.5 million. Again, this does not factor in the probable necessity of canopy and racking systems and the associated structural work they would require. Additionally, the need to cluster panels in non-contiguous spaces to reach the maximum percentage of building energy consumption supported by renewable energy would require extensive string wiring back to a centralized inverter, creating an additional safety hazard.

Example #2

Member property example #2 is a 712-unit garden-style apartment community in Alexandria, consisting of seven 4-story buildings.

The property averages 4,029,169 kWh of annual consumption, requiring an offset of 604,375 kWh to meet the 15% standard. While the property boasts significant roof and green space to accommodate renewable energy systems, installation would likely require the removal of several trees. This could potentially run afoul of local tree preservation policies/efforts.

Meeting the 15% standard would require a DC system size of 510 kW. The vendor recommends installation of 850 600W solar panels. Applying the $3/watt standard cost, the total comes to approximately $1.5 million.

600W X 850 panels X $3 unit cost = $1,530,000

This property, originally constructed in 1964, operates as market-rate affordable housing, with rents well below market averages. Given its age, it is likely that the property will require substantial renovation in the next 10-15 years. Taking into account the below-market rent levels that such a property can command, the addition of $1.5 million in cost could very well scuttle reinvestment in the property, leading either to substandard housing or a loss of affordable housing stock coveted by the Commonwealth and its jurisdictions.

Example #3

Member property example #2 is an 18-story, 853,000 square foot commercial office tower in Reston.

The property averages 9,458,913 kWh of annual consumption, requiring an offset of 1,418,837 kWh to meet the 15% standard. As depicted above, there is very little usable space on the roof of the office tower itself. The adjoining parking structure could accommodate renewable energy systems with the use of canopy systems, adding approximately $1.50 per watt.

Meeting the 15% standard would require a DC system size of 1,183 kW. The vendor recommends installation of 1,970 600W solar panels. Applying the $3/watt standard cost, plus the additional $1.50 per watt standard for canopy systems, the total comes to approximately $5.3 million.

600W X 1,970 panels X $4.50 unit cost = $5,319,000

Cost Impact: The code change proposal will decrease the cost

The deletion of the requirements of section C405.15 will decrease the cost of construction in the general amounts shown in the reason statement by avoiding the costs of on-site renewable energy systems as well as the procurement of off-site credits.

EC-C405.17(1)-24

IECC: C405.17 (New), C405.17.1 (New), C405.17.2 (New), C405.17.2.1 (New), C405.17.2.2 (New), C405.17.2.3 (New), C405.17.2.4 (New), C405.17.2.5 (New), C405.17.2.5.1 (New), C405.17.2.5.2 (New), C405.17.2.5.3 (New), C405.17.2.5.3.1 (New), C405.17.2.5.3.2 (New), C405.17.2.6 (New)

Proponents: William Penniman, representing Sierra Club Virginia Chapter (wpenniman@aol.com)

2024 International Energy Conservation Code [CE Project]

Add new text as follows:

C405.17 ELECTRIC VEHICLE POWER TRANSFER.

C405.17.1 Definitions.

AUTOMOBILE PARKING SPACE. A space within a building or private or public parking lot, exclusive of driveways, ramps, columns, office and work areas, for the parking of an automobile.

ELECTRIC VEHICLE (EV). An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles and electric motorcycles, primarily powered by an electric motor that draws current from a building electrical service, electric vehicle supply equipment (EVSE), a rechargeable storage battery, a fuel cell, a photovoltaic array or another source of electric current.

ELECTRIC VEHICLE CAPABLE SPACE (EV CAPABLE SPACE). A designated automobile parking space that is provided with electrical infrastructure such as, but not limited to, raceways, cables, electrical capacity, a panelboard or other electrical distribution equipment space necessary for the future installation of an EVSE.

ELECTRIC VEHICLE READY SPACE (EV READY SPACE). An automobile parking space that is provided with a branch circuit and an outlet, junction box or receptacle that will support an installed EVSE.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). Equipment for plug-in power transfer, including ungrounded, grounded and equipment grounding conductors; electric vehicle connectors; attached plugs; any personal protection system; and all other fittings, devices, power outlets or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the electric vehicle.

ELECTRIC VEHICLE SUPPLY EQUIPMENT INSTALLED SPACE (EVSE SPACE). An automobile parking space that is provided with a dedicated EVSE connection.

C405.17.2 Electric vehicle power transfer infrastructure. Parking facilities shall be provided with electric vehicle power transfer infrastructure in accordance with Sections C405.17.2.1 through C405.17.2.6 and all applicable fire safety regulations.

C405.17.2.1 Quantity. Except to the extent the number of potential chargers is limited by any applicable fire safety regulations, the number of required electric vehicle (EV) spaces, EV capable spaces and EV ready spaces shall be determined in accordance with this section and Table C405.17.2.1 based on the total number of automobile parking spaces and shall be rounded up to the nearest whole number. For R-2 buildings, the C405.17.2.1 requirements shall be based on the total number of dwelling units or the total number of automobile parking spaces, whichever is less.

1. Where more than one parking facility is provided on a building site, the number of required automobile parking spaces required to have EV power transfer infrastructure shall be calculated separately for each parking facility.
2. Where one shared parking facility serves multiple building occupancies, the required number of spaces shall be determined

proportionally based on the floor area of each building occupancy.

3. Installed electric vehicle supply equipment installed spaces (EVSE spaces) that exceed the minimum requirements of this section may be used to meet the minimum requirements for EV ready spaces and EV capable spaces.

4. Installed EV ready spaces that exceed the minimum requirements of this section may be used to meet the minimum requirements for EV capable spaces.

5. Where the number of EV ready spaces allocated for R-2 occupancies is equal to the number of dwelling units or to the number of automobile parking spaces allocated to R-2 occupancies, whichever is less, requirements for EVSE spaces for R-2 occupancies shall not apply.

6. Requirements for a Group S-2 parking garage shall be determined by the occupancies served by that parking garage. Where new automobile spaces do not serve specific occupancies, the values for Group S-2 parking garage in Table C405.17.2.1 shall be used

Exception: Parking facilities serving occupancies other than R2 with fewer than 10 automobile parking spaces.

TABLE C405.17.2.1—REQUIRED EV POWER TRANSFER INFRASTRUCTURE

OCCUPANCY	EVSE SPACES	EV READY SPACES	EV CAPABLE SPACES
Group A	3%	0%	10%
Group B	3%	0%	10%
Group E	3%	0%	10%
Group F	2%	0%	5%
Group H	1%	0%	0%
Group I	5%	0%	10%
Group M	5%	0%	10%
Group R-1	5%	5%	30%
Group R-2	5%	5%	30%
Groups R-3 and R-4	2%	0%	5%
Group S exclusive of parking garages	1%	0%	0%
Group S-2 parking garages	5%	0%	10%

C405.17.2.2 EV Capable Spaces. Each EV capable space used to meet the requirements of Section C405.17.2.1 shall comply with the following:

1. A continuous raceway or cable assembly shall be installed between an enclosure or outlet located within 3 feet (914 mm) of the EV capable space and electrical distribution equipment.

2. Installed raceway or cable assembly shall be sized and rated to supply a minimum circuit capacity in accordance with Section C405.17.2.5.

3. The electrical distribution equipment to which the raceway or cable assembly connects shall have dedicated overcurrent protection device space and electrical capacity to supply a calculated load in accordance with Section C405.17.2.5.

4. The enclosure or outlet and the electrical distribution equipment directory shall be marked: “For electric vehicle supply equipment (EVSE).”

C405.17.2.3 EV Ready Spaces. Each branch circuit serving EV ready spaces used to meet the requirements of Section C405.17.2.1 shall comply with the following:

1. Terminate at an outlet or enclosure located within 3 feet (914 mm) of each EV ready space it serves.

2. Have a minimum system and circuit capacity in accordance with Section C405.17.2.5.

3. The electrical distribution equipment directory shall designate the branch circuit as “For electric vehicle supply equipment (EVSE)”

and the outlet or enclosure shall be marked “For electric vehicle supply equipment (EVSE).”

C405.17.2.4 EVSE Spaces.
An installed EVSE with multiple output connections shall be permitted to serve multiple EVSE spaces. Each EVSE installed to meet the requirements of Section C405.17.2.1, serving either a single EVSE space or multiple EVSE spaces, shall comply with the following:

1. Have a minimum system and circuit capacity in accordance with Section C405.17.2.5.
2. Have a nameplate rating not less than 6.2 kW.
3. Be located within 3 feet (914 mm) of each EVSE space it serves.
4. Be installed in accordance with Section C405.17.2.6.

C405.17.2.5 System and circuit capacity. The system and circuit capacity shall comply with Sections C405.17. 2.5.1 and C405.17.2.5.2.

C405.17.2.5.1 System capacity. The electrical distribution equipment supplying the branch circuit(s) serving each EV capable space, EV ready space and EVSE space shall comply with one of the following:

1. Have a calculated load of 7.2 kVA or the nameplate rating of the equipment, whichever is larger, for each EV capable space, EV ready space and EVSE space.

2. Meets the requirements of Section C405.17.2.5.3.1.

C405.17.2.5.2 Circuit capacity.
The branch circuit serving each EV capable space, EV ready space and EVSE space shall comply with one of the following:

1. Have a rated capacity not less than 50 amperes or the nameplate rating of the equipment, whichever is larger.

2. Meets the requirements of Section C405.17.2.5.3.2.

C405.17.2.5.3 System and circuit capacity management. Where system and circuit capacity management is selected in Section C405.17.2.5.1 or C405.17.2.5.2, the installation shall comply with Sections C405.17. 2.5.3.1 and C405.17.2.5.3.2.

C405.17.2.5.3.1 System capacity management. The maximum equipment load on the electrical distribution equipment supplying the branch circuits(s) serving EV capable spaces, EV ready spaces and EVSE spaces controlled by an energy management system shall be the maximum load permitted by the energy management system, but not less than 3.3 kVA per space.

C405.17.2.5.3.2 Circuit capacity management.

Each branch circuit serving multiple EVSE spaces, EV ready spaces or EV capablespaces controlled by an energy management system shall comply with one of the following:

1. Have a minimum capacity of 25 amperes per space.

2. Have a minimum capacity of 20 amperes per space for R-2 occupancies where all automobile parking spaces are EV ready spaces or EVSE spaces.

C405.17.2.6 EVSE installation. EVSE shall be installed in accordance with NFPA 70 and shall be listed and labeled in accordance with UL 2202 (2009 with revisions through February 2018) or UL 2594 (2016). EVSE shall be accessible in accordance with Section 1107 of the International Building Code.

Reason Statement:

The purpose of this proposal is to incorporate into Virginia's commercial building code most of the substance of 2024 IECC's Appendix CG, with modifications (a) to substantially reduce the number of affected parking spaces and (b) to assure compliance with all applicable fire safety regulations. Specifically: (1) the percentage of parking spaces requiring EVSE or EV Capable spaces specified by Table C405.17.2.1 Required EV Power Infrastructure is reduced by two-thirds for most categories of occupancies; and (2) language is added to Sections C405.17.2 and C405.17.2.1 to confirm both (i) the primacy of compliance with fire safety regulations and (ii) the fact that such regulations may limit the potential number of spaces that may fitted with EV charging and thus the potential number of parking spaces subject to requirements for EV infrastructure.

While Appendix CG comes with the 2024 IECC, activation of Appendix CG requires inserting language into the Virginia Construction Code for residential construction, which this proposal would do by adding a new Section C405.17.

Adoption of this proposal would benefit occupants and users of new commercial building—whether owners, employees, customers, or visitors—by facilitating convenient electric vehicle charging, which can readily be expanded as the need grows. Implementation would benefit residents and the public with cost savings, pollution reduction (including greenhouse gases, ozone and carbon monoxide) and more equitable access to EVs and EV charging for residents. It would avoid the much higher costs of having to retrofit parking areas and building electrical systems.

Under the proposed Section C405.17, builders would have to provide basic levels of EV charging readiness: EV Capable Space (basic infrastructure for future installation of a branch circuit and charger); or EV Ready Space (basic infrastructure plus a branch circuit, outlet, junction box or receptacle); or EVSE Space (includes actual charging). The number of each type of EV space depends upon the type of building for which parking is provided. The numbers are tailored to reflect expected times for users to stay at a building and the fact that, while most EV charging now occurs at home, many people do not have access to EV charging where they live. Under the proposal, the greatest number of EV-related spaces are required in multifamily residential buildings, but lesser levels are required in other types of buildings. The three types of EV spaces are designed to minimize future EV charging installation costs, since retrofits are much more costly than incorporating EV infrastructure into initial construction.

By agreement among members of the ICC's committee to develop the 2024 IECC, these EV charging requirements were to have been included in the main body of the 2024 IECC (as proposed here). It was shifted to an appendix on appeal. Activating an appendix requires text in the code itself, which is the purpose of this proposal.

Virginians would benefit from a requiring minimum levels of EV charging infrastructure in new construction. EVs have many economic and health benefits for vehicle users. EVs are cheaper to use and maintain compared to vehicles with internal combustion engines (ICE). While most charging currently occurs at home, many EV owners and potential buyers do not have EV infrastructure at their dwellings or even the potential to install charging in the future. Locating at least a minimum number of chargers at places of work and business, will help to alleviate this barrier to EV adoption and afford residents of older buildings access to the benefits of EVs.

Growing EV usage is very important to Virginia for additional reasons. As explained in the ICC commentary accompanying the 2024 IECC, "The U.S. transportation sector accounted for 29 percent of the nation's greenhouse gas (GHG) emissions in 2019." That is specifically due to the traditional predominance of vehicles with internal combustion engines (ICE). Greenhouse gases from charging and operating EVs are less than 30% of GHG emissions from fueling and operating ICE vehicles. https://theicct.org/why-evs-are-already-much-greener-than-combustion-engine-vehicles-jul25/ EVs are also far more energy efficient than burning fuels in vehicle engines.

Reducing GHG emissions is a stated policy goal in Virginia law because climate change is a current and growing danger for Virginians. (See., e.g., § 45.2-1706.1. Commonwealth Clean Energy Policy. "A. The Commonwealth recognizes that effectively addressing climate change and enhancing resilience will advance the health, welfare, and safety of the residents of the Commonwealth. The Commonwealth further recognizes that addressing climate change requires reducing greenhouse gas emissions across the Commonwealth's economy sufficient to reach net-zero emission by 2045 in all sectors, including the electric power, transportation, industrial, agricultural, building, and infrastructure sectors….") Virginia faces growing threats, including more heat-illnesses, disruption of outdoor work, worsening storms, flooding, sea level rise, supply-chain disruption, damage to crops, trees and natural resources, arrival of diseases and pests, etc.

Bringing on EVs will also reduce other air pollutants that also threaten Virginian's health and welfare. ICE vehicles are a major source of ozone and other pollutants, including carbon monoxide risks in homes with garages.

Providing EV electric infrastructure as part of new construction is no different from the building code's requiring electrical infrastructure for HVAC, machinery and appliances likely to be used in the future or from the code's requiring more efficient equipment and lighting in new buildings.

Facilitating adoption of EVs requires that drivers have access to convenient, cost-effective EV charging. That can most easily be provided as part of new construction. As recognized in the IECC commentary on Appendix CG, it is very costly and complicated to renovate EV charging infrastructure into existing buildings.

The importance of incorporating EV charging into new construction is particularly great in the case of buildings whose parking is governed by condominium or common-interest-area boards, which divergent interests can use high retrofit costs to block EV adoption by some occupants.

Cost Impact: The code change proposal will increase the cost

The cost of installing infrastructure would depend on which of the three types of EV infrastructure is involved. The costs would be lower for an EV Capable Space and not much more for the EV Ready Space option if the electrical room or panel is close to the chosen spaces. Since electricity will be installed anyway (e.g. for garage or parking lighting, fans etc.), it would not be difficult or very costly to go the extra steps during building construction when an electrician is on site.

Construction costs will be reduced over time since retrofitting garages is much more expensive than installing at the outset the basic infrastructure to expand chargers. This has been repeatedly documented by PNNL and others.

Occupant/drivers' costs will also be reduced. EVs are less costly to operate (maintenance and energy) than traditional internal combustion engines, but access to chargers is a problem that deters EV usage. The lack of home charging is a particular barrier, which can be offset by chargers in residential and non-residential locations. Access to overnight charging is particularly important in residences and for long-distance drivers (hotels, motels, and many workers).

Additional savings will result in the form of reduced air pollution and the corresponding health benefits to all members of the public. Fuel combustion in vehicles is one of the major sources of ozone, particulates, CO_2, CO, SO_2 and other pollutants, which harm health and, in some cases drive climate change. The costs and harms are growing and harming all Virginians.

EC-C409-24

VECC: R409 (New), C409 (New)

Proponents: William Abrahamson, representing Phius, Phius Alliance (wabrahamson@gparch.com)

2021 Virginia Energy Code

Add new text as follows:

R409 PASSIVE BUILDING COMPLIANCE OPTION. ***R409.1 Phius standard compliance.*** *Compliance based on the Phius CORE 2024 of Phius ZERO 2024 (or later) Standard will include performance calculations by Phius-approved software or the use of the Phius Prescriptive Path.*
R409.1.1 Phius documentation. *Prior to the issuance of a building permit, a Phius Design Certification letter must be provided to the code official:*

R409.1.2 Project certificate. Prior to the issuance of a certificate of occupancy, a Phius 2024 (or later) Final certificate must be provided to the code official.

C409 PASSIVE BUILDING COMPLIANCE OPTION. C409.1 Phius standard compliance. Compliance based on the Phius CORE 2024 of Phius ZERO 2024 (or later) Standard will include performance calculations by Phius-approved software or the use of the Phius Prescriptive Path.
C409.1.1 Phius documentation. Prior to the issuance of a building permit, a Phius Design Certification letter must be provided to the code official.

C409.1.2 Project certificate. Prior to the issuance of a certificate of occupancy, a Phius 2024 (or later) Final certificate must be provided to the code official.

Reason Statement:

Explicitly including Phius certification as an alternate compliance path allows builders and homeowners to provide high-performing, energy efficient homes governed by rigorous, consistently vetted standards and testing without redundant reporting or conflicting requirements for envelope, mechanical, or plumbing standards.

Buildings constructed to the Phius standard provide superior indoor air quality, resilience during power outages, and an extremely quiet, comfortable indoor environment. Project teams are increasingly adopting passive building principles and the Phius standard for single-family, multifamily, and commercial buildings to achieve Net Zero buildings, resulting in over 7,000 units certified, and totaling over 7.4 million square feet across North America. Project teams are increasingly adopting passive building principles and the Phius standard for single-family, multifamily, and commercial buildings to achieve Net Zero buildings, resulting in over 7,000 units certified, and totaling over 7.4 million square feet across North America.

Phius is a non-profit 501(c)(3) organization committed to making high-performance passive building the mainstream market standard. Phius trains and certifies professionals, maintains the Phius climate-specific passive building standard, certifies and quality assures passive buildings, and conducts research to advance high-performance building**.**

See attached materials for more info on the standard, benefits, and cost impacts.

Cost Impact: The code change proposal will not increase or decrease the cost

This proposal will not incur any additional costs that a construction team would not otherwise elect to incur for their project.

This proposal could reduce soft costs and management costs by reducing redundant compliance checks and has the potential to reduce material costs by allowing builders to right-size the insulation, fenestration, and mechanical equipment based on the detailed energy modeling required by Phius certification.

REC-R402.1.2-24

VRC: TABLE N1102.1.2 (R402.1.2), TABLE N1102.1.3 (R402.1.3); IRC: TABLE N1102.1.3 (R402.1.3)

Proponents: DeAnthony Pierce, City of Roanoke, representing Virginia Building & Code Officials Association (deanthony.pierce@roanokeva.gov)

2021 Virginia Residential Code

Revise as follows:

TABLE N1102.1.2 (R402.1.2) MAXIMUM ASSEMBLY *U*-FACTORS[a] AND FENESTRATION REQUIREMENTS
Portions of table not shown remain unchanged.

CLIMATE ZONE	FRAME WALL *U*-FACTOR
3	~~0.079~~ 0.060
4 except Marine	~~0.079~~ 0.060
5 and Marine 4	~~0.079~~ 0.060

For SI: 1 foot = 304.8 mm.

a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.

b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall *U*-factors shall not exceed 0.17 in Climate Zones 0 and 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.

c. In Warm Humid locations as defined by Figure R301.1 and Table R301.1, the basement wall *U*-factor shall not exceed 0.360.

d. The SHGC column applies to all glazed fenestration.

   Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

e. There are no SHGC requirements in the Marine Zone.

f. A maximum U-factor of 0.32 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:

   1. Above 4,000 feet in elevation above sea level, or

   2. In windborne debris regions where protection of openings is required by Section R301.2.1.2.

TABLE N1102.1.3 (R402.1.3) INSULATION MINIMUM *R*-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]
Portions of table not shown remain unchanged.

CLIMATE ZONE	WOOD FRAME WALL *R*-VALUE[g]
3	~~15 or 13+1~~[g] 20 or 13&5ci or 15&2.9ci [g]
4 except Marine	~~15 or 13+1~~[g] 20 or 13&5ci or 15&2.9ci [g]
5 and Marine 4	~~15 or 13+1~~[g] 20 or 13&5ci or 15&2.9ci [g]

For SI: 1 foot = 304.8 mm.

NR = Not Required.

ci = continuous insulation.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

   Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. “5ci or 13” means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. “10ci or 13” means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. “15ci or 19 or 13&5ci” means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs. as indicated in the table. The slab-edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation shall not be required in Warm Humid locations as defined by Figure N1101.7 and Table N1101.7.

g. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, “13&5” means R-13 cavity insulation plus R-5 continuous insulation.

h. Mass walls shall be in accordance with Section N1102.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

i. A maximum *U*-factor of 0.32 shall apply in Climate Zones 3 through 8 to vertical fenestration products installed in buildings located either:

   1. Above 4,000 feet in elevation, or
   2. In windborne debris regions where protection of openings is required by Section R301.2.1.2.

2024 International Residential Code

Revise as follows:

TABLE N1102.1.3 (R402.1.3) INSULATION MINIMUM *R*-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

Portions of table not shown remain unchanged.

For SI: 1 foot = 304.8 mm.NR = Not Required, ci = Continuous Insulation.

h. ~~"30 or 19+7.5ci or 20ci" means R-30 cavity insulation alone or R-19 cavity insulation with R-7.5 continuous insulation or R-20 continuous insulation alone.~~ "20 or 13+ 5ci or 15+2.9ci" means R-20 cavity insulation alone or R-13 cavity insulation with R-5 continuous insulation or R-15 cavity insulation with R-2.9 continuous insulation.

Reason Statement:

This proposal is meant to be a replace Virginia's Amended "R-15 or 13+1" wall insulation requirement, which has been in-place since the 2012 Code Cycle.

When the Amendment was adapted, it generally aligned with the requirements in the Model I-Codes. Since than, prescriptive insulation values have incrementally increased in the Model I-Codes, while Virginia's Wall insulation has remained the same.

This proposal will put Virginia's insulation requirements, roughly in-line with the 2018 Model I-Codes.

Cost Impact: The code change proposal will increase the cost

If adopted, this code change will increase the cost to builders who generally use 2x4 framing, and R-15 batt insulation, since it will require the use of either 2x6 framing, or added continuous insulation on the exterior.

The cost of framing would also increase since window framing around exterior window and door openings would have to be extended, to facilitate the continuous insulation, or if 2x6 studs are used.

2.9 continuous insulation with R-15 batt insulation was determined to be roughly equivalent to R-13 + 5 continuous. Through preliminary research, R-2.9 rigid board insulation was regularly available at retail chains such as Lowes and Home Depot. For this reason, R-15 with 2.9 continuous was added as an option for builders who prefer to build with 2x4 studs, and use R-15 insulation.

Attached Files

- **VBCOA 2024 Code Change Proposal_N1102 Tables.pdf**
  https://va.cdpaccess.com/proposal/1408/2011/files/download/946/

Proponents: VBCOA

2024 Virginia Residential Code

Revise as follows:

SECTION N1102 (R402)
BUILDING THERMAL ENVELOPE

…

TABLE N1102.1.2 (R402.1.2)
MAXIMUM ASSEMBLY *U*-FACTORS[a] AND FENESTRATION REQUIREMENTS

CLIMATE ZONE	3	4 EXCEPT MARINE	5 EXCEPT MARINE 4
CEILING *U*-FACTOR	0.030	0.026	0.026
WOOD-FRAMED WALL *U*-FACTOR	~~0.079~~ 0.060	~~0.079~~ 0.060	~~0.079~~ 0.060

…

TABLE N1102.1.3(R402.1.3)

INSULATION MINIMUM *R*-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	3	4 EXCEPT MARINE	5 EXCEPT MARINE 4
CEILING *R*-VALUE	38	49	49
WOOD-FRAMED WALL *R*-VALUE	~~15 or 13+1~~ 20 or 13&5ci or 15&2.9ci	~~15 or 13+1~~ 20 or 13&5ci or 15&2.9ci	~~15 or 13+1~~ 20 or 13&5ci or 15&2.9ci

Reason Statement:

This proposal is meant to be a replace Virginia's Amended "R-15 or 13+1" wall insulation requirement, which has been in-place since the 2012 Code Cycle.

When the Amendment was adapted, it generally aligned with the requirements in the Model I-Codes. Since than, prescriptive insulation values have incrementally increased in the Model I-Codes, while Virginia's Wall insulation has remained the same.

This proposal will put Virginia's insulation requirements, roughly in-line with the 2018 Model I-Codes.

Resiliency Impact Statement:

This proposal will increase the resiliency of new homes to withstand exterior temperature extremes, by increasing the overall Building Thermal Envelope of a home. The incremental increase in wall insulation can further assist a home with maintaining its internal temperature longer, when mechanical equipment becomes inoperable in events such as blackouts.

Cost Impact:

If adopted, this code change will increase the cost to builders who generally use 2x4 framing, and R-15 batt insulation, since it will require the use of either 2x6 framing, or added continuous insulation on the exterior.

The cost of framing would also increase since window framing around exterior window and door openings would have to be extended, to facilitate the continuous insulation, or if 2x6 studs are used.

2.9 continuous insulation with R-15 batt insulation was determined to be roughly equivalent to R-13 + 5 continuous. Through preliminary research, R-2.9 rigid board insulation was regularly available at retail chains such as Lowes and Home Depot. For this reason, R-15 with 2.9 continuous was added as an option for builders who prefer to build with 2x4 studs, and use R-15 insulation.

REC-R402.1.2(1)-24

IRC: TABLE N1102.1.2 (R402.1.2), TABLE N1102.1.3 (R402.1.3)

Proponents: Eric Lacey, representing Responsible Energy Codes Alliance (eric@reca-codes.com)

2024 International Residential Code

Revise as follows:

TABLE N1102.1.2 (R402.1.2) MAXIMUM ASSEMBLY *U*-FACTORS[a] AND FENESTRATION REQUIREMENTS
Portions of table not shown remain unchanged.

CLIMATE ZONE	3	4 EXCEPT MARINE	5 AND MARINE 4
CEILING *U*-FACTOR	~~0.030~~ 0.026	~~0.026~~ 0.024	~~0.026~~ 0.024

For SI: 1 foot = 304.8 mm.

a. Nonfenestration *U*-factors and *F* -factors shall be obtained from measurement, calculation, an approved source or Appendix NF where such appendix is adopted or approved.

b. Mass walls shall be in accordance with Section N1102.2.6. Where more than half the insulation is on the interior, the mass wall *U*-factors shall not exceed 0.17 in Climate Zones 0 and 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.

c. In Warm Humid locations as defined by Figure N1101.7 and Table N1101.7, the *basement wall U*-factor shall not exceed 0.360.

d. A maximum *U*-factor of 0.30 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4,000 feet in elevation above sea level, or
2. In windborne debris regions where protection of openings is required by Section R301.2.1.2.

e. *F*-factors for slabs shall correspond to the *R*-values of Table N1102.1.3 and the installation conditions of Section N1102.2.10.1.

TABLE N1102.1.3 (R402.1.3) INSULATION MINIMUM *R*-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]
Portions of table not shown remain unchanged.

CLIMATE ZONE	3	4 EXCEPT MARINE	5 AND MARINE 4
CEILING *R*-VALUE	~~38~~ 49	~~49~~ 60	~~49~~ 60

For SI: 1 foot = 304.8 mm.NR = Not Required, ci = Continuous Insulation.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. "5ci or 13" means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13&5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.

c. Slab insulation shall be installed in accordance with Section N1102.2.10.1.

d. Basement wall insulation shall not be required in Warm Humid locations as defined by Figure N1101.7 and Table N1101.7.

e. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, "13&5" means R-13 cavity insulation plus R-5 continuous insulation.

f. Mass walls shall be in accordance with Section N1102.2.6. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

g. A maximum *U*-factor of 0.30 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4,000 feet in elevation.

2. In windborne debris regions where protection of openings is required by Section R301.2.1.2.

h. "30 or 19+7.5ci or 20ci" means R-30 cavity insulation alone or R-19 cavity insulation with R-7.5 continuous insulation or R-20 continuous insulation alone.

Reason Statement:

This proposal reverses an efficiency rollback incorporated into the 2024 *IECC* by restoring the ceiling insulation R-values to R-60 for Virginia's climate zones (which is the current requirement in the Uniform Construction Code). This requirement was rolled back in the 2024 *IECC* as part of a large compromise among *IECC*-Residential Development Committee Members referred to as the "omnibus." However, significant portions of the omnibus related to electrification and decarbonization were removed from the 2024 *IECC* by the ICC Board of Directors as a result of several appeals, leaving in place several material efficiency rollbacks. These rollbacks would not have been approved in the 2024 *IECC* but for the omnibus compromise, and we recommend that Virginia adopt prescriptive envelope requirements at least as efficient as the 2021 *IECC*. Ceiling insulation is one of the longest-lasting efficiency measures in a building and will provide comfort and energy savings for occupants in all seasons, as well as improved passive survivability in the event of natural disasters and long-term power outages.

Cost Impact: The code change proposal will not increase or decrease the cost

This proposal will maintain Virginia's current ceiling insulation prescriptive baseline, so there will be no increase in construction costs. However, if Virginia reduces ceiling insulation requirements (per the 2024 IECC), this would increase costs for homeowners over the 70-100 year useful life of the building.

REC-R402.1.2(2)-24

VRC: TABLE N1102.1.2 (R402.1.2), TABLE N1102.1.3 (R402.1.3); VCC: 1301.1.1.1

Proponents: Eric Lacey, representing Responsible Energy Codes Alliance (eric@reca-codes.com)

2021 Virginia Residential Code

Revise as follows:

TABLE N1102.1.2 (R402.1.2) MAXIMUM ASSEMBLY *U*-FACTORS[a] AND FENESTRATION REQUIREMENTS

Portions of table not shown remain unchanged.

CLIMATE ZONE	FENESTRATION *U*-FACTOR[f]	SKYLIGHT *U*-FACTOR	GLAZED FENESTRATION SHGC[d, e]	CEILING *U*-FACTOR	FRAME WALL *U*-FACTOR	MASS WALL *U*-FACTOR[b]	FLOOR *U*-FACTOR	BASEMENT WALL *U*-FACTOR	CRAWL SPACE WALL *U*-FACTOR
3	0.30	0.55	0.25	0.026	0.060 ~~0.079~~	0.098	0.047	0.091c	0.136
4 except Marine	0.30	0.55	0.40	0.024	0.045 ~~0.079~~	0.098	0.047	0.059	0.065
5 and Marine 4	0.30	0.55	0.40	0.024	0.045 ~~0.079~~	0.082	0.033	0.050	0.055

For SI: 1 foot = 304.8 mm.

a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.

b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall *U*-factors shall not exceed 0.17 in Climate Zones 0 and 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.

c. In Warm Humid locations as defined by Figure R301.1 and Table R301.1, the basement wall *U*-factor shall not exceed 0.360.

d. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

e. There are no SHGC requirements in the Marine Zone.

f. A maximum U-factor of 0.32 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4,000 feet in elevation above sea level, or
2. In windborne debris regions where protection of openings is required by Section R301.2.1.2.

TABLE N1102.1.3 (R402.1.3) INSULATION MINIMUM *R*-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

Portions of table not shown remain unchanged.

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b, i]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b, e]	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE[g]	MASS WALL *R*-VALUE[h]	FLOOR *R*-VALUE	BASEMENT[c,g] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c,g] WALL *R*-VALUE
3	0.30	0.55	0.25	49	20 or 13&5ci or 0&15ci ~~15 or 13+1~~[g]	8/13	19	5ci or 13[f]	10ci, 2 ft	5ci or 13[f]
4 except Marine	0.30	0.55	0.40	60	30 or 20&5ci or 13&10ci or 0&20ci ~~15 or 13+1~~[g]	8/13	19	10ci or 13	10ci, 4 ft	10ci or 13
5 and Marine 4	0.30	0.55	0.40	60	30 or 20&5ci or 13&10ci or 0&20ci ~~15 or 13+1~~[g]	13/17	30	15ci or 19 or 13&5ci	10ci, 4 ft	15ci or 19 or 13&5ci

For SI: 1 foot = 304.8 mm.

NR = Not Required.

ci = continuous insulation.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

   Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. "5ci or 13" means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13&5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs. as indicated in the table. The slab-edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation shall not be required in Warm Humid locations as defined by Figure N1101.7 and Table N1101.7.

g. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, "13&5" means R-13 cavity insulation plus R-5 continuous insulation.

h. Mass walls shall be in accordance with Section N1102.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

i. A maximum *U*-factor of 0.32 shall apply in Climate Zones 3 through 8 to vertical fenestration products installed in buildings located either:

   1. Above 4,000 feet in elevation, or

   2. In windborne debris regions where protection of openings is required by Section R301.2.1.2.

2021 Virginia Construction Code

Revise as follows:

1301.1.1.1 Changes to the *International Energy Conservation Code* (IECC). The following changes shall be made to the IECC :

~~14. Change the wood frame wall *R*-value categories for Climate Zones 3A, 4A and 5A in Table R402.1.3 to read:~~

		~~Wood Frame Wall *R*-Value~~
		~~15 or 13+1~~[h]

~~15. Change the frame wall *U*-factor categories for Climate Zones 3A, 4A and 5A in Table R402.1.2 to read:~~

~~Frame Wall *U*-Factor~~
~~0.079~~

Reason Statement:

This proposal will reduce energy costs for homeowners and improve comfort and passive survivability in new homes by adopting the wall insulation requirements as they appear in the 2021 and 2024 IECC. Virginia is now several cycles behind the model energy code in requirements that apply to wall insulation.

	IECC Wall Insulation R-Value (CZ4)	VA UCC Wall Insulation R-Value (CZ4)
2009	13	13
2012	20 or 13+5	15 or 13+1
2015	20 or 13+5	15 or 13+1
2018	20 or 13+5	15 or 13+1
2021	30 or 20+5 or 13+10 or 0+20	15 or 13+1
2024	30 or 20+5 or 13+10 or 0+20	

Virginia currently allows 75% higher wall U-factors (less stringent) than the 2021/24 IECC. That means Virginia homes allow 75% more heat transfer through the opaque walls than a home built to the 2021 or 2024 IECC. While we understand that initial construction costs are higher with increased insulation requirements, the long-term benefits in lower energy bills and increased comfort for the building owners/occupants are well-documented. Wall insulation is most cost-effectively installed at construction and is likely to remain unchanged over the useful life of the building. The homes constructed today will generate roughly 1200 utility bills (100 years x 12 months), and the amount of wall insulation will directly impact what the homeowner pays every month. It is critical to build new homes to reduce energy use wherever feasible, particularly in the systems and components that will last the longest. Because the IECC provides a wide range of compliance options -- prescriptive, Total UA, simulated performance, Energy Rating Index -- an increase in wall insulation requirements may not require a complete redesign of the proposed home, as long as the home achieves the same overall level of energy savings.

Cost Impact: The code change proposal will increase the cost

In its analysis for the efficiency improvements in the 2021 IECC, the U.S. Department of Energy estimated that the increased construction cost of an additional R-5 continuous insulation would be $0.98/ft2 wall area, or $374.96 for the multifamily prototype/$1,961.96 for the single-family prototype. This improvement was part of a 30-year life-cycle energy cost savings of $2,243 in climate zone 4, with an estimated payback period of 12.4 years. *See* U.S. Department of Energy, *National Cost-Effectiveness of the Residential Provisions of the 2021 IECC* (June 2021).

REC-R402.1.2(4)-24

VCC: 1301.1.1.1 (New)

Proponents: William Penniman, representing Sierra Club Virginia Chapter (wpenniman@aol.com)

2021 Virginia Construction Code

Revise as follows:

1301.1.1.1 Changes to the IECC. The following changes shall be made to the IECC:. (Portions of code section not shown remain unchanged.)

~~15. Change the frame wall U-factor categories for Climate Zones 3A, 4A and 5A in Table R402.1.2 to read:~~

	~~Frame Wall U-Factor~~
	~~0.079~~

~~16. Change the wood frame wall R-Value categories for Climate Zones 3A, 4A, and 5A in Table R402.1.3 to read:~~

	~~Wood Frame Wall R-Value Wood Frame Wall R-Value~~
	~~15 or 13+1~~

Reason Statement:

The purpose of this proposal is to bring Virginia's standards for wall insulation into compliance with the 2024 IECC.

Virginia's residential building code has been behind the IECC's wall energy efficiency standards for over a decade -- since the 2012 IECC update. Virginia is even farther behind today since it failed to strengthen code standards for wall insulation to adopt the 2021 IECC standards, which strengthened wall insulation standards beyond the IECC's 2012 level, and which remain in the 2024 IECC standards.

Despite a decade of actual experience, IECC never weakened the wall insulation standards to levels below the 2012 IECC standards. Instead, as noted, the IECC strengthened the wall insulation standards in 2021.

Tightening wall insulation standards is important to residents —whether owners or tenants--, since it would help them save money, and experience greater comfort and a healthier home for decades after the dwelling is built.

Tightening prescriptive construction standards for wall insulation will help to

(a) reduce occupancy costs, including for heating and conditioning of air in the dwelling,
(b) reduce exposure to mold that can build up in walls,
(c) increase residents' comfort,
(d) increase physical and economic resiliency to power outages, climate change and rising energy prices,
(e) reduce gaps for pests to enter the dwelling,
(f) reduce pressure on utilities to raise rates in order to build and operate more energy delivery capabilities, and
(g) reduce the air pollution that drives climate impacts and other harms to Virginia's health, property and economy.

Legal Standards. Remaining at 5.0 ACH level would leave Virginia's building code out of compliance with statutory standards. **Sections 36-99A and 36-99B of the Virginia Code** states that building codes are required to "protect the health, safety and welfare of the residents of the Commonwealth" and that adjustments to reduce construction costs must nevertheless be **"consistent with recognized standards of health, safety, energy efficiency and water efficiency."** VIRGINIA ACTS OF ASSEMBLY – 2021 SPECIAL SESSION I, CHAPTER 425, Section 1 (referred to herein as "**H2227")**, which was enacted in 2021, calls for adoption of energy efficiency standards that are "at least as stringent" as the latest IECC considering factors such as consumer costs "over time" and air pollution.

Cost and energy savings. Beginning with its review of the 2012 IECC, in which the 3.0 ACH standard was first adopted, the U.S. Department of Energy and the Pacific Northwest National Laboratories (collectively DOE) has found that residents would save money from full implementation of each IECC update from 2012-2024 even after considering incremental purchase and mortgage costs. Focusing on the three most significant IECC updates containing the 3.0 ACH standard, DOE found that, over 30 years, lifecycle savings (i.e., net of additional purchase and mortgage costs): **full implementation of the 2012 IECC** (which introduced the 3.0 ACH requirement for Virginia's climate zone) would save average Virginia residents **$5,836, if adopted**; **full implementation of the 2021 IECC** would save Virginia residents **$8,376, if adopted**; and **full implementation of the 2024 IECC** would save residents of Virginia's Climate Zone 4 **$3,790 and Zones 2 and 5 an average of $2,502 compared to 2021 IECC**. Savings would have been achieved year in and year out, with rapid payback and lasting for decades. [2]

Collectively, Virginians would save billions of dollars in energy costs from full implementation of the IECC, greatly benefiting residents and Virginia's economy. In its July 2021 report on "Cost-Effectiveness of the 2021 IECC for Residential Buildings in Virginia" (PNNL-31627), PNNL found that aggregate energy cost savings for Virginia residents from adopting the full 2021 IECC would be $7,192,000 in the first year and $2,487,000,000 over 30 years. Virginia would achieve substantial pollution reductions and add jobs.

Significantly, even as it preserved the 2021 IECC's prescriptive wall insulation standards, the 2024 IECC offered 's builders greater flexibility to achieve total efficiency targets through Simulated Building Performance and ERI compliance paths. These performance-based paths permit builders to trade some efficiency measures for other efficiency measures, provided they meet the code's overall efficiency goals. Importantly, however, the 2024 IECC's compliance flexibility are expressly tied to the 2024 Prescriptive Path's standards for envelope efficiency, including wall insulation. **The added flexibility was not intended to permit builders to reduce efficiency from a state-weakened baseline below the 2024 IECC's prescriptive standards for walls or otherwise**. Such double-dipping would be anything but "consistent with" or "at least as stringent as" the 2024 IECC.

Pollution Reductions. DOE has also repeatedly found that full compliance with the IECC's updates will reduce energy use and air pollution, including greenhouse gas pollution, which is critical to Virginians' future. Energy use in buildings is one of the largest drivers of CO_2 emissions in Virginia. By cutting energy usage, **full implementation of the IECC's efficiency standards without weakening amendments would reduce air pollution, including greenhouse gas pollution that is driving climate change**. DOE found that full implementation of the 2024 IECC alone would reduce carbon emissions by 6.5% compared to the 2021 IECC, and the 2021 IECC would reduce carbon emissions by 8.7% compared to the prior IECC. (Full implementation of just the 2021 IECC "**will reduce statewide CO_2 emissions over 30 years by 28,420,000 metric tons,** equivalent to the annual CO_2 emissions of 6,181,000 cars on the road (1 MMT CO_2 = 217,480 cars driven/year).") Applying the social cost of carbon to the CO_2 reductions recognizes huge economic savings from to Virginia and the U.S. [3]

Given the 50-100 lifespans of new buildings, the accumulation of more efficient buildings over years will have significant impacts on reducing future climate and other pollution. Conversely, permitting less efficient new building to be constructed under weaker building code standards will have the opposite effect: driving up pollution and climate driven harms to all Virginians.

Climate change is already harming Virginia, and the harms will get much worse if we do not sharply reduce GHG emissions (particularly CO_2 and methane). Growing climate dangers include harms to communities, infrastructure, people, property and the economy from rising seas, worsening storms and more severe rainfall events. Growing dangers also include rising atmospheric and water temperatures that threaten worsening heat-related illnesses, limits on economic activity, agriculture, fisheries, and our natural heritage. The likelihood of mitigating and recovering from those harms declines the longer we delay maximizing energy efficiency and minimizing GHG pollution.

--[1] See IECC; https://basc.pnnl.gov/information/infiltration-meets-ach50-requirements ; http://passivehousebuildings.com/books/phc-2019/five-principles-of-passive-house-design-and-construction/ .

--[2] The U.S. Department of Energy and Pacific Northwest National Laboratories found that **full compliance with the 2012 IECC, including its stronger standards for wall insulation,** would save money even after considering purchase and mortgages costs and otherwise benefit residents compared to earlier standards. DOE/PNNL, National Energy Cost Savings for New Single and Multifamily Homes, A Comparison of the 2006, 2009, and 2012 Editions of the IECC, https://www.energycodes.gov/sites/default/files/documents/NationalResidentialCostEffectiveness.pdf Subsequently, DOE found that the 2021 IECC update, which strengthened wall insulation standards again, would reduce energy use and save money over the life of the dwelling, even after considering purchase and mortgage costs. DOE/PNNL, **Cost-Effectiveness of the 2021 IECC for Residential Buildings in Virginia** (July 2021). And, DOE/PNNL found that the 2024 IECC would save money for residents even after considering purchase and mortgage costs, **Energy Savings Analysis: 2024 IECC for Residential Buildings** (Dec. 2024); https://www.energycodes.gov/national-and-state-analysis. PNNL, **National Cost-Effectiveness of the Residential Provisions of the 2024 IECC** (January 2025). See also https://www.energycodes.gov/determinations

--[3] PNNL, Impacts of Model Building Energy Codes (Nov. 2023) (estimating climate and health benefits in excess of $40,000,000,000 2010-2040 from residential energy building code). See also Notes [1][2] and PNNL report cited above.

Cost Impact: The code change proposal will increase the cost

Increasing the amount of wall insulation will somewhat increase construction costs. However, many choices affect the incremental costs, and the flexibility afforded by the Simulated Performance and ERI paths will enable builders to reduce costs.

Moreover, as discussed in the Reason Statement, **repeated findings by DOE and PNNL have shown that there is a net reduction of costs to residents when the IECC is fully implemented: (a) the cost increases are more than offset by the resulting energy cost savings; (b) the cost savings will last for decades and be accompanied by other important benefits, including more comfortable and healthier dwellings and greater resiliency to power outages and energy cost increases**.

As found by DOE/PNNL (see notes in Reason Statement), residents will save money by keeping up with the IECC. Looking at the three IECC updates relevant to wall insulation, the savings are substantial.

Savings from Full Adoption of 2024, 2021 and 2012 IECC

National or Virginia Average	Life-cycle Cost Savings
Nat'l – Full 2024 IECC Savings CZ 4, 3 & 5	CZ4 -$3,790 CZ3 - $2,509 CZ5 - $2,496
VA - Full 2021 IECC Savings	$8,376
VA- Full 2012 IECC Savings	$5,836

Energy cost savings over time are critical to defining "affordability" of housing.

- By reducing residents' occupancy costs (including utilities) and making dwellings more resilient, the 2024 IECC's energy efficiency requirements will make housing more affordable for owner-occupants and tenants for decades, not just at a buyer's closing date.
- H2227 which requires a decision based on savings and other benefits over time compared to construction costs, not by just looking at construction costs.
- State and federal laws and policies define "affordability" in terms of occupancy costs, including mortgages, rents and utility costs.
- Insulation represents only a small component of total construction costs. Insulation represents 0.017 of the cost of construction, according to a published survey. *"How Much Does It Cost To Build A House In 2023?"* https://www.forbes.com/home-improvement/contractor/cost-to-build-a-house/_ Yet, unlike other housing construction costs, energy efficiency saves money for residents during many years of occupancy, making housing more affordable.
- There are programs in Virginia to assist low-income residents with costs of downpayments, mortgages and rents and to subsidize builders' construction of low-income housing. *See* JLARC, *Report to the Governor and the General Assembly, Affordable Housing in Virginia 2021.*

REC-R402.1.3-24

IECC: TABLE R402.1.3, R402.2.3.1; IRC: TABLE N1102.1.3 (R402.1.3), N1102.2.3.1 (R402.2.3.1)

Proponents: Andrew Clark, representing Home Builders Association of Virginia (aclark@hbav.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

TABLE R402.1.3 INSULATION MINIMUM *R*-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	0	1	2	3	4 EXCEPT MARINE	5 AND MARINE 4	6	7 AND 8
Vertical fenestration *U*-factor	0.50	0.50	0.40	0.30	0.30	0.28[g]	0.28[g]	0.27[g]
Skylight *U*-factor	0.60	0.60	0.60	0.53	0.53	0.50	0.50	0.50
Glazed vertical fenestration SHGC	0.25	0.25	0.25	0.25	0.40	NR	NR	NR
Skylight SHGC	0.28	0.28	0.28	0.28	0.40	NR	NR	NR
Ceiling *R*-value	30	30	38	38	49	49	49	49
Insulation entirely above roof deck	25ci	25ci	25ci	25ci	30ci	30ci	30ci	35ci
Wood-framed wall *R*-value[e]	13 or 0&10ci	13 or 0&10ci	13 or 0&10ci	20 or 13&5ci or 0&15ci	30 or 20&5ci or 13&10ci or 0&20ci	30 or 20&5ci or 13&10ci or 0&20ci	30 or 20&5ci or 13&10ci or 0&20ci	30 or 20&5ci or 13&10ci or 0&20ci
Mass wall *R*-value[f]	3/4	3/4	4/6	8/13	8/13	13/17	15/20	19/21
Floor *R*-value[h]	13 or 7+5ci or 10ci	13 or 7+5ci or 10ci	13 or 7+5ci or 10ci	19 or 13+5ci or 15ci	19 or 13+5ci or 15ci	30 or 19+7.5ci or 20ci	30 or 19+7.5ci or 20ci	38 or 19+10ci or 25ci
Basement wall *R*-value[b, e]	0	0	0	5ci or 13[d]	10ci or 13	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci
Unheated slab *R*-value & depth[c]	0	0	0	10ci, 2 ft	10ci, ~~3~~ 2 ft	10ci, ~~3~~ 2 ft	10ci, 4 ft	10ci, 4 ft
Heated slab *R*-value & depth[c]	R-5ci edge and R-5 full slab	R-5ci edge and R-5 full slab	R-5ci edge and R-5 full slab	R-10ci, 2 ft and R-5 full slab	R-10ci, 3 ft and R-5 full slab	R-10ci, 3 ft and R-5 full slab	R-10ci, 4 ft and R-5 full slab	R-10ci, 4 ft and R-5 full slab
Crawl space wall *R*-value[b, e]	0	0	0	5ci or 13[d]	10ci or 13	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci

For SI: 1 foot = 304.8 mm.

NR = Not Required, ci = Continuous Insulation.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. “5ci or 13” means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13&5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.

c. Slab insulation shall be installed in accordance with Section R402.2.10.1.

d. Basement wall insulation is not required in Warm Humid locations as defined by Figure R301.1 and Table R301.1.

e. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, “13&5” means R-13 cavity insulation plus R-5 continuous insulation.

f. Mass walls shall be in accordance with Section R402.2.6. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

g. A maximum *U*-factor of 0.30 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4,000 feet in elevation.
2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the *International Residential Code*.

h. "30 or 19+7.5ci or 20ci" means R-30 cavity insulation alone or R-19 cavity insulation with R-7.5 continuous insulation or R-20 continuous insulation alone.

R402.2.3.1 Roof truss framing separating conditioned and unconditioned space. Where wood vertical roof truss framing members are used to separate *conditioned space* and unconditioned space, they shall comply with Table R402.1.3 for wood-framed walls. Steel frame vertical roof truss framing members used to separate *conditioned space* and unconditioned space shall comply with Section R402.2.7.

Exception: Attic knee walls and roof truss framing that comply with all of the following:

1. The attic knee wall or roof truss framing assembly is provided with an air barrier and is insulated to not less than R-15 in Climate Zone 3 and not less than R-20 in Climate Zones 4-6.

2. The attic knee wall or roof truss framing assembly is not more than 5 feet in height.

3. One additional credit is achieved above the minimum number of credits required by Section R408.

2024 International Residential Code

Revise as follows:

TABLE N1102.1.3 (R402.1.3) INSULATION MINIMUM *R*-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	0	1	2	3	4 EXCEPT MARINE	5 AND MARINE 4	6	7 AND 8
VERTICAL FENESTRATION *U*-FACTOR	0.50	0.50	0.40	0.30	0.30	0.28[g]	0.28[g]	0.27[g]
SKYLIGHT *U*-FACTOR	0.60	0.60	0.60	0.53	0.53	0.50	0.50	0.50
GLAZED VERTICAL FENESTRATION SHGC	0.25	0.25	0.25	0.25	0.40	NR	NR	NR
SKYLIGHT SHGC	0.28	0.28	0.28	0.28	0.40	NR	NR	NR
CEILING *R*-VALUE	30	30	38	38	49	49	49	49
INSULATION ENTIRELY ABOVE ROOF DECK	25ci	25ci	25ci	25ci	30ci	30ci	30ci	35ci
WOOD-FRAMED WALL *R*-VALUE[e, h]	13 or 0&10ci	13 or 0&10ci	13 or 0&10ci	20 or 13&5ci[h] or 0&15ci[h]	30 or 20&5ci or 13&10ci or 0&20ci	30 or 20&5ci or 13&10ci or 0&20ci	30 or 20&5ci or 13&10ci or 0&20ci	30 or 20&5ci or 13&10ci or 0&20ci
MASS WALL *R*-VALUE[f]	3/4	3/4	4/6	8/13	8/13	13/17	15/20	19/21
FLOOR *R*-VALUE [h]	13 or 7+5ci or 10ci	13 or 7+5ci or 10ci	13 or 7+5ci or 10ci	19 or 13+5ci or 15ci	19 or 13+5ci or 15ci	30 or 19+7.5ci or 20ci	30 or 19+7.5ci or 20ci	38 or 19+10ci or 25ci
BASEMENT WALL *R*-VALUE [b, e]	0	0	0	5ci or 13[d]	10ci or 13	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci
UNHEATED SLAB *R*-VALUE & DEPTH[c]	0	0	0	10ci, 2 ft	10ci, ~~3~~ 2 ft	10ci, ~~3~~ 2 ft	10ci, 4 ft	10ci, 4 ft
HEATED SLAB *R*-VALUE & DEPTH[c]	R-5ci edge and R-5 full slab	R-5ci edge and R-5 full slab	R-5ci edge and R-5 full slab	R-10ci, 2 ft and R-5 full slab	R-10ci, 3 ft and R-5 full slab	R-10ci, 3 ft and R-5 full slab	R-10ci, 4 ft and R-5 full slab	R-10ci, 4 ft and R-5 full slab
CRAWL SPACE WALL *R*-VALUE [b, e]	0	0	0	5ci or 13[d]	10ci or 13	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci

For SI: 1 foot = 304.8 mm.NR = Not Required, ci = Continuous Insulation.

a. ***R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.**

b. **"5ci or 13" means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13&5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.**

c. **Slab insulation shall be installed in accordance with Section N1102.2.10.1.**

d. **Basement wall insulation shall not be required in Warm Humid locations as defined by Figure N1101.7 and Table N1101.7.**

e. **The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, "13&5" means R-13 cavity insulation plus R-5 continuous insulation.**

f. **Mass walls shall be in accordance with Section N1102.2.6. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.**

g. A maximum *U*-factor of 0.30 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4,000 feet in elevation.

2. In windborne debris regions where protection of openings is required by Section R301.2.1.2.

h. "30 or 19+7.5ci or 20ci" means R-30 cavity insulation alone or R-19 cavity insulation with R-7.5 continuous insulation or R-20 continuous insulation alone.

N1102.2.3.1 (R402.2.3.1) Roof truss framing separating conditioned and unconditioned space. Where wood vertical roof truss framing members are used to separate *conditioned space* and unconditioned space, they shall comply with Table N1102.1.3 for wood-framed walls. Steel frame vertical roof truss framing members used to separate *conditioned space* and unconditioned space shall comply with Section N1102.2.7.

Exception: Attic knee walls and roof truss framing that comply with all of the following:

1. The attic knee wall or roof truss framing assembly is provided with an air barrier and is insulated to not less than R-15 in Climate Zone 3 and not less than R-20 in Climate Zones 4-6.

2. The attic knee wall or roof truss framing assembly is not more than 5 feet in height.

3. One additional credit is achieved above the minimum number of credits required by Section N1108.

Reason Statement:

This proposal adopts revisions made to Table N1102.1.3 (R402.1.3) during the 2024 ICC code development process but also provides an additional 1ft reduction in depth requirements for unheated slabs in Climate Zones 4 and 5.

Table Formatting Revisions: Table N1102.1.3 reorganizes its format to align with the IECC Commercial tables, flipping rows and columns so climate zones appear in headers and assembly types in rows.

Incorporation of SHGC and Roof Insulation Values: The maximum solar heat gain coefficients (SHGCs) for skylights are now included within Table N1102.1.3 rather than as a footnote. R-value requirements for insulation installed entirely above the roof deck and separate R-value and depth requirements for heated and unheated slabs are now incorporated.

Changes to Fenestration and Floor Insulation Requirements

- In Climate Zones 5 through 8, vertical fenestration U-factors have been decreased to reduce heat loss through windows and doors in these cooler climates.
- Skylight U-factors in all climate zones have also been decreased.
- For floors above unconditioned spaces, the table now provides additional prescriptive R-value options similar to the expanded wood-framed wall insulation options of the 2021 IRC. These include requirements for cavity insulation only, continuous insulation only, and a combination of cavity and continuous insulation.

Alignment with Section N1108 and Ceiling R-Value Adjustments: The 2024 IRC includes a reduction in efficiency of ceiling R-values, reverting back to the requirements of the 2018 IRC. This allows designers and builders to make energy saving decisions based on the specific project. Ceiling insulation in Table R402.1.3 was reduced from R-49 to R-38 in climate zones 2 and 3 and reduced from R-60 to R-49 in climate zones 4 through 8. The associated ceiling U-factors were adjusted for the same climate zones in Table R402.1.2. The new U-factor is 0.030 for climate zones 2 and 3 and 0.026 for climate zones 4 through 8.

Changes to Footnotes: Footnote H added to Table N1102.1.3 to clarify cavity and continuous insulation requirements for floors. Footnotes related to SHGC and slab requirements have been removed as the information is now located in the table.

Alternative to Continuous Insulation in Attic Knee Walls: This amendment adds an alternate insulation method for shorter attic knee walls up to 5 feet in height. Energy neutrality is maintained by requiring an additional credit in section R408 that offsets energy impact. This option can be used to optimize costs and reduce complexity at the site by allowing cavity only insulation.

Cost Impact: The code change proposal will decrease the cost

Based on costs in the 2021 IECC Residential Cost Effectiveness Analysis from Home Innovation Research Labs, this amendment can save almost $1.50 per square foot of knee wall area in Climate Zones 4-6.

REC-R402.4.1.2-24

VRC: N1102.4.1.2, N1102.4.1.3; VCC: 1301.1.1.1

Proponents: Eric Lacey, representing Responsible Energy Codes Alliance (eric@reca-codes.com)

2021 Virginia Residential Code

Delete without substitution:

~~N1102.4.1.2 (R402.4.1.2) Testing.~~ ~~The building or *dwelling unit* shall be tested and verified as having an air leakage rate not exceeding 5 air changes per hour. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E779, or ASTM E1827 and reported at a pressure of 0.2 inches w.g. (50 Pa). A written report of the results of the test shall be signed by the party conducting the test and provided to the building official. Testing shall be conducted by a Virginia licensed general contractor, a Virginia licensed HVAC contractor, a Virginia licensed home inspector, a Virginia registered design professional, a certified BPI Envelope Professional, a certified HERS rater, or a certified duct and envelope tightness rater. The party conducting the test shall have been trained on the equipment used to perform the test. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.~~

~~Note:~~ ~~Should additional sealing be required as a result of the test, consideration may be given to the issuance of temporary certificate of occupancy in accordance with Section 116.1.1.~~

~~During testing:~~

1. ~~Exterior windows and doors and fireplace and stove doors shall be closed, but not sealed beyond the intended weather stripping or other infiltration control measures;~~
2. ~~Dampers, including exhaust, intake, makeup air, backdraft, and flue dampers shall be closed, but not sealed beyond intended infiltration control measures;~~
3. ~~Interior doors, if installed at the time of the test, shall be open;~~
4. ~~Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;~~
5. ~~Heating and cooling systems, if installed at the time of the test, shall be turned off; and~~
6. ~~Supply and return registers, if installed at the time of the test, shall be fully open.~~

~~Exception:~~ ~~When testing individual *dwelling units*, an air leakage rate not exceeding 0.30 cubic feet per minute per square foot [0.008 $m^3/(s \times m^2)$] of the *dwelling unit* enclosure area, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch water gauge (50 Pa), shall be permitted in all climate zones for:~~

1. ~~Attached single- and multiple-family building *dwelling units*.~~
2. ~~Buildings or *dwelling units* that are 1,500 square feet (139.4 m^2) or smaller.~~

~~Mechanical *ventilation* shall be provided in accordance with Section M1505 of this code or Section 403.3.2 of the *International Mechanical Code*, as applicable, or with other *approved* means of *ventilation*.~~

~~N1102.4.1.3 (R402.4.1.3) Leakage rate.~~ ~~When complying with Section N1101.2.1 (R401.2.1), the building or *dwelling unit* shall have an air leakage rate not exceeding 5 air changes per hour in Climate Zones 3 through 5, when tested in accordance with Section N1102.4.1.2 (R402.4.1.2).~~

2021 Virginia Construction Code

Revise as follows:

1301.1.1.1 Changes to the *International Energy Conservation Code* (IECC). The following changes shall be made to the IECC :

~~19. Change Section R402.4.1.2 of the IECC to read:~~

~~**R402.4.1.2 Testing.** The *building* or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). A written report of the results of the test shall be signed by the party conducting the test and provided to the building official. Testing shall be conducted by a Virginia licensed general contractor, a Virginia licensed HVAC contractor, a Virginia licensed home inspector, a Virginia *registered design professional*, a certified BPI Envelope Professional, a certified HERS rater, or a certified duct and envelope tightness rater. The party conducting the test shall have been trained on the equipment used to perform the test. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.~~

~~**Note:** Should additional sealing be required as a result of the test, consideration may be given to the issuance of a temporary certificate of occupancy in accordance with Section 116.1.1 .~~

~~**During testing:**~~

1. ~~Exterior windows and doors and fireplace and stove doors shall be closed, but not sealed beyond the intended weatherstripping or other infiltration control measures.~~
2. ~~Dampers, including exhaust, intake, makeup air, backdraft and flue dampers, shall be closed, but not sealed beyond intended infiltration control measures.~~
3. ~~Interior doors, if installed at the time of the test, shall be open.~~
4. ~~Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed.~~
5. ~~Heating and cooling systems, if installed at the time of the test, shall be turned off.~~
6. ~~Supply and return registers, if installed at the time of the test, shall be fully open.~~

~~20. Change Section R402.4.1.3 of the IECC to read:~~

~~**R402.4.1.3 Leakage rate.** When complying with Section R401.2.1 , the building or dwelling unit shall have an air leakage rate not exceeding 5.0 air changes per hour in Climate Zones 3 through 5, when tested in accordance with Section R402.4.1.2 .~~

Reason Statement:

This proposal would improve the efficiency and durability of residential buildings and help maintain healthier indoor air quality by incorporating the air leakage testing requirements of the 2024 IECC into Virginia's code. Since the 2012 edition, the IECC has required all new residential dwellings in Virginia's climate zones to be tested and to verify a maximum total envelope leakage of 3.0 ACH50. However, Virginia did not adopt a testing requirement until the 2018 edition of the VCC, and set the maximum leakage allowance at 5.0 ACH50. That requirement remained unchanged in the 2021 VCC update, even though the 2021 IECC adopted additional flexibility that allows code users several alternatives for meeting the air tightness requirements. We believe Virginia is ready to catch up with the IECC envelope air leakage requirements. A well-sealed, verified thermal envelope will provide energy savings and promote better indoor air quality over the 70- to 100-year useful life of the home.

This proposal intends to delete the VA-specific amendments in order to incorporate the 2024 IECC air leakage testing requirements as published. This would result in the following changes:

1. All new dwelling units would be required to be air leakage tested, but the maximum allowable leakage for prescriptive compliance would improve from 5.0 ACH50 to 3.0 ACH50 in all Virginia climate zones.

2. The performance path baseline (R405) would be set at 3.0 ACH50, but dwellings could test as high as 5.0 ACH50 as long as efficiency losses are accounted for in other efficiency improvements. This allows considerable flexibility for code users who still find it challenging to achieve 3.0 ACH50, while maintaining the same overall efficiency required by the code.

3. Multifamily dwelling units (of any size) and buildings with 1500 square feet or less of conditioned floor area have the option to be tested to 0.27 cfm/min/ft2 of testing unit enclosure area. This will help address the challenges of achieving low ACH in smaller dwellings.

Cost Impact: The code change proposal will increase the cost

It is possible that some additional time or materials will be required to achieve the lower air leakage number; however, we note that the largest cost is typically the cost of the blower door test itself, which is already required under the VA UCC.

REC-R402.4.1.2(1)-24

VCC: 1301.1.1.1

Proponents: William Penniman, representing Sierra Club Virginia Chapter (wpenniman@aol.com)

2021 Virginia Construction Code

Revise as follows:

1301.1.1.1 Changes to the *International Energy Conservation Code* (IECC). (Portions of code section not shown remain unchanged.) The following changes shall be made to the IECC :

19. ~~Change Section R402.4.1.2 of the IECC to read:~~

    ~~**R402.4.1.2 Testing.** The *building* or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). A written report of the results of the test shall be signed by the party conducting the test and provided to the building official. Testing shall be conducted by a Virginia licensed general contractor, a Virginia licensed HVAC contractor, a Virginia licensed home inspector, a Virginia *registered design professional*, a certified BPI Envelope Professional, a certified HERS rater, or a certified duct and envelope tightness rater. The party conducting the test shall have been trained on the equipment used to perform the test. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.~~

    ~~**Note:** Should additional sealing be required as a result of the test, consideration may be given to the issuance of a temporary certificate of occupancy in accordance with Section 116.1.1 .~~

    ~~**During testing:**~~

    1. ~~Exterior windows and doors and fireplace and stove doors shall be closed, but not sealed beyond the intended weatherstripping or other infiltration control measures.~~
    2. ~~Dampers, including exhaust, intake, makeup air, backdraft and flue dampers, shall be closed, but not sealed beyond intended infiltration control measures.~~
    3. ~~Interior doors, if installed at the time of the test, shall be open.~~
    4. ~~Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed.~~
    5. ~~Heating and cooling systems, if installed at the time of the test, shall be turned off.~~
    6. ~~Supply and return registers, if installed at the time of the test, shall be fully open.~~

20. ~~Change Section R402.4.1.3 of the IECC to read:~~

    ~~**R402.4.1.3 Leakage rate.** When complying with Section R401.2.1 , the building or dwelling unit shall have an air leakage rate not exceeding 5.0 air changes per hour in Climate Zones 3 through 5, when tested in accordance with Section R402.4.1.2 .~~

Reason Statement:

The purpose of this proposal is to bring Virginia's standards for air leakage rates into compliance with the 2024 IECC.

Virginia needs to adopt the IECC’s 3.0 ACH (or 3 ACH50) air leakage standard, which has been in the national code since the 2012 IECC update. There is no valid reason for Virginia to continue a prescriptive air leakage standard that dates back to 2009.

The 2024 IECC is the fifth consecutive IECC to set the prescriptive standard for Virginia's climate zones at a maximum of 3.0 ACH. The IECC would not have repeatedly prescribed a 3.0 ACH maximum if actual experience had demonstrated that compliance was either impractical or raised costs or burdens that outweighed the benefits. The IECC has had four cycles, since 2012, to raise the ACH from 3.0 to 5.0, but it has not done so.

Tightening building air sealing to 3.0 ACH is important to residents—both owners and tenants--, since it would help them save money, and experience greater comfort and a healthier home for decades after the dwelling is built. Virginia's 5.0 ACH standard allows 67% more air changes per hour than the IECC's 3.0 ACH standard.

Tightening prescriptive construction standards to 3.0 ACH will help to

(a) reduce occupancy costs, including for heating and conditioning of air in the dwelling,
(b) reduce exposure to mold that can build up in walls,
(c) increase residents' comfort,
(d) increase physical and economic resiliency to power outages, climate change and rising energy prices,
(e) reduce gaps for pests to enter the dwelling,
(f) reduce pressure on utilities to raise rates in order to build and operate more energy delivery capabilities, and
(g) reduce the air pollution that drives climate impacts and other harms to Virginia's health, property and economy.

It is noteworthy that, while the 2024 IECC retains the 3.0 ACH prescriptive standard, It also **offers builders some flexibility to trade efficiency measures, including to allow up to 4.0 ACH of air leakage, when implementing Simulated Building Performance and ERI implementation methods. However, the 2024 IECC's addition of trading flexibility is premised on full adoption of the IECC's prescriptive baseline code, including 3.0 ACH.**

Legal Standards. Remaining at 5.0 ACH level would leave Virginia's building code out of compliance with statutory standards. **Sections 36-99A and 36-99B of the Virginia Code make clear that building codes are required to "protect the health, safety and welfare of the residents of the Commonwealth" and that adjustments to reduce construction costs must nevertheless be "consistent with recognized standards of health, safety, energy efficiency and water efficiency." H2227**, which was enacted in 2021, calls for adoption of energy efficiency standards that are **"at least as stringent" as the latest IECC considering factors such as consumer costs "over time" and air pollution.** VIRGINIA ACTS OF ASSEMBLY – 2021 SPECIAL SESSION I, CHAPTER 425, Section 1 (referred to herein as "H2227"). Thus, like energy costs over time, pollution is a named factor to be considered in connection with building code efficiency standards.

Broad Consensus. There is a broad consensus among recognized standards that tighter sealing of walls protects the health, safety and welfare of residents, and some recognized programs have stricter standards, which is part of why the IECC has incorporated the 3.0 ACH prescriptive standard in five consecutive IECC cycles from 2012-2024.

> In its commentary on its 2024 ACH levels for new residential construction, the ICC explains the importance of its air leakage standards: "**Insulation alone is not enough to moderate indoor temperatures. Sealing the building envelope is critical to good thermal performance of the building.** Insulation is important because it traps pockets of air creating stagnant air resistant to temperature change, but the air barrier is needed to stop the movement of air from scrubbing away those pockets of air. **Regardless of the compliance option chosen in Section R401.2, air leakage limits apply, and all air leakage requirements of this section must be met**." Citing EPA, the IECC commentary states that air leakage "can account for 25 to 40 percent of the energy used for heating and cooling in a typical residence." (ICC, 2024 IECC Code and Commentary.)
>
> In EnergyStar: A complete Thermal Enclosure System (2017), EPA advised: "The energy savings from comprehensive air sealing can quickly add up when you consider all the places hot or cool air can enter or escape from your home. Having a well-sealed home also means better air quality because dirt, pollen, pests, and moisture can't get in as easily. In addition, good sealing practices help protect your home against mold and moisture damage that can be caused by condensation."
>
> Even the NAHB has advised builders of the importance of air sealing and strategies to go below 3.0 ACH. See NAHB, et al., "TechNote – Building Tightness Code Compliance & Air Sealing Overview", which (a) states "Air leakage in a building should be minimized;" (b) identifies benefits to residents including ""Heating & cooling energy savings; Reduced potential for moisture movement through the building thermal enclosure; Improved insulation effectiveness and reduced risk of ice dams; Reduced peak heating and cooling loads resulting in smaller HVAC equipment; Improved comfort (reduces drafts and noise); Improved indoor air quality (limits contaminants from garages, crawl spaces, attics, and adjacent units)" and (c) suggests a possible construction strategy with a goal of 2.5 ACH – stricter than the IECC.

The feasibility of meeting a 3.0 ACH standard is underscored by the IECC's repeated adoption of 3.0 ACH for Virginia's climate zones; by its adoption of a 2.5 ACH standard for Climate Zones north of Virginia's; by use of 3.0 in the EnergyStar program; by DOE's use of tighter standards in its net-zero ready program (2.5 ACH for CZ3-4 and 2.0 for CZ 5); and by the PassiveHouse standard of 0.6 ACH for its program.[1]

Cost and energy savings. Beginning with its review of the 2012 IECC, in which the 3.0 ACH standard was first adopted, the U.S. Department of Energy and the Pacific Northwest National Laboratories (collectively DOE) has found that residents would save money from full implementation of each IECC update from 2012-2024 even after considering incremental purchase and mortgage costs. Focusing on the three most significant IECC updates containing the 3.0 ACH standard, DOE found that, over 30 years, lifecycle savings (i.e., net of additional purchase and mortgage costs): **full implementation of the 2012 IECC** (which introduced the 3.0 ACH requirement for Virginia's climate zone) would have saved average Virginia residents **$5,836**; **full implementation of the 2021 IECC** would have save Virginia residents **$8,376**; and full implementation of the 2024 IECC would save Virginia residents of Virginia's Climate Zone 4 **$3,790 and Zones 2 and 5 an average of $2,502 compared to 2021 IECC**. Savings would have been achieved year in and year out, with rapid payback and lasting for decades. [2]

Collectively, Virginians would save billions of dollars in energy costs from full implementation of the IECC, greatly benefiting residents and Virginia's economy. In its July 2021 report on "Cost-Effectiveness of the 2021 IECC for Residential Buildings in Virginia" (PNNL-31627), PNNL found that aggregate energy cost savings for Virginia residents from adopting the full 2021 IECC would be $7,192,000 in the first year and $2,487,000,000 over 30 years. Virginia would achieve substantial pollution reductions and add jobs.

Pollution Reductions. DOE has also repeatedly found that full compliance with the IECC's updates will reduce energy use and air pollution, including greenhouse gas pollution, which is critical to Virginians' future. Energy use in buildings is one of the largest drivers of CO_2 emissions in Virginia. By cutting energy usage, **full implementation of the IECC's efficiency standards without weakening amendments would reduce air pollution, including greenhouse gas pollution that is driving climate change**. DOE found that full implementation of the 2024 IECC alone would reduce carbon emissions by 6.5% compared to the 2021 IECC, and the 2021 IECC would reduce carbon emissions by 8.7% compared to the prior IECC. (Full implementation of just the 2021 IECC "**will reduce statewide CO_2 emissions over 30 years by 28,420,000 metric tons,** equivalent to the annual CO_2 emissions of 6,181,000 cars on the road (1 MMT CO_2 = 217,480 cars driven/year).") Applying the social cost of carbon to the CO_2 reductions recognizes huge economic savings from to Virginia and the U.S. [3]

The accumulation of more efficient buildings over years will have significant impacts on reducing future climate and other pollution. Conversely, allowing less efficient new building to be constructed under weaker building code standards will have the opposite effect: driving up pollution and climate driven harms to all Virginians.

Climate change is already harming Virginia, and the harms will get much worse if we do not sharply reduce GHG emissions (particularly CO_2 and methane). Growing climate dangers include harms to communities, infrastructure, people, property and the economy from rising seas, worsening storms and more severe rainfall events. Growing dangers also include rising atmospheric and water temperatures that threaten worsening heat-related illnesses, limits on economic activity, agriculture, fisheries, and our natural heritage. The likelihood of mitigating and recovering from those harms declines the longer we delay maximizing energy efficiency and minimizing GHG pollution.

--[1] See IECC; https://basc.pnnl.gov/information/infiltration-meets-ach50-requirements ; http://passivehousebuildings.com/books/phc-2019/five-principles-of-passive-house-design-and-construction/ .

--[2] The U.S. Department of Energy found that full compliance with the 2012 IECC would save money and benefit residents compared to earlier standards. DOE/PNNL, National Energy Cost Savings for New Single and Multifamily Homes, A Comparison of the 2006, 2009, and 2012 Editions of the IECC, https://www.energycodes.gov/sites/default/files/documents/NationalResidentialCostEffectiveness.pdf DOE found that the 2024 and 2021 IECC updates would reduce energy use and save money over the life of the dwelling, even after considering mortgage costs. U.S. Department of Energy, **Energy Savings Analysis: 2024 IECC for Residential Buildings** (Dec. 2024); DOE/PNNL, **Cost-Effectiveness of the 2021 IECC for Residential Buildings in Virginia** (July 2021), https://www.energycodes.gov/national-and-state-analysis. Following promulgation of the 2012 IECC, DOE found that the 2012 IECC changes improved efficiency and were cost effective for occupants because they saved money year after year for decades, more than recouping the cost of construction. DOE/PNNL, **National Energy Cost Savings for New Single and Multifamily Homes, A Comparison of the 2006, 2009, and 2012 Editions of the IECC**, https://www.energycodes.gov/sites/default/files/documents/NationalResidentialCostEffectiveness.pdf See also https://www.energycodes.gov/determinations

--[3] PNNL, Impacts of Model Building Energy Codes (Nov. 2023) (estimating climate and health benefits in excess of $40,000,000,000 2010-2040 from residential energy building codes). See Notes [1][2] and PNNL report cited above.

Cost Impact: The code change proposal will increase the cost

Bringing Virginia in line with the IECC's 3.0 ACH air leakage standards may modestly increase the cost of construction, but those costs will be outweighed by reduced occupancy costs and improved health, comfort and resiliency for residents. The excess of benefits over costs is why the IECC has required 3.0 ACH for Virginia's Climate Zones for 5 consecutive updates: 2012-2024. (See Reason Statement, above.)

The costs of additional caulking, weather-stripping, gaskets, taping and other sealing measures are very limited, since workers will be on site, and the quantity of additional material is small. Planning, care and attention by builders during the framing, insulating and sealing processes is mainly what is needed to achieve the 3.0 ACH standard.

According to GreenBuildingAdvisor, "Once builders get their crews trained, 3 ACH50 should cost them the same as 5 or 7 ACH50." https://www.greenbuildingadvisor.com/article/how-much-air-leakage-in-your-home-is-too-much

Having had more than a decade to train their crews to seal gaps and to meet blower door tests, Virginia builders should be fully capable of meeting the 3.0 ACH prescriptive standard. In addition to the time since the IECC's 2012 adoption of 3.0 ACH, Virginia builders will have a year from the effective date of Virginia's 2024 update to adjust their construction practices to meet the long-recognized model standard.

Under the 2024 IECC, cost impacts can also mitigated by the 2024 IECC's permitting builders to go to 4.0 ACH with trading options for Simulated Performance and ERI compliance paths. However, that flexibility was premised upon full implementation of the IECC's prescriptive standards.

Achieving 3.0 ACH or better during initial construction is critical. Leaving buyers to retrofit after a house has been purchased would be very expensive since it would require the owner to reopen, close and refinish walls, replace windows and doors, etc. In addition to energy cost saving, comfort and health benefits from achieving 3.0 ACH, minimizing the need for future retrofits and repairs should be recognized as a cost benefit to residents.

REC-R403.14-24

IECC: R403.14 (N1103.14) (New)

Proponents: William Penniman, representing Sierra Club Virginia Chapter (wpenniman@aol.com)

2024 International Energy Conservation Code [RE Project]

Add new text as follows:

R403.14 (N1103.14) Ceiling fans. R403.14 (N1103.14). A ceiling fan (with variable speeds and reversible direction) shall be installed in each bedroom.

Exception: such fans are not required in rooms with ceilings less than 8 feet high.

Reason Statement:

Ceiling fans save energy and energy costs, while improving comfort for residents. They are an inexpensive, well-established technology. While distributing air with a ceiling fan will can improve comfort in any occupied room, this proposal is limited to bedrooms, which are occupied for sustained periods every night.

The U.S. Department of Energy (https://www.energy.gov/energysaver/fans-cooling) states:

“Ceiling fans are the most effective type of circulating fan. They help improve comfort year-round by effectively circulating air throughout a room.

- **Summer Use:** Run ceiling fans counterclockwise to create a cooling breeze.
- **Winter Use:** Reverse the direction to clockwise and set to low speed to circulate warm air from the ceiling down to living spaces.
- **Energy Savings:** Using a ceiling fan allows you to raise the thermostat setting by about 4°F without reducing comfort. In moderate climates, ceiling fans can sometimes replace air conditioning altogether.”

The potential energy and energy-cost savings are very large when residents have the ability to live comfortably with temperatures set up to 4°F higher during the summer air-conditioning season. The benefits from ceiling fans will grow as climate change extends and exacerbates the annual air-conditioning season. As noted by DOE, winter demand can be reduced as well as summer demand.

Reduced demands for electricity will also reduce the driver of utilities’ capital and operating costs. That will reduce rates for all customers and reduce utilities’ need for intrusive and harmful construction projects to build or modify generation, transmission, distribution. Those reductions will benefit all Virginians.

Cost Impact: The code change proposal will increase the cost

Installing ceiling fans will modestly increase costs of construction but it will save money and improve comfort for residents for many years. The ability to reduce air conditioning demands by up to 4.0 F degrees will provide large savings for occupants and for utilities.

Ceiling fan with variable speeds and reversible directions can be purchased at retail for under $60 on Amazon or under $66 at Lowes, and installation is no different from (and can even replace with a fan-and-light) installing a ceiling light. https://www.amazon.com/s?k=ceiling+fans+for+bedroom&crid=7S8YNULXX7R4&sprefix=ceiling+fans%2Caps%2C189&ref=nb_sb_ss_p13n-expert-pd-ops-ranker_10_12 ; https://www.lowes.com/pl/ceiling-fans/indoor/4294395604-2003401792

REC-R404.1-24

IRC: N1104.1 (R404.1); IECC: R404.1

Proponents: Andrew Clark, representing Home Builders Association of Virginia (aclark@hbav.com)

2024 International Residential Code

Revise as follows:

N1104.1 (R404.1) Lighting equipment. Not less than 90 percent of the ~~All~~ permanently installed luminaires shall be capable of operation with an efficacy of not less than 45 lumens per watt or shall contain lamps capable of operation with an efficacy of not less than 65 lumens per watt.

Exceptions:

1. Appliance lamps
2. Antimicrobial lighting used for the sole purpose of disinfecting
3. General service lamps complying with DOE 10 CFR, Part 430.32.
4. Luminaires with a rated electric input of not greater than 3.0 watts.

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R404.1 Lighting equipment. Not less than 90 percent of the ~~All~~ permanently installed luminaires shall be capable of operation with an efficacy of not less than 45 lumens per watt or shall contain lamps capable of operation with an efficacy of not less than 65 lumens per watt.

Exceptions:

1. Appliance lamps
2. Antimicrobial lighting used for the sole purpose of disinfecting.
3. General service lamps complying with DOE 10 CFR, Part 430.32.
4. Luminaires with a rated electric input of not greater than 3.0 watts.

Reason Statement: This proposal restores the 10% allowance from the 2018 Code permitting a limited number of lighting sources that do not meet the current definition of high-efficacy lighting sources. The allowance is restored to provide design flexibility.

Cost Impact: The code change proposal will not increase or decrease the cost

The proposed code change may result in a modest reduction in construction costs; however, its primary benefit is the increased design flexibility it provides.

REC-R404.2-24

IECC: SECTION 202, R404.2, R404.2.1, R404.2.2; IRC: SECTION 202, N1104.2 (R404.2), N1104.2.1 (R404.2.1), N1104.2.2 (R404.2.2)

Proponents: Andrew Clark, representing Home Builders Association of Virginia (aclark@hbav.com)

2024 International Energy Conservation Code [RE Project]

Delete without substitution:

~~**AUTOMATIC SHUTOFF CONTROL.** A device capable of automatically turning loads off without *manual* intervention. *Automatic shutoff controls* include devices such as, but not limited to, occupancy sensors, vacancy sensors, door switches, programmable time switches (i.e., timeclocks), or count-down timers.~~

~~**R404.2 Interior lighting controls..** All permanently installed luminaires shall be controlled as required in Sections R404.2.1 and R404.2.2.~~

~~**Exception:** Lighting controls shall not be required for safety or security lighting.~~

~~**R404.2.1 Habitable spaces.** All permanently installed luminaires in habitable spaces shall be controlled with a *manual dimmer* or with an *automatic* shutoff control that automatically turns off lights within 20 minutes after all occupants have left the space and shall incorporate a *manual* control to allow occupants to turn the lights on or off.~~

~~**R404.2.2 Specific locations.** All permanently installed luminaires in garages, unfinished basements, laundry rooms and utility rooms shall be controlled by an *automatic* shutoff control that automatically turns off lights within 20 minutes after all occupants have left the space and shall incorporate a *manual* control to allow occupants to turn the lights on or off.~~

2024 International Residential Code

Delete without substitution:

~~**[RE] AUTOMATIC SHUTOFF CONTROL.** For the definition applicable in Chapter 11, see Section N1101.6.~~

~~**N1104.2 (R404.2) Interior lighting controls.** All permanently installed luminaires shall be controlled as required in Sections N1104.2.1 and N1104.2.2.~~

~~**Exception:** Lighting controls shall not be required for safety or security lighting.~~

~~**N1104.2.1 (R404.2.1) Habitable spaces.** All permanently installed luminaires in *habitable spaces* shall be controlled with a *manual dimmer* or with an *automatic shutoff control* that automatically turns off lights within 20 minutes after all occupants have left the space and shall incorporate a *manual* control to allow occupants to turn the lights on or off.~~

~~**N1104.2.2 (R404.2.2) Specific locations.** All permanently installed luminaires in garages, unfinished *basements*, laundry rooms and utility rooms shall be controlled by an *automatic shutoff control* that automatically turns off lights within 20 minutes after all occupants have left the space and shall incorporate a *manual* control to allow occupants to turn the lights on or off.~~

Reason Statement:

This proposal seeks to simplify the interior residential lighting provisions of the code by removing the 2021 requirements mandating interior lighting controls in the form of a “dimmer, an occupant sensor, or another control,” as well as the 2024 IRC/IECC provisions requiring dimmers or automatic shutoff controls for all permanently installed luminaires in habitable spaces and automatic shutoff controls with manual on/off options in garages, basements, laundry rooms, and utility rooms. Removing these provisions restores consumer choice and design flexibility, without jeapordizing energy savings from the expanded use of hig-efficacy lighting sources.Limited Energy

Savings:

Limited Energy Savings: A report by the Washington State University Energy Program found that energy savings from increased use of residential lighting controls are significantly lower than those achieved through the high-efficacy lighting sources already required under the Virginia Residential Code (N1104.1/R404.1). As high-efficacy lamps have become standard, the marginal benefit of additional control strategies continues to decline, providing little measurable improvement in overall residential energy performance. The report also cited U.S. Department of Energy analysis showing that properly controlled exterior residential lighting offers far greater savings potential than interior controls, reducing energy use by up to 36%. (Source: Washington State University Energy Program).

Uncertainty about compliant control types: The 2021 VRC requires all permanently installed lighting fixtures to be controlled by a dimmer or an occupant sensor control, yet also allows for the use of "another control" that is installed and built into the fixture. Without further clarification, this term can be interpreted to include a standard on/off switch, effectively negating the intended requirement.

Unclear Applicability: The 2021 VRC lists specific exceptions for certain areas—bathrooms, hallways, exterior fixtures, and safety or security lighting—but provides no clear guidance on other common spaces such as closets, laundry rooms, mudrooms, garages, pantries, and utility rooms. The revisions introduced in the 2024 IECC further build upon this lack of clarity, expanding control requirements without resolving how they apply to these common residential areas.

Cost Impact: The code change proposal will decrease the cost

Proposal will decrease construction costs

REC-R404.5-24

IECC: 404.5 (N1104.5) (New), 404.5.1 (N1104.5.1) (New), 404.5.2 (N1104.5.2) (New), 404.5.2.1 (N1104.5.2.1) (New), 404.5.2.2 (N1104.5.2.2) (New), 404.5.2.3 (N1104.5.2.3) (New), 404.5.2.4 (N1104.5.2.4) (New), 404.5.2.5 (N1104.5.2.5) (New)

Proponents: William Penniman, representing Sierra Club Virginia Chapter (wpenniman@aol.com)

2024 International Energy Conservation Code [RE Project]

Add new text as follows:

404.5 (N1104.5) ELECTRIC VEHICLE POWER TRANSFER.

404.5.1 (N1104.5.1) Definitions.

AUTOMOBILE PARKING SPACE. A space within a building or private or public parking lot, exclusive of driveways, ramps, columns, office and work areas, for the parking of an automobile.

ELECTRIC VEHICLE (EV). An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles and electric motorcycles, primarily powered by an electric motor that draws current from a building electrical service, electric vehicle supply equipment (EVSE), a rechargeable storage battery, a fuel cell, a photovoltaic array or another source of electric current.

ELECTRIC VEHICLE CAPABLE SPACE (EV CAPABLE SPACE). A designated automobile parking space that is provided with electrical infrastructure such as, but not limited to, raceways, cables, electrical capacity, a panelboard or other electrical distribution equipment space necessary for the future installation of an EVSE.

ELECTRIC VEHICLE READY SPACE (EV READY SPACE). An automobile parking space that is provided with a branch circuit and an outlet, junction box or receptacle that will support an installed EVSE.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). Equipment for plug-in power transfer, including ungrounded, grounded and equipment grounding conductors; electric vehicle connectors; attached plugs; any personal protection system; and all other fittings, devices, power outlets or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the electric vehicle.

ELECTRIC VEHICLE SUPPLY EQUIPMENT INSTALLED SPACE (EVSE SPACE). An automobile parking space that is provided with a dedicated EVSE connection.

404.5.2 (N1104.5.2) Electric vehicle power transfer infrastructure. New residential automobile parking spaces for residential buildings shall be provided with electric vehicle power transfer infrastructure in accordance with Sections R404.5.2.1 through R404.5.2.5.

404.5.2.1 (N1104.5.2.1) Quantity.

New one- and two-family dwellings and townhouses with a designated attached or detached garage or other on-site private parking provided adjacent to the dwelling unit shall be provided with one EV capable, EV ready or EVSE space per dwelling unit. R-2 occupancies or allocated parking for R-2 occupancies in mixed-use buildings shall be provided with an EV capable space, EV ready space or EVSE space for 40 percent of the dwelling units or automobile parking spaces, whichever is less; provided that the required number of served spaces shall be reduced to the extent that shared charging facilities are planned and designed to serve vehicles owned by occupants of multiple dwelling units.

Exceptions:

1. Where the local electric distribution entity certifies in writing that it is not able to provide 100 percent of the necessary distribution capacity within 2 years after the estimated certificate of occupancy date, the required EV charging infrastructure shall be reduced based on the available existing electric distribution capacity.

2. Where substantiation is approved that meeting the requirements of Section R404.5.2.5 will alter the local utility infrastructure design requirements on the utility side of the meter so as to increase the utility side cost to the builder or developer by more than $450 per dwelling unit.

3. To the extent the number of EVSE charging spaces must be reduced to comply with applicable fire safety codes.

404.5.2.2 (N1104.5.2.2) EV Capable Spaces.

R404.5.2.2 (N1104.5.2.2)EV capable spaces.

Each EV capable space used to meet the requirements of Section R404.5.2.1 shall comply withall of the following:

1. A continuous raceway or cable assembly shall be installed between a suitable panelboard or other on-site electrical distribution equipment and an enclosure or outlet located within 6 feet (1828 mm) of the EV capable space.

2. The installed raceway or cable assembly shall be sized and rated to supply a minimum circuit capacity in accordance with Section R404.5.2.5.

3. The electrical distribution equipment to which the raceway or cable assembly connects shall have sufficient dedicated space and spare electrical capacity for a two-pole circuit breaker or set of fuses.

4. The electrical enclosure or outlet and the electrical distribution equipment directory shall be marked: “For future electric vehicle supply equipment (EVSE).”

404.5.2.3 (N1104.5.2.3) EV Ready Spaces.

Each branch circuit serving EV ready spaces shall comply withall of the following:

1. Termination at an outlet or enclosure, located within 6 feet (1828 mm) of each EV ready space it serves and marked “For electric vehicle supply equipment (EVSE).”

2. Service by an electrical distribution system and circuit capacity in accordance with Section R404.5.2.5.

3. Designation on the panelboard or other electrical distribution equipment directory as “For electric vehicle supply equipment (EVSE).”

404.5.2.4 (N1104.5.2.4) EVSE Spaces.

An installed EVSE with multiple output connections shall be permitted to serve multiple EVSE spaces. Each EVSE serving either a single

EVSE space or multiple EVSE spaces shall comply with the following:

1. Be served by an electrical distribution system in accordance with Section R404.5.2.5.

2. Have a nameplate charging capacity of not less than 6.2 kVA (or 30A at 208/240V) per EVSE space served. Where an EVSE serves three or more EVSE spaces and is controlled by an energy management system in accordance with Section R404.5.2.5, the nameplate charging capacity shall be not less than 2.1 kVA per EVSE space served.

3. Be located within 6 feet (1828 mm) of each EVSE space it serves.

4. Be installed in accordance with NFPA 70 and be listed and labeled in accordance with UL 2202 (Electric Vehicle (EV) Charging System Equipment—with revisions through February 2018) or UL 2594 (Standard for Electric Vehicle Supply Equipment Standard for Electric Vehicle Supply Equipment.)

404.5.2.5 (N1104.5.2.5) Electrical distribution system capacity.
The branch circuits and electrical distribution system serving each EV capable space, EV ready space and EVSE space used to comply with Section R404.5.2.1 shall comply with one of the following:

1. Sized for a calculated EV charging load of not less than 6.2 kVA per EVSE, EV ready or EV capable space. Where a circuit is shared or managed, it shall be in accordance with NFPA 70.

2. The capacity of the electrical distribution system and each branch circuit serving multiple EVSE spaces, EV ready spaces or EV capable spaces designed to be controlled by an energy management system in accordance with NFPA 70 shall be sized for a calculated EV charging load of not less than 2.1 kVA per space. Where an energy management system is used to control EV charging loads for the purposes of this section, it shall not be configured to turn off electrical power to EVSE or EV used to comply with Section R404.5.2.1.

Reason Statement:

The purpose of this proposal is to incorporate into Virginia's residential building code the substance of 2024 IECC's Appendix RE which spells out requirements to install electric vehicle charging infrastructure in connection with new residential construction. Appendix RE comes with the 2024 IECC, but activation of Appendix RE requires inserting language into the Virginia Construction Code for residential construction, which this proposal would do by adding a new Section R404.5 and N1104.5.

The terms of Appendix RE are modified by (a) allowing the number of served spaces for R2 occupancies to be reduced by use of shared charging spaces and (b) the number of charging spaces shall be reduced to the extent required by any restrictions imposed by fire safety regulations.

Adoption of this proposal would benefit residents of new buildings by facilitating convenient electric vehicle charging, which can readily be expanded as the need grows. Implementation would benefit residents and the public with cost savings, pollution reduction (including greenhouse gases, ozone and carbon monoxide) and more equitable access to EVs and EV charging for residents. It would avoid the much higher costs of having to retrofit parking areas and building electrical systems.

Under Section 405, builders would be able to choose among three levels of EV charging readiness: EV Capable Space (raceway and basic infrastructure for future installation of a branch circuit and charger); or EV Ready Space (basic infrastructure plus a branch circuit, outlet, junction box or receptacle); or EVSE Space (includes actual charging).

The optionality allows builders to minimize construction costs while still making easier and much less costly for the owner to add an EV charger in the future. As explained in the IECC Commentary, "EV capable spaces are the first step towards the preparation of future electric vehicle charging infrastructure. The raceways, electrical capacity, and panelboard placed and sized accordingly will ease future installations and reduce future costs."

By agreement among members of the ICC's committee to develop the 2024 IECC, these EV charging requirements were to have been included in the main body of the 2024 IECC (as proposed here). It was shifted to an appendix on appeal but activating an appendix requires text in the code itself.

It would serve Virginians' near and long-term interest to require minimum levels of EV charging infrastructure in new construction. Given the savings to vehicle users and the pollution reduction benefits to the community, requiring installation of EV charging infrastructure is just as appropriate as it is for the building code to require lighting and other electric infrastructure for lighting and future equipment (HVAC, appliances, etc.), as well as safety measures like carbon monoxide alarms needed for houses with garages for traditional gas/diesel fired vehicles.

EVs have many economic and health benefits for vehicle users, and assuring installation of basic electric infrastructure to serve EVs as their usage grows will best serve Virginia and its residents. EVs are cheaper to use and maintain compared to vehicles with internal combustion engines (ICE).

At-home charging is important for EV owners. It accounts for approximately 80% EV charging today and is much more convenient than searching for public chargers. However, many EV owners and potential buyers do not have EV infrastructure at their dwellings or even the potential to install charging in the future. That is a barrier to EV adoption and the inherent benefits of EVs for residents.

Growing EV usage is very important to Virginia. As explained in the ICC commentary accompanying the 2024 IECC, "The U.S. transportation sector accounted for 29 percent of the nation's greenhouse gas (GHG) emissions in 2019." That is specifically due to the traditional predominance of vehicles with internal combustion engines (ICE). Greenhouse gases from charging and operating EVs are less than 30% of GHG emissions from fueling and operating ICE vehicles. https://theicct.org/why-evs-are-already-much-greener-than-combustion-engine-vehicles-jul25/ Emissions will go down further as the electric system adopts more to zero-carbon energy sources. EVs are also far more energy efficient than burning fuels in vehicle engines.

Reducing GHG emissions is a stated policy goal in Virginia law because climate change is a current and growing danger for Virginians. (See., e.g., § 45.2-1706.1. Commonwealth Clean Energy Policy. "A. The Commonwealth recognizes that effectively addressing climate change and enhancing resilience will advance the health, welfare, and safety of the residents of the Commonwealth. The Commonwealth further recognizes that addressing climate change requires reducing greenhouse gas emissions across the Commonwealth's economy sufficient to reach net-zero emission by 2045 in all sectors, including the electric power, transportation, industrial, agricultural, building, and infrastructure sectors….") Virginia faces growing threats, including more heat-illnesses, disruption of outdoor work, worsening storms, flooding, sea level rise, supply-chain disruption, damage to crops, trees and natural resources, arrival of diseases and pests, etc.

Bringing on EVs will also reduce other air pollutants that also threaten Virginian's health and welfare. ICE vehicles are a major source of ozone and other pollutants, including carbon monoxide risks in homes with garages.

Providing EV electric infrastructure as part of new construction is no different from the building code's requiring electrical infrastructure for HVAC and other appliances likely to be used in the future or from its requiring more efficient equipment in homes (heat pumps, high-efficiency appliances and lighting). (The infrastructure for future EV charging could be used for other purposes if a resident were to choose to do so.)

Facilitating adoption of EVs requires that drivers have access to convenient, cost-effective EV charging. That can most easily be provided as part of new construction. It is very costly and complicated to renovate EV charging infrastructure into existing buildings. In the absence of a raceway from the electric panel to the garage, retrofitting would require reopening and repairing walls, which is very expensive and disruptive. Expanding EV charging at home is important and cannot be replicated by the slow process of trying to grow a highway-based charging system. That is why so much charging occurs at home.

The importance of incorporating into new construction is particularly great in the case of buildings whose parking is governed by condominium or common-interest-area boards. The high costs of retrofitting is a particularly large and a common barrier in apartment buildings where residents' choices are restricted by the need for third-party approvals and possible financial interests.

Cost Impact: The code change proposal will increase the cost

The cost of installing infrastructure would depend on the builder's choice among the three levels of EV charging readiness, which are provided by this proposal. The costs would be minimal for an EV Capable Space and not much more for the EV Ready Space option if the panel box is in or near a garage or outdoor parking space and low regardless of the location. The costs could be under $100 per garage. Upstream costs would also provide an exception to the requirements. Since electricity will be installed anyway (e.g. for garage or parking lighting at a minimum), it would not be difficult or costly to go the extra steps during building construction—far less than undertaking to install EV charging capabilities as a retrofit.

REC-R405.2-24

IRC: N1105.2 (R405.2), TABLE N1105.4.2(1) [R405.4.2(1)]

Proponents: Eric Lacey, representing Responsible Energy Codes Alliance (eric@reca-codes.com)

2024 International Residential Code

Revise as follows:

N1105.2 (R405.2) Simulated building performance compliance. Compliance based on *simulated building performance* requires that a *building* comply with the following:

1. The requirements of the sections indicated within Table N1105.2.
2. The proposed total *building thermal envelope* thermal conductance (TC) shall be less than or equal to the required total *building thermal envelope* TC using the prescriptive *U-factors* and *F-factors* from Table N1102.1.2 multiplied by 1.08 in *Climate Zones* 0, 1 and 2, and 1.15 in Climates Zones 3 through 8, in accordance with Equation 11-6 and Section N1102.1.5. The area-weighted maximum *fenestrationSHGC* permitted in Climate Zones 0 through 3 shall be 0.30.

$$\text{For Climate Zones 0–2: } TC_{Proposed\ design} \leq 1.08 \times TC_{Prescriptive\ reference\ design}$$
$$\text{For Climate Zones 3–8: } TC_{Proposed\ design} \leq 1.15 \times TC_{Prescriptive\ reference\ design}$$

Equation 11-6

3. For each *dwelling unit*~~with one or more fuel-burning *appliances* for space heating, water heating, or both, the annual *energy cost* of the *dwelling unit* shall be less than or equal to 80 percent of the annual *energy cost* of the *standard reference design*. For all other *dwelling units*,~~ the annual *energy cost* of the *proposed design* shall be less than or equal to 89 ~~85~~percent of the annual *energy cost* of the *standard reference design*. For each *dwelling unit* with greater than 5,000 square feet (465 m^2) of *living space* located above *grade plane*, the annual *energy cost* of the *dwelling unit* shall be reduced by an additional 5 percent of annual *energy cost* of the *standard reference design*. Energy prices shall be taken from an *approved source*, such as the US Energy Information Administration's State Energy Data System prices and expenditures reports. Code officials shall be permitted to require time-of-use pricing in *energy cost* calculations.

   Exceptions:

   1. The energy use based on source energy expressed in *Btu* or *Btu* per square foot of *conditioned floor area* shall be permitted to be substituted for the *energy cost*. The source energy multiplier for electricity shall be 2.51 . The source energy multipliers shall be 1.09 for natural gas, 1.15 for propane, 1.19 for *fuel oil*, and 1.30 for imported liquified natural gas.
   2. The energy use based on site energy expressed in *Btu* or *Btu* per square foot of *conditioned floor area* shall be permitted to be substituted for the *energy cost.*

TABLE N1105.4.2(1) [R405.4.2(1)] SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Heating systems[d, e, j, k]	Fuel Type/Capacity: same as proposed design.	As proposed.
	Product class: same as proposed design.	As proposed.
	Efficiencies: For other than electric heating without a heat pump: same as proposed design. Where the proposed design utilizes electric heating without a heat pump, the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the *IECC* – Commercial Provisions.	As proposed.
	~~Heat pump: complying with 10 CFR §430.32~~	~~As proposed~~
	~~Fuel gas and liquid fuel furnaces: complying with 10 CFR §430.32~~	~~As proposed.~~
	~~Fuel gas and liquid fuel boilers: complying with 10 CFR §430.32~~	~~As proposed.~~
Cooling systems[d, f, k]	Fuel Type: electric Capacity: same as proposed design	As proposed.
	Efficiencies: ~~complying with 10 CFR §430.32~~ Same as proposed design.	As proposed.

<table>
<tr><th>BUILDING COMPONENT</th><th colspan="4">STANDARD REFERENCE DESIGN</th><th colspan="3">PROPOSED DESIGN</th></tr>
<tr><td rowspan="12">Service water heating[d, g, k]</td><td colspan="4" rowspan="7">Use, in units of gal/day = 25.5 + (8.5 × N_{br})
where: N_{br} = number of bedrooms.</td><td colspan="3">Use, in units of gal/day = 25.5 + (8.5 × N_{br}) × (1 − $HWDS$)
where:
N_{br} = number of bedrooms.
$HWDS$ = factor for the compactness of the hot water distribution system.</td></tr>
<tr><td colspan="2">Compactness ratio[l] factor</td><td>HWDS</td></tr>
<tr><td>1 story</td><td>2 or more stories</td><td></td></tr>
<tr><td>> 60%</td><td>> 30%</td><td>0</td></tr>
<tr><td>> 30% to ≤ 60%</td><td>> 15% to ≤ 30%</td><td>0.05</td></tr>
<tr><td>> 15% to ≤ 30%</td><td>> 7.5% to ≤ 15%</td><td>0.10</td></tr>
<tr><td>< 15%</td><td>< 7.5%</td><td>0.15</td></tr>
<tr><td colspan="4">Fuel type: same as proposed design</td><td colspan="3">As proposed.</td></tr>
<tr><td colspan="4">Rated storage volume: same as proposed design</td><td colspan="3">As proposed.</td></tr>
<tr><td colspan="4">Draw pattern: same as proposed design</td><td colspan="3">As proposed.</td></tr>
<tr><td colspan="4">Efficiencies: ~~Uniform Energy Factor complying with 10 CFR §430.32~~ Same as proposed design.</td><td colspan="3">As proposed.</td></tr>
<tr><td colspan="4">Tank temperature: 120°F (48.9°C)</td><td colspan="3">Same as standard reference design.</td></tr>
<tr><td rowspan="6">Thermal distribution systems</td><td colspan="4">Duct insulation: in accordance with Section N1103.3.3.</td><td colspan="3">Duct insulation: as proposed.[m]</td></tr>
<tr><td colspan="4">Duct location: Same as proposed design.</td><td colspan="3">Duct location: as proposed.[l]</td></tr>
<tr><td>~~Foundation type~~</td><td>~~Slab on grade~~</td><td>~~Unconditioned crawl space~~</td><td>~~Basement or conditioned crawl space~~</td><td colspan="3">—</td></tr>
<tr><td>~~Duct location (supply and return)~~</td><td>~~One-story building: 100% in unconditioned attic~~
~~All other: 75% in unconditioned attic and 25% inside conditioned space~~</td><td>~~One-story building: 100% in unconditioned crawl space~~
~~All other: 75% in unconditioned crawl space and 25% inside conditioned space~~</td><td>~~75% inside conditioned space~~
~~25% unconditioned attic~~</td><td colspan="3" rowspan="2">Duct system leakage to outside: The measured total duct system leakage rate shall be entered into the software as the duct system leakage to outside rate.
Exceptions:
1. Where duct system leakage to outside is tested in accordance ANSI/RESNET/ICC 380 or ASTM E1554, the measured value shall be permitted to be entered.
2. Where total duct system leakage is measured without space conditioning equipment installed, the simulation value shall be 4 cfm per 100ft^2 of conditioned floor area.</td></tr>
<tr><td colspan="4">Duct system leakage to outside: for duct systems serving > 1,000 ft^2 of conditioned floor area, the duct leakage to outside rate shall be 4 cfm per 100 ft^2 of conditioned floor area.
For duct systems serving ≤ 1,000 ft^2 of conditioned floor area, the duct leakage to outside rate shall be 40 cfm.</td></tr>
<tr><td colspan="4">Distribution System Efficiency (DSE): for hydronic systems and ductless systems a thermal distribution system efficiency (DSE) of 0.88 shall be applied to both the heating and cooling system efficiencies.</td><td colspan="3">Distribution System Efficiency (DSE): f or hydronic systems and ductless systems, DSE shall be as specified in Table N1105.4.2(2).</td></tr>
</table>

For SI: 1 square foot = 0.93 m^2, 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m^2, 1 gallon (US) = 3.785 L, °C = (°F – 32)/1.8, 1 degree = 0.79 rad, 1 cubic foot per minute = 28.317 L/min.

a. Hourly calculations as specified in the ASHRAE Handbook of Fundamentals *,* or the equivalent, shall be used to determine the energy loads resulting from infiltration.

b. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 ASHRAE Handbook of Fundamentals *,* page 26.24 and the “Whole-house Ventilation” provisions of 2001 ASHRAE Handbook of Fundamentals *,* page 26.19 for intermittent mechanical ventilation.

c. Thermal storage element shall mean a component that is not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element shall be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or shall be connected to such a room with pipes or ducts that allow the element to be actively charged.

d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.

e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.

f. For a proposed design without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.

g. For a proposed design with a nonstorage-type water heater,For a proposed design without a proposed water heater, the following assumptions shall be made for both the proposed design and standard reference design. For a proposed design with a heat pump water heater, the following assumptions shall be made for the standard reference design, except the fuel type shall be electric:

Fuel Type: Same as the predominant heating fuel type

Rated Storage Volume: 40 gallons

Draw Pattern: Medium

Efficiency: Uniform Energy Factor complying with 10 CFR §430.32

h. For residences with conditioned basements, R-2 and R-4 residences, and for townhouses, the following formula shall be used to determine glazing area:

$AF = A_S \times FA \times F$

where:

AF = Total glazing area.

A_S = Standard reference design total glazing area.

FA = (Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 × below-grade boundary wall area).

F = (above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater.

and where:

- Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions.
- Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.
- Below-grade boundary wall is any thermal boundary wall in soil contact.
- Common wall area is the area of walls shared with an adjoining dwelling unit.

i. The factor for the compactness of the hot water distribution system is the ratio of the area of the rectangle that bounds the source of hot water and the fixtures that it serves (the "hot water rectangle") divided by the floor area of the dwelling.

   1. Sources of hot water include water heaters, or in multiple-family buildings with central water heating systems, circulation loops or electric heat traced pipes.

   2. The hot water rectangle shall include the source of hot water and the points of termination of all hot water fixture supply piping.

   3. The hot water rectangle shall be shown on the floor plans and the area shall be computed to the nearest square foot.

   4. Where there is more than one water heater and each water heater serves different plumbing fixtures and appliances, it is permissible to establish a separate hot water rectangle for each hot water distribution system and add the area of these rectangles together to determine the compactness ratio.

   5. The basement or attic shall be counted as a story when it contains the water heater.

   6. Compliance shall be demonstrated by providing a drawing on the plans that shows the hot water distribution system rectangle(s), comparing the area of the rectangle(s) to the area of the dwelling and identifying the appropriate compactness ratio and *HWDS* factor.

j. For a proposed design with electric resistance heating, a split system heat pump complying with 10 CFR §430.32 (2021) shall be assumed modeled in the standard reference design.

k. For heating systems, cooling systems, or water heating systems not included in this table, the standard reference design shall be the same as proposed design.

l. Only sections of ductwork that are installed in accordance with Section N1103.3.4, Items 1 and 2 are assumed to be located completely inside conditioned space. All other sections of ductwork are not assumed to be located completely inside conditioned space.

m. Sections of ductwork installed in accordance with Section N1103.3.5.1 are assumed to have an effective duct insulation *R*-value of R-25.

Reason Statement:

The proposed changes above will reverse the largest efficiency rollbacks incorporated into the 2024 *IECC* and maintain Virginia's current performance path approach to efficiency trade-offs for heating, cooling, and water heating equipment. It will also eliminate an unnecessary new credit for duct location. The proposal will also incorporate a single efficiency improvement to buildings with all equipment types based on the U.S. Department of Energy's Determination that the 2024 IECC reduced annual energy costs by roughly 6.6% as compared to the 2021 IECC. We believe the combination of these changes will allow Virginia code users to continue to use the performance path essentially as they do today, avoiding the controversies that have accompanied the 2024 IECC revisions to this section.

All of these new trade-off credits were included in the 2024 *IECC* as part of a large compromise among *IECC*-R Development Committee Members referred to as the "omnibus." However, significant portions of the omnibus related to electrification and decarbonization were removed from the 2024 *IECC* by the ICC Board of Directors as a result of several appeals, leaving in place several material efficiency rollbacks. These rollbacks would not have been approved in the 2024 *IECC* but for the omnibus compromise, and we recommend that Virginia eliminate these trade-off credits to be consistent with the 2021 *IECC* and the current VA Construction Code approach to equipment efficiency in the performance path.

Equipment trade-offs were correctly eliminated in the 2009 version of the *IECC* (and in Virginia's adoption of the 2009 IRC/IECC) and were consistently rejected in every *IECC* and Virginia code update cycle until the ICC Residential Committee-developed 2024 *IECC*. Nearly every state that adopts the *IECC* has eliminated these trade-offs as well. Equipment trade-offs reduce building efficiency because commonly installed cooling, heating, and water heating equipment typically exceeds the federal minimum efficiencies, but states are unable to set more reasonable efficiency requirements (or more reasonable assumptions in the standard reference design baseline) because of federal preemption. **The result is an unwarranted trade-off credit that allows buildings to be constructed 11-22% less efficient overall than if the trade-offs were not allowed**. *See* ICF International, *Review and Analysis of Equipment Trade-offs in Residential Energy Codes,* at ii (Sep. 23, 2013).

Although proponents of equipment trade-offs argue that they are “energy neutral,” the reality is that they are a short-term trade-off that will have long-term negative impacts on homeowners –who are often unaware that such trade-offs are taking place. For example, if a trade-off is permitted for water heater efficiency, an instantaneous natural gas water heater would allow the builder to reduce the efficiency of the rest of the home by an average of 9%. The remaining home will be 9% less efficient for its entire useful lifetime. As the water heater is replaced every 10-15 years, the envelope of that home will continue to underperform by 9%. By contrast, under the current Virginia Construction Code (and the 2021 *IECC*), no trade-off credit is awarded for the instantaneous water heater, which means the rest of the home will be built to meet the code. As the water heater is swapped out in future years, a home built to the current Virginia UCC-compliant home will outperform a home built using a water heater performance trade-off allowed by 9%.

Regarding duct location, the current Virginia Uniform Construction Code does not award performance path trade-off credit for ducts located inside conditioned space. In both the prescriptive path and the performance path, builders are neither penalized nor credited for the location of duct systems. Although it is generally good building practice to locate all ducts and air handlers inside conditioned space, many builders in Virginia already do this.

The 2024 *IECC* already provides another performance-based alternative that provides credit for equipment efficiency and duct location (the Energy Rating Index), as well as multiple credits for equipment and duct location in Table R408.2. Both of these compliance paths do not carry such a high risk of free ridership (and reduced overall efficiency) as the proposed performance path credits. The simulated performance path lacks several of the built-in protections of the ERI path, and thus cannot guarantee an equivalent level of performance. We strongly recommend eliminating these loopholes from the performance path and implementing provisions consistent with the Virginia Construction Code and the 2021 *IECC*.

Finally, this proposal replaces the two multipliers in Section N1105.2(3)/R405.2(3) with a single multiplier. Although we do not oppose setting a different multiplier based on whether a home uses fossil fuel-fired or electric appliances, for a starting place we recommend setting a multiplier that is consistent with the U.S. Department of Energy's Determination on energy cost savings associated with the prescriptive path of the 2024 IECC, and one that properly reflects the impact of equipment trade-offs (if any). In December of 2024, U.S. DOE found that homes built to the 2024 IECC prescriptive path will have 6.6% lower annual energy costs than homes built to the 2021 IECC, on average. *See* U.S. Department of Energy, *Notification of Determination*, 89 Fed. Reg. 106458 (Dec. 30, 2024). The current Virginia Construction Code already requires that the proposed home in Section R405 not exceed 95% of the annual energy costs of the standard reference design home. A 6.6% reduction in energy costs is roughly 89%, and that number is proposed above as a single multiplier. We note, however, that if efficiency trade-offs are allowed for heating, cooling, water heating equipment, or for duct location, there would need to be additional changes to the multiplier, and the result would likely be lower than the 80/85% in the published 2024 IECC. However, for purposes of this proposal, assuming the equipment trade-offs and duct location credit are deleted, we view 89% as a reasonable starting place that would maintain consistency across compliance paths.

Cost Impact: The code change proposal will increase the cost

This proposal improves the overall efficiency of the performance path by roughly 6.6%, which may increase costs depending on decisions made by code users. However, these changes, taken as a single package, would maintain consistency with improvements made in the prescriptive path.

REC-R405.2(2)-24

IECC: R405.2, R406.3

Proponents: Eric Lacey, representing Responsible Energy Codes Alliance (eric@reca-codes.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R405.2 Simulated building performance compliance.. Compliance based on *simulated building performance* requires that a *building* comply with the following:

1. The requirements of the sections indicated within Table R405.2.
2. The proposed total *building thermal envelope* thermal conductance (TC) shall be less than or equal to the required total building thermal envelope TC using the prescriptive *U*-factors and *F*-factors from Table R402.1.2 multiplied by 1.08 ~~in Climate Zones 0, 1 and 2, and 1.15 in Climate Zones 3 through 8,~~ in accordance with Equation 4-2 and Section R402.1.5. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

   Equation 4-2 ~~For Climate Zones 0–2:~~ $TC_{Proposed\ design} \leq 1.08 \times TC_{Prescriptive\ reference\ design}$

   ~~For Climate Zones 3–8:~~ $\cancel{TC_{Proposed\ design} \leq 1.15 \times TC_{Prescriptive\ reference\ design}}$

3. For each *dwelling unit* with one or more fuel-burning appliances for space heating, water heating, or both, the annual *energy cost* of the *dwelling unit* shall be less than or equal to 80 percent of the annual *energy cost* of the *standard reference design*. For all other *dwelling units*, the annual *energy cost* of the proposed design shall be less than or equal to 85 percent of the annual *energy cost* of the *standard reference design*. For each dwelling unit with greater than 5,000 square feet (465 m^2) of *living space* located above grade plane, the annual *energy cost* of the *dwelling unit* shall be reduced by an additional 5 percent of annual *energy cost* of the *standard reference design*. Energy prices shall be taken from an *approved* source, such as the US Energy Information Administration's State Energy Data System prices and expenditures reports. Code officials shall be permitted to require time-of-use pricing in *energy cost* calculations.

   Exceptions:

   1. The energy use based on source energy expressed in Btu or Btu per square foot of *conditioned floor area* shall be permitted to be substituted for the *energy cost*. The source energy multiplier for electricity shall be 2.51. The source energy multipliers shall be 1.09 for natural gas, 1.15 for propane, 1.19 for fuel oil, and 1.30 for imported liquified natural gas.
   2. The energy use based on site energy expressed in Btu or Btu per square foot of conditioned floor area shall be permitted to be substituted for the energy cost.

R406.3 Building thermal envelope.. The proposed total *building thermal envelope* thermal conductance (TC) shall be less than or equal to the required total *building thermal envelope* TC using the prescriptive *U*-factors and *F*-factors from Table R402.1.2 multiplied by 1.08 ~~in Climate Zones 0, 1 and 2, and by 1.15 in Climates Zones 3 through 8,~~ in accordance with Equation 4-2 and Section R402.1.5. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

Reason Statement:

The most cost-effective time to properly insulate homes is at construction, when an incremental investment in envelope efficiency will pay dividends over the 70-100 year useful life of the home. As such, the code should not allow unlimited trade-offs of envelope efficiency for other measures.

This proposal updates the thermal envelope trade-off backstops to reflect Virginia's weaker wall insulation requirements. The IECC allows substantial trade-off flexibility in the performance path and Energy Rating Index (and in above-code programs), but these trade-offs are not unlimited. The 2024 IECC allows the thermal envelope to be (on average) 15% less efficient than the IECC prescriptive envelope requirements in Virginia's climate zones, as long as the efficiency losses are accounted for elsewhere.

In Virginia, the current wall insulation requirements allow even weaker envelope efficiency (because the baseline to which 15% is applied is already much lower). Based on a simple REScheck-Web analysis of a sample 2500 square-foot home, we found that on an envelope-only (Total UA) comparison, Virginia's residential thermal envelope currently under-performs the 2024 IECC envelope by about 20%. If the wall insulation is improved to R-20, REScheck shows that the envelope is still 7.6% worse than the 2024 IECC envelope. Compliance reports from REScheck are linked at the bottom of this proposal.

This proposal modifies the envelope backstop from a 15% maximum trade-off cap to an 8% cap, which means envelope efficiency can still be 8% worse than Virginia's code (with R-20 wall insulation requirements), and approximately 15% weaker than an unamended 2024 IECC. While we would prefer to see all new homes perform at the same level, irrespective of compliance path, this proposal limits the underperformance of homes built to Sections R405 and R406 to approximately the same level of performance allowed under the 2024 IECC. Again, this adjustment is based on a scenario where Virginia updates its wall insulation requirement to R-20; if that requirement remains at R-15, we recommend an even more stringent backstop.

Cost Impact: The code change proposal will not increase or decrease the cost

This proposal will neither increase nor decrease the cost of construction. This proposal does not require anything more than what is already required for code compliance. It just ensures that in any performance-based compliance path, the thermal envelope efficiency cannot be more than 8% worse than a home built to the prescriptive path of Virginia's 2024 IECC with an R-20 wall insulation requirement.

Attached Files

- **Sample VA Home - R15 Walls.pdf**
  https://va.cdpaccess.com/proposal/1511/2223/files/download/1000/
- **Sample VA Home - R20 Walls.pdf**
  https://va.cdpaccess.com/proposal/1511/2223/files/download/999/
- **Sample VA Home - Full 2024 IECC.pdf**
  https://va.cdpaccess.com/proposal/1511/2223/files/download/998/

REC-R408.2.9-24

IRC: N1108.2.9 (R408.2.9)

Proponents: Eric Lacey, representing Responsible Energy Codes Alliance (eric@reca-codes.com)

2024 International Residential Code

Delete without substitution:

~~**N1108.2.9 (R408.2.9) Opaque walls.** For *buildings* in Climate Zones 4 and 5, the maximum *U-factor* of 0.060 shall be permitted to be used for wood-framed walls for compliance with Table N1102.1.2 where complying with one or more of the following:~~

1. ~~Primary space heating is provided by a *heat pump* that meets one of the efficiencies in Section N1108.2.2.~~
2. ~~All installed *water heaters* are *heat pumps* that meet one of the efficiencies in Section N1108.2.3.~~
3. ~~In addition to the number of credits required by Section N1108.2, three additional credits are achieved.~~
4. ~~*Renewable energy resources* are installed to meet the requirements of Section N1108.2.7.~~

Reason Statement:

New Section R408.2.9 is an efficiency loophole incorporated into the 2024 *IECC* with potential long-term negative impacts. It allows a reduction in wall insulation where one of four conditions is met. There are several problems with this section:

1. None of the specific measures will provide efficiency for as long as the wall insulation being traded off. Measures 1 and 2 have significantly shorter useful lifetimes than wall insulation; measure 4 creates an efficiency trade-off for renewable energy, which is not allowed in either the prescriptive or performance paths of the *IECC*; and measure 3 allows a code user to select 3 more credits from Table R408.2, effectively creating a prescriptive envelope trade-off for 40+ measures that may or may not match the longevity or efficiency of wall insulation. No analysis was provided to justify this trade-off or to quantify whether these measures could save a comparable amount of energy as well-insulated walls.

2. Some advocates have been urging states to allow double-counting of these measures, effectively reducing envelope efficiency without any improvements elsewhere in the building. The charging language does not clarify whether measures 1, 2, and 4 are *in addition to* measures already used to comply with Section R408.2, or whether a code user may simply double-count these measures and reduce envelope efficiency. Neither the proponent's reason statement for this measure (REPI-33-21) nor any of the debate in the 2024 IECC development cycle addressed the possibility of double-counting, and it would seem to contradict language in measure 3 (which requires 3 credits "in addition to the number of credits required by Section R408.2"). Yet advocates at the state and national level have argued that code users should receive credit for these measures both to comply with Section R408.2 and to receive the benefits of an insulation reduction under R408.2.9.

This entire section is problematic, and will only to lead to reduced efficiency. The only reason it is included in the 2024 IECC is because it was part of a deal among IECC Residential Consensus Committee members where sustainability measures and efficiency rollbacks that failed to achieve the required number of votes were grouped into a large "omnibus" package. In response to several appeals, the ICC Board of Directors later reversed the portions of the omnibus related to sustainability, but left in place the efficiency rollbacks, making the 2024 IECC less stringent than the 2021 IECC in several places. Other states considering the 2024 IECC have either deleted this controversial section or are in the process of debating it. We strongly recommend deleting the entire section and maintaining the stringency of the IECC.

Cost Impact: The code change proposal will not increase or decrease the cost

This section is a problematic and confusing exception that was introduced in the 2024 IECC. Eliminating it does not change the base efficiency requirements of the code, so it will neither increase nor decrease costs for code users.

CS10-24

VRC: 13VAC5-21-10.

Proponents: DHCD Staff, representing DHCD (sbco@dhcd.virginia.gov)

2021 Virginia Building and Fire Code Related Regulations

Revise as follows:

13VAC5-21-10. Definitions.

A. The following words and terms when used in this chapter shall have the following meanings unless the context clearly indicates otherwise:

“Applicant” means a person seeking a certificate.

“Active certificate” means a certificate that is not revoked, suspended, or inactive.

“BCAAC” means the Building Code Academy Advisory Committee appointed pursuant to subdivision 7 of § 36-137 of the Code of Virginia.

“BHCD” means the Virginia Board of Housing and Community Development.

“Certificate” means a certificate of competence issued pursuant to subdivision 6 of § 36-137 of the Code of Virginia concerning the content, application, and intent of specified subject areas of the building and fire prevention regulations promulgated by the BHCD and issued to present or prospective personnel of local governments and to any other persons seeking to become qualified to perform inspections pursuant to Chapter 6 (§ 36-97 et seq.) of Title 36 of the Code of Virginia, Chapter 9 (§ 27-94 et seq.) of Title 27 of the Code of Virginia, and any regulations adopted thereunder, who have completed training programs or in other ways demonstrated adequate knowledge.

“Certificate holder” means a person to whom a certificate has been issued.

“Code academy” means the Virginia Building Code Academy established under subdivision 14 of § 36-139 of the Code of Virginia or individual or regional training academies accredited by the Department pursuant to subdivision 7 of § 36-137 of the Code of Virginia.

“Department” means the Virginia Department of Housing and Community Development.

“Inactive certificate” means a certificate where the certificate holder has not attended the periodic training designated by the Department or has not met the continuing education requirements.

“Provisional certificate” means a temporary certificate issued in accordance with Section 13VAC5-21-51 (C).

“SFPC” means the Virginia Statewide Fire Prevention Code (~~13VAC5-51~~ 13-VAC5-52).

“State Review Board” means the Virginia State Building Code Technical Review Board established under § 36-108 of the Code of Virginia.

“USBC” means the Virginia Uniform Statewide Building Code (13VAC5-63).

“VADR” means the Virginia Amusement Device Regulations (13VAC5-31).

B. Words and terms used in this chapter that are defined in the USBC, VADR, or SFPC and that are not defined in this chapter shall have the meaning ascribed to them in those regulations unless the context clearly indicates otherwise.

Reason Statement: This change is editorial. The VAC section referenced for the SFPC is being updated.

Cost Impact: The code change proposal will not increase or decrease the cost
This change is editorial and will not increase or decrease cost.

CS51-24

VRC: 13VAC5-21-51.

Proponents: DHCD staff on behalf of the Building Code Academy Advisory Committee (BCAAC); (sbco@dhcd.virginia.gov)

2021 Virginia Building and Fire Code Related Regulations

Revise as follows:

Virginia Certification Standards
*
13VAC5-21-51. Issuance and maintenance of certificates.

A. Certificates will be issued when an applicant has complied with the current applicable requirements of this chapter. Certificates will be classified as active or inactive. An inactive certificate will be considered out of compliance and a noncompliance notice will be issued to the certificate holder. In such cases, notification shall also be provided to the locality or company employing the certificate holder. Exceptions to the issuance of a noncompliance notice may be considered where there is a separation from employment by medical or military leave for 12 consecutive months or more during the continuing education period. An inactive certificate may be reinstated as an active certificate after completing makeup training courses designated by the Department.

B. All certificates issued since June 1978 are valid unless revoked or suspended, except that provisional certificates shall remain valid as set out under subsection C of this section.

C. A provisional certificate may be issued to (i) a person who has been directed by the Department to obtain a certificate; (ii) an applicant requesting a certificate under the alternative training provisions of 13VAC5-21-45; (iii) an applicant when the required training has not been provided or offered; (iv) an inactive certificate holder when the issuance of a provisional certificate is determined to be warranted by the Department; or (v) a person who, due to extenuating and warranting circumstances either on behalf of the code academy or beyond the person’s control, has not fully complied with the eligibility requirements of training and competency established herein.

Such a provisional certificate may be issued when the applicant or person has satisfactorily completed the code academy core module and completed any training through the code academy or through other providers determined to warrant the issuance of the provisional certificate.

The provisional certificate is valid for a period of one year after the date of issuance and shall only be issued once to any individual, except that a provisional certificate shall remain valid when the required training has not been provided or offered.

D. All certificate holders shall attend periodic maintenance training as designated by the Department and shall attend ~~16~~ <u>24</u> hours of continuing education every two years as approved by the Department. If a certificate holder possesses more than one certificate, the ~~16~~ <u>24</u> hours shall satisfy the continuing education requirement for all certificates.

<u>**Note:** The number of CE hours required by the VCS at the start of a CE reporting period is applicable through the end of that CE reporting period. When the number of CE hours required by this section is changed, the new requirement is applicable to CE reporting periods beginning after the effective date of the updated VCS.</u>

Reason Statement:

This proposal is being submitted by DHCD staff on behalf of the Building Code Academy Advisory Committee (BCAAC).

Change Summary: The proposal increases the minimum number of continuing education hours required for all certificate holders (every two years) from 16 hours, to 24 hours. A note is also proposed to be added to the VCS to clarify that the increased CE hours would not impact CE periods that start before the new requirement is effective.

Background Information and Reason:

The current DHCD certification requirement is **16 hours every two years** (or **8 hours per year** for comparison purposes), and this requirement has remained unchanged since 2008 when the DHCD CE policy was first established. The current 16-hour requirement applies to all certificate holders regardless of the number or type of certification(s) they hold.

In practice, most Virginia code enforcement professionals already engage in more than 16 hours of professional development over a two-year period. By raising the standard to 24 hours, we align the formal requirement with the professional development practices already taking place in many Virginia localities. This adjustment also ensures that our requirements are consistent with other states with statewide inspection certifications, and other similar job roles, many of which set much higher continuing education benchmarks to maintain the skills and knowledge of their certificate holders.

CE requirements for other US States with statewide inspector certifications, ICC CE requirements, and other Virginia requirements for life-safety related roles:

- **California**
  - **15 hours per year** - 45 hours of continuing education every three years for all inspectors, plan examiners and building officials, with 8 of those hours relating to accessibility requirements

- **Connecticut**
  - **30 hours per year** for Building Official, Assistant Building Official, and Plan Reviewer
  - **20 hours per year** for Residential Building Inspector
  - **10 hours per year** for Construction Inspector, Electrical Inspector, HVAC Inspector, Mechanical Inspector, and Plumbing Inspector

- **Florida**
  - **7 hours per year** with specific topic requirements
    - 14 hours every two years – a minimum of two hours of energy conservation, one hour in the area of accessibility, two hours in the area of Florida laws and rules (other than accessibility and ethics) and one hour in the area of ethics.
- **New York**
  - **6 hours per year for "Building Safety Inspectors",** with at least 3 of these hours from programs approved by the NY dept. of State
  - **24 hours per year for "Code Enforcement Officials"**, with at least 12 of these hours from programs approved by the NY dept. of State. Of these 12 approved hours, 3 hours of Code enforcement and administration, 3 hours of Uniform Fire Prevention and Building Code, and 3 hours of Energy Conservation

- **Massachusetts** (3-year cycle)
  - **15 hours per year for "Building Code Enforcement Officials" (Inspector of buildings, building commissioner, and local inspector)**

- **ICC CE requirements**
  - Requirements are based on number of ICC Certs held. 3 year period. ICC also requires a certain percentage of hours to come from ICC or an ICC preferred provider.
    - 1 Cert = **5 hours per year** (15 hours every 3 years)
    - 2-5 certs – **10 hours per year** (30 hours every 3 years)
    - 6-10 certs = **15 hours per year** (45 hours every 3 years)
    - 11+ = **20 hours per year** (60 hours every 3 years)
    - MCP and CBO = **20 hours per year** (60 hours every 3 years)

- **Virginia State Police**
  - **20 hours per year** (40 hours every 2 years)

- **Virginia EMS Professionals**
  - Paramedic – **30 hours per year** (60 hours every 2 years)
  - EMT – **20 hours per year** (40 hours every 2 years)
  - Advanced EMT – **25 hours per year** (50 hours every 2 years)

To ensure that our Virginia enforcement staff remain knowledgeable, skilled, and responsive to emerging practices and technologies, we propose increasing the CE requirement to **24 hours every two years**, which represents an increase of 8 hours for the 2-year period (or 4 additional hours per year).

This change is both reasonable and attainable. The broad range of activities that qualify as CE already provides staff with significant

flexibility to meet the requirement. Eligible activities include nearly any type of professional training, workshop, conference training session, or documented meeting that contributes to employee growth and job performance. Furthermore, many of these opportunities are available at **little to no cost**, such as in-house training, webinars, online self-paced training, and regularly scheduled departmental and organization meetings. Additionally, there is no limit to the number of hours that can be earned from online self-paced training – an extremely convenient method to earn CE hours. There is also no requirement for a certain number of hours to come from "preferred providers" and no requirement that any percentage or number of hours be earned through in-person events. As a result, staff can easily achieve the increased requirement without incurring additional financial burden. Refer to the DHCD CE Policy to view the extensive list of acceptable events: (See page 2 – "Acceptable programs, Courses, and Activities")
https://www.dhcd.virginia.gov/sites/default/files/Docx/jack-proctor/contining-education-policy.pdf

Also, many certificate holders are already earning (or required to earn) CE hours to maintain other certifications, including 1031 certifications and ICC certifications. DHCD accepts these same hours used towards other CE requirements, allowing certificate holders to reuse the same CEs for their DHCD Continuing Education.

Ultimately, this change is an investment in the long-term success of Virginia code enforcement professionals, resulting in even safer and more code compliant construction throughout Virginia.

Implementation Date: Approval of this change would not impact CE reporting periods that are already underway and will ensure a lengthy notification period to ensure certificate holders are aware of and well prepared for the change. The increased CE hour requirement would be applicable starting with the next two-year CE period after the adoption of the 2024 codes. For example, if the 2024 VCS were approved and effective in October 2027, the new requirement would be applicable starting with the May 1, 2030 CE period (events completed between May 1, 2028 to April 30, 2030) for certificate holders with last names beginning with A-M, and the May 1, 2031 CE period (events completed between May 1, 2029 to April 30, 2031) for certificate holders with last names beginning with N-Z.

Cost Impact: The code change proposal will not increase or decrease the cost

This code change proposal will not impact the cost of construction; however, the increase in required training hours might result in increased costs to code enforcement personnel or their employers.

AD40-24

VRC: 13VAC5-31-40.

Proponents: DHCD staff on behalf of the Amusement Device Technical Advisory Committee (ADTAC); (sbco@dhcd.virginia.gov)

2021 Virginia Building and Fire Code Related Regulations

Revise as follows:

13VAC5-31-40. Incorporated standards.

A. The following standards are hereby incorporated by reference for use as part of this chapter:

  1. American National Standards Institute (ANSI) Standard No. ~~B77.1-2017~~ B77.1-2022 for the regulation of passenger tramways; and

  2. American Society for Testing and Materials (ASTM) Standard Nos. ~~F747-21a,~~ F747-24, ~~F770-21a,~~ F770-24, F1159-16e1, ~~F1193-18a,~~ F1193-25, ~~F1957-99 (2017),~~ F1957-24, ~~F2007- 18,~~ F2007-24, F2137-19, ~~F2291-21,~~ F2291-25, ~~F2374-21a,~~ F2374-24, ~~F2375-09 (2017),~~ F2375-25, ~~F2376-21a,~~ F2376-24, F2460-19, ~~F2461-20a,~~ F2461-23, ~~F2959-21,~~ F2959-25a, ~~F2960-16,~~ F2960-23, ~~F2970-20,~~ F2970-22, ~~F2974-20,~~ F2974-24a and ~~F3054-18~~ F3054-23 for the regulation of amusement devices.

  The standards referenced in subsection A of this section may be procured from:

ANSI 25 W 43rd Street New York, NY 10036	ASTM 100 Barr Harbor Dr. West Conshohocken, PA 19428-2959

B. The provisions of this chapter govern where they are in conflict with any provisions of the standards incorporated by reference in this chapter.

C. The following requirements supplement the provisions of the ASTM standards incorporated by reference in this chapter:

  1. The operator of an amusement device shall be at least 16 years of age, except when the person is under the supervision of a parent or guardian and engaged in activities determined not to be hazardous by the Commissioner of the Virginia Department of Labor and Industry;

  2. The amusement device shall be attended by an operator at all times during operation except that (i) one operator is permitted to operate two or more amusement devices provided they are within the sight of the operator and operated by a common control panel or station and (ii) one operator is permitted to operate two small mechanical rides with separate controls provided the distance between controls is no more than 35 feet and the controls are equipped with a positive pressure switch; and

  3. The operator of an amusement device shall not be (i) under the influence of any drugs that may affect the operator's judgment or ability to assure the safety of the public or (ii) under the influence of alcohol.

D. Where an amusement device was manufactured under previous editions of the standards incorporated by reference in this chapter, the previous editions shall apply to the extent that they are different from the current standards.

Reason Statement: The proposal is submitted by DHCD staff on behalf of the Amusement Device Technical Advisory Committee (ADTAC). Each time the Virginia Amusement Device Regulation (VADR) is updated, the ADTAC reviews the standards that are referenced in the existing VADR and determines if updates to the edition of the standards referenced in the VADR are appropriate. This proposal makes updates to the standards as recommended by the ADTAC at their August 28, 2025 meeting.

Cost Impact: The code change proposal will not increase or decrease the cost

The proposal does not increase or decrease the cost of construction.

AD40(1)-24

VRC: 13VAC5-31-40., 13VAC5-31-75.

Proponents: Victoria Baselice, representing Loudoun County Fire Marshal Office (victoria.baselice@loudoun.gov)

2021 Virginia Building and Fire Code Related Regulations

Revise as follows:

13VAC5-31-40. Incorporated standards.

A. The following standards are hereby incorporated by reference for use as part of this chapter:

1. American National Standards Institute (ANSI) Standard No. B77.1-2017 for the regulation of passenger tramways; and

2. American Society for Testing and Materials (ASTM) Standard Nos. F747-21a, F770-21a, F1159-16e1, F1193-18a, F1957-99 (2017), F2007- 18, F2137-19, F2291-19 F2291-21, F2374-21a, F2375-09 (2017), F2376-21a, F2460-19, F2461-20a, F2959-21, F2960-16, F2970-20, F2974-20, and F3054-18 for the regulation of amusement devices.

The standards referenced in subsection A of this section may be procured from:

ANSI 25 W 43rd Street New York, NY 10036	ASTM 100 Barr Harbor Dr. West Conshohocken, PA 19428-2959

B. The provisions of this chapter govern where they are in conflict with any provisions of the standards incorporated by reference in this chapter.

C. The following requirements supplement the provisions of the ASTM standards incorporated by reference in this chapter:

1. The operator of an amusement device shall be at least 16 years of age, except when the person is under the supervision of a parent or guardian and engaged in activities determined not to be hazardous by the Commissioner of the Virginia Department of Labor and Industry;

2. Pertaining to inflatable devices, the operator/attendant/supervisor shall have received training or instruction on the proper set up and operation or the inflatable.

~~2.~~ 3. The amusement device shall be attended by an operator at all times during operation except that (i) one operator is permitted to operate two or more amusement devices provided they are within the sight of the operator and operated by a common control panel or station and (ii) one operator is permitted to operate two small mechanical rides with separate controls provided the distance between controls is no more than 35 feet and the controls are equipped with a positive pressure switch; and

~~3.~~ 4. The operator of an amusement device shall not be (i) under the influence of any drugs that may affect the operator's judgment or ability to assure the safety of the public or (ii) under the influence of alcohol.

D. Where an amusement device was manufactured under previous editions of the standards incorporated by reference in this chapter, the previous editions shall apply to the extent that they are different from the current standards.

13VAC5-31-75. Local building department.

A. In accordance with §§ 36-98.3 and 36-105 of the Code of Virginia, the local building department shall be responsible for the enforcement of this chapter and may charge fees for such enforcement activity. The total amount charged for any one permit to operate an amusement device or devices or the renewal of such permit shall not exceed the following, except that when a private inspector is used by the owner or operator of the device, the fees shall be reduced by 75%:

1. $55 for each small mechanical ride or inflatable amusement device covered by the permit;
2. $75 for each circular ride, institutional trampoline, or flat-ride less than 20 feet in height covered by the permit, except concession go-karts.

   Concession go-kart fees shall not exceed $300 per track, for tracks with up to 20 karts. An additional fee of up to $10 may be charged for each additional kart in excess of 20;

3. $100 for each spectacular ride covered by the permit that cannot be inspected as a circular ride or flat-ride in subdivision 2 of this subsection due to complexity or height, except zip lines.

   Zip line fees shall not exceed $150 for each zip line. For the purpose of this section, each portion from launch point to landing point shall be considered a separate zip line and each zip line between a launch point and landing point shall also be considered a separate zip line;

4. $200 for each coaster covered by the permit that exceeds 30 feet in height;
5. $400 for each coaster covered by the permit that exceeds 60 feet in height; and
6. The local building department may charge an additional fee for permits and inspections of generators and associated wiring for amusement device events. Generators subject to these fees are those used exclusively with amusement devices and that are inspected by the local building department. The fee per event shall not exceed $165 and shall not exceed the actual cost to perform the inspection or inspections.

Exception: Small portable generators serving only cord and plug connected equipment loads are not subject to the fee.

1. The wattage for any small generator shall not exceed 3500 watts. Small portable generators exceeding this wattage shall not be exempt.
2. Events with multiple generators exceeding three small portable generators (3500 watts each) and/or more than 10 gallons of gasoline in storage cans shall not be exempt.

Notwithstanding the fee limitations established in this section, the local building department shall be permitted to increase the fees up to 50% when requested to perform weekend or after-hour inspections. The local building department shall also be permitted to increase fees up to 50% when a reinspection is required.

B. Notwithstanding the provisions of subsection A of this section, when an amusement device is constructed in whole or in part at a site for permanent operation at that site and is not intended to be disassembled and moved to another site, then the local building department may utilize permit and inspection fees established pursuant to the USBC to defray the cost of enforcement. This authorization does not apply to an amusement device that is only being reassembled, undergoing a major modification at a site or being moved to a site for operation.

C. A permit application shall be made to the local building department at least ~~five~~ thirty (30) days before the date in which the applicant intends to operate an amusement device. The application shall include the name of the owner, operator or other person assuming responsibility for the device, a general description of the device including any serial or identification numbers available, the location of the property on which the device will be operated, and the length of time of operation. The permit application shall indicate whether a private inspector will be used. If a private inspector is not used, the applicant shall give reasonable notice when an inspection is sought and may stipulate the day such inspection is requested provided it is during the normal operating hours of the local building department. In addition to the information required on the permit application, the applicant shall provide proof of liability insurance of an amount not less than $1 million per occurrence or proof of equivalent financial responsibility. The local building department shall be notified of any change in the liability insurance or financial responsibility during the period covered by the permit.

D. Generators shall be installed not less than 10 feet from combustible materials and isolated from the public. Generators must maintain a minimum distance of 20 feet from inflatables.
1. 2A:10BC Fire Extinguisher required within 75 ft of each generator in compliance with fire extinguisher requirements found in the Virginia Construction Code

~~D.~~ E. ~~Notwithstanding the provisions of subsection C of this section, a permit application is not required for a small mechanical ride or an inflatable amusement device that has a certificate of inspection issued by any local building department in this Commonwealth either a six-month period for small mechanical rides or within a one-year period for inflatable amusement devices prior to the dates the small mechanical ride or inflatable amusement device is to be used, regardless of whether the device has been disassembled and moved to a new site. In such cases, the local building department shall be notified and provided with the information required on a permit application as listed in subsection C of this section at least three days prior to operation. In addition, and notwithstanding the provisions of subsection A of this section, the local building department shall be permitted to charge a $50 inspection fee per event to the person notifying the local building department of an event where an inflatable amusement device is operating if the local building department chooses to inspect any or all of the inflatable amusement devices operating at that event. An inspection report shall be provided to the person notifying the local building department of the event if such an inspection is conducted.~~ A permit application is required for small mechanical rides, and inflatable amusement devices regardless of prior inspection issued by any local building department in the Commonwealth.

~~E.~~ F. Local building department personnel shall examine the permit application within ~~five~~ thirty (30) days and issue the permit if all requirements are met. A certificate of inspection for each amusement device shall be issued when the device has been found to comply with this chapter by a private inspector or by an inspector from the local building department. It shall be the responsibility of the local building department to verify that the private inspector possesses a valid certificate of competence as an amusement device inspector from the Virginia Board of Housing and Community Development. ~~In addition, local building department personnel shall be responsible for assuring that the certificate of inspection is posted or affixed on or in the vicinity of the device in a location visible to the public. Local building department personnel shall post or affix such certificates or permit the certificates to be posted or affixed by the private inspector. Permits shall indicate the length of time the device or devices will be operated at the site, clearly identify the device or devices to which it applies and the date of expiration of the permit. Permits shall not be valid for longer than one year, except that permits for small mechanical rides shall not be valid for longer than six months.~~

1. The applicant must upload a manual for each device being used. If no manual is available, the applicant shall reference the state code to installation standards of inflatable devices. The manufacturer's operations manual must be obtained, kept on site and be followed for installation and operation. If the manual is not available, operations must comply with ASTM F2374, which covers design, manufacture, operation and maintenance of inflatable amusement devices. The regulations also detail safety requirements such as anchoring, operator presence wind speed limits and inspection guidelines.
2. In the absence of an installation manual for inflatables, each anchor point on the inflatable shall be secured with no less than 150 pounds of weight per anchor point for non-staked applications or each anchor point shall be staked with no less than a ¾ inch steel stake driven into the ground no less than 18 inches at a 45 degree angle with the tip pointed toward the inflatable.
a) The end/exposed remaining stake shall be blunted/protected to protect from injury.
b) Tethers shall be securely attached to the anchor points (weights/stakes)
3. If the owner's manual is available and includes instructions about a tarp being required to protect the bottom of the inflatable, those instructions must be followed and the tarp used accordingly.
4. In the absence of an installation manual the inflatable shall not be operated or inflated during wind speeds in excess of 15mph.
5. Failure to comply with this regulation or owner's manual requirements shall result in the ride/inflatable not being approved for use.

G. In addition, local building department personnel shall be responsible for assuring that the certificate of inspection is posted or affixed on or in the vicinity of the device in a location visible to the public. Local building department personnel shall post or affix such certificates or permit the certificates to be posted or affixed by the private inspector. Permits shall indicate the length of time the device or devices will be operated at the site, clearly identify the device or devices to which it applies and the date of expiration of the permit. Permits shall not be valid for longer than one year, except that permits for small mechanical rides shall not be valid for longer than six months.

~~F.~~H. In addition to obtaining a certificate of inspection in conjunction with a permit application for amusement devices permanently fixed to a site, a new certificate of inspection shall also be obtained prior to the operation of an amusement device following a major modification, prior to each seasonal operation of a device, at least once during the operating season and prior to resuming the operation of a device following an order from a local building department to cease operation. This requirement shall not apply to small mechanical rides meeting the conditions outlined in subsection D of this section.

~~G.~~ I. For amusement devices manufactured prior to 1978, the owner or operator shall have the information required by 10.1 through 10.6 of ASTM F1193 available at the time of inspection. In addition, the operator of any amusement device shall be responsible for obtaining all manufacturer's notifications, service bulletins and safety alerts issued pursuant to ASTM F770 and the operator shall comply with all recommendations and requirements set out in those documents. A copy of all such documents shall be made available during an inspection.

~~H.~~ J. In the enforcement of this chapter, local building department personnel shall have authority to conduct inspections at any time an amusement device would normally be open for operation or at any other time if permission is granted by the owner or operator, to issue an order to temporarily cease operation of an amusement device upon the determination that the device may be unsafe or may otherwise endanger the public and to accept and approve or deny requests for modifications of the rules of this chapter in accordance with the modification provisions of the USBC.

~~I.~~K. In accordance with subdivision 7 of § 36-137 of the Code of Virginia, the local building department shall collect a 2.0% levy of fees charged for permits under this chapter and transmit it quarterly to DHCD to support training programs of the Virginia Building Code Academy. Localities that maintain individual or regional training academies accredited by DHCD shall retain such levy.

~~J.~~L. In accordance with § 36-98.3 of the Code of Virginia and 13VAC5-31-10 B, the procedures for violations of this chapter shall be as prescribed in the USBC.

~~K.~~ M. In accordance with § 36-98.1 of the Code of Virginia, the Virginia Department of General Services (DGS) shall function as the local building department for the application of this chapter to amusement devices located on state-owned property. In accordance with § 36-98.2 and 36-114 of the Code of Virginia, appeals of the application of this chapter by the DGS shall be made directly to the State Building Code Technical Review Board. Further, as a condition of this chapter, such appeals shall be filed within 14 calendar days after receipt of the decision of DGS.

Reason Statement:
Due to recently developing issues and ongoing compliance problems with vendors setting up primarily inflatable amusement devices, this code change is proposed in the best interest of all parties involved — the property owners, vendors, customers, and the inspectors tasked with ensuring safety and compliance.

In 2025, Loudoun County has permitted and stickered approximately 750 amusement devices. This increase followed the transfer of the amusement device inspection function from the Building Department to the Fire Marshal's Office. With the Fire Marshal's Office operating as part of a 24-hour emergency response agency, inspections have been made available during evenings and weekends where they were previously unavailable.

These extended inspection hours have revealed a growing number of questionable and unsafe installation practices, including: missing installation or operation manuals, lack of on-site attendants, improper staking and tethering, trip and impalement hazards, frayed or damaged power cords, leaking generators, missing, insufficiently charged, or out-of-date fire extinguishers, overloaded generators, and excessive quantities of gasoline on site.

Inspectors are increasingly finding themselves in disputes with vendors because the current code language is vague and ambiguous, leaving many questions unanswered. While some manufacturer installation manuals provide sufficient direction, many do not. The proposed changes are intended to establish clear, enforceable requirements that promote safe operation, reduce ambiguity, and eliminate unnecessary confrontations between inspectors and vendors. These clarifications will also assist end users who rent these devices, helping to ensure their installations can be approved without last-minute compliance issues related to inadequate anchoring or other deficiencies.

13VAC5-31-40. Incorporated standards.

- Rationale: It is the intent of this change to have the vendor provide training or guidance to personnel that will be in attendance overseeing use of this device. A manual on site will ensure operator/attendant/supervisor understands and acknowledges the requirements of the devices to operate safely.

13VAC5-31-75. Local building department.

- Item A. - Rationale: Multiple inflatables with multiple generators that require large amounts of gasoline create a hazardous condition. We have seen larger portable generators in the 19,000 watt range used to power large rides. These configurations need to be inspected for electrical and flammable liquid hazards.
- Item C. - Rationale: Five days to thirty days to allow for verification of documents and properly review and process the permit. Current standard of five days does not provide enough time.
- Item D. - Rationale: Material that is used for inflatables similar to the flammability of tents. Generator tent reference in Virginia

Statewide Fire Prevention Code section 3106.6.2 and 3107.16. Fire extinguisher Section “D- D1” is a NEW SECTION ADDED – following existing sections renumbered below. Complies with the requirements and travel distance of NFPA10.

- Item E. - Rationale: Previously, inspections for installations were considered valid for up to six months or one year after completion. Under that system, as long as the installation or assembly occurred within that period, no new inspection was required. Moving forward, requiring an inspection for every assembly/set up ensures that each installation meets required safety standards and reflects the specific conditions present at the time of setup. The former approach allowed for variations in environmental and site conditions to go unverified, which could lead to nonconformities or safety risks such as uneven or soft terrain, unanchored or improperly anchored inflatables, inadequate clearance to overhead power lines, damaged extension cords, improper storage of flammable liquids, etc.
- Item F. - Rationale: In absence of a manual, referencing state code and ASTM standards fulfils the requirement for installation standards at events. Manuals are not provided to inspectors to verify inflatable is installed safely and securely. Based on inflatable size and per ASTM and building code wind load requirements, in the absence of actual instruction in the manual from the manufacturer, 150 pounds of weight per anchor or ¾” diameter, 18” long, driven in at a 45° angle with the tip pointed toward the inflatable. Stakes at each anchor point should be sufficient to keep the inflatable from becoming airborne. The manuals advise using a tarp or ground cover beneath the unit to protect it and minimize wear and tear, especially on hard surfaces. The manual is considered the authoritative source for set up and takedown procedures and safety.

Cost Impact: The code change proposal will not increase or decrease the cost

No increases.

Attached Files

- **ADI Final with pictures3.pdf**
  https://va.cdpaccess.com/proposal/1494/2165/files/download/958/

Background

Due to recently developing issues and ongoing compliance problems with vendors setting up primarily inflatable amusement devices, this code change is proposed in the best interest of all parties involved — the property owners, vendors, customers, and the inspectors tasked with ensuring safety and compliance.

In 2025, Loudoun County has permitted and stickered approximately 750 amusement devices. This increase followed the transfer of the amusement device inspection function from the Building Department to the Fire Marshal's Office. With the Fire Marshal's Office operating as part of a 24-hour emergency response agency, inspections have been made available during evenings and weekends where they were previously unavailable.

These extended inspection hours have revealed a growing number of questionable and unsafe installation practices, including: missing installation or operation manuals, lack of on-site attendants, improper staking and tethering, trip and impalement hazards, frayed or damaged power cords, leaking generators, missing, insufficiently charged, or out-of-date fire extinguishers, overloaded generators, and excessive quantities of gasoline on site.

Inspectors are increasingly finding themselves in disputes with vendors because the current code language is vague and ambiguous, leaving many questions unanswered. While some manufacturer installation manuals provide sufficient direction, many do not. The proposed changes are intended to establish clear, enforceable requirements that promote safe operation, reduce ambiguity, and eliminate unnecessary confrontations between inspectors and vendors. These clarifications will also assist end users who rent these devices, helping to ensure their installations can be approved without last-minute compliance issues related to inadequate anchoring or other deficiencies.

Proposed Changes
Black text = existing language to remain
Red text = new or changed language
Green text = rationale statement

13VAC5-31-40. Incorporated standards.

A. The following standards are hereby incorporated by reference for use as part of this chapter:

1. 1.American National Standards Institute (ANSI) Standard No. B77.1-2017 for the regulation of passenger tramways; and
2. 2.American Society for Testing and Materials (ASTM) Standard Nos. F747-21a, F770-21a, F1159-16e1, F1193-18a, F1957-99 (2017), F2007-18, F2137-19, F2291-19 F2291-21, F2374-21a, F2375-09 (2017), F2376-21a, F2460-19, F2461-20a, F2959-21, F2960-16, F2970-20, F2974-20, and F3054-18 for the regulation of amusement devices.

The standards referenced in subsection A of this section may be procured from:

ANSI 25 W 43rd Street New York, NY 10036	ASTM 100 Barr Harbor Dr. West Conshohocken, PA 19428-2959

B. The provisions of this chapter govern where they are in conflict with any provisions of the standards incorporated by reference in this chapter.

C. The following requirements supplement the provisions of the ASTM standards incorporated by reference in this chapter:

1. The operator of an amusement device shall be at least 16 years of age, except when the person is under the supervision of a parent or guardian and engaged in activities determined not to be hazardous by the Commissioner of the Virginia Department of Labor and Industry;
2. Pertaining to inflatable devices, the operator/attendant/supervisor shall have received training or instruction on the proper set up and operation or the inflatable.

Rationale: It is the intent of this change to have the vendor provide training or guidance to personnel that will be in attendance overseeing use of this device. A manual on site will ensure operator/attendant/supervisor understands and acknowledges the requirements of the devices to operate safely.

3. The amusement device shall be attended by an operator at all times during operation except that (i) one operator is permitted to operate two or more amusement devices provided they are within the sight of the operator and operated by a common control panel or station and (ii) one operator is permitted to operate two small mechanical rides with separate controls provided the distance between controls is no more than 35 feet and the controls are equipped with a positive pressure switch; and
4. The operator of an amusement device shall not be (i) under the influence of any drugs that may affect the operator's judgment or ability to assure the safety of the public or (ii) under the influence of alcohol.

D. Where an amusement device was manufactured under previous editions of the standards incorporated by reference in this chapter, the previous editions shall apply to the extent that they are different from the current standards.

13VAC5-31-75. Local building department.

A. In accordance with §§ 36-98.3 and 36-105 of the Code of Virginia, the local building department shall be responsible for the enforcement of this chapter and may charge fees for such enforcement activity. The total amount charged for any one permit to operate an amusement device or devices or the renewal of such permit shall not exceed the following, except that when a private inspector is used by the owner or operator of the device, the fees shall be reduced by 75%:

   1. $55 for each small mechanical ride or inflatable amusement device covered by the permit;
   2. $75 for each circular ride, institutional trampoline, or flat-ride less than 20 feet in height covered by the permit, except concession go-karts.
      - Concession go-kart fees shall not exceed $300 per track, for tracks with up to 20 karts. An additional fee of up to $10 may be charged for each additional kart in excess of 20;
   3. $100 for each spectacular ride covered by the permit that cannot be inspected as a circular ride or flat-ride in subdivision 2 of this subsection due to complexity or height, except zip lines.
      - Zip line fees shall not exceed $150 for each zip line. For the purpose of this section, each portion from launch point to landing point shall be considered a separate zip line and each zip line between a launch point and landing point shall also be considered a separate zip line;
   4. $200 for each coaster covered by the permit that exceeds 30 feet in height;
   5. $400 for each coaster covered by the permit that exceeds 60 feet in height; and
   6. The local building department may charge an additional fee for permits and inspections of generators and associated wiring for amusement device events. Generators subject to these fees are those used exclusively with amusement devices and that are inspected by the local building department. The fee per event shall not exceed $165 and shall not exceed the actual cost to perform the inspection or inspections.

   Exception: Small portable generators serving only cord and plug connected equipment loads are not subject to the fee.

   1. The wattage for any small generator shall not exceed 3500 watts. Small portable generators exceeding this wattage shall not be exempt.
   2. Events with multiple generators exceeding three small portable generators (3500 watts each) and/or more than 10 gallons of gasoline in storage cans shall not be exempt.

Rationale: Multiple inflatables with multiple generators that require large amounts of gasoline create a hazardous condition. We have seen larger portable generators in the

19,000 watt range used to power large rides. These configurations need to be inspected for electrical and flammable liquid hazards.

Notwithstanding the fee limitations established in this section, the local building department shall be permitted to increase the fees up to 50% when requested to perform weekend or after-hour inspections. The local building department shall also be permitted to increase fees up to 50% when a reinspection is required.

B. Notwithstanding the provisions of subsection A of this section, when an amusement device is constructed in whole or in part at a site for permanent operation at that site and is not intended to be disassembled and moved to another site, then the local building department may utilize permit and inspection fees established pursuant to the USBC to defray the cost of enforcement. This authorization does not apply to an amusement device that is only being reassembled, undergoing a major modification at a site or being moved to a site for operation.

C. A permit application shall be made to the local building department at least ~~five~~ thirty (30) days before the date in which the applicant intends to operate an amusement device. The application shall include the name of the owner, operator or other person assuming responsibility for the device, a general description of the device including any serial or identification numbers available, the location of the property on which the device will be operated, and the length of time of operation. The permit application shall indicate whether a private inspector will be used. If a private inspector is not used, the applicant shall give reasonable notice when an inspection is sought and may stipulate the day such inspection is requested provided it is during the normal operating hours of the local building department. In addition to the information required on the permit application, the applicant shall provide proof of liability insurance of an amount not less than $1 million per occurrence or proof of equivalent financial responsibility. The local building department shall be notified of any change in the liability insurance or financial responsibility during the period covered by the permit.

Rationale: Five days to thirty days to allow for verification of documents and properly review and process the permit. Current standard of five days does not provide enough time.

D. Generators shall be installed not less than 10 feet from combustible materials and isolated from the public. Generators must maintain a minimum distance of 20 feet from inflatables.

    1. 2A:10BC Fire Extinguisher required within 75 ft of each generator in compliance with fire extinguisher requirements found in the Virginia Construction Code

Rationale: Material that is used for inflatables similar to the flammability of tents. Generator tent reference in Virginia Statewide Fire Prevention Code section 3106.6.2 and 3107.16. Fire extinguisher Section “D- D1” is a NEW SECTION ADDED

– following existing sections renumbered below. Complies with the requirements and travel distance of NFPA10.

E. ~~Notwithstanding the provisions of subsection C of this section, a permit application is not required for a small mechanical ride or an inflatable amusement device that has a certificate of inspection issued by any local building department in this Commonwealth either a six-month period for small mechanical rides or within a one-year period for inflatable amusement devices prior to the dates the small mechanical ride or inflatable amusement device is to be used, regardless of whether the device has been disassembled and moved to a new site. In such cases, the local building department shall be notified and provided with the information required on a permit application as listed in subsection C of this section at least three days prior to operation. In addition, and notwithstanding the provisions of subsection A of this section, the local building department shall be permitted to charge a $50 inspection fee per event to the person notifying the local building department of an event where an inflatable amusement device is operating if the local building department chooses to inspect any or all of the inflatable amusement devices operating at that event. An inspection report shall be provided to the person notifying the local building department of the event if such an inspection is conducted.~~

A permit application is required for small mechanical rides, and inflatable amusement devices regardless of prior inspection issued by any local building department in the Commonwealth.

Rationale:
Previously, inspections for installations were considered valid for up to six months or one year after completion. Under that system, as long as the installation or assembly occurred within that period, no new inspection was required. Moving forward, requiring an inspection for every assembly/set up ensures that each installation meets required safety standards and reflects the specific conditions present at the time of setup. The former approach allowed for variations in environmental and site conditions to go unverified, which could lead to nonconformities or safety risks such as uneven or soft terrain, unanchored or improperly anchored inflatables, inadequate clearance to overhead power lines, damaged extension cords, improper storage of flammable liquids, etc.

F. Local building department personnel shall examine the permit application within ~~five~~ thirty (30) days and issue the permit if all requirements are met. A certificate of inspection for each amusement device shall be issued when the device has been found to comply with this chapter by a private inspector or by an inspector from the local building department. It shall be the responsibility of the local building department to verify that the private inspector possesses a valid certificate of competence as an amusement device inspector from the Virginia Board of Housing and Community Development.

1. The applicant must upload a manual for each device being used. If no manual is available, the applicant shall reference the state code to installation standards of inflatable devices. The manufacturer's operations manual must be obtained, kept on site and be followed for installation and operation. If the manual is not available, operations must comply with ASTM F2374, which covers design, manufacture, operation and maintenance of inflatable amusement devices. The regulations also detail safety requirements such as anchoring, operator presence wind speed limits and inspection guidelines.

Rationale: In absence of a manual, referencing state code and ASTM standards fulfils the requirement for installation standards at events.

2. In the absence of an installation manual for inflatables, each anchor point on the inflatable shall be secured with no less than 150 pounds of weight per anchor point for non-staked applications or each anchor point shall be staked with no less than a ¾ inch steel stake driven into the ground no less than 18 inches at a 45 degree angle with the tip pointed toward the inflatable.
    a) The end/exposed remaining stake shall be blunted/protected to protect from injury.
    b) Tethers shall be securely attached to the anchor points (weights/stakes)
3. If the owner's manual is available and includes instructions about a tarp being required to protect the bottom of the inflatable, those instructions must be followed and the tarp used accordingly.
4. In the absence of an installation manual the inflatable shall not be operated or inflated during wind speeds in excess of 15mph.
5. Failure to comply with this regulation or owner's manual requirements shall result in the ride/inflatable not being approved for use.

Rationale: Manuals are not provided to inspectors to verify inflatable is installed safely and securely. Based on inflatable size and per ASTM and building code wind load requirements, in the absence of actual instruction in the manual from the manufacturer, 150 pounds of weight per anchor or ¾" diameter, 18" long, driven in at a 45° angle with the tip pointed toward the inflatable. Stakes at each anchor point should be sufficient to keep the inflatable from becoming airborne.

The manuals advise using a tarp or ground cover beneath the unit to protect it and minimize wear and tear, especially on hard surfaces. The manual is considered the authoritative source for set up and takedown procedures and safety.

G. In addition, local building department personnel shall be responsible for assuring that the certificate of inspection is posted or affixed on or in the vicinity of the device in a location visible to the public. Local building department personnel shall post or affix such certificates or permit the certificates to be posted or affixed by the private inspector. Permits shall indicate the length of time the device or devices will be operated at the site, clearly identify the device or devices to which it applies and the date of expiration of the permit. Permits shall not be valid for longer than one year, except that permits for small mechanical rides shall not be valid for longer than six months.

H. In addition to obtaining a certificate of inspection in conjunction with a permit application for amusement devices permanently fixed to a site, a new certificate of inspection shall also be obtained prior to the operation of an amusement device following a major modification, prior to each seasonal operation of a device, at least once during the operating season and prior to resuming the operation of a device following an order from a local building department to cease operation. This requirement shall not apply to small mechanical rides meeting the conditions outlined in subsection D of this section.

I. For amusement devices manufactured prior to 1978, the owner or operator shall have the information required by 10.1 through 10.6 of ASTM F1193 available at the time of inspection. In addition, the operator of any amusement device shall be responsible for obtaining all manufacturer's notifications, service bulletins and safety alerts issued pursuant to ASTM F770 and the operator shall comply with all recommendations and requirements set out in those documents. A copy of all such documents shall be made available during an inspection.

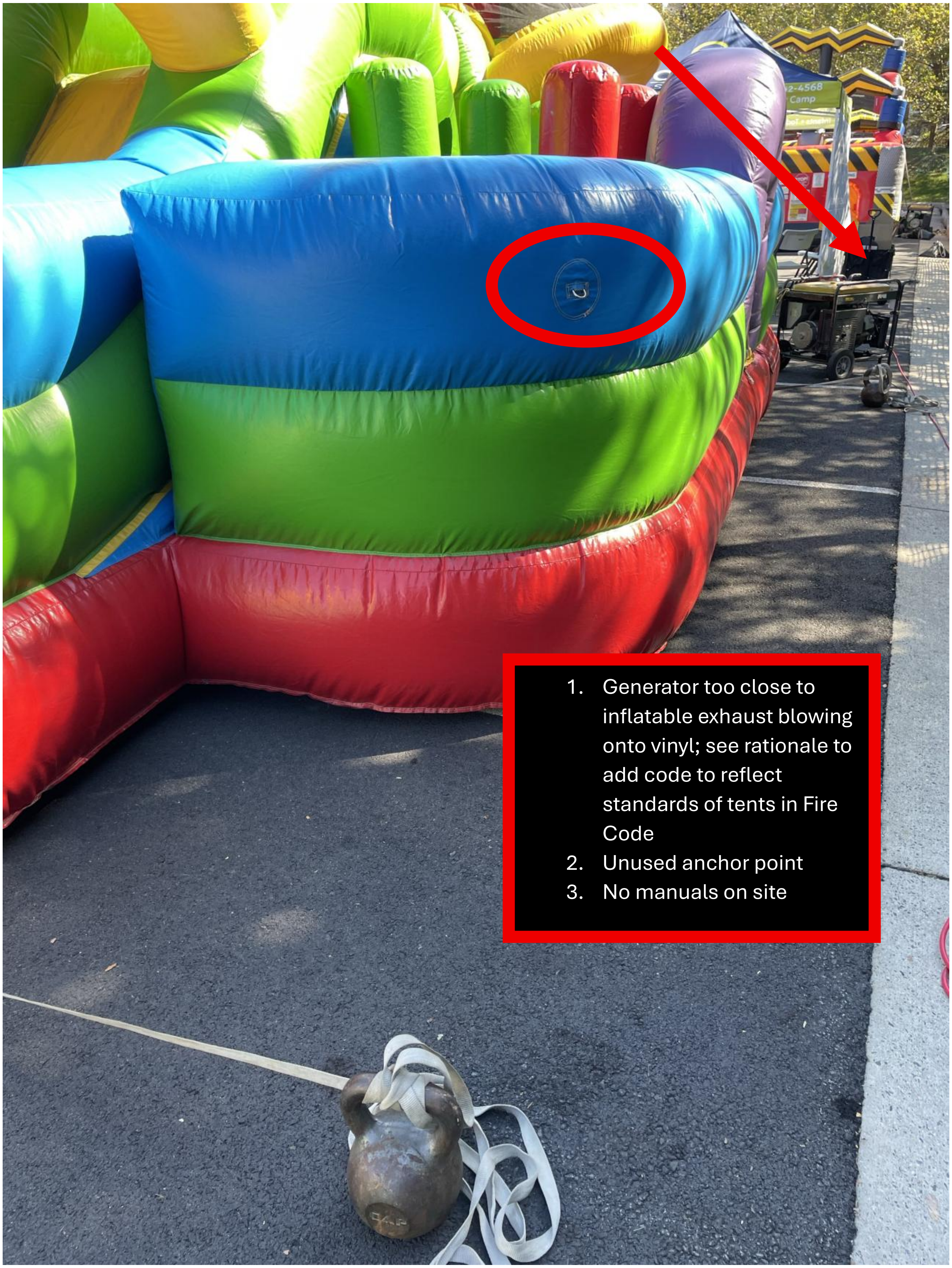
J. In the enforcement of this chapter, local building department personnel shall have authority to conduct inspections at any time an amusement device would normally be open for operation or at any other time if permission is granted by the owner or operator, to issue an order to temporarily cease operation of an amusement device upon the determination that the device may be unsafe or may otherwise endanger the public and to accept and approve or deny requests for modifications of the rules of this chapter in accordance with the modification provisions of the USBC.

K. In accordance with subdivision 7 of § 36-137 of the Code of Virginia, the local building department shall collect a 2.0% levy of fees charged for permits under this chapter and transmit it quarterly to DHCD to support training programs of the Virginia Building Code Academy. Localities that maintain individual or regional training academies accredited by DHCD shall retain such levy.

L. In accordance with § 36-98.3 of the Code of Virginia and 13VAC5-31-10 B, the procedures for violations of this chapter shall be as prescribed in the USBC.

M. In accordance with § 36-98.1 of the Code of Virginia, the Virginia Department of General Services (DGS) shall function as the local building department for the application of this chapter to amusement devices located on state-owned property. In accordance with § 36-98.2 and 36-114 of the Code of Virginia, appeals of the application of this chapter by the DGS shall be made directly to the State Building Code Technical Review Board. Further, as a condition of this chapter, such appeals shall be filed within 14 calendar days after receipt of the decision of DGS.

Improper staking; manual not on site; vendor argued “this is how they’ve done it for years”
Common problem


1. Generator too close to inflatable exhaust blowing onto vinyl; see rationale to add code to reflect standards of tents in Fire Code
2. Unused anchor point
3. No manuals on site

[redacted]

USE FOR
FUNNY FARM
SLIDE

Date: _______

TRIPLE LINDY SLIDE (DRY) OPERATING INSTRUCTIONS

This instruction manual should be used in conjunction with Inflatable 2000, Inc. Operations Manual. Specific rules that apply to the Triple Lindy Slide are detailed in this manual. Always read the "Safety Rules" label attached to the inflatable game prior to operation. This label will specify any instructions relevant to the game ensure safe operation.

MODEL NUMBER	*Triple Lindy Slide*
SERIAL NUMBER	
DIMENSIONS	*41'x18'7"x25'2"'*
INFLATION FAN REQUIREMENTS	*(1) 1.5 HP blower* *(1) 1 HP Blower* *(Reverse air louver assembly)*
MINIMUM ANCHOR / TETHER POINTS	*(16)*
MAXIMUM WEIGHT RESTRICTION	*275 LB EACH RIDER*
MINIMUM HEIGHT REQUIREMENT	*44"*
MAXIMUM HEIGHT REQUIREMENT	*80"*
MAXIMUM NUMBER OF PARTICIPANTS	*3 TOTAL (1 RIDER PER LANE)*
MINIMUM NUMBER OF TRAINED OPERATORS	*3*
TOTAL WEIGHT OF TRIPLE LINDY SLIDE	*1,026 LBS*

1. Attendant(s) MUST be present and operating the inflatable unit at ALL times!
2. Set up your Triple Lindy Slide on an incline of no more than 15 degrees.
3. Be sure the area that you will be setting your inflatable up is free of all debris including any rocks or sharp objects. Grass or hard ground is fine for set up as long as there are no rocks, debris or sharp objects.
4. Lay out a ground tarp to protect the inflatable.
5. Footprint of inflated Triple Lindy Slide is: 41'x18'7"x25'2".
6. Required clearance from adjacent obstacles is five feet (5') around and above the perimeter of the inflatable.
7. Required area for inflated Triple Lindy Slide is: 51'x28'7"x30'2".
8. Unroll the inflatable and attach (2) 1.5 HP inflation blower (producing minimum 650 cubic feet per minute – Reverse air louver assembly) to the inflation tube. Tie off [illegible] flaps are closed.

Anchor / tether the inflatable(s) before inflating. Using (16) 40" stakes at 80 % depth and 5/8" diameter into firm ground, such as grass or directly into asphalt. Staking should be 90 degrees (i.e. perpendicular). A minimum of 125 lb sand or water bag for 20 mph winds. See "Anchoring for soft and hard ground surfaces illustration in manual. (Stakes provided).

10. Tie off any unused blower tubes.
11. The Triple Lindy Slide is to be anchored by at least (16) anchor / tether points.
12. The Triple Lindy Slide should not be operated in wind speeds in excess of 15 MPH. Deflate immediately if wind gusts develop.
13. Do not secure the inflatable to a vehicle (or any object) that could be inadvertently moved while the Triple Lindy Slide is in operation.
14. You are now ready to inflate the unit.
    - The trained operator(s) should now perform an inspection of the attraction.
        - It is strongly recommended that any parts of the inflatable showing any signs of wear or distress (worn seams, tears in the vinyl, broken zippers, etc…) be given special attention and immediately sent back to Inflatable 2000 for repair or replacement (at owners expense).
    - (2) Trained operator(s) should be present at all times. Under no circumstances should the Triple Lindy Slide (or any inflatable), be left unattended! During operation of the Triple Lindy Slide, (1) trained operator(s) should stand in front of the entrance watching entrance / exit and (1) operator should be at the top platform. Operator(s) should stay at the front entrance directing patrons when to enter / exit and make sure


See manual above – 40” stake to be used but at 80% into the ground. This is approximately 10% staked into ground. Vendor on site argued “this is how we’ve always done it”

AD75-24

VRC: 13VAC5-31-75.

Proponents: Corian Carney, representing York County (corian.carney@yorkcounty.gov); Ryan Celestino, representing City of Newport News (celestinore@nnva.gov)

2021 Virginia Building and Fire Code Related Regulations

Revise as follows:

13VAC5-31-75. Local building department.

A. In accordance with §§ 36-98.3 and 36-105 of the Code of Virginia, the local building department shall be responsible for the enforcement of this chapter and may charge fees for such enforcement activity. The total amount charged for any one permit to operate an amusement device or devices or the renewal of such permit shall not exceed the following, except that when a private inspector is used by the owner or operator of the device, the fees shall be reduced by 75%:

1. $55 for each small mechanical ride or inflatable amusement device covered by the permit;

   <u>Multi-device inflatables, or 'bounce parks' shall have separate fees for each device connected to the inflatable park.</u>

2. $75 for each circular ride, institutional trampoline, or flat-ride less than 20 feet in height covered by the permit, except concession go-karts.

   Concession go-kart fees shall not exceed $300 per track, for tracks with up to 20 karts. An additional fee of up to $10 may be charged for each additional kart in excess of 20;

3. $100 for each spectacular ride covered by the permit that cannot be inspected as a circular ride or flat-ride in subdivision 2 of this subsection due to complexity or height, except zip lines.

   Zip line fees shall not exceed $150 for each zip line. For the purpose of this section, each portion from launch point to landing point shall be considered a separate zip line and each zip line between a launch point and landing point shall also be considered a separate zip line;

4. $200 for each coaster covered by the permit that exceeds 30 feet in height;

5. $400 for each coaster covered by the permit that exceeds 60 feet in height; and

6. The local building department may charge an additional fee for permits and inspections of generators and associated wiring for amusement device events. Generators subject to these fees are those used exclusively with amusement devices and that are inspected by the local building department. The fee per event shall not exceed $165 and shall not exceed the actual cost to perform the inspection or inspections.

   Exception: Small portable generators serving only cord and plug connected equipment loads are not subject to the fee.

Notwithstanding the fee limitations established in this section, the local building department shall be permitted to increase the fees up to 50% when requested to perform weekend or after-hour inspections. The local building department shall also be permitted to increase fees up to 50% when a reinspection is required.

B. Notwithstanding the provisions of subsection A of this section, when an amusement device is constructed in whole or in part at a site for permanent operation at that site and is not intended to be disassembled and moved to another site, then the local building department may utilize permit and inspection fees established pursuant to the USBC to defray the cost of enforcement. This authorization does not apply to an amusement device that is only being reassembled, undergoing a major modification at a site or being moved to a site for operation.

C. A permit application shall be made to the local building department at least five days before the date in which the applicant intends to operate an amusement device. The application shall include the name of the owner, operator or other person assuming responsibility for the device, a general description of the device including any serial or identification numbers available, the location of the property on which the device will be operated, and the length of time of operation. The permit application shall indicate whether a private inspector will be used. If a private inspector is not used, the applicant shall give reasonable notice when an inspection is sought and may stipulate the day such inspection is requested provided it is during the normal operating hours of the local building department. In addition to the information required on the permit application, the applicant shall provide proof of liability insurance of an amount not less than $1 million per occurrence or proof of equivalent financial responsibility. The local building department shall be notified of any change in the liability insurance or financial responsibility during the period covered by the permit.

D. Notwithstanding the provisions of subsection C of this section, a permit application is not required for a small mechanical ride or an inflatable amusement device that has a certificate of inspection issued by any local building department in this Commonwealth either a six-month period for small mechanical rides or within a one-year period for inflatable amusement devices prior to the dates the small mechanical ride or inflatable amusement device is to be used, regardless of whether the device has been disassembled and moved to a new site. In such cases, the local building department shall be notified and provided with the information required on a permit application as listed in subsection C of this section at least three days prior to operation. In addition, and notwithstanding the provisions of subsection A of this section, the local building department shall be permitted to charge a $50 inspection fee per event to the person notifying the local building department of an event where an inflatable amusement device is operating if the local building department chooses to inspect any or all of the inflatable amusement devices operating at that event. An inspection report shall be provided to the person notifying the local building department of the event if such an inspection is conducted.

E. Local building department personnel shall examine the permit application within five days and issue the permit if all requirements are met. A certificate of inspection for each amusement device shall be issued when the device has been found to comply with this chapter by a private inspector or by an inspector from the local building department. It shall be the responsibility of the local building department to verify that the private inspector possesses a valid certificate of competence as an amusement device inspector from the Virginia Board of Housing and Community Development. In addition, local building department personnel shall be responsible for assuring that the certificate of inspection is posted or affixed on or in the vicinity of the device in a location visible to the public. Local building department personnel shall post or affix such certificates or permit the certificates to be posted or affixed by the private inspector. Permits shall indicate the length of time the device or devices will be operated at the site, clearly identify the device or devices to which it applies and the date of expiration of the permit. Permits shall not be valid for longer than one year, except that permits for small mechanical rides shall not be valid for longer than six months.

F. In addition to obtaining a certificate of inspection in conjunction with a permit application for amusement devices permanently fixed to a site, a new certificate of inspection shall also be obtained prior to the operation of an amusement device following a major modification, prior to each seasonal operation of a device, at least once during the operating season and prior to resuming the operation of a device following an order from a local building department to cease operation. This requirement shall not apply to small mechanical rides meeting the conditions outlined in subsection D of this section.

G. For amusement devices manufactured prior to 1978, the owner or operator shall have the information required by 10.1 through 10.6 of ASTM F1193 available at the time of inspection. In addition, the operator of any amusement device shall be responsible for obtaining all manufacturer's notifications, service bulletins and safety alerts issued pursuant to ASTM F770 and the operator shall comply with all recommendations and requirements set out in those documents. A copy of all such documents shall be made available during an inspection.

H. In the enforcement of this chapter, local building department personnel shall have authority to conduct inspections at any time an amusement device would normally be open for operation or at any other time if permission is granted by the owner or operator, to issue an order to temporarily cease operation of an amusement device upon the determination that the device may be unsafe or may otherwise endanger the public and to accept and approve or deny requests for modifications of the rules of this chapter in accordance with the modification provisions of the USBC.

I. In accordance with subdivision 7 of § 36-137 of the Code of Virginia, the local building department shall collect a 2.0% levy of fees charged for permits under this chapter and transmit it quarterly to DHCD to support training programs of the Virginia Building Code Academy. Localities that maintain individual or regional training academies accredited by DHCD shall retain such levy.

J. In accordance with § 36-98.3 of the Code of Virginia and 13VAC5-31-10 B, the procedures for violations of this chapter shall be as prescribed in the USBC.

K. In accordance with § 36-98.1 of the Code of Virginia, the Virginia Department of General Services (DGS) shall function as the local building department for the application of this chapter to amusement devices located on state-owned property. In accordance with § 36-98.2 and 36-114 of the Code of Virginia, appeals of the application of this chapter by the DGS shall be made directly to the State Building Code Technical Review Board. Further, as a condition of this chapter, such appeals shall be filed within 14 calendar days after receipt of the decision of DGS.

Reason Statement: This change is aimed at eliminating confusion between applicants and building departments for the purpose of fee schedules when large inflatables are used that encompass multiple devices.

Cost Impact: The code change proposal will not increase or decrease the cost

This change is only a clarification to prevent future confusion.

Final General Stakeholder Workgroup Meeting – Day 2
(January 6, 2026)

Date: January 6, 2026

Time: 9:00 AM

Location: 4224 Cox Rd, Glen Allen, VA 23060 - Virginia Housing Center

AGENDA

I. Welcome
II. Introductions
III. Code Change Proposals (see list below)

VCC Proposals

1. B101.2(2)-24
2. B103.5-24
3. B103.7-24
4. B105.2-24
5. B107.1-24
6. B109.2-24
7. B109.3.1-24
8. B109.4-24
9. B109.4(1)-24
10. B113.6-24
11. B113.7-24
12. B119.5(1)-24
13. B202-24
14. B302.1-24
15. B406.2.7-24
16. B406.2.7(1)-24
17. B407.4.1.1-24
18. B706.3-24
19. B907.5.2.1.2-24
20. B917.1.1-24
21. B918.1-24
22. B918.2-24
23. B1006.3.4(1)-24
24. B1110.4-24
25. B1110.20-24
26. B1210.1.1-24
27. B2403.6-24
28. B3104.1.1-24
29. B3105.2-24
30. B3500(1)-24

VEBC Proposals

31. EB102.2-24
32. EB102.2.2-24
33. EB103.9-24
34. EB202(1)-24
35. EB307-24
36. EB401.1-24
37. EB403.1-24
38. EB506.2-24
39. EB602.3.4-24
40. EB702.2-24
41. EB706.2-24
42. EB801.2-24
43. EB801.3-24
44. EB805.2.1.1-24
45. EB901.1-24

VRC Proposals

46. RB311-24
47. RB314.3-24
48. RB318.7.6-24
49. RB324.7-24
50. RB339-24
51. RB408.4-24

Note: See January 5, 2026, “General Stakeholder Workgroup Meeting – Day 1” agenda (page 1 of this document) for VPMC, SFPC, Trades, Energy, VCS and VADR proposals that will be discussed on January 5th.

2024 cdpVA Proposal Subject Matter Designations

(cdpVA Proposal Name “Agenda Number” Prefixes)

The following prefixes will be utilized as part of each proposal name to assist in identifying the subject matter of the proposal. DHCD staff assign proposal names after they have been submitted, reviewed and before they are placed in “Ready for Public Comment” status.

B = Virginia Construction Code
EB = Virginia Existing Building Code
PM = Virginia Property Maintenance Code
FP = Statewide Fire Prevention Code
BF = Virginia Construction Code - IFC
EC = Virginia Energy Conservation Code
M = Virginia Mechanical Code
M-FG = Virginia Fuel Gas Code
P = Virginia Plumbing Code
E = VCC Electrical
RB = Virginia Residential Code
REC = Virginia Residential Code - Energy
RE = Virginia Residential Code - Electric
RM = Virginia Residential Code - Mechanical
RM-FG = Virginia Residential Code - Fuel Gas
RP = Virginia Residential Code - Plumbing
IB = Industrialized Building Safety Regulations
MH = Manufactured Home Safety Regulations
AD = Virginia Amusement Device Regulations
CS = Virginia Certification Standards

Example: cdpVA Proposal Agenda Number “**RM-FG**2415.7-24” indicates a proposal to the fuel gas provisions (VRC Section G2415.7) of the 2024 Virginia Residential Code.

B101.2(2)-24

VCC: 101.2

Proponents: Angela Navarro, ALN Policy and Law, representing Virginia League of Conservation Voters

2021 Virginia Construction Code

Revise as follows:

101.2 Incorporation by reference. Chapters 2 – 35 of the 2021 *International Building Code* ®, published by the International Code Council, Inc. (ICC), are adopted and incorporated by reference to be an enforceable part of the USBC. The term "IBC®" means the 2021 *International Building Code* , published by the International Code Council, Inc. Any codes and standards referenced in the IBC are also considered to be part of the incorporation by reference, except that such codes and standards are used only to the prescribed extent of each such reference. In addition, any provisions of the appendices of the IBC specifically identified to be part of the USBC are also considered to be part of the incorporation by reference.
The following appendix to the 2024 International Energy Conservation Code® (IECC®) has been adopted and is a part of this code.

- Appendix RE Electric Vehicle Charging Infrastructure

Notes:

1. The IBC references other International Codes and standards including the following major codes:

   2020 NFPA 70

   2021 *International Energy Conservation Code* ® (IECC ®)

   2021 *International Fuel Gas Code* ® (IFGC ®)

   2021 *International Mechanical Code* ® (IMC ®)

   2021 *International Plumbing Code* ® (IPC ®)

   2021 *International Residential Code* ® (IRC ®)

2. The IRC is applicable to the *construction* of detached one-family and two-family dwellings and townhouses as set out in Section 310 .

Reason Statement:

The proposal will incorporate the 2024 IECC Appendix RE into Virginia's residential building code. Appendix RE sets for the requirements for electric vehicle ready and electric vehicle capable infrastructure for electric vehicle charging in new residential construction.

The electric vehicle requirements in Appendix RE were originally planned for inclusion in the 2024 IECC, but were shifted to an appendix on appeal. As a result, in order for Virginia to adopt the electric vehicle charging infrastructure requirements, Virginia will need to add the text into the Virginia Construction Code for residential construction. This proposal does just that by adding a new Section R404.5 and N1104.5.

The proposal provides the option for new residential construction, defined as one and two household dwelling units and townhomes with attached or detached garages or other on-site private parking, to select among three levels of EV charging infrastructure. The first is EV Capable, which includes the raceway and basic infrastructure for future installation of equipment for plug-in power. The second is EV Ready, which is the basic infrastructure plus a branch circuit and outlet, junction box, or receptacle for future installation of equipment for plug-in power. The third level is the provision of the full electric vehicle charging infrastructure.

These three options provide maximum flexibility for the builders of new residential homes to select which level of investment to make while easing the burden for new homeowners when making the decision to install electric vehicle charging. The IECC commentary provides helpful guidance on this point, stating "EV capable spaces are the first step towards the preparation of future electric vehicle charging infrastructure. The raceways, electrical capacity, and panelboard placed and sized accordingly will ease future installations and reduce future costs."

As EV homeownership steadily increases in Virginia, these provisions are crucial to ensuring that home charging is not a barrier for future homeowners. The Virginia Auto Dealers Association released updated information on the growth of EV charging in 2025's first quarter, stating "sales of fully battery electric vehicles (BEVs), plug-in hybrids (PHEVs), and traditional hybrids all posted substantial gains compared to the same period in 2024. BEV sales rose by 18%, PHEVs surged 66% (though still account for a tiny slice of the market), and hybrid sales jumped 59%."

Electric vehicle adoption provides a number of economic and environmental benefits for Virginia. On the economic benefits, EV's can help households lower their monthly expenses on both fuel and vehicle maintenance. EV's can also drive broader economic benefits like job creation in manufacturing, such as the recent announcement from RBW for an EV manufacturing facility in Danville.

Electric vehicle adoption also drives significant environmental benefits. The primary benefit of EVs is decreasing the reliance on fossil fuels. As Virginia increases the amount of generation on the electric grid from carbon-free sources, the carbon reduction benefits will continue to grow over time. Further, because EVs don't burn gasoline, there are additional air pollution reduction benefits, including reductions in nitrogen oxides and particulate matter. Therefore, EVs deliver both climate reduction benefits and broader air quality benefits.

The proposal will help Virginians by removing barriers to EV adoption, which will deliver these important benefits to both households and the Commonwealth. By ensuring that home charging is not a costly barrier in Virginia going forward, this proposal provides a common-sense and practical step forward.

Cost Impact: The code change proposal will increase the cost

The code change will have a cost impact, and that impact will depend on which of the three levels the residential homebuilder selects. The costs are small for EV Capable spaces and increase as the infrastructure level increases. However, the investment in making the dwelling unit EV-ready can increase its sale price and marketability due to growing buyer demand for electric vehicle convenience and sustainability. For example, according to a study in Nature Sustainability from researchers at Princeton and the University of Maryland, the increased availability of EV charging infrastructure within close proximity to the home increases home values by over $17,000 on average.

Attached Files

- **Appendix RE Electric Vehicle Charging Infrastructure.pdf**
  https://va.cdpaccess.com/proposal/1464/2266/files/download/1036/

Appendix RE Electric Vehicle Charging Infrastructure

Section RE101 Electric Vehicle Power Transfer

RE101.1 Definitions.

AUTOMOBILE PARKING SPACE.

A space within a *building* or private or public parking lot, exclusive of driveways, ramps, columns, office and work areas, for the parking of an automobile.

ELECTRIC VEHICLE (EV).

An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles and electric motorcycles, primarily powered by an electric motor that draws current from a building electrical service, *electric vehicle supply equipment* (EVSE), a rechargeable storage battery, a fuel cell, a photovoltaic array or another source of electric current.

ELECTRIC VEHICLE CAPABLE SPACE (EV CAPABLE SPACE).

A designated *automobile parking space* that is provided with electrical infrastructure such as, but not limited to, raceways, cables, electrical capacity, a panelboard or other electrical distribution equipment space necessary for the future installation of an *EVSE*.

ELECTRIC VEHICLE READY SPACE (EV READY SPACE).

An *automobile parking space* that is provided with a branch circuit and an outlet, junction box or receptacle that will support an installed *EVSE*.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE).

Equipment for plug-in power transfer, including ungrounded, grounded and equipment grounding conductors; electric vehicle connectors; attached plugs; any personal protection system; and all other fittings, devices, power outlets or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the *electric vehicle*.

ELECTRIC VEHICLE SUPPLY EQUIPMENT INSTALLED SPACE (EVSE SPACE).

An *automobile parking space* that is provided with a dedicated *EVSE* connection.

RE101.2 Electric vehicle power transfer infrastructure.

New residential *automobile parking spaces* for residential *buildings* shall be provided with *electric vehicle power* transfer infrastructure in accordance with Sections RE101.2.1 through RE101.2.5.

RE101.2.1 Quantity.

New one- and two-family dwellings and townhouses with a designated attached or detached garage or other on-site private parking provided adjacent to the *dwelling unit* shall be provided with one *EV capable*, *EV ready* or *EVSE* space per *dwelling unit*. R-2 occupancies or allocated parking for R-2 occupancies in mixed-use *buildings* shall be provided with an *EV capable space*, *EV ready space* or *EVSE* space for 40 percent of the *dwelling units* or *automobile parking spaces*, whichever is less.

Exceptions:

1. Where the local electric distribution entity certifies in writing that it is not able to provide 100 percent of the necessary distribution capacity within 2 years after the estimated certificate of occupancy date, the required *EV* charging infrastructure shall be reduced based on the available existing electric distribution capacity.
2. Where substantiation is *approved* that meeting the requirements of Section RE101.2.5 will alter the local utility infrastructure design requirements on the utility side of the meter so as to increase the utility side cost to the builder or developer by more than $450 per *dwelling unit*.

RE101.2.2 EV capable spaces.

Each *EV capable space* used to meet the requirements of Section RE101.2.1 shall comply with all of the following:

1. A continuous raceway or cable assembly shall be installed between a suitable panelboard or other on-site electrical distribution equipment and an enclosure or outlet located within 6 feet (1828 mm) of the *EV capable space*.
2. The installed raceway or cable assembly shall be sized and rated to supply a minimum circuit capacity in accordance with Section RE101.2.5.

3. The electrical distribution equipment to which the raceway or cable assembly connects shall have sufficient dedicated space and spare electrical capacity for a two-pole circuit breaker or set of fuses.
4. The electrical enclosure or outlet and the electrical distribution equipment directory shall be marked: “For future electric vehicle supply equipment (EVSE).”

RE101.2.3 EV ready spaces.

Each branch circuit serving *EV ready spaces* shall comply with all of the following:

1. Termination at an outlet or enclosure, located within 6 feet (1828 mm) of each *EV ready space* it serves and marked “For electric vehicle supply equipment (EVSE).”
2. Service by an electrical distribution system and circuit capacity in accordance with Section RE101.2.5.
3. Designation on the panelboard or other electrical distribution equipment directory as “For electric vehicle supply equipment (EVSE).”

RE101.2.4 EVSE spaces.

An installed *EVSE* with multiple output connections shall be permitted to serve multiple *EVSE spaces*. Each *EVSE* serving either a single *EVSE space* or multiple *EVSE spaces* shall comply with the following:

1. Be served by an electrical distribution system in accordance with Section RE101.2.5.
2. Have a nameplate charging capacity of not less than 6.2 kVA (or 30A at 208/240V) per *EVSE space* served. Where an *EVSE* serves three or more *EVSE spaces* and is controlled by an energy management system in accordance with Section RE101.2.5, the nameplate charging capacity shall be not less than 2.1 kVA per *EVSE space* served.
3. Be located within 6 feet (1828 mm) of each *EVSE space* it serves.
4. Be installed in accordance with NFPA 70 and be *listed* and *labeled* in accordance with UL 2202 or UL 2594.

RE101.2.5 Electrical distribution system capacity.

The branch circuits and electrical distribution system serving each *EV capable space*, *EV ready space* and *EVSE space* used to comply with Section RE101.2.1 shall comply with one of the following:

1. Sized for a calculated *EV* charging load of not less than 6.2 kVA per *EVSE*, *EV ready* or *EV capable space*. Where a circuit is shared or managed, it shall be in accordance with NFPA 70.
2. The capacity of the electrical distribution system and each branch circuit serving multiple *EVSE spaces*, *EV ready spaces* or *EV capable spaces* designed to be controlled by an energy management system in accordance with NFPA 70 shall be sized for a calculated *EV* charging load of not less than 2.1 kVA per space. Where an energy management system is used to control *EV* charging loads for the purposes of this section, it shall not be configured to turn off electrical power to *EVSE* or *EV ready spaces* used to comply with Section RE101.2.1.

Section RE102 Referenced Standards

RE102.1 General.

See Table RE102.1 for standards that are referenced in various sections of this appendix. Standards are listed by the standard identification with the effective date, standard title, and the section or sections of this appendix that reference the standard.

TABLE RE102.1 REFERENCED STANDARDS

STANDARD ACRONYM	STANDARD NAME	SECTIONS HEREIN REFERENCED
UL 2202—2009	*Electric Vehicle (EV) Charging System Equipment— with revisions through February 2018*	RE101.2.4
UL 2594—2016	*Standard for Electric Vehicle Supply Equipment*	RE101.2.4

B103.5-24

VCC: 103.5

Proponents: David Beahm, representing Warren County (dbeahm@warrencountyva.gov)

2021 Virginia Construction Code

Revise as follows:

103.5 Functional design. The following criteria for functional design is in accordance with § 36-98 of the Code of Virginia. The USBC shall not supersede the regulations of other state agencies that require and govern the functional design and operation of *building* related activities not covered by the USBC, including (i) public water supply systems, (ii) waste water treatment and disposal systems, and (iii) solid waste facilities. Nor shall state agencies be prohibited from requiring, pursuant to other state law, that *buildings* and *equipment* be maintained in accordance with provisions of this ~~code. In addition, as established by this code, the building official may refuse to issue a permit until the applicant has supplied certificates of functional design approval from the appropriate state agency or agencies. For purposes of coordination, the *locality* may require reports to the building official by other departments or agencies indicating compliance with their regulations applicable to the functional design of a *building* or *structure* as a condition for issuance of a building permit or certificate of occupancy. Such reports shall be based upon review of the plans or inspection of the project as determined by the *locality*. All~~ code. All enforcement of these conditions shall not be the responsibility of the building official, but rather the agency imposing the condition.

> **Note:** Identified state agencies with functional design approval are listed in the "Related Laws Package," which is available from *DHCD*.

Reason Statement: This section already indicates that the Building Official is not responsible for the enforcement of the regulations of other agencies. It also infers that the Building Official has no control over their approval process. It therefore doesn't make sense that the Building Official be required to or be able to hold issuing a building permit based on their regulations or conditions. The responsibility of imposing their requirements should solely be on their respective agency.

Cost Impact: The code change proposal will decrease the cost

This will decrease the cost of construction in allowing the construction to begin as soon as approved without having to wait on other agencies that may be delaying approval due to their regulations. It will decrease any loan interest that may be in place or the return on investment being realized sooner when sold.

B103.7-24

VCC: 103.7

Proponents: DHCD Staff, representing DHCD (sbco@dhcd.virginia.gov)

2021 Virginia Construction Code

Revise as follows:

103.7 State buildings and structures. This section establishes the application of the USBC to state-owned *buildings* and *structures* in accordance with § 36-98.1 of the Code of Virginia. The USBC shall be applicable to all state-owned *buildings* and *structures*, and to all buildings and structures built on state-owned property, with the exception that §§ 2.2-1159 through 2.2-1161 of the Code of Virginia shall provide the standards for ready access to and use of state-owned *buildings* by the physically handicapped.

Any state-owned *building* or *structure* or *building* or structure built on state-owned property for which preliminary plans were prepared or on which *construction* commenced after the initial effective date of the USBC shall remain subject to the provisions of the USBC that were in effect at the time such plans were completed or such *construction* commenced. Subsequent reconstruction, renovation or demolition of such *building* or *structure* shall be subject to the pertinent provisions of this code. Acting through the Division of Engineering and Buildings, the Virginia Department of General Services shall function as the building official for state-owned *buildings* or structures and for all buildings and structures built on state-owned property. The department shall review and approve plans and specifications, grant modifications, and establish such rules and regulations as may be necessary to implement this section. It ~~shall~~ may provide for the inspection of state-owned buildings or structures and for all buildings and structures built on state-owned property and enforcement of the USBC and standards for access by ~~the physically handicapped~~ individuals with physical disabilities by delegating inspection and USBC enforcement duties to the State Fire Marshal's Office, to other appropriate state agencies having needed expertise, and to *local building departments*, all of which shall provide such assistance within a reasonable time and in the manner requested. State agencies and institutions occupying *buildings* shall pay to the *local building department* the same fees as would be paid by a private citizen for the services rendered when such services are requested by the ~~department~~ Department of General Services. The ~~department~~ Department of General Services may alter or overrule any decision of the *local building department* after having first considered the *local building department's* report or other rationale given for its decision. When altering or overruling any decision of a *local building department*, the ~~department~~ Department of General Services shall provide the *local building department* with a written summary of its reasons for doing so.

Exception: (Expires July 1, 2027) In accordance with §36-98.1 of the Code of Virginia, enforcement of the USBC for bus shelters to be constructed for transit agencies receiving state funds from the Commonwealth Mass Transit Fund, pursuant to § 33.2-1526.1 of the Code of Virginia, and that do not exceed 256 square feet, shall be delegated to the local building official in lieu of the Department of General Services.

Notwithstanding any provision of this code to the contrary, roadway and railway tunnels and bridges owned by either the Virginia Department of Transportation or the Virginia Passenger Rail Authority shall be exempt from this code. The Virginia Department of General Services shall not have jurisdiction over such roadway and railway tunnels, bridges and other limited access highways provided, however, that the Department of General Services shall have jurisdiction over any occupied *buildings* within any Department of Transportation or the Virginia Passenger Rail Authority rights-of-way that are subject to this code.

Except as provided in subsection E of § 23.1-1016 of the Code of Virginia, and notwithstanding any provision of this code to the contrary, at the request of a public institution of higher education, the Virginia Department of General Services, as further set forth in this provision, shall authorize that institution of higher education to contract with a building official of the *locality* in which the *construction* is taking place to perform any inspection and certifications required for the purpose of complying with this code. The ~~department~~ Department of General Services shall publish administrative procedures that shall be followed in contracting with a building official of the *locality*. The authority granted to a public institution of higher education under this provision to contract with a building official of the *locality* shall be subject to the institution meeting the conditions prescribed in subsection A of § 23.1-1002 of the Code of Virginia.

Note: In accordance with § 36-98.1 of the Code of Virginia, roadway tunnels and bridges shall be designed, constructed and operated to comply with fire safety standards based on nationally recognized model codes and standards to be developed by the Virginia Department of Transportation, in the case of roadway tunnels and bridges, and by the Virginia Passenger Rail Authority, in the case of railway tunnels and bridges, in each case in consultation with the State Fire Marshal. Emergency response planning and activities related to the standards shall be developed by the Department of Transportation or the Virginia Passenger Rail Authority, respectively, and coordinated with the appropriate local officials and emergency service providers. On an annual basis, the Department of Transportation shall provide a report on the maintenance and operability of installed fire protection and detection systems in roadway tunnels and bridges and the Virginia Passenger Rail Authority shall provide a report on the maintenance and operability of installed fire protection and detection systems in its railway tunnels and bridges to the State Fire Marshal.

Reason Statement: This proposal is intended to correlate the USBC with § 36-98.1 of the Code of Virginia. Some changes were a result of HB285 and HB1425 during the 2024 General Assembly session and some were from previous GA sessions.

Cost Impact: The code change proposal will not increase or decrease the cost

This proposal will not increase or decrease cost. The text in the new exception is only pointing to existing state law.

B105.2-24

VCC: 105.2

Proponents: DHCD Staff, representing DHCD (sbco@dhcd.virginia.gov)

2021 Virginia Construction Code

Revise as follows:

105.2 Technical assistants. The building official, subject to any limitations imposed by the *locality*, shall be permitted to utilize *technical assistants* to assist the building official in the enforcement of the USBC. *DHCD* shall be notified by the building official or their designee within 60 days of the ~~employment of, contracting with or termination~~ separation of ~~all~~ a *technical* ~~*assistants*~~ *assistant*.

> **Note:** *Technical assistants* are subject to sanctions in accordance with the *VCS*.

Reason Statement:

The requirement for localities/Building Officials to notify DHCD when they hire a new technical assistant is no longer necessary, as actions required for new technical assistants (creating a DHCD registration system profile and requesting a Learning Center account) can and should be completed by the new employee. There is no special action required on the part of DHCD.

It remains important for localities to notify DHCD when a technical assistant leaves a locality so that the DHCD profile can be updated accordingly. The word "termination" is changed to "separation" to be inclusive or more inclusive of any situation where the employee leaves the locality, including resignation, termination, or retirement. This change does not impact the separate notification requirements for permanent or acting Building Officials in VCC 105.1 (no changes are proposed to that section). “or their designee” is added to recognize that this notification does not need to come from the Building Official directly.

Cost Impact: The code change proposal will not increase or decrease the cost

This proposal will not increase or decrease cost.

B107.1-24

VCC: 107.1

Proponents: David Beahm, representing Warren County (dbeahm@warrencountyva.gov)

2021 Virginia Construction Code

Revise as follows:

107.1 Authority for charging fees. In accordance with § 36-105 of the Code of Virginia, fees may be levied by the *local governing body* in order to defray the cost of enforcement of the ~~USBC.~~ USBCand shall not exceed the actual cost by more than 10%. With the exception of the levy collected pursuant to Section 107.2 , fees levied pursuant to this section shall be used only to support the functions of the *local building department.*

> **Note:** See subsection D of § 36-105 of the Code of Virginia for rules for permit fees involving property with easements or liens.

Reason Statement: Many smaller jurisdictions struggle to have the appropriate resources to perform inspections to satisfy the general public and businesses. This increase would allow those, as well as all, to have a buffer to provide more personal, equipment (vehicles, computers, etc.) and software to assist. The increase will still be required to be solely used for the enforcement of the USBC and not to provide a revenue stream to the jurisdiction and would allow local jurisdictions to see the value in providing what is needed.

Cost Impact: The code change proposal will increase the cost

It will increase the fees by 10% possibly if the jurisdiction chooses to.

B109.2-24

VCC: 109.2, 109.3, 109.4, 109.5, 109.6, 110.1, 113.3, 113.7.2, 116.1, 116.2

Proponents: David Beahm, representing Warren County (dbeahm@warrencountyva.gov)

2021 Virginia Construction Code

Revise as follows:

109.2 Site plan. When determined necessary by the building official, a site plan shall be submitted with the application for a permit. The site plan shall show to scale the size and location of all proposed *construction*, including any associated wells, septic tanks or drain fields. The site plan shall also show to scale the size and location of all existing *structures* on the site, the distances from lot lines to all proposed *construction*, the established street grades and the proposed finished grades. When determined necessary by the building official, the site plan shall contain the elevation of the lowest floor of any proposed *buildings*. The site plan shall also be drawn in accordance with an accurate boundary line survey. When the application for a permit is for demolition, the site plan shall show all *construction* to be demolished and the location and size of all *existing structures* that are to remain on the site.

Exceptions:

1. Site plansfor new one- and two-family dwellings shall not be required to include information for wells, septic tanks, drain fields, distances to lot lines, established street grades, elevation of the lowest floor or boundary lines per 109.4 Exception.
2. Site plans are generally not necessary for alterations, renovations, repairs or the installation of*equipment*.

~~**Note:** Site plans are generally not necessary for alterations, renovations, repairs or the installation of *equipment*.~~

109.3 Engineering details. When determined necessary by the building official, *construction* documents shall include adequate detail of the structural, mechanical, plumbing or electrical components. Adequate detail may include computations, stress diagrams or other essential technical data and when proposed *buildings* are more than two stories in height, adequate detail may specifically be required to include where floor penetrations will be made for pipes, wires, conduits, and other components of the electrical, mechanical and plumbing systems and how such floor penetrations will be protected to maintain the required structural integrity or fire-resistance rating, or both. When dry floodproofing is provided, the engineering details shall include detail of the *walls*, floors, and flood shields designed to resist floodrelated loads, including the sealing of floor and *wall* penetrations. All engineered documents, including relevant computations, shall be sealed by the *RDP* responsible for the design.

Exception: For new one- and two- family dwellings per 109.4 Exception.

109.4 Examination of documents. The building official shall examine or cause to be examined all construction documents or site plans, or both, within a reasonable time after filing. If such documents or plans do not comply with the provisions of this code, the permit applicant shall be notified in writing of the reasons, which shall include any adverse construction document review comments or determinations that additional information or engineering details need to be submitted. The review of construction documents for new one- and two-family dwellings for determining compliance with the technical provisions of this code not relating to the site, location or soil conditions associated with the dwellings shall not be required when identical construction documents for identical dwellings have been previously approved in the same *locality* under the same edition of the code and such construction documents are on file with the *local building department*.

Exception: For new one- and two-family dwellings that applications for a permit have been made by an RDP or a properly licensed Class A contractor shall not require examination. Plans and documents shall be signed and sealed or signed and license number affixed respectively. All plans, documents and construction shall be in accordance with Section 103.1.

109.5 Approval of construction documents. The approval of construction documents shall be limited to only those items within the scope of the USBC. Either the word "Approved" shall be stamped on all required sets of approved construction documents or an equivalent endorsement in writing shall be provided. One set of the approved construction documents shall be retained for the records of the *local building department* and one set shall be kept at the *building* site and shall be available to the building official at all reasonable times.

Exception: For new one- and two-family dwellings no "Approved" stamp or any other endorsement by the local building department shall be required when the application is presented per 109.4 Exception. However, one set of the documents indicated in 109.4 Exception shall be provided to the local building department for every building application.

109.6 Phased approval. The building official is authorized to issue a permit for the *construction* of foundations or any other part of a *building* or *structure* before the *construction* documents for the whole *building* or *structure* have been submitted, provided that adequate information and detailed statements have been filed complying with pertinent requirements of this code. The holder of such permit for the foundation or other parts of a *building* or *structure* shall proceed at the holder's own risk with the *building* operation and without assurance that a permit for the entire *structure* will be granted.

Note: Phased approval shall not apply to 109.4 Exception applications.

110.1 Approval and issuance of permits. The building official shall examine or cause to be examined all applications for permits or amendments to such applications within a reasonable time after filing. If the applications or amendments do not comply with the provisions of this code ~~or all pertinent laws and ordinances~~, the permit shall not be issued and the permit applicant shall be notified in writing of the reasons for not issuing the permit. If the application complies with the applicable requirements of this code, a permit shall be issued as soon as practicable. The issuance of permits shall not be delayed in an effort to control the pace of *construction* of new detached one- or two-family dwellings.

113.3 Minimum inspections. The following minimum inspections shall be conducted by the building official when applicable to the *construction* or permit:

1. Inspection of footing excavations and reinforcement material for concrete footings prior to the placement of concrete.
2. Inspection of foundation systems during phases of *construction* necessary to assure compliance with this code.
3. Inspection of preparatory work prior to the placement of concrete.
4. Inspection of structural members and fasteners prior to concealment.
5. Inspection of electrical, mechanical and plumbing materials, *equipment* and systems prior to concealment.
6. Inspection of energy conservation material prior to concealment.
7. Final inspection.

Note: For new one-and two-family dwellings, permitted under 109.4 Exception, the final inspections, when approved, shall be determined to have completed Section 116.1, Exception 3.

113.7.2 Qualifications. In determining third-party inspector qualifications, the building official may consider such items as *DHCD* inspector certification, other state or national certifications, state professional registrations, related experience, education and any other factors that would demonstrate competency and reliability to conduct inspections.

Exception: For new one- and two-family dwellings per 109.4 Exception that applications for a permit have been made by an RDP shall be approved as a third-party inspector on that permit for the allowed inspections within the written policy.

116.1 General; when to be issued. Prior to occupancy or *change of occupancy* of a *building* or *structure*, a certificate of occupancy shall be obtained in accordance with this section. The building official shall issue the certificate of occupancy within 5 *working days* after approval of the final inspection and when the *building* or *structure* or portion thereof is determined to be in compliance with this code and any pertinent laws or ordinances, or when otherwise entitled.

Exceptions:

1. A certificate of occupancy is not required for an accessory *structure* as defined in the IRC .
2. A new certificate of occupancy is not required for an addition to an existing Group R-5 *building* that already has a certificate of occupancy.
3. A certificate of occupancy shall be issued at the time of permit issuance when applied for per 109.4 Exception and will be determined in compliance when all final inspections have been approved.

116.2 Contents of certificate. A certificate of occupancy shall specify the following:

1. The edition of the USBC under which the permit is issued.
2. The group classification and occupancy in accordance with the provisions of Chapter 3 .
3. The type of *construction* as defined in Chapter 6 .
4. If an automatic sprinkler system is provided and whether or not such system was required.
5. Any special stipulations and conditions of the building permit and if any modifications were issued under the permit, there shall be a notation on the certificate that modifications were issued.
6. Group R-5 occupancies complying with Section R320.3 of the VRC shall have a notation of compliance with that section on the certificate.
7. Group R-5 109.4 Exception shall be indicated when applicable.

Reason Statement:

Section 109.2 provides for the building official to have information and documentation provide to the department that we have no authority/responsibility/enforcement over per Section 103.5. This may be a consideration for large projects and anything that is subject to the VCC, but it should not affect a new one- and two-family dwelling that is being built by a Class A contractor who is the applicant or designed by an RDP.

Section 109.3 will need to have the exemption shown given that no department review is required when submitting this specific permit. If the plans are not subject to the Building Official's review, there is no need to have engineering details provided.

Section 109.4 requires the examination of plans and documents, which is needed in many cases, but for a new one- and two-family dwelling that is being applied for and built by a Class A contractor should not need to be reviewed, given that they know the code and are required to meet the code. If a code violation is found during inspections it will be up to the contractor to correct, or no passed inspection will be given. The permit will not be able to continue, and the certificate of occupancy will not be valid. In this case the contractor would be required to be the applicant and the contractor for the permit to be issued in this regard. If the applicant is an RDP the plans would be assumed to have designed per code and again, any violation found during inspections would need to be corrected or construction could not continue, and certificate of occupancy would not be valid. The exemption includes the indication that Section 103.1 would be required and that the individuals utilizing this exception would be fully responsible if they do not conform to the code during construction.

Section 109.5 requires that the plans be approved or an equivalent method, but if Section 109.4 were used the plans would not be required to be reviewed and would not be approved by the Building Official and no indication would be provided as such.

Section 109.6 would not be necessary for this Exception given the timing and would not be a possible method to start work without having the permit issued because the plans do not require review or Building Official approval.

Section 110.1 should only address what is under the authority of the Building Official and not indicate that permits can be held up by other laws or ordinances. This goes back to the proposal (Functional Design (1383)) and what authority the Building Official jurisdiction over.

Section 113.3 would indicate that only when final inspections for one- and two-family dwellings using 109.4 Exception have received all approved finals the certificate of occupancy would be approved. See additional portion of this proposal in Section 116.2.

Section 113.7.2 would allow the RDP that has made application can perform the inspections that are allowed under the jurisdictions written Third Party Policy without having to go through the qualification process for that permit only. Again, they would be attesting that they have completed the inspection per Section 103.1.

Section 116.1 would have the certificate of occupancy to be issued at the time the permit is issued, which would at that time have all of the information that is required to be on the certificate of occupancy and would only be in affect once all of the final inspections have been approved. There would be no waiting on obtaining a document when the required inspections have been approved. All other agencies would be required to enforce their regulations and not the Building Official.

Section 116.2 would require a new item to be placed on the certificate of occupancy if 109.4 Exception is used, to indicate that while the Building Official has approved the required inspections the applicant can be fully held responsible for any code violation that is found given that they have taken on an expedited permit process and they are attesting to the fact that they know the code sufficiently enough to have undertaken this obligation.

Cost Impact: The code change proposal will decrease the cost

This will decrease the cost of construction in allowing the construction to be completed as soon as all finals are approved not having to wait on a certificate of occupancy to be issued or other agencies delaying the issuance. It will decrease any loan interest that may be in place or the return on investment being realized sooner when sold.

B109.3.1-24

VCC: 109.3.1 (New)

Proponents: Duru Meric, VA, representing Self (durumer@amazon.com)

2021 Virginia Construction Code

Add new text as follows:

109.3.1 Deferred submittals. Deferral of any submittal items shall have the prior approval of the building official. The registered design professional in responsible charge shall list the deferred submittals on the construction documents for review by the building official. Deferred submittals may include but are not limited to; fire protection systems, stairs, steel connections, steel joists, precast concrete, curtain walls, pre-engineered metal buildings, exterior platforms, cold form metal framing, awnings.
Documents for deferred submittal items may be submitted after the initial permit approval to the registered design professional in responsible charge who shall review them and forward them to the building official with a notation indicating that the deferred submittal documents have been reviewed and found to be in general conformance to the design of the buildings. The deferred submittal items shall not be installed until the deferred submittal documents have been approved by the building official.

Reason Statement: The 2024 International Building Code (IBC) Chapter 1 Section 107.3.4.1 includes deferred submittals requirements. These requirements are currently omitted from the Virginia Construction Code (VCC) Chapter 1, creating uncertainty in the deferred submittal timeline. The proposal intends to include clarification to VCC Chapter 1 Section 109.3 Engineering Details by the addition of Section 109.3.1 Deferred Submittal. This section is based on IBC Chapter 1 Section 107.3.1 Deferred Submittals. See attachment for IBC code reference. This proposal provides clarification on deferred submittal requirements.

Based on the established industry standards, the Architect of Record (AOR) provides performance and design criteria for the delegated design scope. The General Contractor (GC) secures a qualified and licensed design professional to prepare and seal the design. The AOR reviews the design for conformance post-permit issuance with the original design concept. This process is more efficient with time and budgets. Deferred submittals are no different than the established practice of foundations-only permit that Authority Having Jurisdictions (AHJ) issue all the time. Not defining the timeline creates unclarity in the process and causing deviation from industry standards by introducing additional front-end demands on the AOR, potentially impacting project schedules.

The lack of defined timeline impacts AHJ resources. It increases number of permit reviews and revisions causing hardship on AHJ capabilities to meet the increased demand of reviews within given timeline. The deferred design will go into additional series of revisions after securing the qualified and licensed design professional to prepare and seal design documents. This will cause another series of AHJ reviews and increase the challenges AHJs' ability to meet the review timelines.

As an example, it is an industry standard to design the structure of the building for the loads and reactions from deferred submittal items. During construction, the Structural Engineer of Record (SEOR) will then verify these assumptions with the drawings and calculations provided in the deferred submittal. For instance, with the case of stair design, the SEOR will show the loading and reaction assumptions from the stairs on their drawings but will not design the stair framing since this is done by a specialty designer with expertise in stair design. Typically, this specialty designer is the steel fabricator. This is the most efficient and safest process for the design of the stairs, as the steel fabricators that design and detail them are experts at designing stairs since this has been industry standard for so long. They are also the ones erecting the steel and have specific ways in which they want to assemble the stairs; deciding between which sections are assembled in the shop, and which are connected in the field. Because of this, the design of the stairs and stair connections will end up being changed during construction through RFIs from the steel fabricator regardless. Therefore, it is inefficient to have the SEOR go outside of their area of expertise and against industry norms to design something that will likely be changed during the delegated design process.

Adding the IBC Chapter 1 Section 107.3.4.1 Deferred Submittal and implementing clear deferred submittal requirements would streamline the process for all parties involved.

Cost Impact: The code change proposal will decrease the cost

Current unclarity in the deferred submittal requirements creates challenges in defining the design scope causing additional front-end demands on the Architect of Record (AOR). It also increases the amount of Authority Having Jurisdiction (AHJ) reviews and challenges AHJ capabilities to meet the increased review cycles within given timeline. Having clarity on the deferred submittal description and timeline will eliminate the additional review cycle processes.

Attached Files

- **IBC 2024 Chapter 107.3.4.1.jpg**
  https://va.cdpaccess.com/proposal/1543/2257/files/download/1022/

B109.4-24

VCC: 109.4, 109.4.1, 109.4.2 (New), 109.4.3 (New), 109.4.3.1 (New), 109.4.3.2 (New), 109.4.4 (New), 116.1

Proponents: Paul Milde, representing Virginia House of Delegates, District 64

2021 Virginia Construction Code

Revise as follows:

109.4 Examination of documents. 109.4Examination of documents.
The building official shall examine or cause to be examined all construction documents or site plans, or both, within~~a reasonable time after filing. If such documents or plans do not comply with the provisions of this code, the permit applicant shall be notified in writing of the reasons, which shall include any adverse construction document review comments or determinations that additional information or engineering details need to be submitted. The review of construction documents for new one- and two-family dwellings for determining compliance with the technical provisions of this code not relating to the site, location or soil conditions associated with the dwellings shall not be required when identical construction documents for identical dwellings have been previously approved in the same*locality*under the same edition of the code and such construction documents are on file with the*local building department*.~~15 business days for Group R-5 structures and accessory structures to Group R-5, and within 25 business days for all other structures.

109.4.1 ~~Expedited construction document review~~Identical One- and Two-family Dwellings. The ~~building official may accept reports from an approved person or agency that the construction documents have been examined and conform to the requirements of the USBC and may establish requirements for the person or agency submitting such reports. In addition, where such reports have been submitted, the building official may expedite the issuance of the permit.~~review of construction documents for new one- and two-family dwellings for determining compliance with the technical provisions of this code not relating to the site, location or soil conditions associated with the dwellings shall not be required when identical construction documents for identical dwellings have been previously approved in the same locality under the same edition of the code and such construction documents are on file with the local building department.

Add new text as follows:

109.4.2 Concurrent review. When the issuance of permits are contingent upon review and approval by other state agencies that require and govern the functional design and operation of building related activities not covered by the USBC, including (i) public water supply systems, (ii) waste water treatment and disposal systems, and (iii) solid waste facilities, the examination of construction documents by the building official shall not be delayed until such approval is granted by the state agency.

109.4.3 Expedited construction review. The building official may accept reports from an approved individual or agency that the construction documents have been examined and conform to the requirements of the USBC. Such individual or agency shall be approved in accordance with Section 109.4.3.2. Where such reports have been submitted, the building official may expedite the issuance of the permit.

109.4.3.1 Third-party construction document examination. Under circumstances where the building official is unable to examine, or cause to be examined, the construction documents within the timeframe set forth in Section 109.4, or an agreed upon date, the building official shall accept third-party plan review reports from individuals or agencies approved in accordance with the building official's written policy required by Section 109.4.3.2. The building official shall approve such reports unless there is cause for rejection. Failure to approve a report shall be in writing within five working days of receiving it stating the reason for the rejection. The building official shall notify the permit applicant of their inability to comply with the timeframe set forth in Section 109.4 within five working days after filing.

109.4.3.2 Third-party plans examiners. Each building official charged with the enforcement of the USBC shall have a written policy establishing the minimum acceptable qualifications for approval of third-party plans examiners. The policy shall include the format and time frame required for submission of reports, any prequalification or preapproval requirements before conducting a third-party plan review, and any other requirements and procedures established by the building official.

109.4.4 Notification. Upon completion of construction documents examination by the building official, the permit applicant shall be notified in writing, via electronic mail, of the status of the project and required next steps.

Exception: If the permit applicant does not have a valid email address, notification via telephone or mutually agreed upon method is acceptable.

If the construction documents do not comply with the provisions of this code, the permit applicant shall be notified in writing, via electronic mail, of the reasons, which shall include any adverse construction document review comments or determinations that additional information or engineering details need to be submitted.

Exception: If the permit applicant does not have a valid email address, notification via a mutually agreed upon method is acceptable.

Revise as follows:

116.1 General; when to be issued. Prior to occupancy or *change of occupancy* of a *building* or *structure*, a certificate of occupancy shall be obtained in accordance with this section. The building official shall issue the certificate of occupancy within ~~5~~ 2 *working days* after approval of the final inspection and when the *building* or *structure* or portion thereof is determined to be in compliance with this code and any pertinent laws or ordinances, or when otherwise entitled.

Exceptions:

1. A certificate of occupancy is not required for an accessory *structure* as defined in the IRC .
2. A new certificate of occupancy is not required for an addition to an existing Group R-5 *building* that already has a certificate of occupancy.

Reason Statement:

Summary of changes:

109.4 - "A reasonable time" was replaced with set times. The balance of existing provisions set forth by the Section have been relocated to other sections.

109.4.1 - These are existing provisions that have been relocated from Section 109.4 to their own subsection to provide clarity and highlight the importance of the proposed timeframes in Section 109.4.

109.4.2 - New provisions have been added to address concerns related to building departments not performing technical review of construction documents prior to receiving approval from the Virginia Department of Health.

109.4.3 - "Person" has been replaced with "individual" for consistency with terminology used in Section 113.7.

109.4.3.1 - Newly proposed Section intended to allow for third-party plan review if the local building departments cannot comply with the newly proposed timeframe for construction document review.

109.4.3.2 - Newly proposed Section, modeled after existing requirements for third-party inspectors (see Section 113.7.1) intended to set the framework for establishing policies for third-party plan reviewers.

109.4.4 - Newly proposed requirements intended to eliminate the need for contractors to constantly monitor permit status due to lack of notification from building departments. The exceptions have been added to account for isolated cases where the permit applicant may not have an email address nor the means to create or utilize one.

116.1 - Revised the timeframe for the issuance of the Certificate of Occupancy from 5 working days to 2 working days.

Summary of June 25th Expediting Permits and COs Study Group (See Attached)

Cost Impact: The code change proposal will not increase or decrease the cost

"The code change proposal will not increase or decrease the cost" option was selected.

Attached Files

- **20250625-expediting-permits-and-cos-sg-meeting-summary.pdf**

[illegible] expediting permits and [illegible] sg meeting summary.pdf
https://va.cdpaccess.com/proposal/1397/2029/files/download/948/

B109.4(1)-24

VCC: 109.4, 109.4.1, 110.1, 113.7, 113.7.1

Proponents: Anthony Smith, Secure Solar Futures, representing Virginia Distributed Solar Alliance (VA-DSA) (tony@securesolarfutures.com)

2021 Virginia Construction Code

Revise as follows:

109.4 Examination of documents. The building official shall examine or cause to be examined all construction documents or site plans, or both, within a reasonable time after filing. If such documents or plans do not comply with the provisions of this code, the permit applicant shall be notified in writing of the reasons, which shall include any adverse construction document review comments or determinations that additional information or engineering details need to be submitted. The review of construction documents for new one- and two-family dwellings for determining compliance with the technical provisions of this code not relating to the site, location or soil conditions associated with the dwellings shall not be required when identical construction documents for identical dwellings have been previously approved in the same *locality* under the same edition of the code and such construction documents are on file with the *local building department*.

Exception:

For rooftop electrical equipment installations classified as nonstructural electrical equipment and systems installed on existing residential and commercial buildings that applications for a permit have been made by an RDP or a properly licensed Class A contractor shall not require examination. Plans and documents shall be signed and sealed or signed and license number affixed respectively. All plans, documents and construction shall be in accordance with this code.

109.4.1 Expedited construction document review. The building official ~~may~~ shall accept reports from an approved person or agency that the construction documents have been examined and conform to the requirements of the USBC and may establish requirements for the person or agency submitting such reports. In addition, where such reports have been submitted, the building official ~~may~~ shall expedite the issuance of the permit.

110.1 Approval and issuance of permits. The building official shall examine or cause to be examined all applications for permits or amendments to such applications within a reasonable time after filing. If the applications or amendments do not comply with the provisions of this code or all pertinent laws and ordinances, the permit shall not be issued and the permit applicant shall be notified in writing of the reasons for not issuing the permit. If the application complies with the applicable requirements of this code, a permit shall be issued as soon as practicable. The issuance of permits shall not be delayed in an effort to control the pace of *construction* of new detached one- or two-family dwellings.

Exception:

For rooftop electrical equipment installations classified as nonstructural electrical equipment and systems installed on existing residential and commercial buildings, where applications for a permit have been made by an RDP or a properly licensed Class A contractor shall be approved for a permit. Plans and documents shall be signed and sealed or signed and license number affixed respectively affirming that the application complies with the applicable requirements of this code. A permit shall be issued within two weeks from the date of submission of the signed and sealed or signed and license number affixed documents.

113.7 Approved inspection agencies. The building official ~~may~~ shall accept reports of inspections and tests from individuals or inspection agencies approved in accordance with the building official's written policy required by Section 113.7.1 . The individual or inspection agency shall meet the qualifications and reliability requirements established by the written policy. Under circumstances where the building official is unable to make the inspection or test required by Section 113.3 or 113.4 within 2 *working days* of a request or an agreed upon date or if authorized for other circumstances in the building official's written policy, the building official shall accept reports for review. The building official shall approve the report from such approved individuals or agencies unless there is cause to reject it. Failure to approve a report shall be in writing within 2 *working days* of receiving it stating the reason for the rejection. Reports of inspections conducted by approved third-party inspectors or agencies shall be in writing, shall indicate if compliance with the applicable provisions of the USBC have been met and shall be certified by the individual inspector or by the responsible officer when the report is from an agency. Reports of inspections conducted for the purpose of verifying compliance with the requirements of the USBC for elevators, escalators, and related conveyances shall include the name and certification number of the elevator mechanic performing the tests witnessed by the third-party inspector or agency.

Exception: The licensed mechanical contractor installing the mechanical system shall be permitted to perform duct tests required by Section R403.3.5 of the IECC or Section N1103.3.5 of the IRC. The contractor shall have been trained on the *equipment* used to perform the test.

Note: Photographs, videotapes or other sources of pertinent data or information may be considered as constituting such reports and tests.

113.7.1 Third-party inspectors. Each building official charged with the enforcement of the USBC shall have a written policy establishing the minimum acceptable qualifications for third-party inspectors. The policy shall include the format and time frame required for submission of reports, any reasonable prequalification or preapproval requirements in compliance with the USBC before conducting a third-party inspection and any other reasonable requirements and procedures established by the building official.

Reason Statement:

The proposal clarifies that rooftop electrical equipment installations classified as nonstructural electrical equipment and systems installed on existing residential and commercial buildings may be reviewed, certified, and inspected by qualified third-party RDP's. The intent is to reduce administrative burdens on local governments, expedite approvals, and lower costs for property owners while maintaining full compliance with the USBC.

- Virginia faces increasing electricity demand due to rising home and commercial energy consumption and data centers.
- Residential and commercial solar and battery systems can reduce grid strain and improve energy affordability.
- 16% of residential solar projects in Virginia are canceled during the permitting process, primarily due to barriers.
- The cost of residential solar in the U.S. is approximately double that in Europe, largely due to permitting inefficiencies.
- Modernizing local government permitting processes can reduce costs and increase solar adoption.

Common Permitting Issues in Virginia

The proposal addresses significant challenges in the current permitting process for residential and commercial solar installations in Virginia.

- Installers face varying application submission requirements across different jurisdictions, complicating the process.
- Inconsistent code interpretations among local governments lead to confusion and increased costs.
- Communication issues during application reviews create frustration for installers and delays in the process.
- The median wait time for a residential solar permit in Virginia is nine business days, longer for commercial permits, with some jurisdictions taking much longer (as much as one year for commercial permits).
- High and variable permitting fees create additional barriers for solar adoption.

Proposed Solutions for Permitting Challenges

The proposal offers actionable solutions to improve the permitting process for solar installations in Virginia.

- Amend USBC to align application submission requirements across jurisdictions to simplify the process for installers.
- Create exceptions for rooftop electrical equipment to shorten review timelines to expedite the permitting process, aiming for a more efficient system.
- Create exceptions for rooftop electrical equipment for third-party inspection programs to streamline inspections and reduce delays.

Cost Impact: The code change proposal will decrease the cost

The proposed changes will decrease the burdens of government by providing more streamlined review and permitting of rooftop electrical equipment projects that can now be assumed by third party RDPs. It will also reduce taxpayer burden by reducing the costs and time delays for permitting public sector solar projects, such as public schools, that will be more readily able to reduce their energy costs with solar. Following are a few references supporting cost reduction from streamlined permitting, specifically for PV solar.

Streamlining structural engineering compliance of rooftop solar photovoltaic installations using an open-source approach [Solar Energy Journal, 2024]

Cost-Reduction Roadmap for Residential Solar Photovoltaics (PV), 2017–2030 [U.S. Dept. of Energy, National Renewable Energy Lab, Jan 2018]

A 21st-Century Permitting Regime for Rooftop Solar and Home Batteries in Virginia [Permit Power, Sept 2025]

Streamlining rooftop solar permitting could cut costs by 61%. [PV Magazine, October 27, 2025]

Can cutting rooftop solar costs make up for losing tax credits? [Canary Media, July 23, 2025]

No-Cost Rooftop Solar Stimulus How streamlining residential solar installations can jumpstart a green economic recovery [San Francisco Planning and Urban Research Association (SPUR), May 2021]

- **SPUR_a_no_cost_rooftop_solar_stimulus.pdf**
  https://va.cdpaccess.com/proposal/1498/2167/documentation/11687/attachments/download/1006/
- **NREL SolarAPP+ Performance Review (2023 Data).pdf**
  https://va.cdpaccess.com/proposal/1498/2167/documentation/11687/attachments/download/1005/
- **NREL Cost reducation roadmap for residential solar rooftop.pdf**
  https://va.cdpaccess.com/proposal/1498/2167/documentation/11687/attachments/download/1004/
- **Cheap-as-our-peers-1.pdf.pdf**
  https://va.cdpaccess.com/proposal/1498/2167/documentation/11687/attachments/download/1003/
- **Can cutting rooftop solar costs make up for losing tax… _ Canary Media.pdf**
  https://va.cdpaccess.com/proposal/1498/2167/documentation/11687/attachments/download/1002/
- **A-21st-Century-Permitting-Regime-for-Rooftop-Solar-and-Home-Batteries-in-Virginia-6.pdf.pdf**
  https://va.cdpaccess.com/proposal/1498/2167/documentation/11687/attachments/download/1001/

Attached Files

- **SPUR_a_no_cost_rooftop_solar_stimulus.pdf**
  https://va.cdpaccess.com/proposal/1498/2167/files/download/1012/
- **NREL SolarAPP+ Performance Review (2023 Data).pdf**
  https://va.cdpaccess.com/proposal/1498/2167/files/download/1011/
- **NREL Cost reducation roadmap for residential solar rooftop.pdf**
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- **Cheap-as-our-peers-1.pdf.pdf**
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- **Can cutting rooftop solar costs make up for losing tax… _ Canary Media.pdf**
  https://va.cdpaccess.com/proposal/1498/2167/files/download/1008/
- **A-21st-Century-Permitting-Regime-for-Rooftop-Solar-and-Home-Batteries-in-Virginia-6.pdf.pdf**
  https://va.cdpaccess.com/proposal/1498/2167/files/download/1007/

SPUR

POLICY BRIEF
MAY 2021 UPDATE

A No-Cost Rooftop Solar Stimulus

How streamlining residential solar installations can jumpstart a green economic recovery

Acknowledgements

Authors: Susannah Parsons and Nick Josefowitz

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Contents

Introduction

As California looks to exit the pandemic, the need for a green recovery through the expansion of rooftop solar energy generation and energy storage has never been clearer. This expansion would help address climate change by meeting the state's renewable energy targets, protect communities from wildfires and public safety power shutoffs, and grow local jobs and small businesses in every California community. This brief lays out a set of quick, no-cost actions that state and local governments can take to begin this expansion and updates SPUR's 2020 policy brief with new data and a renewed urgency.

Cities and counties have an opportunity to tackle the long-standing barrier to solar and storage adoption: the "soft costs" associated with permitting and inspection. These processes are intended to protect residents and promote safety, but they can complicate and delay solar installations, particularly for routine, small-scale residential solar and storage systems. In effect, local and state governments should treat installing rooftop solar panels more like getting an appliance such as a new HVAC system or washing machine and less like a construction process, such as a seismic retrofit of a home. By bringing down these "soft costs" while still guaranteeing safety, California and the Bay Area can address economic recovery, resilience and climate change goals at once.

The Golden Solar State

California has established a world-leading energy policy and regulatory approach to reducing climate emissions and transitioning to a fossil-free economy. In particular, Assembly Bill 32 (2006) established the goal of reducing statewide greenhouse gas emissions from all sectors of the economy to 1990 levels by 2020. Senate Bill 32 (2016) expands that requirement to 40% below 1990 levels by 2030. California's renewable portfolio standard, first established in 2002, requires the state to deliver 50% renewable electricity by 2030 and now, Senate Bill 100 (2018) has expanded the standard to 100% renewable by 2045. But despite the state's past success, emissions reductions must accelerate in order to meet the targets by the end of this decade. The California Air Resources Board, California Public Utilities Commission and California Energy Commission estimate the state will need to triple the rate of solar energy generation, including rooftop installations, in order to achieve 100% renewable energy.[1]

Residential solar and storage is an important part of the state's clean energy transition and low-carbon future. California's sunny weather brings abundant solar energy to most parts of the state year-round. For customers, installing rooftop solar panels reduces their electricity bills, and for utility companies, decreases the need for costly grid upgrades, like new transformer stations, to meet increased energy demand. In 2018, the state cancelled or revised $2.6 billion worth of grid transmission projects, savings attributed primarily to increased rooftop solar installations.[2]

Rooftop solar brings critical resilience benefits as well. In 2020, the three largest energy utilities conducted 21 public safety power shutoffs due to record wildfires, slightly less than all such shutoffs in the prior six years

1 California Energy Commission, SB 100 Joint Agency Report, 2021, https://www.energy.ca.gov/sb100

2 California Independent System Operator, "2017-2018 Transmission Plan," https://static1.squarespace.com/static/54c1a3f9e4b04884b35cfef6/t/5ab933322b6a28bbf5c5f130/1522086756653/CAISO-2017-2018_Transmission_Plan.pdf

combined.[3] One of those shutoffs, from Sept 7-10, shut down power for 172,000 customers across 22 counties.[4] These interventions will undoubtedly continue as the climate warms and utilities look to better manage risk: A recent court ruling could result in triple the number of power shutoffs in counties across PG&E's territory in 2021. Rooftop solar, particularly when paired with a battery, can keep the lights on as well as medical devices running through these shutoff emergencies.

Prior to the COVID-19 pandemic, California was well-positioned to accelerate adoption of rooftop solar. The 2019 state building code update requires solar systems on new home construction, a regulatory change that builds upon other policies like net-metering, where customers are reimbursed for the electricity their panels generate and send back to the grid, and other incentives for customers to install rooftop solar and storage. National residential solar installations increased 11% in 2020 over the previous year, continuing a steady upward trend in demand since 2016.[5] The solar industry was also widely considered a driver of green economic growth, adding more than 150,000 jobs across the United States in the last decade and growing at five times the rate of the overall economy.[6] In 2018, the Federal Bureau of Labor Statistics predicted that solar installers in particular would be the fastest growing job over the coming decade.[7] California already employed more than 74,000 solar workers, the majority of whom were installers. These are high potential jobs: median hourly wages for solar industry jobs overall are about 28% higher than the national median wage and are more likely to come with health care and retirement benefits than jobs across the rest of the private sector.[8]

Delivering Rooftop Solar Today

Installing rooftop solar is about twice as expensive in the United States as it is in a country like Germany, despite similar wages and equipment costs.[9] What's behind these differences? As the cost of technology have declined over time, the "soft costs" account for a significant share of the total price of a solar system.[10] For a customer, the soft costs specifically associated with solar installation, including costs for permitting and inspectioncan amount to as much as $1 per watt of the installation, or $5,000 for a typical rooftop system in California.[11] The biggest culprit behind high soft costs is usually time: despite the state's well-established rooftop solar industry, and some legislative reforms, described below, average wait times between when a permit has been submitted and completion of a successful building inspection have remained consistent at 45 to 50 days over the last decade.[12]

3 See https://www.cpuc.ca.gov/psps/ and https://www.cpuc.ca.gov/general.aspx?id=6442467662

4 Pacific Gas and Electric Company, 2020, "compliance report letter on proactive de-energization," https://www.pge.com/pge_global/common/pdfs/safety/emergency-preparedness/natural-disaster/wildfires/PSPS-Report-Letter-09.07.20.pdf

5 Solar Energy Industry Association, 2021, "2020 Market Insight Report" https://www.seia.org/research-resources/solar-market-insight-report-2020-year-review

6 2019 Solar Jobs Census, The Solar Foundation, https://www.thesolarfoundation.org/national/

7 2019-2029 Employment Projections, Bureau of Labor Statistics, https://www.bls.gov/news.release/ecopro.nr0.htm

8 Clean Jobs, Better Jobs, E2/Acore/CELI; https://e2.org/wp-content/uploads/2020/10/Clean-Jobs-Better-Jobs.-October-2020.-E2-ACORE-CELI.pdf

9 Andrew Birch, 2018, "How to Halve the Cost of Residential Solar in the US," https://www.greentechmedia.com/articles/read/how-to-halve-the-cost-of-residential-solar-in-the-us

10 SEIA/Wood Mackenzie Power & Renewables, 2021, "Solar Market Insight Report: 2020 Year in Review," 2020, https://www.seia.org/research-resources/solar-market-insight-report-2020-year-review

11 Soft costs vary based on factors like local sales tax, jurisdictions' permitting systems and installer cost structures. The National Renewable Energy Laboratory models cost benchmarks on a quarterly basis. The upper limit reflects this benchmarking and includes the additional indirect soft costs like customer acquisition. See https://www.nrel.gov/docs/fy21osti/77324.pdf and https://www.seia.org/initiatives/solar-automated-permit-processing-solarapp. Energy Sage provides average installation pricing based on location and system size.

12 O'Shaughnessy, Barbose and Wiser, 2020, "Patience is a virtue: A data-driven analysis of rooftop solar PV permitting timelines in the United States," https://emp.lbl.gov/

Behind High Soft Costs: Permitting and Inspection Challenges

Each rooftop solar system requires a building permit, similar to what's required to build a new foundation for a home, as well as physical inspection before it can be connected to the grid and begin operating. The local permitting authority (usually a building department) takes a substantial fee (up to $450) to review applications to ensure the system meets building code requirements. The process delay behind high soft costs for solar and storage systems is driven in large part by the patchwork of unstandardized and uncoordinated requirements and processes across California's 500+ cities and counties. The base building code is set by the State of California, but individual cities and counties interpret the same building code sections differently, and some impose their own additional unique code requirements. For example, one jurisdiction reviews solar plus storage systems on single-family homes according to the fire code, while the rest of the state uses the residential code. Another jurisdiction requires a minimum of three or four batteries installed per solar system — far more storage capacity than a typical home needs — based on interpretation that the battery in a solar plus storage system must be able to supply energy loads for every device and appliance in the home operating at the same time. Even within jurisdictions, different building code officials have developed different and unwritten interpretations of building codes, leading to uncertainty among installers and significant proportions of applications need to undergo corrections. Permit application submission itself varies greatly, where some building departments manage online databases but others require in-person and paper applications. Some jurisdictions may be able to provide an online portal and a clear and seamless experience while others struggle to manage outdated systems.

After a rooftop solar system is permitted and installed, it must be physically inspected to ensure code compliance, such as proper wiring methods, structural integrity of the building and fire safety measures. Some cities conduct multiple inspections over the course of construction and, in some cases, additional agencies like the fire district will conduct separate checks. As with the permitting process, there is significant variability in department expertise or interpretation of building codes between jurisdictions. The lack of a standardized and shared set of requirements for inspection causes confusion between inspectors and installers, and results in avoidable mistakes — on top of the logistical challenge of scheduling waiting for inspections.

Ultimately, the variability in code interpretation, permit submission, inspection delays and other factors has significant impacts for installers, customers and ultimately the state's ability to achieve its climate targets. The Solar Energy Industry Association reports that a one-week delay as a result of permitting, inspection and interconnection processes results in a customer cancellation rate between 5-10%. This drives down customer satisfaction, and increases the cost for installers to secure each additional new customer. It also increases the cost of managing crews and inventory across a regional market where requirements and installation timelines vary. The accumulated cost over the next 10 years is significant: assuming rooftop solar installations triple in California, we risk imposing up to $7.5 billion in unnecessary soft costs in our effort to meet the state's clean energy targets.[13]

With more than 1 million rooftop solar installations in California and most sharing similar characteristics, the state can evolve permitting and inspection to reflect accumulated knowledge and best practices, and to allow for the scale of adoption needed to meet the state's clean energy targets.

publications/patience-virtue-data-driven-analysis

13 Based on the estimate that permitting and inspection-related soft costs can total up to $1 dollar per watt of installation. California installed roughly 1,000 MW of residential rooftop solar in 2019. See: https://www.seia.org/state-solar-policy/california-solar

Permitting for a Rooftop Solar Stimulus

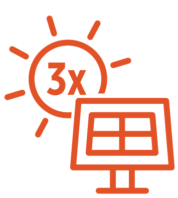
Customers, advocates and research organizations — including SPUR — have long called for changes to the permitting and inspection process for rooftop solar systems.[14] And there has been some incremental success.

Past Permitting Reforms

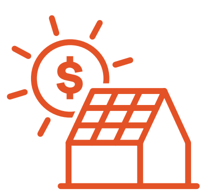
SB 1222 (Leno, 2012) and AB1414 (Friedman, 2017) capped permit fees based on the size of the system. AB 2188 (Muratsuchi, 2014) required local governments to create a streamlined permitting process for small (under 10 kilowatt) rooftop solar systems according to the state's the Solar Permitting Guidebook, which establishes best practices in solar permitting, such as a model streamlining ordinance and standardized inspection checklists. As a result, local jurisdictions must allow applications to be filed online for rooftop solar systems, limit permit review timeframes and consolidate inspection visits. However, many jurisdictions still do not fully comply more than seven years later, most often because permit review time frames still vary significantly from project to project.[15] Other requirements are partially implemented; for example a jurisdiction will allow for a permit application to be submitted online, but applicants must show up at the Building Department and stand in line to receive the permit itself. While some jurisdictions may make a good faith effort to comply, AB 2188 included no mechanism to enforce compliance. At the same time, growing demand for solar means that these permit applications dominate the permitting queue in some jurisdictions, while others have already begun to anticipate increased workload as California transitions its building stock to all-electric in the coming years.[16]

Permitting for a Rooftop Solar Decade

What Could Solar Permitting Improvements Deliver for California?

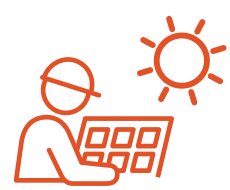


3 TIMES
the solar installations to meet California's clean energy targets



$7.5 BILLION
in soft cost savings

$111 MILLION
in increased annual permit fee revenue for cities and counties



780,000 JOBS
in the solar industry

14 SPUR calls for streamlined permitting for solar systems in Fossil Free Bay Area (2016).

15 Taylor et al. found that as of 2019, 31% of jurisdictions did not comply with AB 2188, indicated by having adopted a local streamlining ordinance with the four parameters outlined in the original law. Anecdotal reports, however, suggest that compliance may be even more uneven within jurisdictions between projects, in part because the timeline requirements are not consistently met. See: Taylor et al., "Explaining jurisdictional compliance with California's top-down streamlined solar permitting law (AB 2188)," 2019, https://eta-publications.lbl.gov/sites/default/files/ab2188-streamlined_solar_permitting_reform_10-7_-_margaret_taylor.pdf

16 TRC Consulting, "Best Practices Guide for Streamlining Electrification Permitting," May 2021, Publication forthcoming.

There's a clear opportunity to evolve the permitting and inspection process in California that allows for more efficient use of staff time, reduces confusion and still ensure safety. "Instant permitting" shows particular promise: Cities including Los Angeles, San José, and Santa Barbara have all implemented an online portal that returns instant permits for rooftop solar systems with success (see sidebar). As part of its COVID-19 response, San Luis Obispo recently moved to both fully online and instant residential solar permitting. The city has reduced some projects' total installation time (from sale to permit approval to successful building inspection) to just 12 hours.

Reducing a months-long process down to an hour or less would accelerate the number of solar systems installed, consistent with what's needed to hit the state's clean energy goals. In fact, the National Renewable Energy Laboratory has found that jurisdictions with online and automated permitting (where an applicant can receive a permit immediately after submitting plans, answering a series of questions and paying their fee) approve an average of 14 times the number of applications as jurisdictions with a traditional over-the-counter process.[17]

Increasing the rate at which Californians install solar would bring a number of associated benefits. For a jurisdiction that typically approves 1,800 rooftop solar permits a year with a permit fee of $300, tripling the number of approvals could increase their fee revenue to $1.5 million or more. Statewide, tripling the number of residential solar installations along with the permit fees, could bring an additional $111 million a year to local governments in California.[18]

For customers, the benefits extend beyond the $3 billion in avoided soft cost described above. Recent research estimates that electrifying homes with rooftop solar could save the average American household as much at $2,500 a year.[19] Ratepayers could save billions in avoided grid upgrades. And the state could leverage a major opportunity for job growth: past research suggests that tripling rooftop solar installations could create 780,000 jobs over the next ten years.[20] The vast majority of solar companies are local, small businesses with under 100 employees, and these jobs pay well with few barriers to entry.[21]

17 Based on the National Renewable Energy Laboratory Solar TRACE tool, 2021. Dataset forthcoming: https://solarapp.nrel.gov/solarTRACE

18 Estimates based CA historical residential solar installations and median permit fee ($350 per project). See National Renewable Energy Laboratory Solar TRACE tool, 2021. Dataset forthcoming: https://solarapp.nrel.gov/solarTRACE

19 Rewiring America, "No Place Like Home: Fighting climate change and saving money by electrifying American households," 2020, https://static1.squarespace.com/static/5e540e7fb9d1816038da0314/t/5f9290062226271c5b66b7d0/1603440672253/Households+Technical_White_Paper.pdf

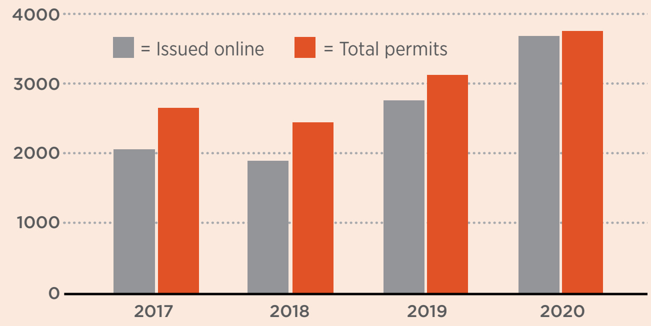
20 Estimate of 26 jobs per every 1 MW installed solar, based on research from NREL's JEDI model. See https://rmi.org/how-covid-19-is-pushing-cities-to-change-solar-permitting-for-the-better/

21 Brookings Institution, "How clean energy jobs and power an equitable COVID-19 recovery," 2020, https://www.brookings.edu/blog/the-avenue/2020/09/10/how-clean-energy-jobs-can-power-an-equitable-covid-19-recovery/. See also: https://www.thesolarfoundation.org/national/

Going instant and online in San José

In 2015, San José implemented a system that allowed for online permit submission for solar systems, but also provided instant approvals. Applicants receive a $40 discount for submitting online, and are able to schedule an inspection through the portal as well. As a result, San José saw a more than 600% increase in residential rooftop solar permits in the following year (In contrast, the growth of residential solar systems across California was 3.3% that same year)[22]. While the city has maintained its over-the-counter option, recent data show that in addition to solar permits increasing, the percent of applicants choosing to process online has also increased. In 2020, 98% of solar permit issuances occurred through the city's online and instant portal. San José added battery storage to the instant permit system in August of last year.

Solar Permits Issued 2017–2020



San Jose permit issuances continue to increase after implementing an online, automated permitting process, and use of the that system has grown over time. Today, the vast majority of solar permits in the city are issues through the automated system. Source: San Jose Building Department permit issuances. Available upon request.

Policies to Support Streamlined Rooftop Solar Permitting and Inspection

Local governments across the California should pursue several significant steps to dramatically reduce the cost of small residential solar installations — and increase their uptake and associated economic benefits. The state should also require all local governments to adopt these best practices within the next few years, to speed expansion.

1. **Improve upon AB 2188 and drive local compliance.** Research shows that fully online permit processes, as opposed to a hybrid of in-person and online options, are what make a meaningful impact on application timelines. The state could improve on AB 2188 by requiring that jurisdictions accept online permit applications (current law only requires that they provide for online submission and electronic signatures). Implementation of prior permit streamlining law has been uneven across jurisdictions. The state should provide incentives in the form of grants and technical assistance to drive more consistent compliance. The

22 Based on interconnection data for the state's Distributed Generation Statistics for California's investor-owned utility territory (Pacific Gas & Electric, Southern California Edison and San Diego Gas & Electric. https://www.californiadgstats.ca.gov/charts/nem

state should also hold jurisdictions accountable for non-compliance, either through legal action or making new grant funding contingent on AB 2188 compliance.

2. **Standardize local building codes and inspections requirements for rooftop solar across the Bay Area.** A household appliance like a washing machine would be significantly more expensive if manufacturers had to produce enough models to comply with thousands of different cities' code requirements — the same argument can be made for rooftop solar and storage systems. Local jurisdictions should only modify state building codes with regard to solar and storage to address specific local risks (like snow loads, wind loads and temperature), and should do so in a standardized way. A standard set of requirements for rooftop solar and storage would go a long way toward reducing delay and uncertainty in the inspection process.

3. **Provide automated and instant approval for online applications.** By creating online applications that ask standardized questions and filter for compliant answers, software can easily provide automated and instant approval for solar permits. This software would virtually eliminate the permitting cost born by local jurisdictions and cut permit application processing time to zero for most small residential systems. A number of California jurisdictions have created their own instant systems, but at significant expense. However, the National Renewable Energy Laboratory (a division of the federal Department of Energy) has created an online portal, SolarAPP, that is open-source and free for jurisdictions to adopt. This portal is a significant opportunity to reduce permit timelines, relieving building department workloads and standardizing processes across the state (see sidebar).

4. **Reduce or eliminate permit fees for rooftop solar systems.** Permitting fees are used to subsidize the administrative cost of processing new solar projects. Ultimately, if jurisdictions improve their permitting and inspection processes with automated and instant online permitting, these fees could be reduced or eliminated for the vast majority of rooftop solar installations — which would increase access to solar panels for more would-be customers.

5. **Explore offering virtual building inspections.** Virtual inspections would allow building inspectors to inspect many more worksites a day and better manage workloads, while reducing the delay associated with scheduling a building inspection visit and the amount of time that contractors must wait on site for the building inspector to arrive. Los Angeles has provided virtual building inspections since 2019. The pandemic prompted a number of cities to allow their building inspectors to perform virtual home visits and safety organizations like International Code Council, National Fire Protection Association and International Association of Electrical Inspectors have offered guidance. Cities and counties should consult best practices, engage with stakeholders including those organizations who represent building inspection officials, and explore this option for residential systems.

AB 2188 has demonstrated that a few jurisdictions adopting best practices is not enough; cities and counties across California should implement these ideas in order to drive more widespread adoption and meet the state's clean energy targets. What's more, widespread implementation reduces barriers to solar for more people and more communities, while allowing contractors to better plan for a customer market that spans political boundaries.

SolarAPP: The new national standard

Until recently, jurisdictions like San José had to build custom software solutions to address permitting challenges for rooftop solar. Over the past year, however, the National Renewable Energy Laboratory has partnered with solar companies and code enforcement officials to create the Solar Automated Permit Processing platform (SolarAPP), an online and automatic solar permitting software that local jurisdictions across the United States can use for free. SolarAPP was developed with national building code and safety agencies like the International Code Council, Underwriters Laboratories and the National Fire Safety Association. The platform is built according to the national electrical code, though it also allows for local customization options around snow, fire and earthquake safety requirements.

Like with a credit card application, SolarAPP asks a set of standardized questions and only accepts applications with compliant answers. SolarAPP then provides an instant assessment of the system's compliance with state building codes and instantaneously approves or identifies the noncompliant answers. Importantly for local governments, it can be used on its own or integrated with online permitting management software that some jurisdictions already use, and allows local jurisdictions to collect permit fees within it.

Finally, SolarAPP also produces a standardized building inspection checklist that can integrate with any inspection process, including virtual inspections. The platform is in use in jurisdictions around the country, and has issued more than 100 automatic solar permits since its rollout in January 2021. About 50 jurisdictions in California are in various stages of exploring or implementing SolarAPP, including the city of Pleasant Hill. Going forward, NREL will expand the software to include compliance checks for batteries and electric vehicle charging.

Beyond Rooftop Solar: Streamlining Electrical Vehicle Charging and Building Decarbonization

In some ways, rooftop solar is just the beginning of a major transition for California's built environment. Today, buildings account for 25% of the state's carbon emissions; in the coming decade, more of California's building stock will transition to low- or no-carbon, and hundreds of thousands of electric vehicle charging stations will need to be installed. In fact, Governor Newsom signed an executive order[23] setting a target that 100% of in-state sales of new passenger vehicles will be zero-emission by 2035. Getting to 100% EV sales hinges on rapidly building out charging infrastructure, an effort that will accelerate job growth and economic recovery. Yet the delays and costs for permitting electric vehicle charging stations are even more significant than those for rooftop solar and storage.[24] This issue also extends to the replacement of gas-fired appliances with clean electrical ones (like electric heat pumps), as the replacement often needs to be done within a day or two when an appliance breaks, leaving no time for lengthy permitting and building inspections. By successfully streamlining our solar and storage permitting, and working through challenges that arise, cities will provide the roadmap for what we need to do for electric vehicle charging, building decarbonization permitting and beyond.

23 Rocky Mountain Institute, 2019, "Reducing EV Charging Infrastructure Costs," https://rmi.org/insight/reducing-ev-charging-infrastructure-costs/

24 Rocky Mountain Institute, 2019, "Reducing EV Charging Infrastructure Costs," https://rmi.org/insight/reducing-ev-charging-infrastructure-costs/

Conclusion

As cities and counties emerge from the COVID-19 pandemic, they face both the newfound need for job and small-business creation as well as the continued threats of wildfires and climate change. Expanding rooftop solar and storage can spur local economic development, increase energy resilience and move the state closer to its emissions targets. But success will require a permitting process that is simple and automatic for homeowners, installers and regulators.

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SolarAPP+ Performance Review (2023 Data)

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and Kaifeng Xu[1]

1 National Renewable Energy Laboratory
2 Clean Kilowatts LLC

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Technical Report
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Executive Summary

The Solar Automated Permit Processing Plus (SolarAPP+) platform is an online portal designed to facilitate and expedite residential rooftop solar photovoltaic (PV) and battery storage permitting processes. SolarAPP+ allows PV contractors to upload system specifications, have that information automatically reviewed for code compliance, and receive instant approval for code-compliant systems, reducing the authority having jurisdiction (AHJ) staff time needed for review. SolarAPP+ also provides inspection checklists to verify installation practices and adherence to approved designs. SolarAPP+ is available to AHJs at no cost.

Consistent with previous performance reviews, in this report we summarize SolarAPP+ adoption trends to date and compare various metrics for PV systems permitted through SolarAPP+ to those for systems permitted through traditional AHJ permitting processes.

As of the end of 2023, 752 AHJs had expressed interest in the platform, with 167 AHJs either fully adopting (97) or piloting (70) the platform. In 2023, 668 installers submitted 18,906 permits through the SolarAPP+ platform, including 4,834 permits for PV+storage systems. SolarAPP+ permits accounted for around 43% of all permits issued in all participating AHJs (Figure ES-1), and more than 80% of all permits in several participating AHJs.

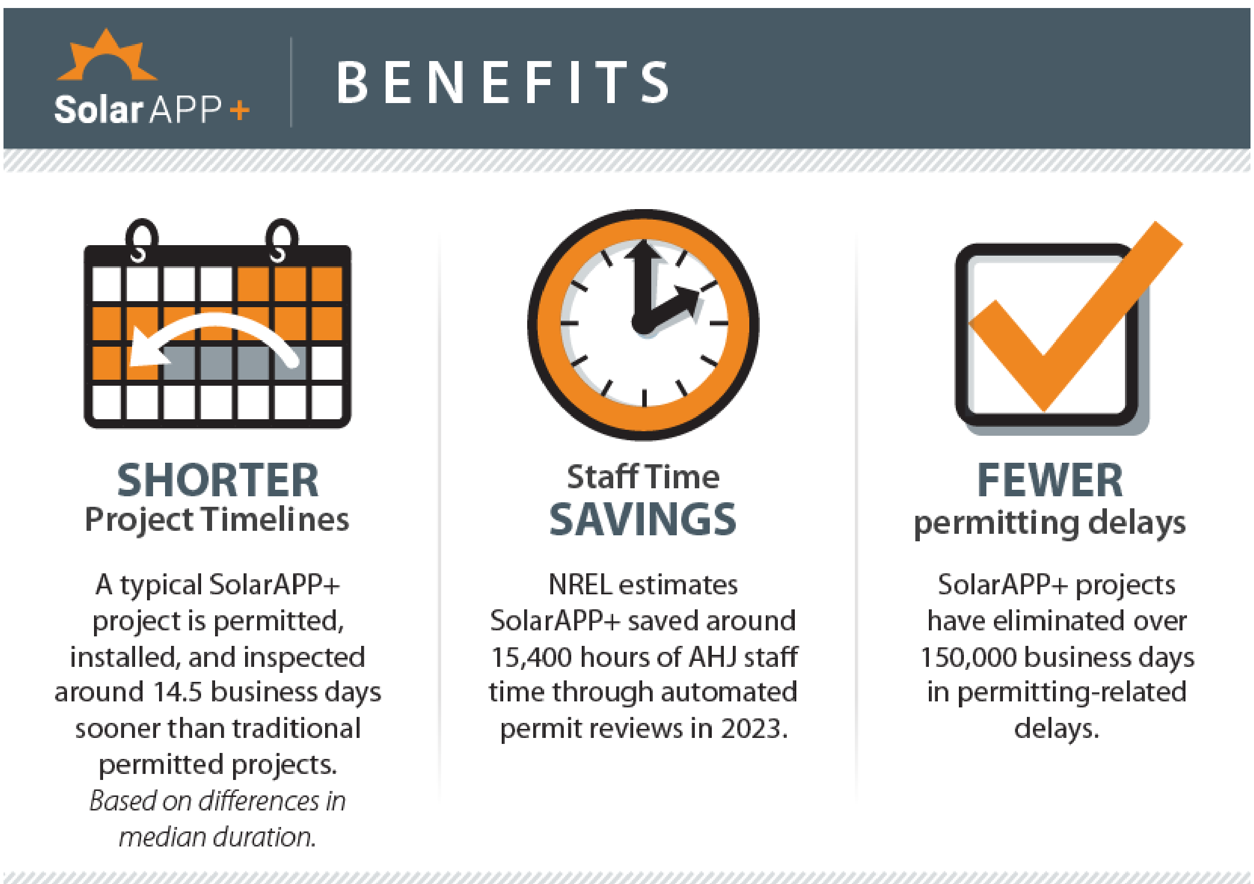

Figure ES-1. Summary of performance review results

Consistent with previous SolarAPP+ performance reviews, we find that permitting timelines are significantly shorter for SolarAPP+ projects as compared to traditionally permitted projects. In 2023, we estimate that:

- A typical SolarAPP+ project is permitted and inspected 14.5 business days sooner than traditional projects (based on median timelines).
- Automatic SolarAPP+ permitting saved around 15,400 hours of AHJ staff time and collectively accelerated PV permitting by around 150,000 business days in 2023.
- SolarAPP+ reduced PV installation costs by around 2%–13%, increased rooftop PV deployment by around 2%–17%, abated around 0.5M-2.0M tCO_2 emissions, and saved around $945,000 in household electricity costs in SolarAPP+ AHJs.

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1 Introduction

The Solar Automated Permit Processing Plus (SolarAPP+) platform is an online portal designed to facilitate and expedite permitting of residential rooftop solar photovoltaic (PV) and battery storage systems. SolarAPP+ was developed by the National Renewable Energy Laboratory (NREL) in collaboration with local governments, code development organizations, and industry stakeholders. SolarAPP+ is available to local permitting authorities at no cost.

This report is part of an ongoing series of reviews of SolarAPP+ performance. Consistent with previous performance reviews, we summarize SolarAPP+ adoption trends to date and compare various metrics for PV systems permitted through SolarAPP+ to those for systems permitted through traditional authority having jurisdiction (AHJ) permitting processes. In this introduction, we briefly explain the impetus for SolarAPP+ development, the functions of the platform, and the results of previous performance reviews.

1.1 The Need for Standardized PV Permitting

Most rooftop PV systems are subject to local permitting requirements implemented by local AHJs. Figure 1 depicts a typical permitting process and how it relates to the interconnection processes implemented by utilities. Rapid and accelerating rooftop PV deployment has strained the capacity of AHJs to efficiently navigate these processes (Cook et al. 2021). Conversely, although states typically set minimum requirements, individual AHJs often implement unique permitting requirements (Stanfield et al. 2012). Local permitting variability has presented a challenge to the expanding rooftop PV market by increasing compliance costs (Dong and Wiser 2013; Burkhardt et al. 2015; Cook et al. 2021) and permitting timelines (O'Shaughnessy et al. 2022). A growing number of AHJs and utilities have responded by reforming and standardizing permitting processes to reduce delays (Stanfield et al. 2012; Fekete et al. 2022). However, PV permitting reforms have, to date, occurred in a piecemeal fashion, and many AHJs lack the resources to implement reforms (Parsons and Josefowitz 2020).

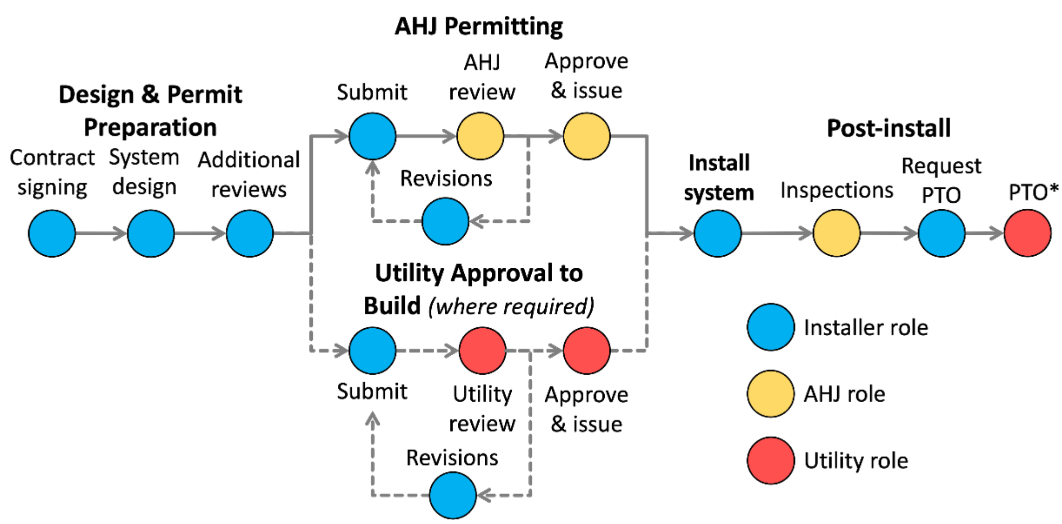

Figure 1. The rooftop PV permitting process

1.2 The SolarAPP+ Platform

SolarAPP+ was developed by NREL in response to the evolving challenges in rooftop PV permitting. NREL developed the platform in collaboration with industry and the building safety community, with funding from the U.S. Department of Energy. SolarAPP+ streamlines AHJ permitting for residential rooftop PV systems that meet certain eligibility requirements,[1] automating the review of eligible systems through the steps illustrated in Figure 2. SolarAPP+ allows PV contractors to upload system specifications, have that information automatically reviewed for code compliance, and obtain instant approval for code-compliant systems. Based on the application inputs, SolarAPP+ also generates checklists and electrical schematics for inspectors to confirm that installed systems match preapproved designs. The SolarAPP+ project formally began in September 2019 with development and testing of the software for alignment with national model codes. NREL piloted the software with five communities in 2021 (Williams et al. 2022). SolarAPP+ was then officially launched in July 2021.

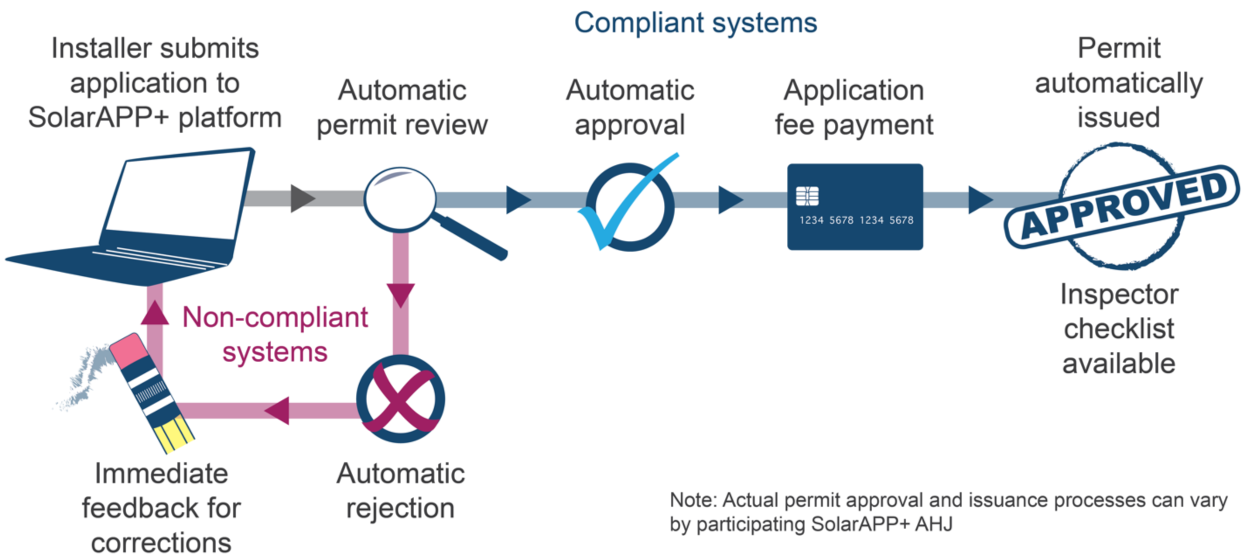

Figure 2. Example SolarAPP+ permit application and approval process

Note: In most AHJs, the fee payment and permit issuance occurs via the AHJ's existing permitting system.

1.3 Past SolarAPP+ Performance Reviews

NREL has published three reviews of SolarAPP+ platform performance to date. Williams et al. (2022) analyzed the performance of five SolarAPP+ pilots, Cook et al. (2022) evaluated platform performance in 10 AHJs that had piloted or implemented SolarAPP+ by the end of 2021, and Cook et al. (2023) evaluated performance in 31 AHJs that had piloted or implemented SolarAPP+ by the end of 2022. The three reviews reach similar conclusions:

- SolarAPP+ saves AHJ staff time otherwise spent on permit and revision reviews.

[1] For a complete list of the eligibility requirements, see https://help.solar-app.org/article/43-what-types-of-systems-are-not-eligible-for-solarapp-review.

- SolarAPP+ instantly issues permits for code-compliant systems, effectively reducing permit review times to zero. By contrast, typical review times through traditional permitting processes are a week or more.
- SolarAPP+ projects had similar inspection durations and passed inspections at similar rates as other projects.
- SolarAPP+ projects complete the full permitting timeline (permit submission to passed inspection) faster than projects using traditional permitting processes.

This report builds on and largely corroborates the results from these previous performance reviews with updated results for projects permitted in 2023.

2 SolarAPP+ Implementation

As of the end of 2023, NREL had contacted over 1,700 AHJs as potential users of the SolarAPP+ platform. Of these, 752 were interested in implementing SolarAPP+.[2] Interested AHJs are geographically distributed throughout the United States and are at various stages in the implementation process (Figure 3). Of the 752 interested AHJs, 127 AHJs were in a technical demonstration stage, 83 AHJs were evaluating and testing SolarAPP+, 66 AHJs were in pilot onboarding, 70 AHJs were in a pilot stage, and 97 AHJs had publicly launched the platform. Interested AHJs have a range of demographic features; 192 of the interested AHJs meet one typical criterion for identifying a community as disadvantaged (median income less than 80% of state median income).

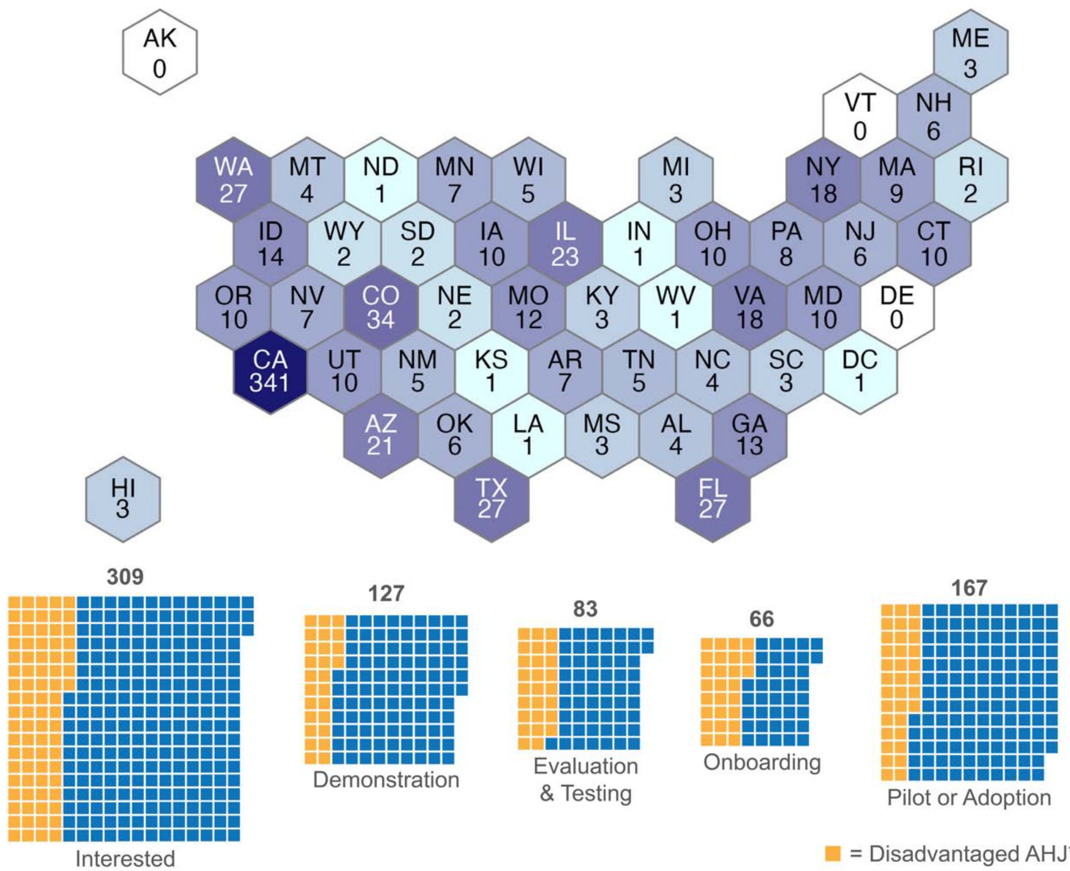

Figure 3. Number of AHJs that have expressed interest in SolarAPP+, by state (top pane) and by adoption stage (bottom pane)

* Refers to AHJs with median income less than 80% of state median income

Figure 4 depicts the platform implementation timelines for the 97 AHJs that had adopted SolarAPP+ by the end of 2023, ordered by the timing of the first interaction. These AHJs are the focus of this study. The median duration from first interaction to pilot was 505 days (or 553 days

[2] An expression of interest occurs when an AHJ follows up on an initial contact, and it includes AHJs at any level of implementation: demonstration, evaluation, testing, pilot, or adoption.

on average), and the median duration from pilot to public adoption was 69 days (or 114 days on average). About 48% of AHJs moved from pilot to adoption in fewer than 3 months, and 84% of AHJs completed the process in fewer than 6 months (Figure 5). Over 70 AHJs adopted SolarAPP+ in the final months of 2023 (Figure 6), due largely to the implementation of a new policy in California requiring AHJs to adopt automatic permitting processes.

Figure 4. AHJ SolarAPP+ implementation timelines

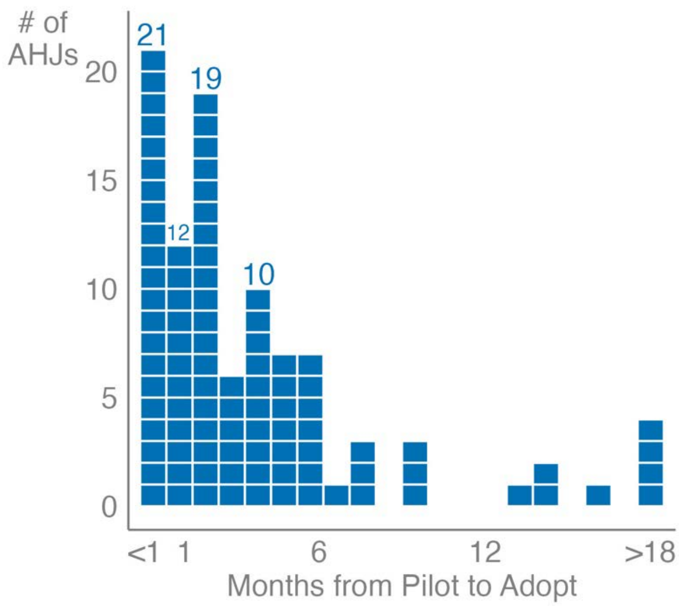

Figure 5. Distribution of AHJ SolarAPP+ implementation timelines from pilot to adoption

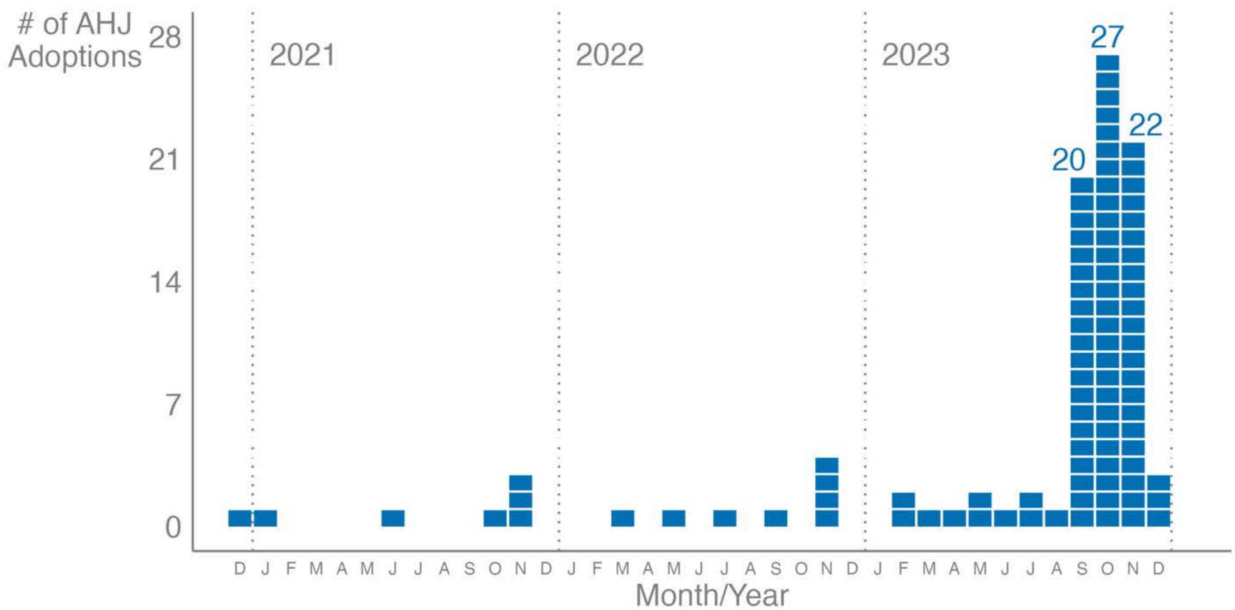

Figure 6. Month of adoption for the 97 AHJs that adopted SolarAPP+ by the end of 2023

NREL documented 215 AHJs that have explored SolarAPP+ but have delayed implementation for various reasons. Figure 7 summarizes the reasons most frequently cited by interested AHJs for delayed implementation. AHJs most commonly cite issues with integrating SolarAPP+ with existing permitting software, issues with payment processing, and conflicts with local codes (e.g., building, electrical, fire, or zoning codes). Note that delayed implementation does not necessarily reflect issues with the SolarAPP+ platform.

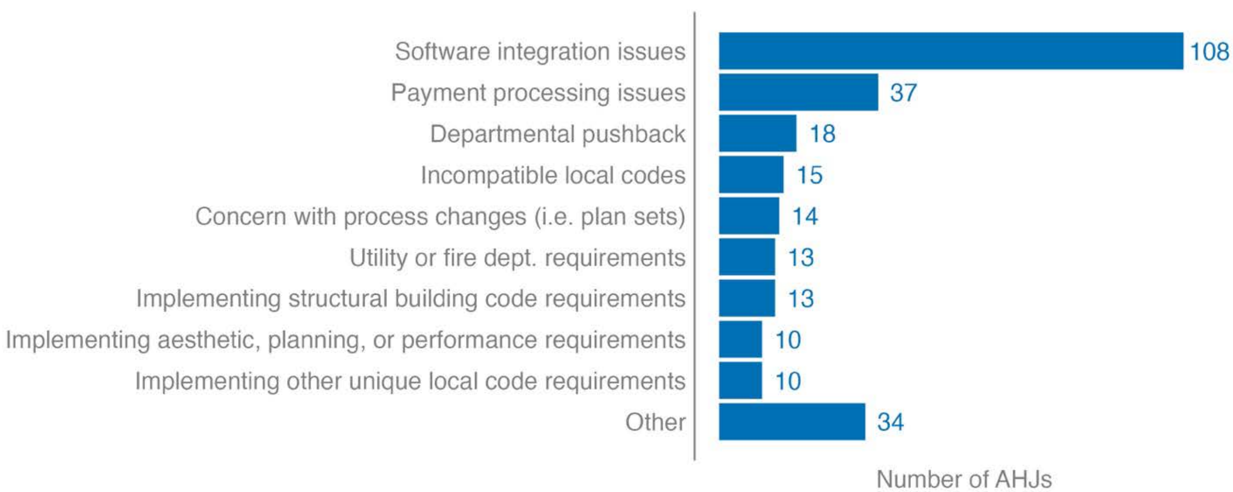

Figure 7. Reasons cited for delays to SolarAPP+ implementation

Note: Some AHJs cite multiple reasons.

Of the more than 1,700 contacted AHJs, 149 AHJs ultimately decided not to adopt SolarAPP+. Figure 8 depicts the reasons provided by these AHJs. Most of these non-adopters are satisfied with their existing permitting systems.

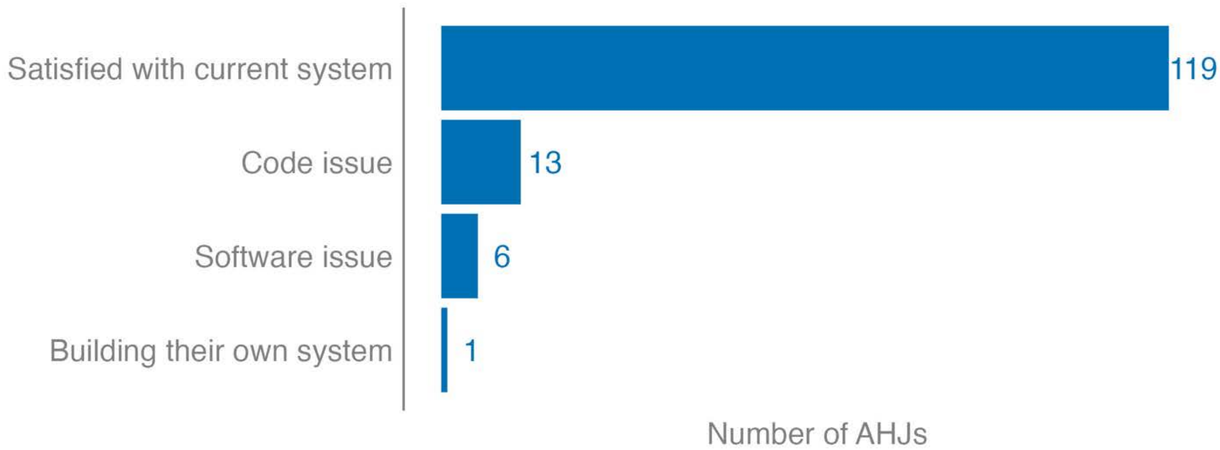

Figure 8. Reasons cited for not adopting SolarAPP+

Note: Some AHJs cite multiple reasons.

3 Performance Review

We review SolarAPP+ performance by comparing metrics for projects processed through SolarAPP+ to those for projects processed through traditional AHJ permitting processes. Performance review data were collected from two sources. First, we pulled data directly from the SolarAPP+ software, including data on projects, installers, AHJ adoption challenges, interested AHJs, and detailed project-level characteristics such as system size, module brand, and information on home electrical upgrades (summary statistics for these project-level characteristics are provided in the appendix). Second, we requested data from 47 AHJs that had adopted SolarAPP+, issued at least 40 SolarAPP+ permits in 2023, and also provided data on permits processed through traditional AHJ permitting processes. Of the 47 AHJs we contacted, 32 were able to provide us with usable data on both SolarAPP+ and traditional permit data. These 32 AHJs provided data, when available, on SolarAPP+ adoption timelines, permit submission dates, permit issuance dates, permit fees, and whether systems included battery storage. Twelve of the AHJs were also able to provide us with the inspection records for all solar permits, including inspection dates, date of final inspection passing, and inspection failure causes. For some analyses, we used the AHJ-provided dates to calculate durations. All durations reported in days are in terms of business days. The degree of data completeness across performance metrics varied by AHJ. The distinct samples used for each analysis are identified in the figure captions.

The term "SolarAPP+ project" refers to any PV or PV+storage system that was entered into SolarAPP+ by a contractor. All SolarAPP+ projects are issued approved system designs/plans, but only some projects are automatically issued a permit via the SolarAPP+ platform, depending on the SolarAPP+ integration pathway chosen by the AHJ.[3] The SolarAPP+ projects that do not receive a permit within SolarAPP+ receive their instant permit from the AHJ after the contractor uploads the SolarAPP+ preapproved system plans in the AHJ's online permitting system. The term "SolarAPP+ permits" refers to both permits automatically issued on the platform and permits issued by the AHJ.

Before proceeding to the results, it is worth noting that our performance review is based on a comparison of outcomes for SolarAPP+ and traditional permits that does not control for potentially confounding factors. Potential differences between the SolarAPP+ and traditional project groups could cause misleading deviations between SolarAPP+ and traditional process durations. For instance, installers that tend to use SolarAPP+ may navigate permitting processes more or less efficiently than installers that use SolarAPP+ less often. Further, the estimated differences between the AHJs in this study are not necessarily representative of the potential impacts of SolarAPP+ in other AHJs. It is possible that the AHJs in this study had more or less efficient traditional permitting processes than an average AHJ prior to implementing SolarAPP+. For these reasons, the reported impacts should be considered approximate impacts of SolarAPP+

[3] SolarAPP+ provides two different implementation pathways for AHJs based on their existing permitting process. AHJs who only accept permits in their traditional process via email, mail, or in person are onboarded using the "standalone" method, where SolarAPP+ also handles their fee collection and issues the final permit. AHJs who use a pre-existing government software system to issue permits are onboarded using the "integrated" method, where SolarAPP+ issues permit documents for upload into their existing software. The contractors then complete their payments in the AHJ's existing software, and that software issues the final permit instantly.

on AHJ permitting process durations. Further research would be required to estimate precise causal impacts of SolarAPP+ on permitting process durations.

3.1 AHJ Permit Volume

In 2023, 668 contractors submitted 18,906 projects and completed 2,879 revisions on these projects (including revisions during inspection) within the SolarAPP+ platform across 150 AHJs (Figure 9). Of those projects, 4,834 were PV+storage projects submitted in 131 AHJs. AHJs with the greatest SolarAPP+ permit volumes were concentrated in Arizona and California (Figure 10).

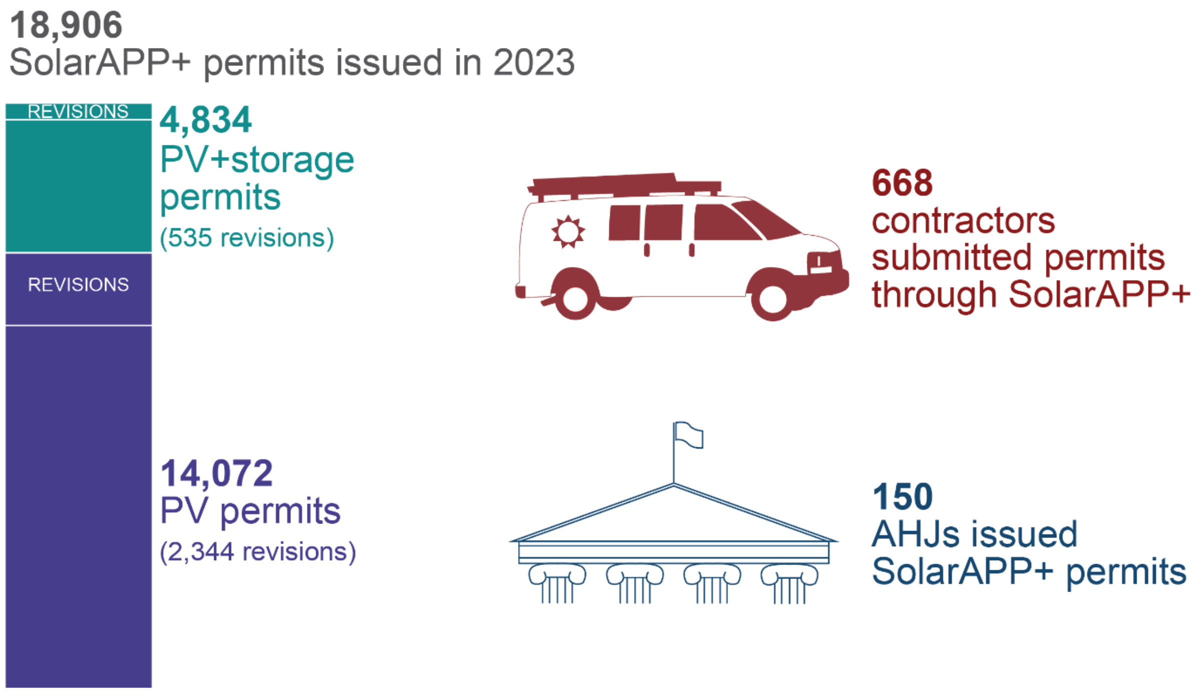

Figure 9. Key statistics on SolarAPP+ permits and revisions in 2023

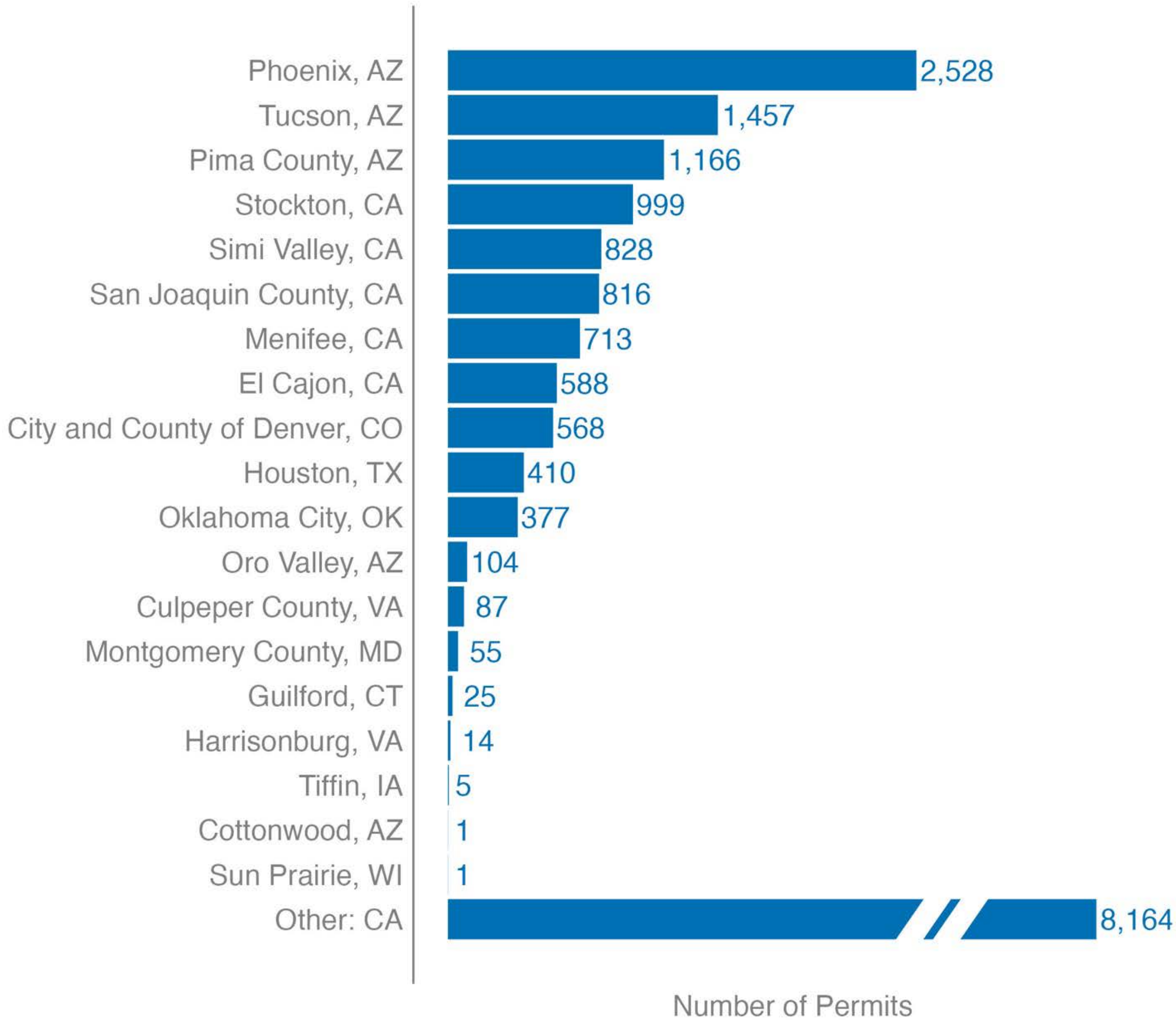

Figure 10. SolarAPP+ permit counts by AHJ

Each AHJ has about 15 installers using SolarAPP+, on average (Figure 11). Participating installers reflect a range of characteristics and installation volumes, confirming that the SolarAPP+ platform is not used exclusively by specific types of installers (Figure 12). The data suggest that a significant share of installers participate in SolarAPP+. For instance, 57 installers submitted SolarAPP+ permits in Tucson, Arizona, in 2023, and data from Barbose et al. (2023) suggest that around 107 installers operated in Tucson in 2022 (the latest year with available data). Although more installers may have been active in Tucson in 2023, the comparison suggests that around half of installers in Tucson used SolarAPP+.

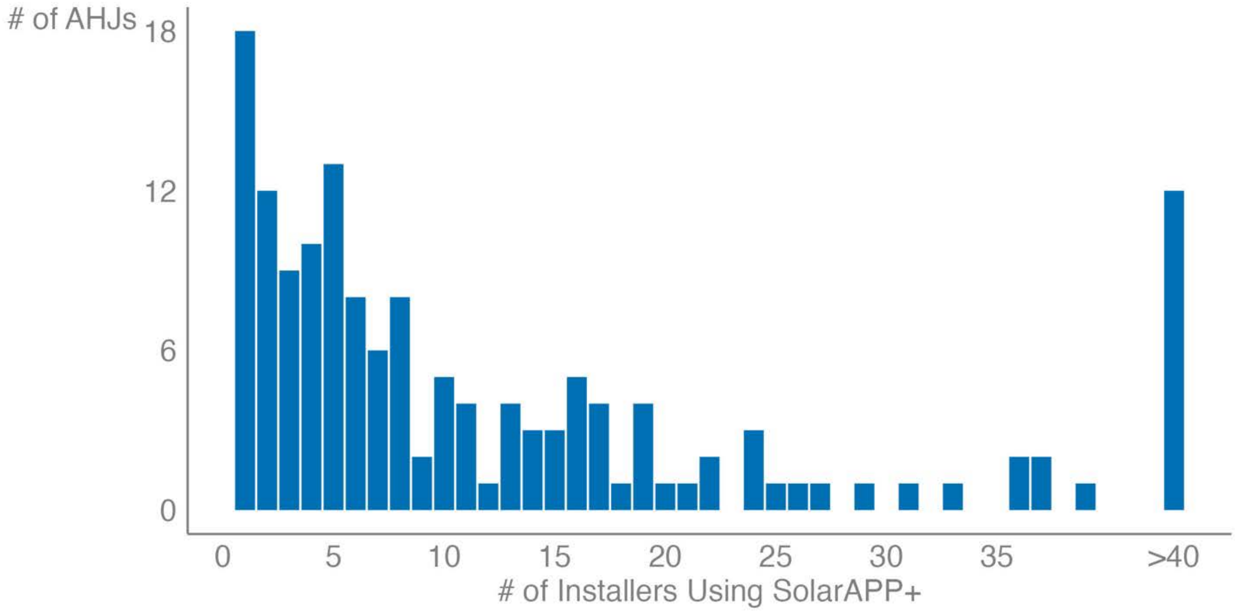

Figure 11. Number of installers using SolarAPP+ by AHJ (2023)

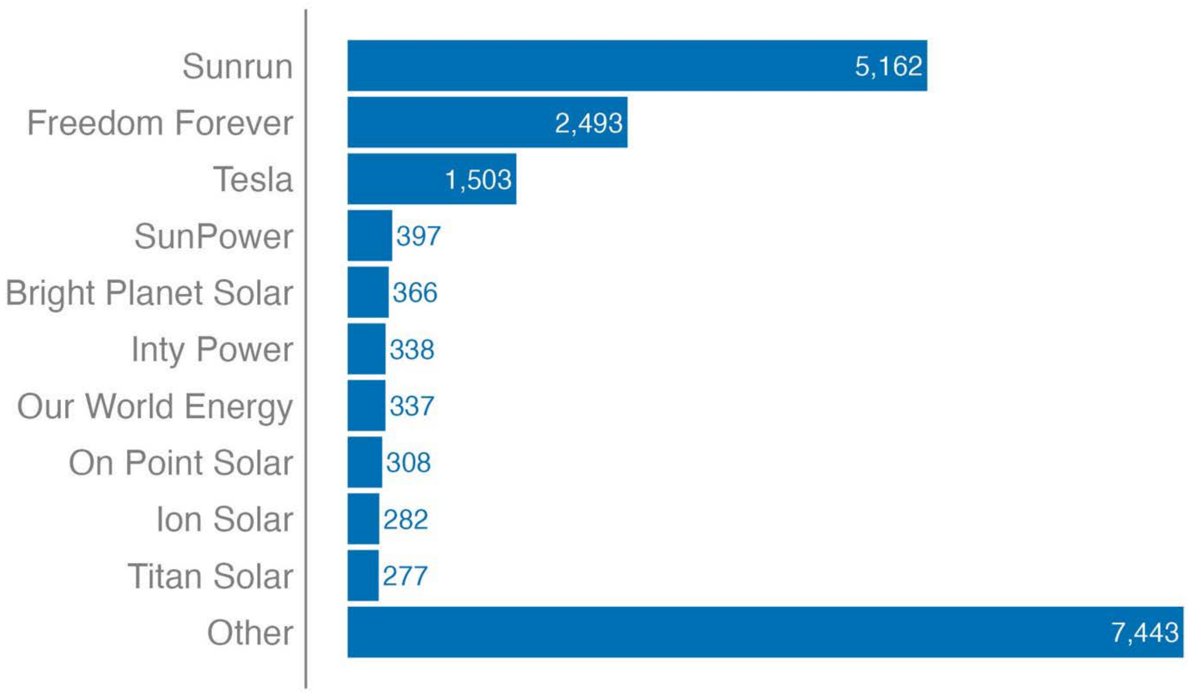

Figure 12. Number of SolarAPP+ projects by participating installer (2023)

After the public launch of SolarAPP+, about 43% of the permits submitted in 2023 in the subsample of 32 AHJs were submitted through the SolarAPP+ platform. The remaining 57% of permits were processed through the AHJs' traditional permitting systems. Figure 13 depicts the distribution of post-launch SolarAPP+ utilization rates by AHJ, showing how utilization rates in most AHJs fall between 20% and 40%, with utilization rates of greater than 80% in several

AHJs. The data suggest that SolarAPP+ utilization rates increase over time. In the 13 AHJs with available data that had publicly launched SolarAPP+ before 2023, monthly utilization rates steadily increased from about 36% in January 2023 to 57% in December 2023 (Figure 14).

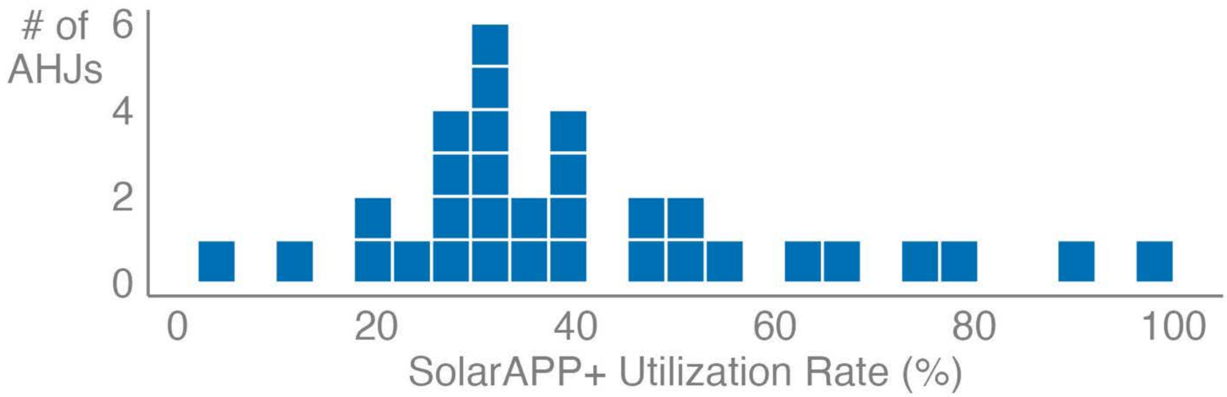

Figure 13. SolarAPP+ utilization rates (2023)

Note: This figure is based on AHJs with at least 30 SolarAPP+ permits submitted in 2023 and available data on traditional permits.

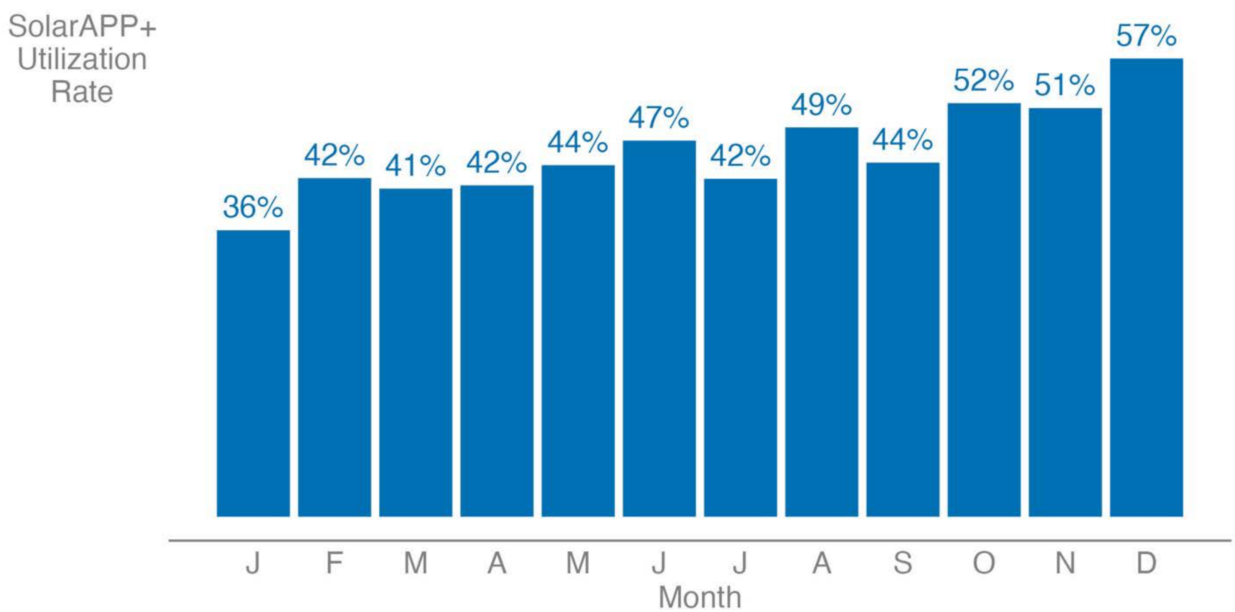

Figure 14. SolarAPP+ utilization rate by month (2023)

Limited to AHJs that publicly launched SolarAPP+ before 2023

3.2 AHJ Permit Review Impacts

Permit review durations refer to the time (in business days) between a permit submission and permit issuance. We compare permit review durations for SolarAPP+ and traditional projects to evaluate the platform's performance during the review stage. In every AHJ, median permit review times for PV-only SolarAPP+ projects were lower than or equal to median review times for traditional permits (Figure 15). The median permit review time for traditional PV-only projects across all AHJs was 7 days.[4] In contrast, SolarAPP+ facilitates instant permits for code-compliant applications, meaning that the median permit review duration for SolarAPP+ projects was zero days. Review times for PV+storage projects are mostly comparable, with a median review time of 9 days for traditional projects and zero days for SolarAPP+ projects. Median durations represent the permitting experiences of most PV customers. However, some customers experience much longer durations. Around 13% of traditional permits took more than 30 business days, and around 4% took longer than 60 days. SolarAPP+ nearly eliminates these extreme durations, with fewer than 1% of SolarAPP+ permits taking longer than 30 days to be issued.

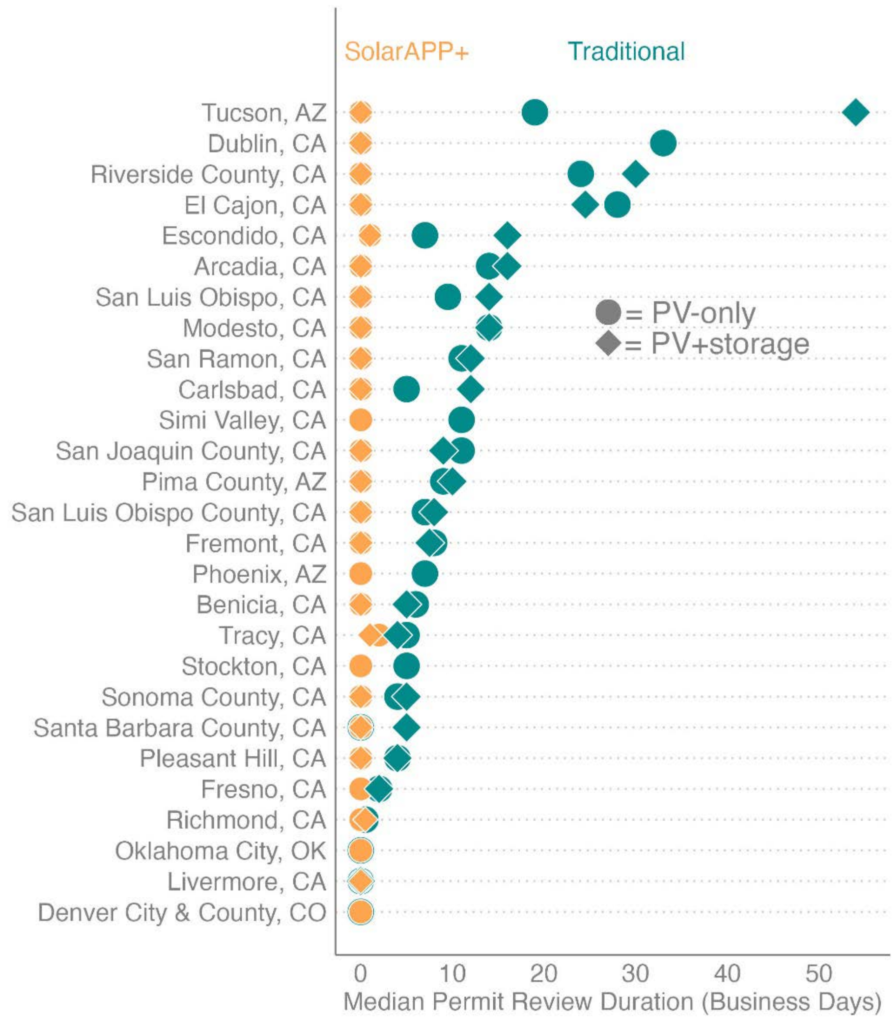

Figure 15. Median permit review times

Note: This figure excludes five AHJs for which duration data were not available for traditional permits.

In addition to reducing permit review durations, the SolarAPP+ platform reduces AHJ staff review time by removing the need for individual permit reviews. The net impact of SolarAPP+ on staff time is influenced by both the time savings from permit reviews and the time required to

[4] Based on feedback from AHJs, these durations reflect timelines for a single permit entry, i.e., they do not include revisions, allowing for an apples-to-apples comparison with SolarAPP+ durations for code-compliant systems.

implement SolarAPP+. According to feedback from AHJs reported in Cook et al. (2022), manual permit reviews require around 25–60 minutes of staff time. Figure 16 depicts the estimated AHJ staff time saved in 2023 by automating permit reviews on the SolarAPP+ platform, assuming reviews take 25–60 minutes. Overall, we estimate that AHJs collectively saved between 9,080 and 21,790 hours of staff time in 2023 by adopting SolarAPP+, including saved time on reviews for permit revisions. This reflects savings for PV-only and PV+storage permits and assuming that every revision must go through AHJ reviews. Estimated staff time savings are the equivalent of about 4–10 full-time employees. Figure 16 depicts the estimated staff time savings in the 10 AHJs with the largest estimated savings in 2023.

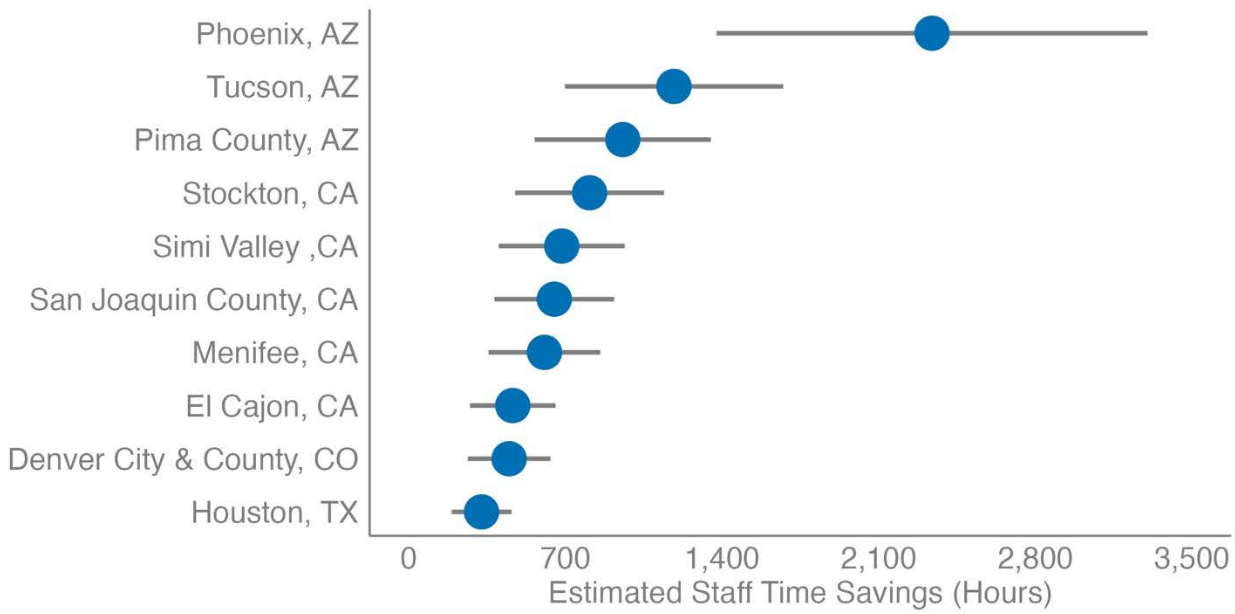

Figure 16. Estimated AHJ staff review time savings (2023) from SolarAPP+ permit processing in the 10 AHJs with the highest estimated savings

Note: The lower and upper bounds of the bars represent staff time savings assuming each review and revision takes between 25 and 60 minutes, respectively, while the points represent the middle of the range (42.5 minutes). These numbers are based on AHJ-provided estimates of permit review time.

3.3 AHJ Inspection Impacts

We define the inspection failure rate as the percentage of projects that failed at least one inspection. Figure 17 depicts inspection failure rates for traditional and SolarAPP+ PV-only projects across 11 AHJs with available data. For PV-only projects, SolarAPP+ inspection failure rates were less than or equal to traditional inspection failure rates in seven of the 11 AHJs in 2023. However, across all 11 AHJs, PV-only inspection failure rates were slightly higher for SolarAPP+ projects than for traditional projects in 2023: about 35% of all SolarAPP+ projects failed an inspection at least once, compared to 29% of traditional projects. That difference is largely driven by Phoenix, the AHJ with the most SolarAPP+ permits and also one of the few AHJs with higher SolarAPP+ inspection failure rates. Excluding Phoenix from the analysis, inspection failure rates were about 23% for SolarAPP+ permits and 26% for traditional permits. As with other analyses, fewer data are available for PV+storage permits, and any analysis of PV+storage data must be treated with caution. With that caveat in mind, the data show that

SolarAPP+ PV+storage inspection failure rates are less than or equal to traditional project rates in the six AHJs with available inspection data for at least 10 records of each type (Figure 18).

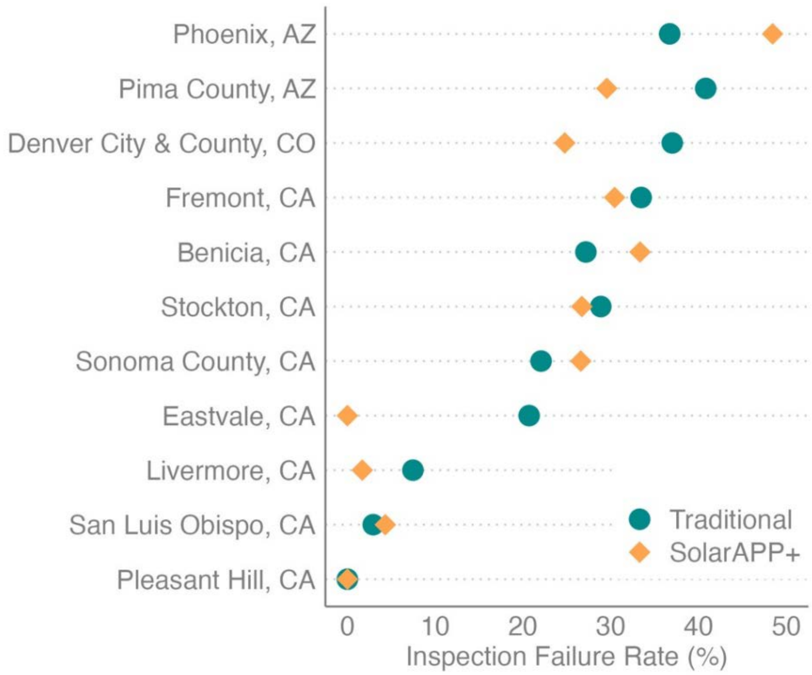

Figure 17. Inspection failure rates for PV-only projects by AHJ (2023)

Note: This figure is limited to AHJs with complete inspection failure data for SolarAPP+ and traditional permits. The figure depicts data from 10,651 inspections (3,455 SolarAPP+, 7,196 traditional).

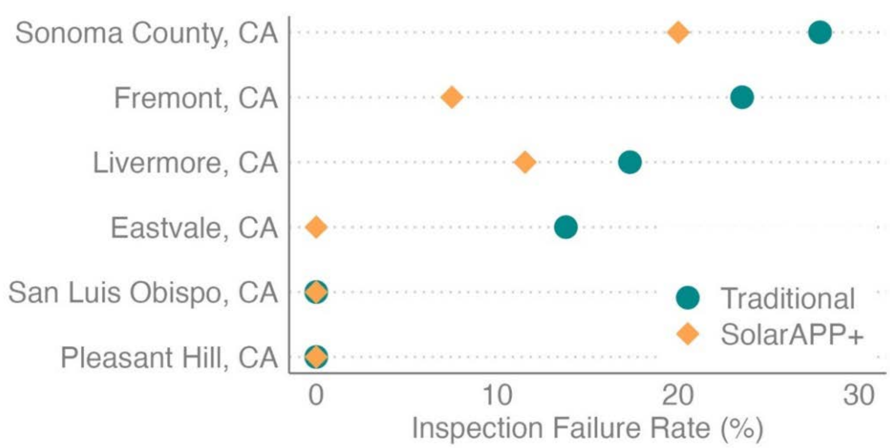

Figure 18. Inspection failure rates for PV+storage projects by AHJ (2023)

Note: This figure is restricted to AHJs with at least 10 inspection records for both SolarAPP+ and traditional permits. The figure depicts data from 682 inspections (156 SolarAPP+, 526 traditional).

While the results are mixed, these results suggest that expedited permitting through SolarAPP+ does not drive any downstream issues with inspections for PV-only or PV+storage projects. Further, the results suggest that—in most AHJs—SolarAPP+ permitting may reduce inspection failure rates. This second result should be treated as a working hypothesis; it is possible that the differences in inspection failure rates reflect preexisting differences between installers that do and do not use SolarAPP+. Further research is required to understand the impacts of SolarAPP + on inspection failure rates.

In addition to tracking the volume of SolarAPP+ inspection failures, we also tracked the reasons for inspection failure (Figure 19). 78% of the identified failures related to a work quality issue, meaning that the system was not installed per the code, either in isolation (71%) or accompanied by other issues (6%). About 13% of failures related to rescheduling, primarily because the homeowner or contractor was not available at the scheduled inspection time. Of the remaining inspection failures, a combined 17% were related to SolarAPP+ (install did not match the SolarAPP+ plan or inspection checklist was not on site). It is possible that more contractor education could result in fewer inspection failures of these types, thereby further improving SolarAPP+ inspection performance.

Figure 19. Known reasons for inspection failures among SolarAPP+ projects

3.4 Solar Adoption Timeline Impacts

In the previous two sections, we explored the impacts of SolarAPP+ at specific stages of the solar adoption timeline. Here, we explore the full timeline impacts of SolarAPP+, from permit submittal to final inspection. Across 27 AHJs with available data for PV-only projects,[5] the median duration from permit submission to final passed inspection was 33 business days for SolarAPP+ permits and 47.5 business days for traditional permits, suggesting that SolarAPP+ reduces permit-to-inspection timelines by around 14.5 days or about 31% (Figure 20). Similarly, across 19 AHJs with available data for PV+storage projects, the median permit-to-inspection duration was 29 days for SolarAPP+ permits and 52 days for traditional permits, suggesting that SolarAPP+ reduces permit-to-inspection timelines by around 44% for PV+storage permits.

[5] These subsamples refer to AHJs for which we have available data for complete durations for both SolarAPP+ and traditional permits.

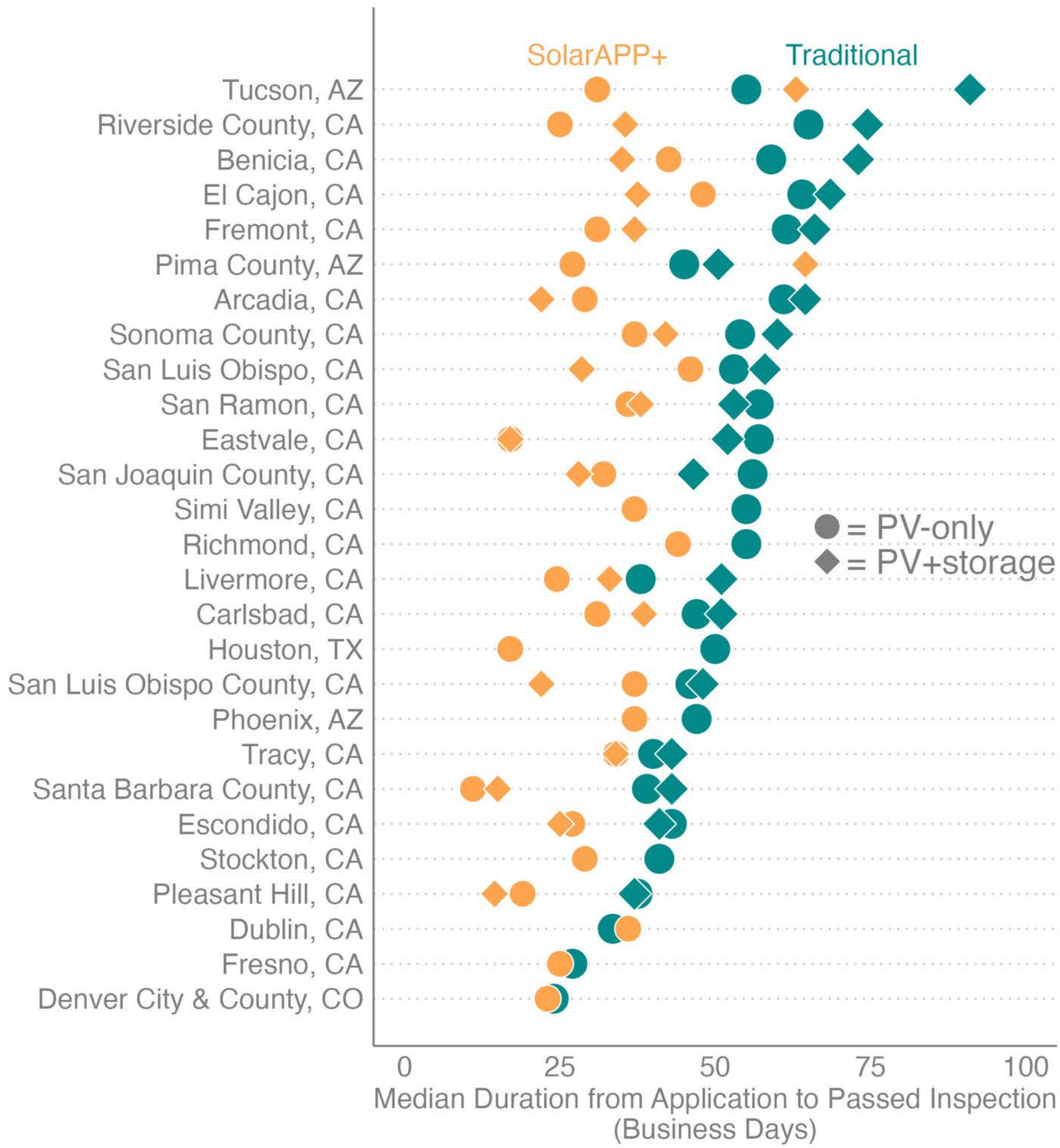

Figure 20. Median project time from permit submission to passed inspection by AHJ (2023)

Note: This figure excludes five AHJs for which duration data were not available for both SolarAPP+ and traditional permits.

Figure 21 depicts the estimated total impact of the SolarAPP+ platform in terms of reduced days for the 27 AHJs with available data. The total impact is a function of the number of permits processed and the estimated permit-to-inspection duration reduction in each AHJ. The figure shows that SolarAPP+ is estimated to have accelerated permitting processes by thousands of days in 2023, with savings of well over 10,000 days in some large AHJs. Across the 27 AHJs, the total estimated acceleration is 154,000 business days. As a reminder, these results are indicative of the total impact of SolarAPP+ on permit-to-inspection durations, but further research would be required to estimate the precise causal impact of SolarAPP+ on total time savings.

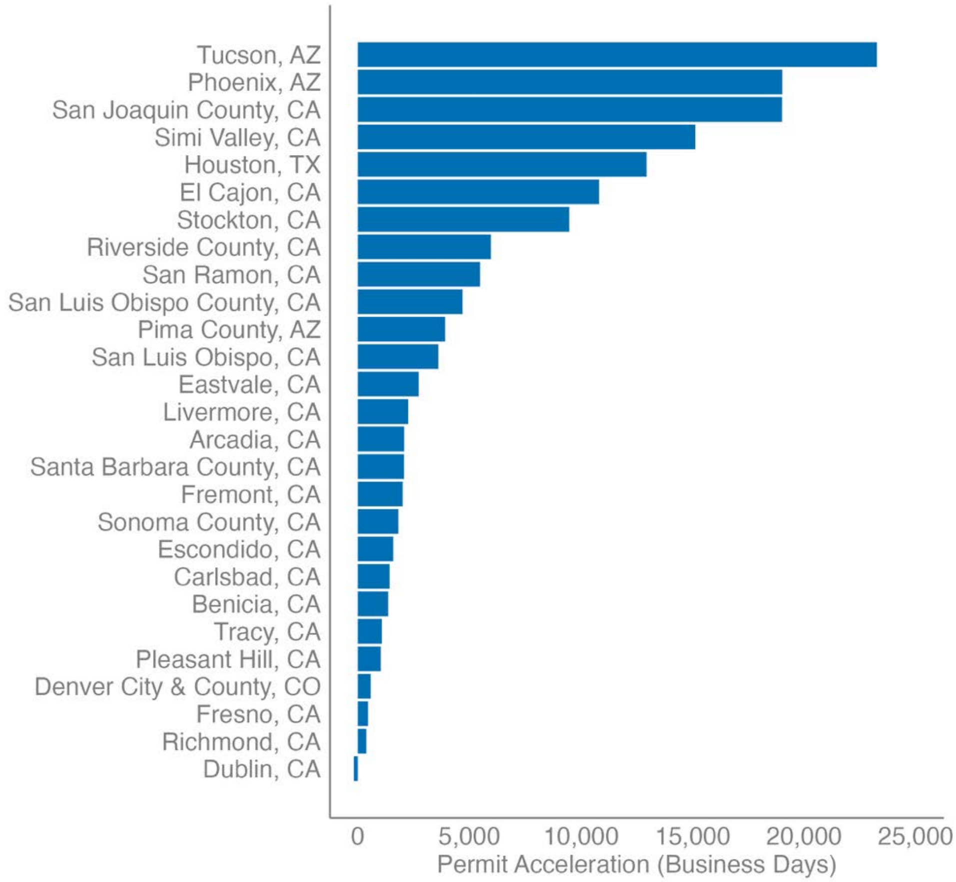

Figure 21. Total estimated acceleration of project timelines (permit submission to passed inspection) across AHJs

4 SolarAPP+ Estimated Impacts

The impact of SolarAPP+ on PV permitting processes may translate to broader impacts on the rooftop PV market. In this section, we explore the potential broader impacts of SolarAPP+ adoption in three dimensions: impacts on PV costs/prices, impacts on PV deployment, and AHJ benefits. We estimate ranges of potential impacts based on lower- and upper-bound assumptions in each of the three dimensions. We estimate the impacts of the 18,906 SolarAPP+ permits issued in 2023.

As in Section 3, we note here that the estimated impacts in this section should be interpreted as indicative of estimates under reasonable assumptions. Again, some estimated impacts may be sensitive to confounding factors that correlate with SolarAPP+ utilization. One possibility is that installers that use SolarAPP+ were already more efficient (i.e., quicker through permitting and inspection) than installers that tend to use traditional permits, in which case some of the estimated impacts of SolarAPP+ are in fact attributable to these preexisting differences. We have no specific reason to suspect that such confounding factors correlate with SolarAPP+ utilization, but the analysis that follows should be interpreted in light of that potential limitation.

4.1 Installation Costs

SolarAPP+ adoption could reduce PV installation costs and prices. We estimate the total impact on costs based on potential savings in permitting fees, permitting costs, cancellation costs, and inspection costs.

4.1.1 Permitting Fees

SolarAPP+ could reduce AHJ budgets for staff time to process PV permits and allow AHJs to reduce PV permitting fees (Plaisted 2022; Cook et al. 2023). Fee savings in AHJs that have already adjusted their fees range from $6–$251 per permit (Cook et al. 2023). Plaisted (2022) estimated fee savings of $215 per permit for PV-only systems and $390 per permit for PV+storage systems. Here, we assume that SolarAPP+ adoption reduces net permitting fees in the range of $50–$250.

4.1.2 Permitting Costs

SolarAPP+ adoption could reduce permitting compliance costs by facilitating the permitting process. Permitting costs can be direct, such as installer time spent preparing permitting applications for specific projects, and indirect, such as installer time spent learning how to navigate different permitting requirements across different AHJs. The Solar Energy Industries Association (SEIA) estimates that direct permitting costs (including inspection) are around $0.13/W, while full (direct and indirect) permitting costs are about $1/W (SEIA 2019). Our best proxy for the impacts of SolarAPP+ on these costs is the estimated 31% reduction in permitting timelines associated with SolarAPP+ estimated in Section 3.4. Assuming SolarAPP+ has a similar impact on costs, that equates to a permitting cost reduction of around $0.04–$0.31/W, which we use to define our lower- and upper-bound assumptions for SolarAPP+ permitting cost reductions.

Our assumed range is comparable to, if slightly lower than, the estimated range of $0.20–$0.57/W in permitting cost savings from SolarAPP+ that was estimated in an independent analysis (Plaisted 2022).

Further, Plaisted (2022) estimated substantially higher direct and indirect permitting cost savings for PV+storage projects of about $0.4–$1.1/W. Plaisted's estimate suggests that SolarAPP+ could play a particularly important role in mitigating permitting costs for PV+storage systems, which tend to be higher than for PV-only systems. Further research is required to characterize the role of SolarAPP + more precisely in PV+storage permitting.

4.1.3 Cancellation Costs

Estimates across the literature suggest that around 11%–33% of PV customers cancel their contracts (Liao 2020; Cook et al. 2021; Cruce et al. 2022).[6] Customer cancellations leave installers with costs that must be recouped through higher prices on successful projects. SolarAPP+ could reduce PV costs by reducing permitting delays and thus reducing cancellation rates. Cruce et al. (2022) estimate that these costs amount to about $0.1/W for a typical system. We assume that SolarAPP+ reduces customer cancellation costs by 2%–5% (see Section 4.2.1), amounting to an additional $0.002–$0.005/W reduction in PV installation prices.

4.1.4 Inspection Costs

SolarAPP+-permitted systems are more likely to pass inspections than other systems in most AHJs (see Section 3.3). This impact remains inconsistent across AHJs and uncertain: It is possible that the measured difference reflects preexisting differences between installers that use SolarAPP+ and those that do not. Insofar as SolarAPP+ improves inspection outcomes, installers would save money by avoiding repeated inspections. However, these cost savings are unlikely to be substantial. Assuming that inspection failures require 8 hours of installer or electrician time to address issues and repeat inspections,[7] assuming a wage of $25.50/hour,[8] each reinspection costs around $200. For those savings to make a material impact, SolarAPP+ would need to lead to significantly fewer reinspections. Excluding Phoenix, SolarAPP+-permitted systems failed inspections 4 percentage points less frequently than other systems in 2023 (see Section 3.3), which only equates to about $8 in savings per installed system. Given the uncertainties and potential minor impact of this cost, we exclude this factor from our analysis below.

4.1.5 Total Installation Cost Impacts

To convert $/W savings estimates to total savings, we multiply the $/W estimates by 6 kW, the median system size of SolarAPP+-permitted systems (see Appendix A.1). The total assumed per-install cost savings range from $300–$2,100. For perspective, those estimates reflect a 2%–13% cost reduction relative to residential PV system cost benchmarks (Ramasamy et al. 2023). We

[6] The wide range may reflect methodological differences and how cancellations are defined, as discussed in Cruce et al. (2022).

[7] Typical inspections last around 20–30 minutes. Most of the time assumed here is to address the inspection failure issue.

[8] Based on a mixed wage of installers (median wage of $22/hour: Palmer et al. 2023) and electricians ($29/hour based on Bureau of Labor Statistics data).

then multiply these system-level savings by the number of SolarAPP+ permits issued in 2023. Table 1 summarizes the three cost savings components. In total, we estimate that SolarAPP+ permitting avoided around $6M–$41M in permitting-related costs in 2023. The wide range primarily reflects the uncertainty in the degree to which SolarAPP+ permitting can reduce both direct and indirect permitting costs.

Table 1. Estimated Cost Savings ($M) From SolarAPP+ Implementation

Cost Savings	Lower Bound	Upper Bound
Permitting fees	0.9	4.7
Permitting costs	4.5	35.2
Cancellation costs	0.2	0.6
Total	**$5.6M**	**$40.5M**

4.2 Deployment

We explore potential impacts of SolarAPP+ on deployment due to avoided customer cancellations, reduced costs, and improved customer experiences.

4.2.1 Avoided Cancellations

As noted in Section 4.1.3, around 11%–33% of PV customers cancel their contracts. Cruce et al. (2022) estimate that about 2% of those cancellations occur during permit review. In our lower-bound case, we use that estimate to assume that SolarAPP+ reduces customer cancellations by 2% by expediting permit reviews. That share likely understates the role of permitting in driving customer cancellations, given that installers cite permitting delays as the key driver of cancellations (Cook et al. 2021) and permitting-related delays can begin before a permit is submitted (Plaisted 2022). We therefore assume that SolarAPP+ reduces customer cancellations by 5% in our upper-bound case. Finally, based on the range of estimates from the literature, we assume that around 22% of contracts are canceled. Under these assumptions, SolarAPP+ adoption would increase deployment by 0.4%–1.1% above background levels by avoiding cancellations.

4.2.2 Deployment Impacts From Reduced Prices

In Section 4.1, we estimated that SolarAPP+ reduces PV costs by $300–$2,100 per install. In competitive markets, most of those cost reductions will be passed through to customers as lower prices. Assuming that 90% of cost reductions are passed through to customers, a $300–$2,100 cost reduction equates to roughly a 2%–17% price reduction relative to post-incentive prices for typical systems.[9] Gillingham and Tsvetanov (2019) estimate that rooftop PV demand declines by about 65% for each doubling in price, meaning that a 2%–17% price reduction from SolarAPP+ equates to roughly a 2%–11% increase in demand.[10]

[9] Assuming a median-sized 6-kW system at the NREL benchmark price of $2.68/W that receives at least a 30% incentive from the federal investment tax credit.
[10] The Gillingham and Tsvetanov estimate may be conservative. Ros and Shetty Sai (2023) estimate rooftop PV price elasticities on the order of 100%–300%.

Plaisted (2022) argues that SolarAPP+-related price reductions would have a particularly substantial impact on PV deployment among low- and moderate-income (LMI) households. The rationale is that LMI customers are more price sensitive, such that a given change in price would have a larger impact on LMI deployment than on deployment among more affluent households. This is a plausible hypothesis, but the precise impact of price reductions on LMI deployment requires further research. LMI households face numerous barriers to adoption unrelated to price, such as lower homeownership rates. Further, many LMI adopters lease rather than purchase PV systems, such that the net impact of cost reductions on LMI PV prices could be muted. The specific impacts of SolarAPP+ on LMI deployment is a potential area for further research.

4.2.3 Improved Customer Experiences

Some households base their rooftop PV adoption decisions on the previous experiences of other adopters (Wolske et al. 2020). In many cases, households actively consult with previous adopters (Sigrin et al. 2017), and paid referrals (i.e., installers paying previous adopters to refer other customers) are common (Mond 2017). Insofar as SolarAPP+ facilitates PV permitting and improves customer experiences, customers of installers who use SolarAPP+ may be more likely to recommend adoption to their peers. This potential impact is highly uncertain and requires further research. We therefore exclude the impact from our lower-bound case. In our upper-bound case, we assume that improved customer experiences result in 0.05 additional referrals per SolarAPP+ adopter, roughly a 10% increase over background referral rates (Mond 2017).

4.2.4 Total Impacts

Table 2 summarizes the three deployment impact components. The total estimated impacts are a 2%–17% increase in deployment, equating to an additional 380–3,260 additional installs. That is, we estimate that the existence of the SolarAPP+ platform *increased* rooftop PV deployment by around 2%–17% in 2023 relative to what would have otherwise been deployed in the same year. For comparison, Plaisted (2022) estimates a 7%–25% increase in deployment for middle-income customers, and a 19%–100% increase for low-income customers.

Table 2. Assumed Deployment Impacts From SolarAPP+ Implementation

Deployment Impact	Base Case	Advanced Case
Reduced cancellations	80	210
Reduced prices	300	2,100
Improved customer experience	0	950
Total	**380**	**3,260**

4.3 AHJ Benefits

SolarAPP+ could benefit AHJs in at least three ways: permitting cost savings, electricity bill savings for AHJ residents, and progress toward sustainability goals.

4.3.1 Permitting Cost Savings

By automating PV permitting, SolarAPP+ frees up AHJ staff time for other AHJ services. Available data suggest that AHJs save around 25–60 minutes of staff time per permit, on average, equating to around 7,900–18,900 hours saved for SolarAPP+ AHJs in 2023. Based on an average wage of \$21.9/hour for administrative staff (BLS 2023), the value of the saved time in 2023 is about \$173,000–\$414,000.

4.3.2 Electricity Bill Savings

While household electricity bill savings may not directly benefit an AHJ, bill reductions from automatic permitting are a type of AHJ service. These bill savings accrue from the accelerated timelines associated with SolarAPP+. In Section 3.4, we estimate that SolarAPP+ systems are permitted and installed 14.5 days faster than other systems, at the median. To estimate a rough heuristic of the bill savings accruing from that acceleration, consider that a typical household uses around 30 kWh per day and pays a rate of around \$0.2/kWh.[11] Under those simplifying assumptions, a typical household spends about \$87 for 14.5 days of electricity use. In the summer months, PV systems could offset nearly that full amount, although rate reforms in states such as California mean that PV systems cannot fully offset those charges. To be conservative, we assume that a typical customer saves \$50 from the accelerated PV timeline. Applying that heuristic, SolarAPP+ PV adopters saved around \$945,000 in 2023 due to the accelerated timelines from SolarAPP+ permitting.

4.3.3 Progress Toward Sustainability Goals

Many AHJs have set sustainability goals, such as achieving target rates of decarbonization by specified dates (Watts et al. 2017). SolarAPP+ adoption could help AHJs achieve their sustainability goals more quickly in at least three ways:

- As discussed in Section 4.2, we estimate that SolarAPP+ increased rooftop PV deployment by about 340–3,150 systems in 2023. That incremental deployment could contribute directly to the clean energy deployment goals of those AHJs. The additional deployment would also accelerate decarbonization. Likewise, accelerated permitting means that PV systems come online faster and begin to abate emissions sooner. Assuming that the 18,906 SolarAPP+-permitted systems came online 14.5 days faster than they otherwise would have, that equates to adding 274,000 days of emissions abatement. Rooftop PV decarbonization benefits are estimated to be on the order of 500 kg CO_2/year avoided per installed system (Zheng et al. 2021),[12] varying with the underlying emissions intensities of the grid in different AHJs. Using that estimate, the total emissions reduction in 2023 from added and accelerated deployment due to SolarAPP+ was around 0.5M–2.0M tCO_2 in 2023. For context, that is roughly the equivalent of offsetting the emissions from the electricity use of 110,000–380,000 homes (EPA n.d.).
- Permitting and inspection cost savings from SolarAPP+ would free up AHJ resources, some of which could be dedicated to clean energy programs.

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[11] The U.S. average is about \$0.16/kWh; we adjust this slightly higher to account for higher rates in California (\$0.27/kWh on average) (EIA 2023).

[12] Zheng et al. (2021) estimate emissions benefits of 110–570 kg CO_2/year for a 4-kW system. Adjusting that for the median SolarAPP+ system (6 kW) and taking the middle of the range yields an estimate of 510 kgCO_2/year.

- SolarAPP+ adoption could help AHJs achieve recognition of their clean energy programs. To provide one tangible example, SolarAPP+ (or similar instant permitting) has been recognized as a key component for SolSmart designation, a program that recognizes AHJs with outstanding achievement in PV permitting. In 2024, two SolarAPP+ adopters (Fremont, California, and Sun Prairie, Wisconsin) were awarded some of the program's first platinum designations.

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Appendix. SolarAPP+ Project Design Characteristics

The SolarAPP+ platform provides a new data source for rooftop PV system characteristics. In this appendix, we describe SolarAPP+ solar and battery system characteristics and discuss how SolarAPP+ projects compare to the broader rooftop PV and battery storage markets. All numbers and figures in this section reflect cumulative data, i.e., including projects permitted before 2023.

A.1 System Size

The median system size for SolarAPP+ PV-only projects is about 6 kW, ranging from 0.2–29 kW (Figure 22).[13] The system sizes are comparable to sizes in the broader rooftop PV market, as indicated by the 7-kW median for systems installed in 2022 estimated by Barbose et al. (2023). Projects in the PV+storage pilot tend to be similarly sized, with a median PV system size of 6 kW. Further, most batteries in the PV+storage pilot have similar rated storage capacities, reflecting the standardized rated output of the limited number of battery products used in the pilot. Out of 40 PV+storage projects with available data, 35 projects had 13.5 kWh of storage capacity.

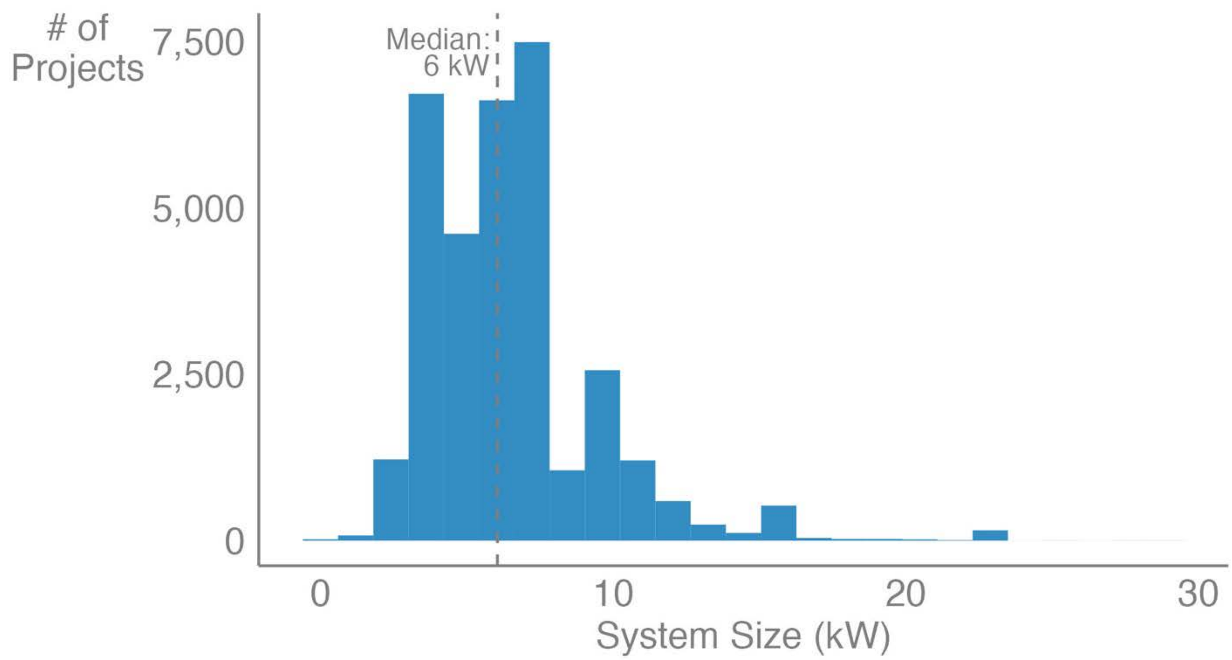

Figure 22. SolarAPP+ PV system size (kW) distribution for PV-only projects (N = 33,359)

A.2 Solar Modules and Inverters

Figure 23 depicts the distribution of module brands used in SolarAPP+ PV-only projects. Module brands largely reflect installer preferences and contractual agreements with module manufacturers. Data from EnergySage (2024) show that Hanwha Q CELLS, Silfab, and

[13] As noted, the statistics in this section are based on cumulative data. However, the median system size restricted to permits submitted in 2023 is also about 6 kW, which is why we use that system size as the basis for our assumptions in Section 4.

Renewable Energy Corporation (REC) modules are similarly popular among other installers off the SolarAPP+ platform. In the PV+storage pilot, JA Solar, Hanwha Q CELLS, and Tesla account for about 77% of PV modules.

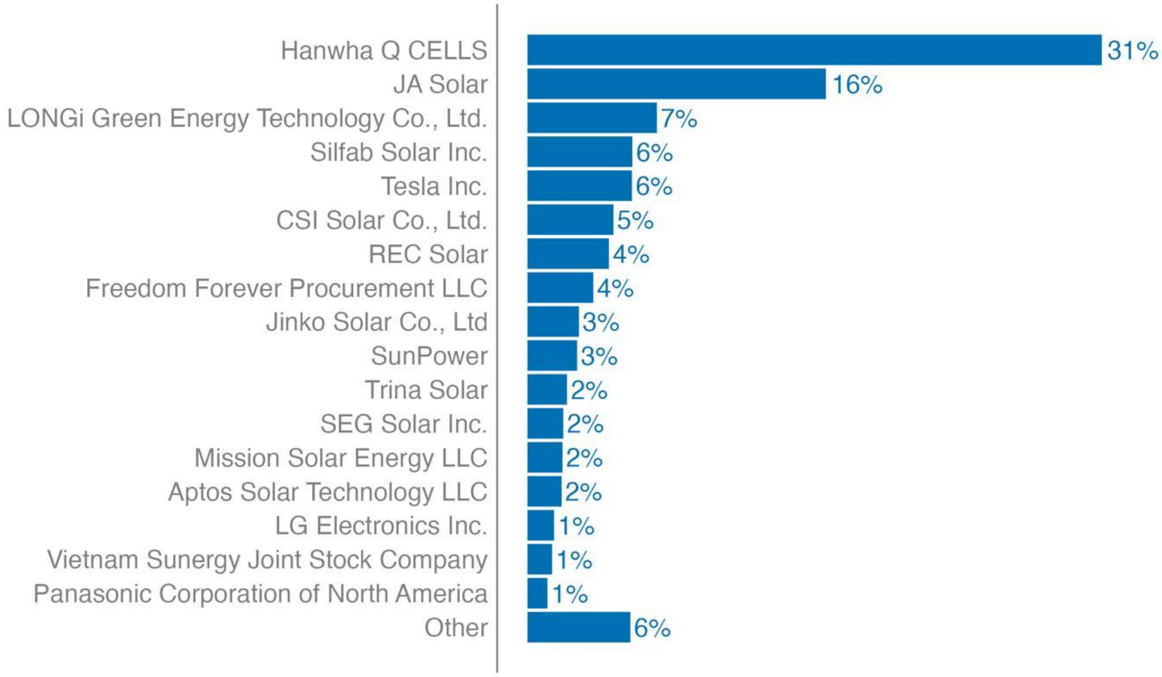

Figure 23. Module brand shares in SolarAPP+ PV-only projects (N = 33,363)

About 82% of SolarAPP+ PV-only systems include module-level power electronics, specifically DC optimizers (46%) and microinverters (36%) (Figure 24). That share is slightly less than the estimated residential marketwide share of 93% (Barbose et al. 2023). Module-level power electronics are less commonly reported in the PV+storage pilot, though the reasons for this remain unclear.

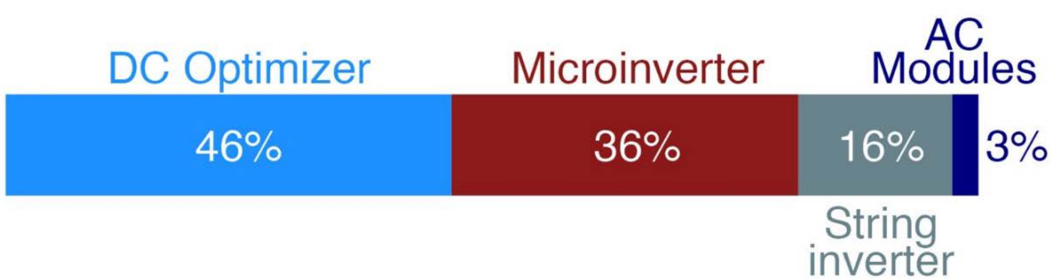

Figure 24. Inverter characteristics of SolarAPP+ PV-only systems (N = 33,363)

Note that percentages don't sum perfectly to 100 due to rounding.

Figure 25 depicts the distribution of inverter brands used in SolarAPP+ projects. Around 80% of SolarAPP+ projects use SolarEdge or Enphase brand inverters, similar to the share of those brands in the broader solar market as estimated by EnergySage (2024).

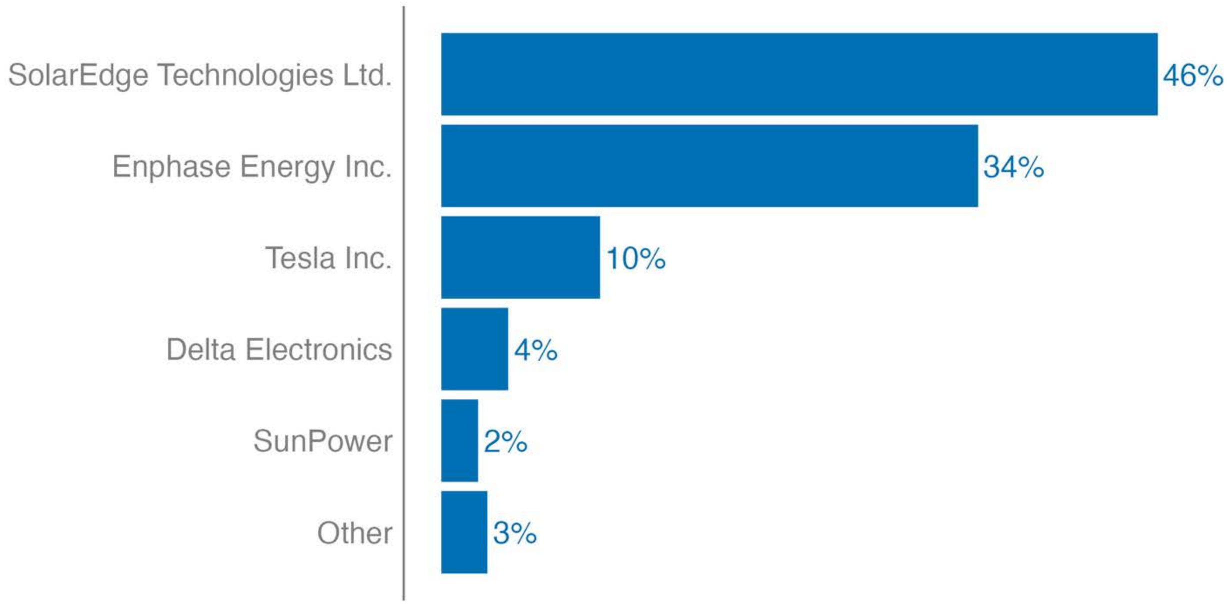

Figure 25. Inverter brand shares in SolarAPP+ PV-only projects (N = 33,363)

A.3 Home Electrical Upgrades and Interconnection Methods

Residential PV system installations can require upgrades to home electrical systems in certain cases. About 18% of SolarAPP+ PV-only permits and 10% of PV+storage permits were associated with a main panel upgrade (Figure 26). Further, about 12% of PV-only permits and 7% of PV+storage permits were associated with derating (reducing) the power limits of the home's main breaker, required in cases where the PV system could cause the home to exceed amperage limits set by the local utility. All PV systems require setting an amperage limit above which the system is automatically disconnected from the grid. SolarAPP+ service disconnect limits ranged from 100 or fewer amps (17% of systems) to 125 amps (5%), 150 amps (3%), 175 amps (8%), or 200 amps (67%). Finally, most SolarAPP+ PV-only systems are connected to the grid using the 120% rule, meaning that the installed system amperage cannot exceed the home meter's safety limit by more than 20%. In contrast, the most common interconnection rule in the PV+storage pilot is the sum-of-breakers rule, which requires that the sum of the home's load and electrical supply (i.e., from PV and batteries) does not exceed the rated capacity of the busbar connecting the home to the distribution grid.

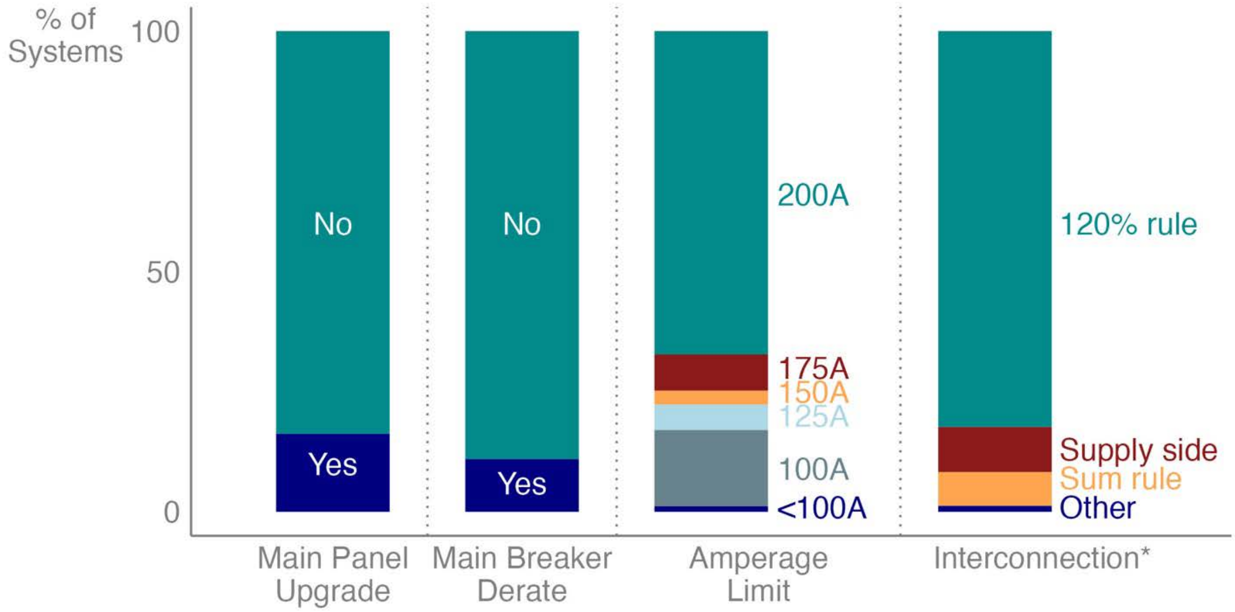

Figure 26. Electrical upgrade features of SolarAPP+ systems

Sample sizes: Panel upgrade N = 25,890; breaker derate N = 19,922; amperage limit and interconnection N = 14,335. *Sum rule = sum of breaker rule; supply-side = supply-side connection; “Other” includes 120% rule on center-fed panels, power control system, and 100% rule

A.4 Battery Characteristics

The following four figures depict data on battery system characteristics. Note that each figure is based on a subsample of data with available information. In some cases, missing data may skew the distributions. For instance, Figure 27 depicts the distribution of battery manufacturers for 569 systems with available data. This distribution is substantially different from other reported distributions (e.g., EnergySage 2024), either because of data reporting issues or because installers that use SolarAPP+ prefer different manufacturers.

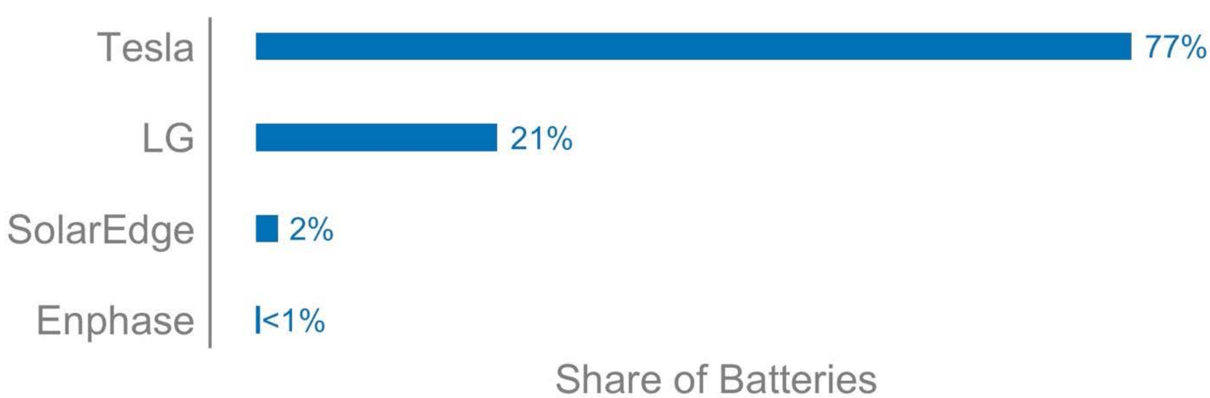

Figure 27. Distribution of battery manufacturers (N = 569)

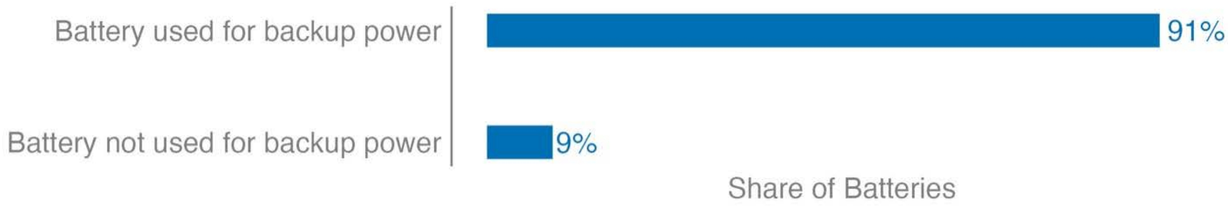

Figure 28. Distribution of batteries used for backup power (N = 945)

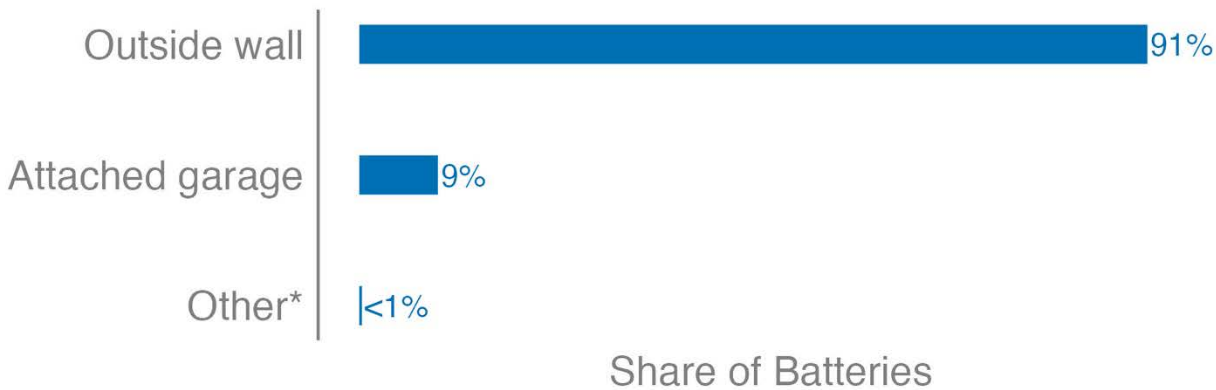

Figure 29. Distribution of battery storage mount locations (N = 5,548)

* Includes accessory structures, basements, detached garages, storage units, and utility spaces

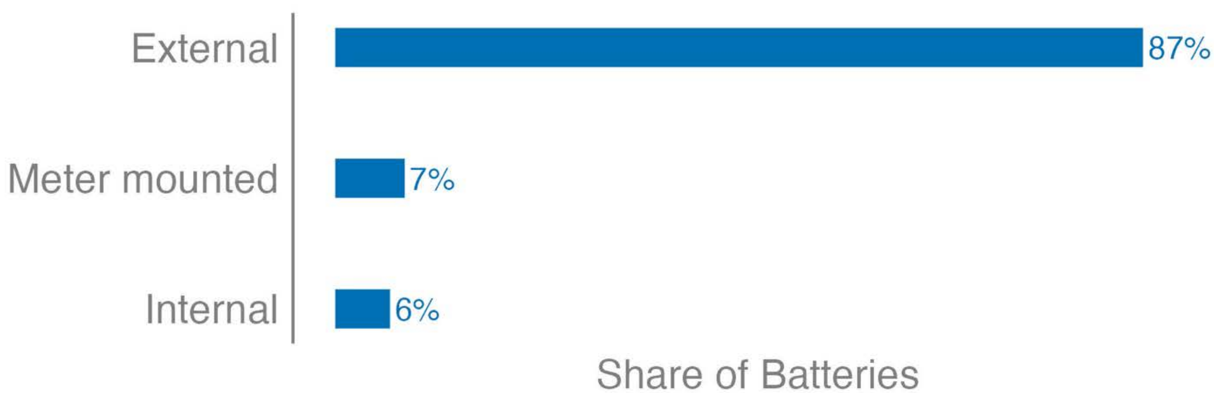

Figure 30. Distribution of battery storage initiation device locations (N = 1,140)

Cost-Reduction Roadmap for Residential Solar Photovoltaics (PV), 2017–2030

Kristen Ardani, Jeffrey J. Cook, Ran Fu, and Robert Margolis

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National Renewable Energy Laboratory

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List of Acronyms and Abbreviations

¢/kWh	Cents per kilowatt-hour
($/Wdc)	Dollars per watt direct current
AHJ	Authority having jurisdiction
ASP	Average selling price
ATB	Annual Technology Baseline
BOS	Balance of system
DOE	U.S. Department of Energy
EIA	U.S. Energy Information Administration
EPC	Engineering, procurement, and construction
GW	Gigawatts
LCOE	Levelized cost of energy
kW	Kilowatts
NREL	National Renewable Energy Laboratory
O&M	Operations and maintenance
PII	Permitting, inspection, and interconnection
PV	Photovoltaic(s)
Q1	Quarter one
RECS	Residential Energy Consumption Survey
SETO	Solar Energies Technologies Office
USD	U.S. dollars

Executive Summary

The installed cost of solar photovoltaics (PV) has fallen rapidly in recent years and is expected to continue declining in the future. In this report, we focus on the potential for continued PV cost reductions in the residential market. From 2010 to 2017, the levelized cost of energy (LCOE) for residential PV declined from 52 cents per kilowatt-hour (¢/kWh) to 15.1 ¢/kWh (Fu et al. 2017). The U.S. Department of Energy's (DOE's) Solar Energy Technologies Office (SETO) recently set new LCOE targets for 2030, including a target of 5 ¢/kWh for residential PV. We present a roadmap for achieving the SETO 2030 residential PV target.

Because the 2030 target likely will not be achieved under business-as-usual trends (NREL 2017), we examine two key market segments that demonstrate significant opportunities for cost savings and market growth: installing PV at the time of roof replacement and installing PV as part of the new home construction process. We estimate that, between 2017 and 2030, an average of 3.3 million homes per year will be built or require roof replacement. This translates into a residential PV technical potential of roughly 30 gigawatts (GW) per year (Figure ES-1). Capturing even a relatively small fraction of this technical potential could have a significant impact on the evolution of the U.S. electricity system.

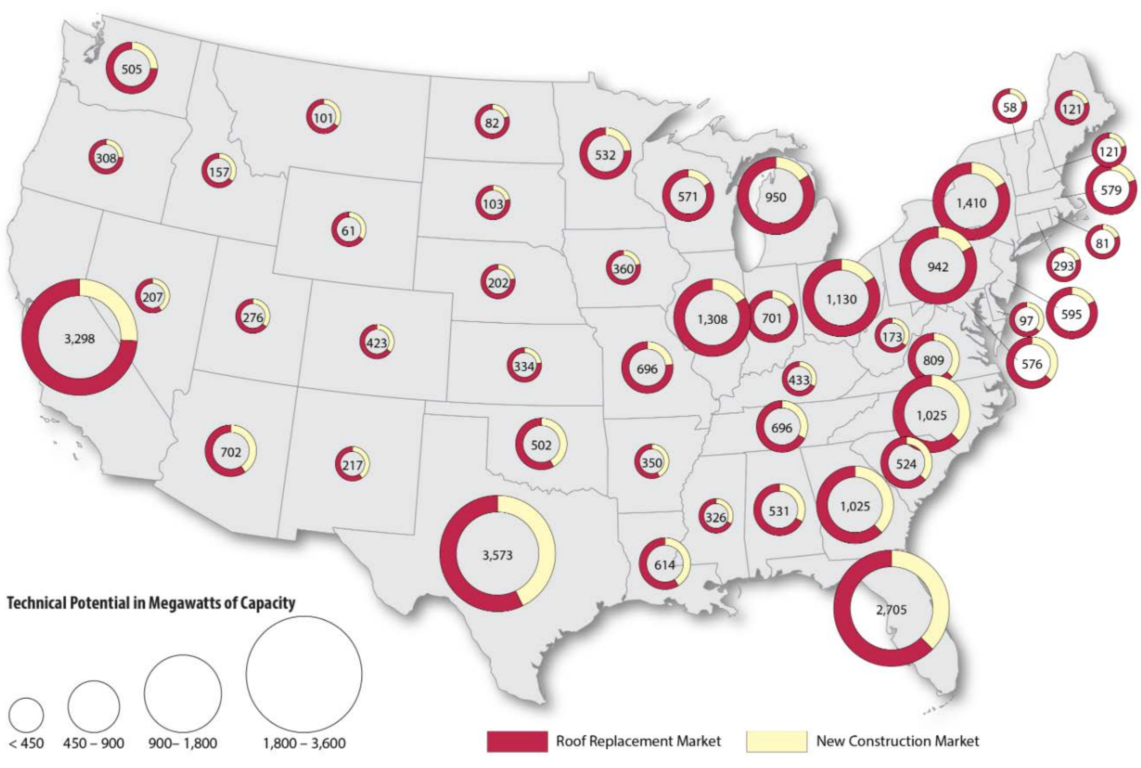

Figure ES-1. Annual average technical potential for residential rooftop PV at time of roof replacement and new construction projected between 2017 and 2030

Within both market segments, we identify four key cost-reduction opportunities: market maturation, business model integration, product innovation, and economies of scale. To assess the potential impact of these cost reductions, we compare modeled residential PV system prices in 2030 to the National Renewable Energy Laboratory's (NREL's) quarter one 2017 (Q1 2017) residential PV system price benchmark (Fu et al. 2017). We use a bottom-up accounting framework to model all component and project-development costs incurred when installing a PV system. The result is a granular accounting for 11 direct and indirect costs associated with installing a residential PV system in 2030.

It is unlikely that all PV installers in these two market segments will pursue the same cost-reduction strategies, so we model four pathways that could be pursued to achieve low-cost residential PV in 2030 (Table ES-1). The two less-aggressive pathways represent a more conservative shift from current technologies and business practices, whereas the two visionary pathways represent a higher level of innovation. We assume that market maturation and subsequent supply chain efficiencies will yield cost reductions across all four modeled pathways by 2030.

Table ES-1. Four Modeled Pathways by Market and Magnitude of Cost Reductions

	Pathway			
	Roof Replacement Market		New Construction Market	
Cost-Reduction Opportunity	**Less Aggressive**	**Visionary**	**Less Aggressive**	**Visionary**
Market Maturation	High	High	High	High
Business Model Integration	Low	High	Low	High
Product Innovation	Low	High	Low	High
Economies of Scale	NA	NA	Low	High

All four modeled pathways demonstrate significant installed-system price savings over the Q1 2017 benchmark, with the visionary pathways yielding the greatest price benefits (Figure ES-2). The largest modeled cost savings are in the supply chain, sales and marketing, overhead, and installation labor cost categories.

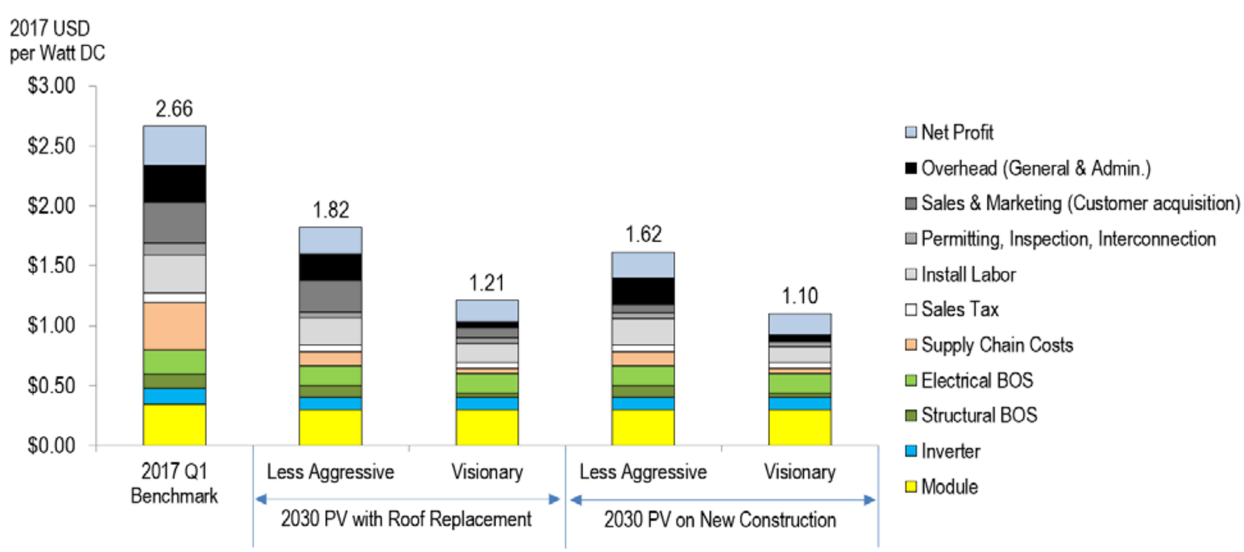

Figure ES-2. Modeled installed residential PV system prices at time of roof replacement and new construction in 2030, compared with a weighted average of the Q1 2017 benchmark

When we translate these installed-system costs into LCOE, we find that the less-aggressive pathways achieve significant cost reductions, but may not achieve the 2030 LCOE target (Figure ES-3). On the other hand, both visionary pathways could result in PV system prices that get very close to (for roof replacement) or achieve (for new construction) the 2030 target in each market segment.

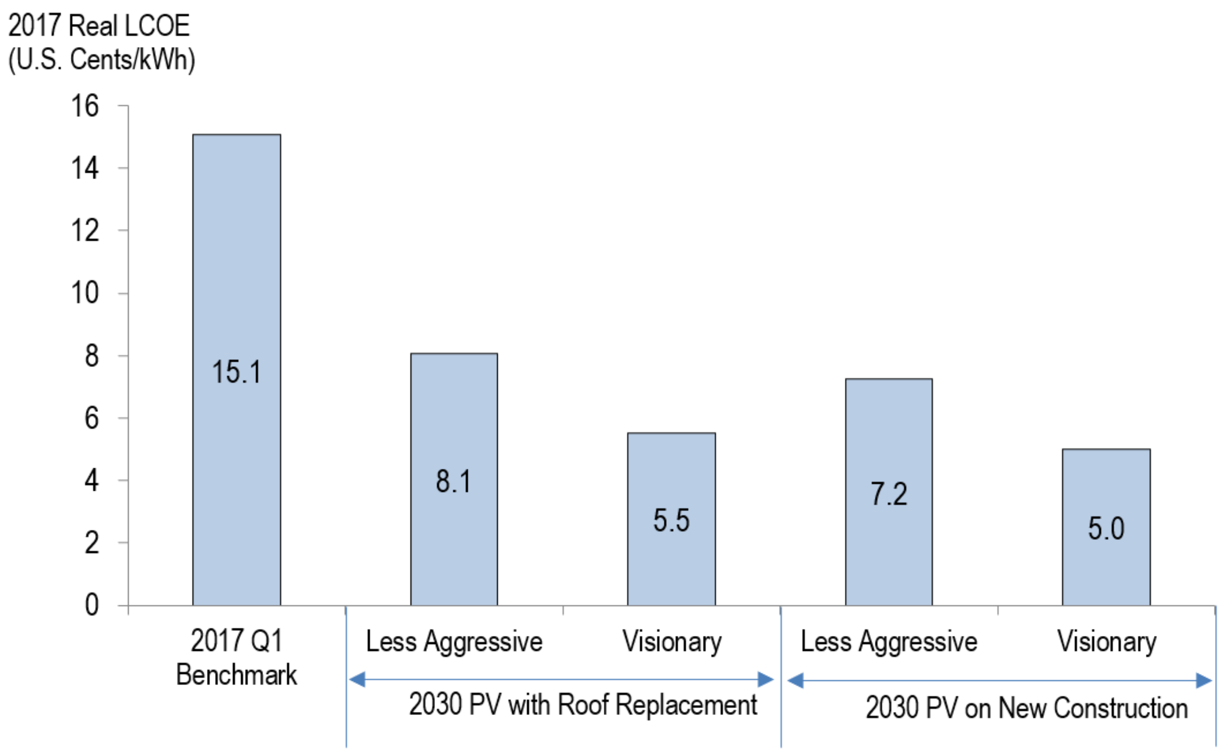

Figure ES-3. Modeled residential PV LCOE at time of roof replacement and new construction in 2030, compared with the LCOE for a weighted average of the Q1 2017 benchmark

Figure ES-4 compares the LCOE impacts of our modeled installed-system cost reductions with the impacts of improvements in other parameters, for the new construction visionary pathway. The results indicate that savings associated with installed-system soft costs account for about 65% of the total savings. Therefore, reducing these soft costs likely will be critical for achieving the 2030 residential PV target.

Although we identify pathways toward the 2030 residential PV target, various barriers and considerations must be addressed to realize this future. First, all four pathways benefit from anticipated market maturation that could significantly reduce supply chain costs. This analysis assumes that PV installers can procure modules at or near spot market prices in 2030. This future is likely to require significant innovation in business models as well as the proliferation of efficient procurement processes.

Second, the two visionary pathways assume that a low-cost integrated PV and roofing product is available by 2030, which could significantly reduce supply chain, installation labor, and permitting costs. Although integrated PV products have been or are being developed, achieving low-cost residential PV with an integrated product is very challenging and will likely require significant investments in research and development.

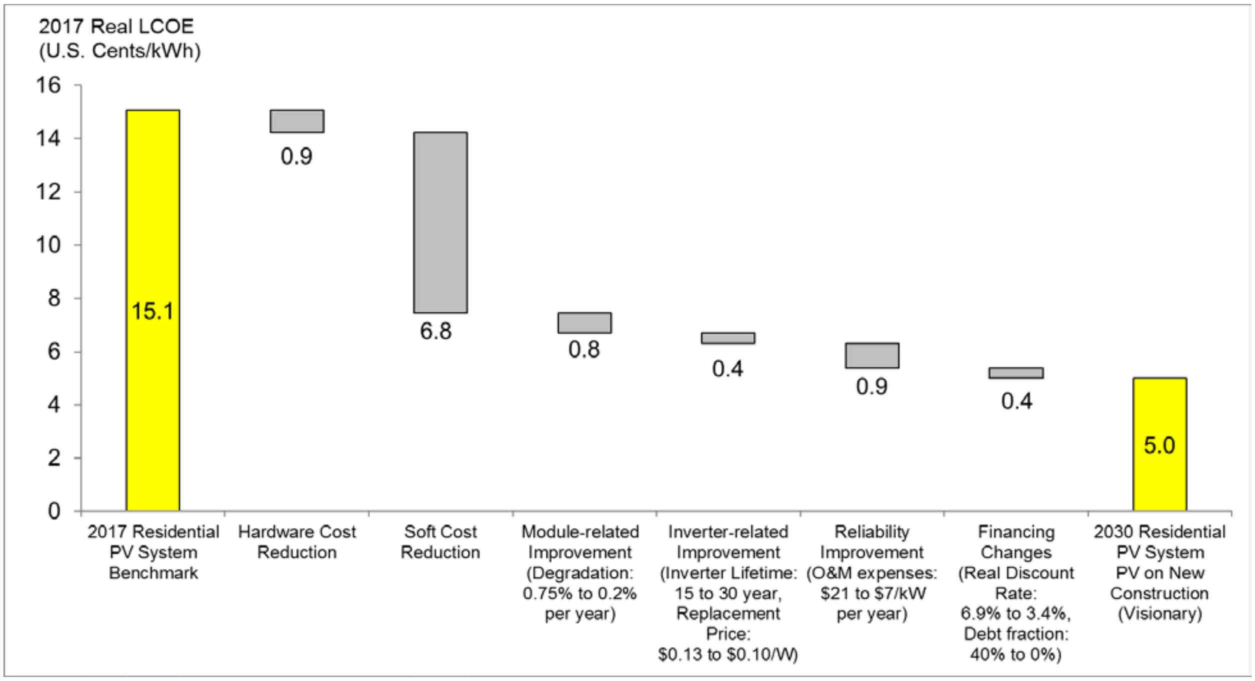

Figure ES-4. Modeled residential PV LCOE reductions for the new home construction market visionary pathway in 2030, compared with the Q1 2017 benchmark

Third, business model integration could provide significant sales, marketing, overhead, and labor savings that reduce installed PV system prices. Although there have been efforts to collaborate across the solar and roofing industries—and across the solar and housing industries—fully integrating across these types of businesses will require significant changes to existing practices. In addition, regulatory challenges such as variation in PV permitting requirements across more than 18,000 authorities having jurisdiction across the United States could serve as another barrier to increasing business model integration.

Fourth, economies of scale yield considerable cost savings, especially for the new construction market. However, the benefits of scale may be less than those assumed in our analysis, resulting from construction timelines, project sizes, and workforce management. In addition, those homebuilders that construct comparatively few homes (e.g., 20 or fewer homes annually), are unlikely to experience the same process efficiencies as those that construct hundreds of homes. In addition, potential permitting challenges and delays associated with deploying PV on new homes could result in additional costs that offset the savings benefits of economies of scale.

Overall, the results of our analysis suggest that it will be challenging but possible to achieve the SETO 2030 residential PV target. We identify two pathways that could play a transformative role in the residential PV sector: one by installing PV at the time of roof replacement, and the other by installing PV as part of the new home construction process. Achieving the SETO target via either pathway will require very aggressive reductions in hardware and soft costs driven by the development of new technologies, services, and business practices.

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1 Introduction

In 2011, the U.S. Department of Energy launched the SunShot Initiative to reduce residential, commercial, and utility-scale photovoltaic (PV) costs by 75% between 2010 and 2020 (DOE 2016). For residential PV systems, this meant reducing the average levelized cost of energy (LCOE) from 52 cents per kilowatt-hour (¢/kWh) to 10 ¢/kWh in 2020 (in 2017 dollars).[1] In 2016, DOE set even more aggressive targets to be achieved by 2030, including a residential PV LCOE of 5 ¢/kWh. This report outlines potential pathways for achieving the 5 ¢/kWh residential PV target by 2030.

Achieving the SETO 2030 target will require significant cost reductions beyond a business-as-usual scenario. In 2017, the average residential PV LCOE in the United States reached 15.1 ¢/kWh (Fu et al. 2017). Based on projections in the "mid" case of the NREL's Annual Technology Baseline (ATB), residential PV would reach an LCOE of 9 ¢/kWh in 2030 (NREL 2017).[2] Thus an additional reduction of 4 ¢/kWh would be required to achieve the SETO 2030 target.

To envision feasible pathways to realizing this aggressive 2030 target, we focus on two particularly promising residential PV markets: installing PV at the time of roof replacement and installing PV as part of the new construction process. We provide detailed component-level cost and system-level price projections for residential PV in these markets in 2030 based on four specific and plausible cost-reduction opportunities: market maturation, business model integration, product innovation, and economies of scale. We then convert the system price projections into LCOE values and analyze the potential of our modeled pathways to achieve the SETO 2030 target, along with the barriers that must be overcome to do so.

The remainder of this report is structured as follows: Section 2 describes the residential market opportunities for PV at time of roof replacement and on new home construction from 2017–2030. Section 3 describes the cost-accounting method we use to assess cost-reduction opportunities. Section 4 discusses our modeled cost-reduction opportunities and pathways. Section 5 shows our results, including the installed-system cost and LCOE reductions enabled by each pathway. Section 6 describes potential barriers to achieving the projected cost-reduction opportunities, and Section 7 discusses conclusions, study limitations, and directions for future research. Appendix A contains our underlying assumptions used to calculate the market potential for residential PV. Appendix B provides additional data and assumptions used in our modeling.

[1] LCOE is calculated by summing the cost to build and operate a PV system over the system's assumed financial life and dividing that total cost by the estimated lifetime electricity generation, yielding a value in cents per kilowatt-hour (EIA 2017a).
[2] This estimate is based on the ATB's mid-level cost projection in 2030 for residential PV with a 16.1% capacity factor (NREL 2017).

2 Technical Potential for Residential PV at Time of Roof Replacement and New Home Construction

From 2010 through 2016, cumulative installed residential PV capacity in the United States increased from 0.6 GW to 8.3 GW (GTM and SEIA 2016). Gagnon et al. (2016) estimate the continental U.S. technical potential for residential PV at 731 GW.[3] Thus residential PV installed through 2016 accounted for about 1% of the technical potential, suggesting opportunities for large-scale expansion.

We focus on two key market segments that offer significant opportunities for reducing costs and expanding the residential PV market: installing PV at the time of roof replacement and installing PV as part of the new home construction process. In the roof replacement market—after accounting for solar suitability and rooftop-replacement schedules—we project that an average of 2.3 million single-family detached homes per year could install PV between 2017 and 2030 in the continental United States (for detailed analysis assumptions see Appendix A). Assuming an average installed-system size of 5 kilowatts (kW) (roughly the average for residential systems installed in 2016), this would represent a potential of 11.5 GW per year. Installing the maximum suitable system size on all these homes would yield a potential of 22 GW per year.

In the new home construction market—taking into account historical suitability and construction rates—we project that an average of one million new single-family homes per year could install PV between 2017 and 2030 across the continental United States.[4] Assuming an average installed-system size of 5 kW, this would represent a potential of 4.8 GW per year. Installing the maximum suitable system size on all these homes would yield a potential of 9.3 GW per year (see Appendix A).

Summing these two potential markets together yields an average market size of 3.3 million homes per year. At an average system size of 5 kW, this would represent a potential of 16.3 GW per year. Installing the maximum suitable system size would yield a potential of 31.4 GW per year (Figure 1). The five states with the largest combined potential are Texas, California, Florida, New York, and Illinois. Capturing even a relatively small fraction of this potential could have a significant impact on the evolution of the U.S. electricity system.

[3] Gagnon et al. (2016) estimate the national technical potential of rooftop PV at 1,118 GW, with residential buildings—defined as those with a footprint of less than 5,000 square feet—accounting for 731 GW.
[4] It is possible that all new homes could be designed to avoid shading and other suitability barriers, which would increase the potential for rooftop PV.

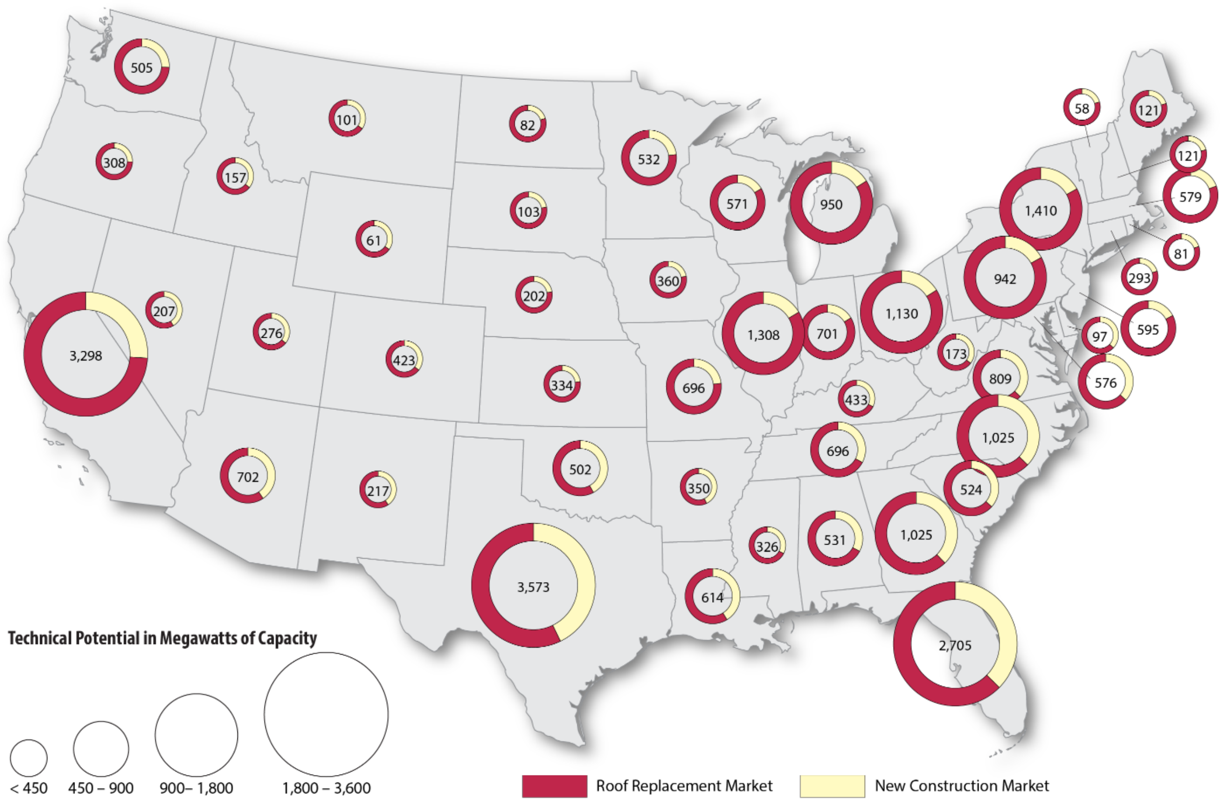


Figure 1. Annual average technical potential for residential rooftop PV at time of roof replacement and new construction projected between 2017 and 2030 (assuming the maximum suitable system size installed on all homes in these markets)

3 Methodology

To assess the potential impact of specific cost-reduction opportunities, we compare modeled residential PV system costs in 2030 to NREL's quarter one 2017 (Q1 2017) residential PV system price benchmark (Fu et al. 2017). Since 2010, NREL has benchmarked current PV system prices for the residential, commercial, and utility-scale sectors (Goodrich et al. 2012, Ardani et al. 2012, Chung et al. 2015, Fu et al. 2016, Fu et al. 2017). These benchmarks are generated using a bottom-up accounting framework for all component and project-development costs incurred when installing PV systems. The residential benchmark models the cash purchase price for systems excluding the federal investment tax credit.

All modeled costs represent the typical average selling price (ASP) between Tier 1 equipment suppliers and first buyers in the global market.[5] Generally, first buyers of equipment from the factory can be developers, engineering, procurement, and construction (EPC) contractors, installers, distributors, retailers, or other end users. Specifically, in our model, costs are represented from the perspective of the installer; thus all hardware benchmarks represent the ASP at which components are purchased by the installer. Importantly, we also apply a 17% fixed margin to all direct costs to model the sales price paid by the end user to the installer. This 17% fixed margin is referred to as "net profit" and is added to total installed costs as a separate category. Although we include assumptions for indirect costs such as business overhead, supply chain costs, and permitting costs, we do not include any additional end-user price gross-up, which is common in the marketplace. We use this approach owing to the wide variation in installer profits in the residential sector, where project pricing is highly dependent on region and project specifics such as local retail electricity rate structures, local rebate and incentive structures, competitive environment, and overall project or deal structures.

In general, the model captures typical installation techniques and business operations within a detailed bottom-up accounting framework. The result is a granular accounting for direct and indirect costs associated with installing a PV system. These cost categories include hardware costs, such as module and inverter prices, as well as "soft costs," such as costs related to the supply chain, labor, and sales and marketing (see Table 1).

For comparison to our 2030 modeled PV system prices, we use the benchmarked national weighted-average Q1 2017 system price for a retrofitted PV installation consisting of a 5.7kW system using 60-cell, multicrystalline, 16.2%-efficient modules from a Tier 1 supplier and a standard flush mount, pitched-roof racking system. The modeled costs of such a system, by category, are displayed in dollars per watt direct current ($/Wdc) in Table 1. In the Q1 2017 benchmark, the highest costs are related to the supply chain, modules, and sales and marketing.

[5] A Tier 1 supplier refers to an established company with its own branded solar panels and at least six projects with non-recourse financing from six different institutions. For more information on these firms, see BNEF (2017).

Table 1. National Weighted-Average Q1 2017 System Cost Benchmark for Residential Retrofit PV Installation by Cost Category (adapted from Fu et al. 2017)

Category	Modeled Value	Description
Module price	$0.35/Wdc	Ex-factory gate (first buyer) price, Tier 1 modules
Inverter price	$0.13/Wdc	Single-phase string inverter, ex-factory gate (first buyer) prices, Tier 1 inverter
Structural balance of system (BOS)	$0.11/Wdc	Includes racking and flashing for roof penetrations
Electrical BOS	$0.20/Wdc	Conductors, switches, combiners, and transition boxes, as well as conduit, grounding equipment, monitoring system or production meters, fuses, and breakers
Supply chain costs	$0.39/Wdc	Includes shipping and handling of equipment, historical inventory and small-scale procurement expenses for both modules and inverters
Sales tax	$0.08/Wdc	Sales tax on the equipment; national benchmark applies an average (by state) weighted by 2016 installed capacities
Direct installation labor	$0.32/Wdc	Modeled labor rate uses weighted average of state rates
Permitting, inspection, and interconnection (PII)	$0.10/Wdc	Includes assumed building permitting and interconnection application fees of $400 and six office staff hours for building permit preparation and submission, and interconnection application preparation and submission
Sales and marketing (customer acquisition)	$0.34/Wdc	Total cost of sales and marketing activities over the last year—including system engineering, marketing and advertising, sales calls, site visits, bid preparation, and contract negotiation; adjusted based on state "cost of doing business" index
Overhead (general and administrative)	$0.31/Wdc	General and administrative expenses—including fixed overhead expenses covering payroll (excluding permitting payroll), facilities, administrative, finance, legal, information technology, and other corporate functions as well as office expenses; adjusted based on state "cost of doing business" index
Profit	$0.32/Wdc	Applies a fixed 17% margin to all direct costs including hardware, installation labor, direct sales and marketing, design, installation, and permitting fees

We use the same cost-accounting framework to model residential PV system costs in 2030 for the roof replacement and new construction markets. Section 4 describes our specific cost-reduction opportunities and pathways.

Consistent with previous benchmarking efforts (Goodrich et al. 2012, Ardani et al. 2012, Chung et al. 2015, Fu et al. 2016, Ardani et al. 2017, Fu et al. 2017), we derived inputs for our model and validated our draft results via interviews with industry and other subject-matter experts. We interviewed 16 representatives from 13 leading organizations closely involved with PV product development and installation, roofing, and new home construction, including PV manufacturers, PV and roofing installation companies, project developers, and industry associations. In these interviews, we focused on gaining a deeper understanding of future trends related to PV product integration, new business models that enhance collaboration across the PV, roofing, and new construction industries, deployment challenges, future cost-reduction opportunities, and cost-model refinement and validation. Our results highlight common themes from interviews. Finally, we also gathered information and data through a review of the published literature.

4 Pathways to Low-Cost Residential PV

The residential PV market is likely to evolve substantially between 2017 and 2030. Although the system cost reductions required to achieve the SETO 2030 target may seem very challenging today, we identify pathways to this goal that are plausible if significant and sustained technology and business-model innovations are realized. We model a total of four pathways, which are characterized by market (roof replacement vs. new construction) and magnitude of cost reductions achieved via four specific cost-reduction opportunities. Section 4.1 describes the cost-reduction opportunities, and Section 4.2 describes the pathways.

4.1 Key Plausible Cost-Reduction Opportunities through 2030

Although there are various opportunities to reduce residential PV costs through 2030, we identify four key opportunities—market maturation, business model integration, product innovation, and economies of scale—and their potential impacts on PV system cost categories.

4.1.1 Market Maturation

Since 2014, the top five residential PV installers captured between 39%–57% of the U.S. market on a quarterly basis (Shiao et al. 2017). The remaining market has been served by a wide array of midsize and small installers. In recent years, there has also been a rapidly evolving set of back office support, software, and other types of firms that serve midsize and small installers. Today, high-volume installers typically have the purchasing power to negotiate lower module and component prices compared with lower-volume installers, especially when bulk purchasing modules and other components from suppliers. With increased PV market maturation, these pricing differentials could be significantly reduced through the development of a mature supply chain, distribution channels, and support services aimed at small, medium, and large companies. Our analysis assumes that, between 2017 and 2030, the market matures such that small, medium, and large installers can procure modules and other components at or near the spot market prices modeled in Woodhouse et al. (2016). This significantly reduces supply chain costs.

4.1.2 Business Model Integration

Currently, most solar companies operate independently from roofing companies and homebuilders, and they often do not coordinate with these traditionally separate businesses. However, some solar companies have begun to collaborate with roofing companies and/or homebuilders to offer PV to prospective customers. For example, SunPower, a PV manufacturer and installer, currently partners with 10 of the 13 largest homebuilders in California to deploy PV on new construction (SunPower 2017). In addition, some roofing companies have begun to integrate PV into their product offerings and businesses more broadly (Solar Power World 2017). Business model integration is less common in the housing industry, but this market segment is quickly evolving. For example, Lennar—the second-largest U.S. housing company—deploys PV on its new homes via its subsidiary SunStreet (Professional Builder 2016, Lennar 2017).

Increased business model integration can offer cost savings over a PV-only approach, including lower customer-acquisition costs, labor time, and overhead expenses. For example, PV can be integrated into existing sales and marketing programs from roofing and housing companies, with reduced added costs. Similarly, overhead expenses and installation labor costs could be reduced by eliminating duplicate back office expenses and integrating installation crews.

4.1.3 Product Innovation

Product innovation could take a variety of forms, such as reduced PV racking and mounting, preassembled PV, and low-cost PV roofing tiles. An integrated PV and roofing product, in particular, could yield significant cost savings, especially if the roof and PV system could be shipped and installed in unison. Although integrated products have low market share today, it is plausible that they could reach the mass market by 2030. For example, several companies have recently introduced or are developing integrated PV products (CertainTeed 2017, GAF 2017, Tesla 2017). Product innovation along these lines could influence the labor, supply chain, and structural BOS cost categories.

Our analysis is limited to standalone PV and does not examine product innovation related to PV plus storage. However, there is a growing interest among homeowners in bundled PV systems that include dispatchable load, batteries, and electric vehicles. Previous NREL analysis shows that bundled PV product offerings allow homeowners to increase PV self-consumption and realize greater value from PV generation by temporally shifting customer load under the PV production curve (O'Shaughnessy et al. 2017). Given the cost declines and the potential benefits of PV plus storage solutions, by 2030 solar homebuilders and roofing companies are likely to expand their offerings beyond standalone PV systems to include storage as well. Early signs of this trend can be seen in the United States, with limited examples of battery manufacturers announcing partnerships with homebuilders to install batteries alongside PV on new construction (Tech Home Builder 2017).

4.1.4 Economies of Scale

Economies of scale are likely to be most accessible to the new housing market, because the cost of individual systems could be reduced by spreading fixed costs across multiple installations. Homebuilders often construct an entire subdivision (averaging 60 housing units), so a combined, or closely related homebuilder/PV installer could achieve cost savings by installing multiple PV systems simultaneously.[6] For example, combining installations could reduce labor costs by requiring the work crew to go to a subdivision only once to complete multiple installations. The overall benefit of economies of scale varies by the quantity of PV systems installed in a particular area, but the key cost categories affected include labor, sales and marketing, and PII costs. Achieving economies of scale in the roof replacement market is more difficult because, with the exception of major storms, rarely does an entire neighborhood require roof replacement at the same time.

4.2 Modeled Cost-Reduction Pathways

Our four modeled pathways explore the impact the cost-reduction opportunities from Section 4.1 could have on residential PV system costs compared with the Q1 2017 benchmark. For each market (roof replacement and new construction), a less-aggressive pathway represents savings due to an incremental shift from current market practices, and a visionary pathway represents savings due to a more dramatic shift. Table 2 characterizes each of the four modeled pathways

[6] The average number of housing units in a subdivision is from a 2014 National Association of Home Builders survey (Emrath 2014).

by market and magnitude of cost reductions realized (i.e., low and high). The remainder of this section discusses the pathways in more detail.

Table 2. Four Modeled Pathways by Market and Magnitude of Cost Reductions

	Pathway			
	Roof Replacement Market		New Construction Market	
Cost-Reduction Opportunity	Less Aggressive	Visionary	Less Aggressive	Visionary
Market Maturation	High	High	High	High
Business Model Integration	Low	High	Low	High
Product Innovation	Low	High	Low	High
Economies of Scale	NA	NA	Low	High

4.2.1 Roof Replacement Market

In the roof replacement market, the less-aggressive pathway models a solar company that maintains its own separate business but loosely partners with a roofing company. These two separate companies may share business leads and office space, but they are not fully integrated into a single company. In addition, the solar company continues to install traditional racked and mounted rooftop PV. Finally, this pathway does not yield a benefit from economies of scale, because PV installed during roof replacement is typically on a project-by-project basis.

In contrast, the visionary pathway represents a company that realizes the available cost-reduction opportunities more fully. A completely integrated roofing and solar company incorporates a low-cost integrated PV and roofing product (a low-cost roofing tile or some other innovative product) into all roof offerings. As with the less-aggressive pathway, economies of scale provide no savings in this pathway.

4.2.2 New Construction Market

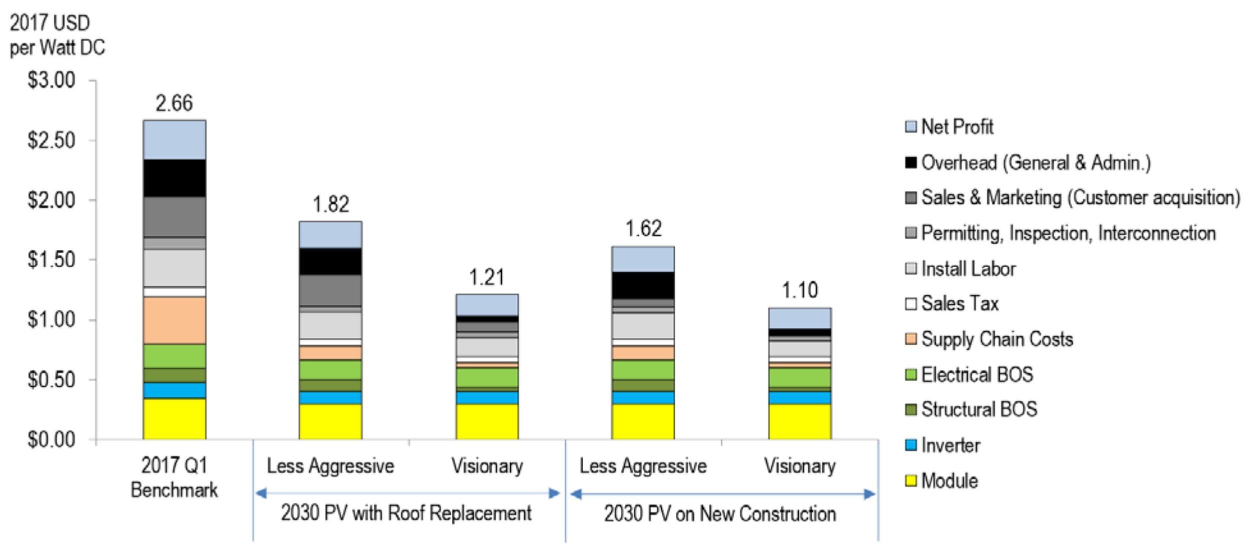
In the new construction market, the less-aggressive pathway is similar to its counterpart in the roof replacement market. The PV installer is only loosely affiliated with a homebuilder and may share office space with the homebuilder or roofing company (when the homebuilder subcontracts the roofing portion of new homes). The PV installer may also establish a formal partnership with a homebuilder, but it is not fully integrated into the construction process/business. The PV installer continues to install a traditional racked and mounted PV product and realizes some economies of scale; we assume the installer can leverage its partnerships with the housing industry to install PV on at least 25% of homes in a typical subdivision (i.e., 60 housing units, per Emrath 2014).

The visionary pathway, in contrast, assumes PV is fully integrated with the home design-build process from the start. It also assumes use of a low-cost integrated PV and roofing product as well as significant economies of scale due to installing PV on all new homes within a subdivision.

5 Cost-Reduction Results by Pathway

Figure 2 shows installed residential PV system prices for each of our modeled pathways in 2030, which all provide significant savings over the Q1 2017 benchmark (see Appendix B for detailed cost breakdowns and assumptions). Savings are largest in the supply chain, sales and marketing, overhead, and installation labor cost categories. Much of the supply chain savings result from the assumed market maturation that eliminates module price premiums related to historical inventory and small-scale procurement (potential savings of $0.27/Wdc); these savings are consistent across each of the pathways. The remaining three cost-reduction opportunities (business model integration, product innovation, and economies of scale) influence the PV system prices in each modeled pathway differently.

Because the two visionary pathways provide substantially larger cost savings compared with their less-aggressive counterparts, we present detailed cost-modeling results for these two pathways in Sections 5.1 and 5.2.



USD = U.S. dollars

Figure 2. Modeled installed residential PV system prices at time of roof replacement and new construction in 2030, compared with a weighted average of the Q1 2017 benchmark

5.1 Roof Replacement Market

The 2030 residential installed PV system price in our roof replacement visionary pathway is 55% lower than the Q1 2017 benchmark system price. Figure 3 breaks out the savings by cost category. The greatest savings are derived from the supply chain, sales and marketing, overhead, and installation labor categories.

Most supply chain efficiencies arise from market maturation (see Section 4.1.1). However, additional supply chain savings are realized under the visionary pathway relative to the less-aggressive pathway, because PV is integrated into the roofing material in the visionary pathway. This product integration would allow the PV and roofing material to be shipped together, thereby eliminating additional shipping costs. In contrast, the less-aggressive pathway assumes that companies continue to install traditional racked and mounted PV that is shipped and installed separately from the roof.

The full integration of a PV installer with a roofing company offers a significant sales and marketing benefit. Individuals invest in retrofitted PV systems voluntarily, but they typically replace their roofs owing to a specific requirement. Therefore, prospective customers may be more inclined to respond positively to PV marketing that is incorporated with a roof purchase, compared with the marketing of PV alone. At the same time, PV marketing could be integrated into existing roofing customer outreach, marketing, and advertising efforts at little or no additional cost. As a result, in the visionary pathway the fully integrated firm has a single sales and marketing budget to sell an integrated PV roofing product, which eliminates most customer acquisition costs (except for system design). In the less-aggressive pathway, we assume a solar company only loosely partners with a roofing company by, for example, sharing customer leads. In return for successful leads, the partner might receive a sales commission.[7] The savings achieved through this approach are substantially lower than the savings in the visionary case.

Similarly, fully integrating a PV installer with a roofing company yields significant overhead savings. A standalone solar company incurs typical overhead costs such as rent, office expenses, professional services, and software/information technology. Because the visionary pathway models an integrated solar and roofing business, these costs would be significantly reduced. Nevertheless, some additional costs would be associated with integration including acquiring PV or roofing expertise. In our model, we account for the costs of a roofing company acquiring PV expertise in the overhead category.

Installation labor costs are also reduced, owing to business model and product integration. Most conventional, racked and mounted rooftop PV systems can be installed by the same class of labor already employed by a roofing company,[8] and we assume that same labor class can be employed to install an integrated PV and roofing product. Combining roofing and PV installation activities creates synergies and logistic efficiencies that reduce truck rolls, crew-hours spent on site, and other direct transportation costs, such as fuel. The use of an integrated PV and roofing product in the visionary pathway also eliminates the labor required for racking and mounting installation, which provides additional labor cost savings over the less-aggressive pathway.

The roof replacement visionary pathway also benefits from savings in other cost categories. For example, the PII cost is reduced because we assume the PV permit cost declines to a standard $200 per system. Structural BOS savings are realized owing to the elimination of racking and mounting, in favor of the integrated product.

[7] Interview findings suggest a broad range of typical sales commissions, from $0.25/W to $1/W, in the current market, depending on the geographic region and pricing structure. For this analysis, we assume the commission is less than the cost of customer acquisition the solar company would otherwise incur working independently.
[8] Interviewees noted that, with appropriate training, many roofing installation crews today retain the level of expertise required to install the components of a PV system that are above the roof (e.g., racking, mounting, modules). However, most roofing companies would likely need to subcontract, or hire, an electrician to install PV system components such as electrical wiring and conduit.

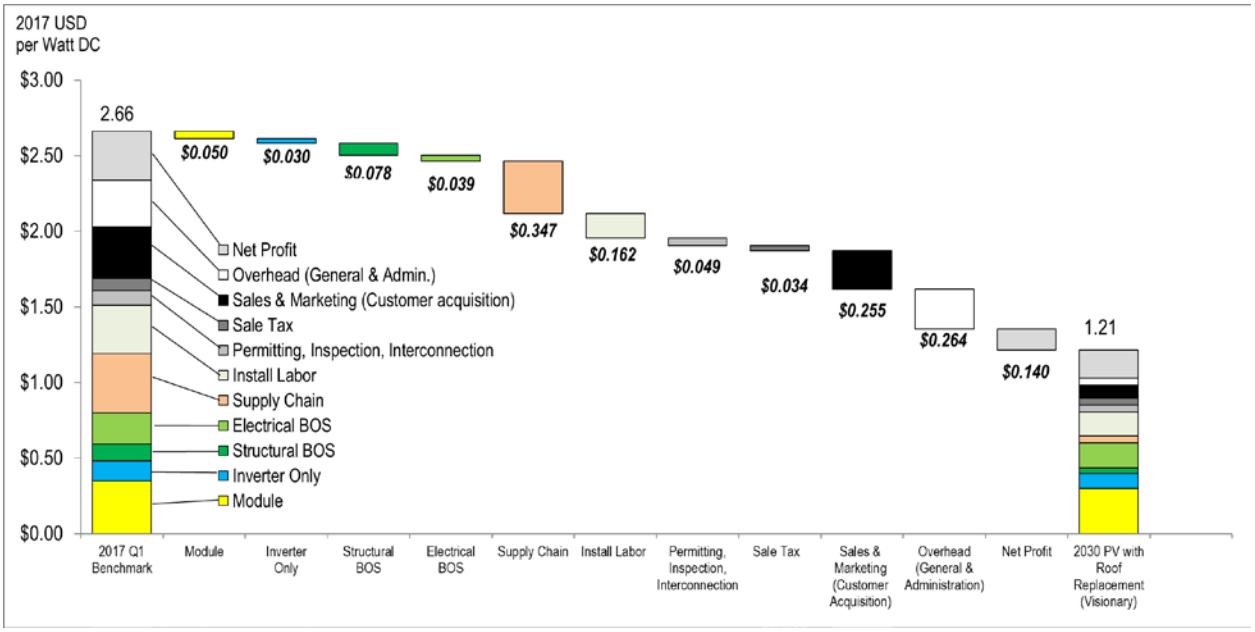


Figure 3. Cost reductions achieved by the roof replacement visionary pathway in 2030

5.2 New Construction Market

The 2030 residential installed PV system price in our new construction visionary pathway is 59% lower than the Q1 2017 benchmark system price (Figure 4), suggesting that installing PV on new homes could yield greater cost savings than installing it during roof replacement. The supply chain savings are the same for the two visionary pathways,[9] but the new construction visionary pathway achieves greater sales and marketing, installation labor, and PII savings, in part by leveraging economies of scale.

Sales and marketing costs are reduced in the new construction visionary pathway, because installing PV on every new home in a development eliminates customer acquisition costs that are currently typical for a retrofitted PV system, such as sales calls, site visits, customer outreach, and bid/pro-forma preparation. The roof replacement visionary pathway provides similar savings. However, installing PV on new homes provides additional savings via design and engineering standardization. Including standard PV system designs and sizes for each home floor plan reduces upfront engineering and design costs that would be incurred when completing a retrofitted PV installation of any kind.

Coordination and collaboration across construction and PV installation crews provides labor savings in both visionary pathways. However, the labor savings in the new construction pathway are greater, owing to economies of scale and the ability of PV installation crews to move readily across multiple co-located housing units.

PII savings are also greater in the new construction visionary pathway compared with the roof replacement visionary pathway, because integrating PV into the building permitting process

[9] Supply chain savings are the same in both visionary pathways because both pathways benefit from market maturation, as outlined in Section 4.1.1, and both incorporate installation of an integrated PV and roofing product.

required for the entire subdivision reduces PII costs per system. In addition, completing multiple new construction PV permits in succession results in savings associated with economies of scale.

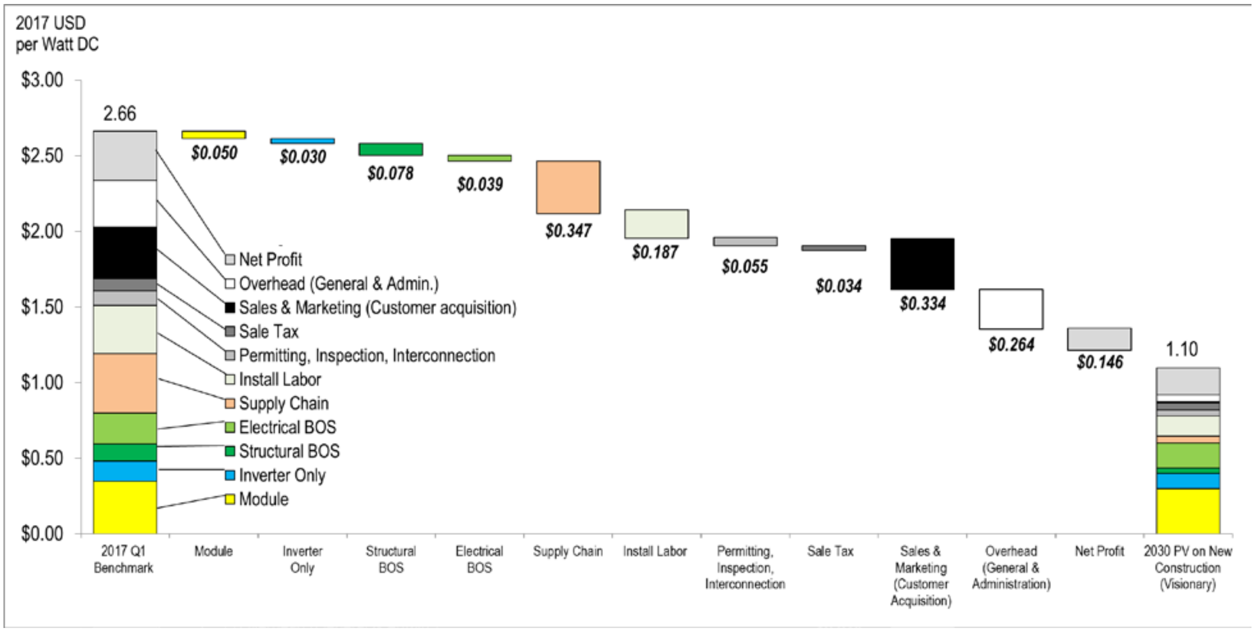


Figure 4. Cost reductions achieved by the new construction visionary pathway in 2030

5.3 Achieving the SETO 2030 LCOE Target

Installed-system prices are a key input for calculating residential PV's LCOE. Other parameters—such as lower operations and maintenance (O&M) costs, more favorable financing terms, and improved PV module performance—are also expected to contribute to declining LCOE through 2030 (Woodhouse et al. 2016). Here we combine our system price results with the other expected improvements to determine whether the SETO 2030 LCOE target can be achieved via our modeled pathways. We model an LCOE for the Q1 2017 benchmark based on the assumptions in Fu et al. (2017), and we model LCOEs for our four pathways based on our modeled system prices and key assumptions from Woodhouse et al. (2016) (Table 3).

As Figure 5 shows, the less-aggressive pathways could progress about 70%–80% toward the SETO 2030 LCOE target of 5 ¢/kWh. In contrast, the new construction visionary pathway achieves the target, and the roof replacement visionary pathway is slightly higher. Thus, our analysis suggests that moving toward a fully integrated roofing product and a fully integrated business model may be critical to achieving the SETO 2030 residential PV target.

Table 3. Assumptions for Calculating Residential PV LCOE

LCOE Cost Input (2017 USD/Wdc)	Q1 2017 Benchmark	2030 Pathways
Installed cost ($/W)	$2.66	Varies by pathway
Annual degradation (%)	0.75%	0.20%
Inverter replacement price ($/W)	$0.13	$0.10
Inverter lifetime (years)	15	30
O&M expenses ($/kw-year)	$21	$7
Pre-inverter derate (%)	90.50%	90.50%
Inverter efficiency (%)	98.00%	98.00%
System size (kWdc)	5.7	5.7
Inverter loading ratio	1.15	1.15
Real discount rate	6.9%	3.4%
Inflation rate	2.5%	2.5%
Debt interest rate	4.80%	4.80%
Debt fraction	40%	0%
Analysis period (years)	30	30

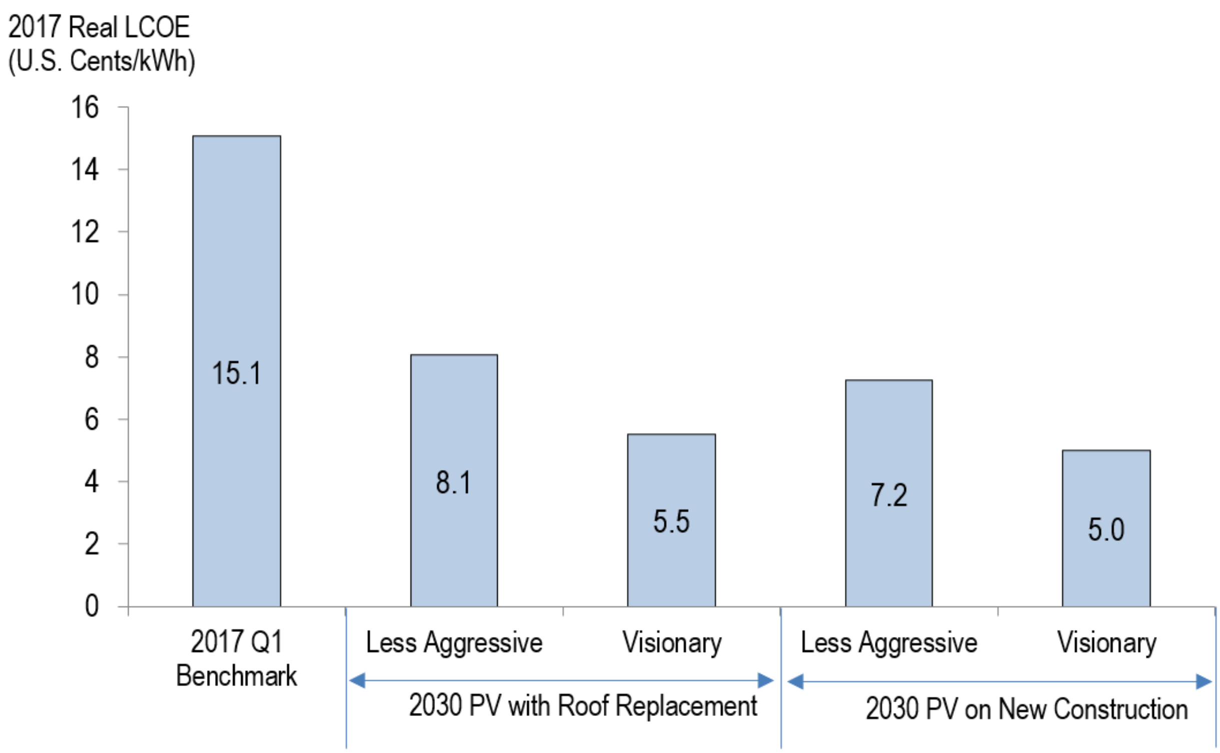


Figure 5. Modeled residential PV LCOE at time of roof replacement and new construction in 2030, compared with the LCOE for a weighted average of the Q1 2017 benchmark

In addition, reducing installed-system costs—particularly soft costs—likely will be critical to achieving the SETO 2030 target in either market. Figure 6 (roof replacement visionary pathway) and Figure 7 (new construction visionary pathway) compare the LCOE impacts of installed-system cost reductions with the impacts of improvements in other parameters. In both pathways, installed-system soft cost reductions account for roughly 65% of the savings in 2030. None of the other individual parameters account for more than 9% of the LCOE reductions.

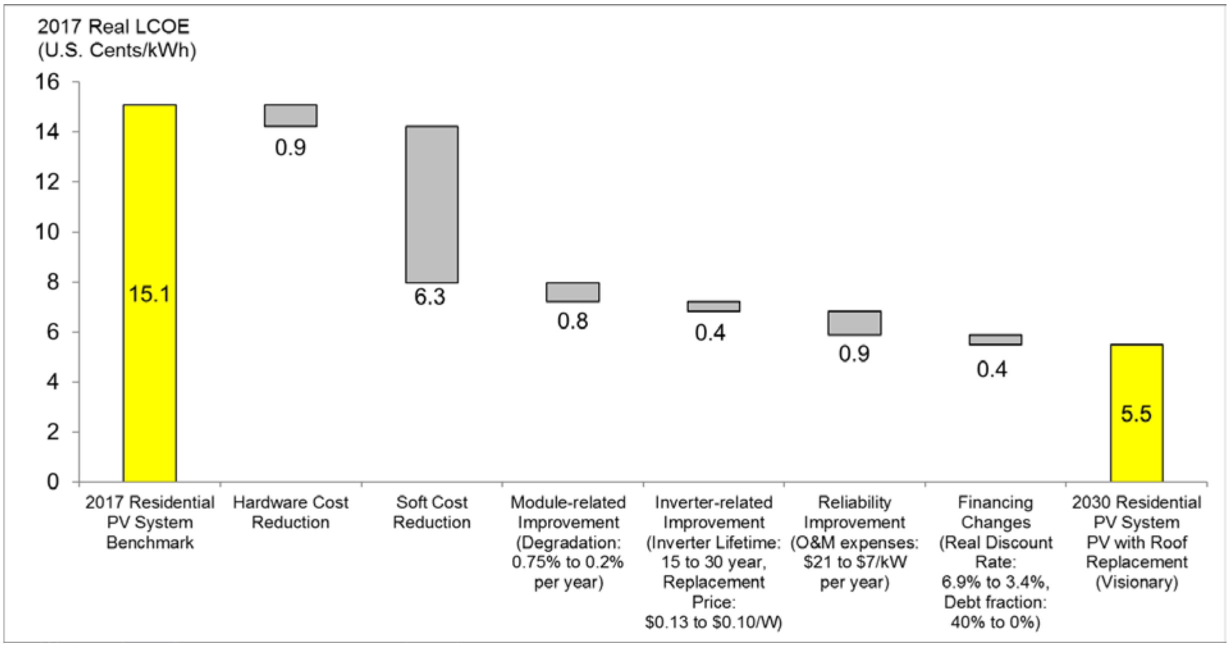


Figure 6. Modeled residential PV LCOE reductions for the roof replacement market visionary pathway in 2030, compared with the Q1 2017 benchmark

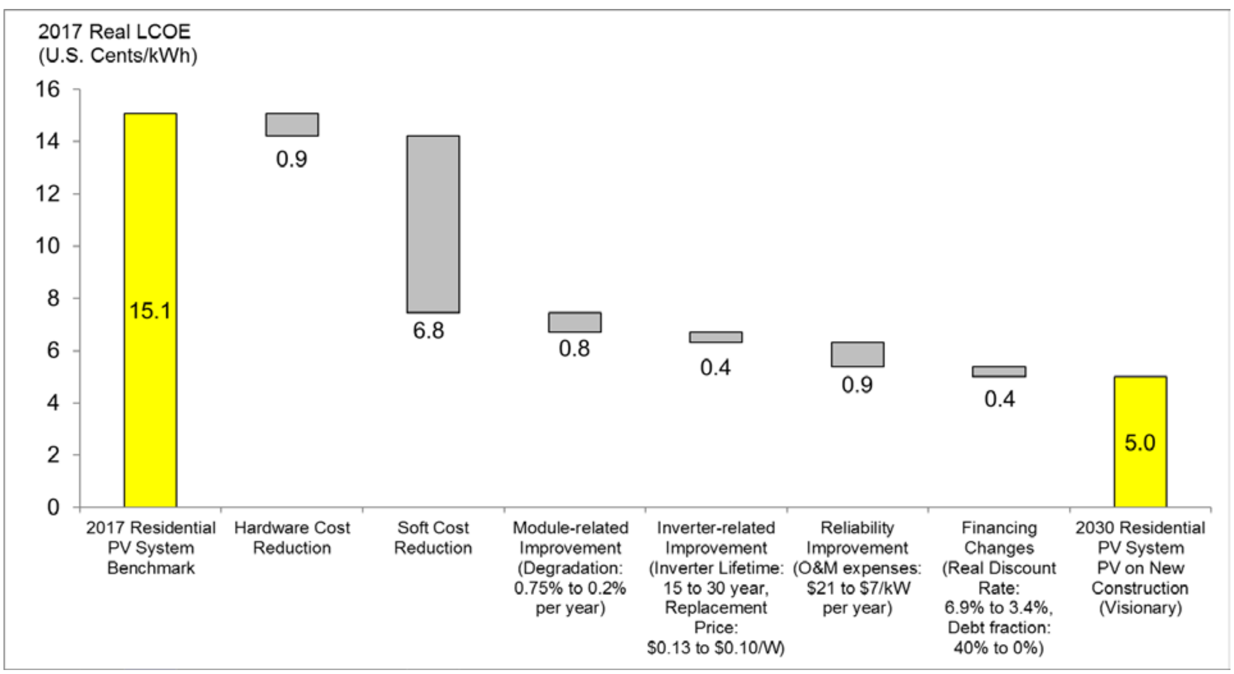


Figure 7. Modeled residential PV LCOE reductions for the new home construction market visionary pathway in 2030, compared with the Q1 2017 benchmark

6 Barriers and Considerations Related to Achieving the SETO 2030 Targets

Although we envision pathways toward ultra-low-cost residential PV in Section 5, our interviewees identified barriers and considerations that must be addressed to achieve these pathways. Here we examine these barriers and considerations in terms of the key cost-reduction opportunities. For two of these opportunities—market maturation and product innovation—the barriers and considerations are consistent across the roof replacement and new construction markets. For the other two opportunities—business model integration and economies of scale—barriers and considerations may differ between the markets.

6.1 Market Maturation

A significant portion of the supply chain cost reductions identified in our analysis is due to market maturation and a resulting narrowing of the gap between spot prices and wholesale prices. In part, this gap is an artifact of rapidly changing prices in a market with significant historical inventories and multiple transactions prior to the end user. As the U.S. PV market matures, we expect installers will be able to procure modules and other components more efficiently, thereby eliminating additional supply chain costs.

Interviewees suggested that the PV industry may reach maturity, as other commodity industries have, through a mix of consolidation and innovation in supply chain service. Some market consolidation is underway, and interviewees believed this trend will continue through 2030, particularly for equipment providers. At the same time, interviewees suggested the development of a diverse set of supply chain service providers that support PV installers will drive down procurement costs further, while increasing PV's value proposition. Interviewees pointed to existing service providers that partner with installers to reduce customer acquisition costs as a model for what is possible. In addition, various third-party service providers seeded by the DOE SETO Incubator Program (DOE 2017) already exist in the market.

If the PV industry reaches maturity, its practices could come to resemble those in other trades, with a robust installer market supported by more regional product dealer and service providers. However, realizing this future likely will require investment in developing new services and bringing them to market at sufficient scale to ensure profit and mass market appeal and to mitigate the procurement disadvantages of smaller purchasers. Currently, it is unclear whether the industry will mature enough to enable a wide variety of installers to procure modules at comparatively low markups. If the required maturation does not occur, the deep supply chain cost reductions we assume across all four pathways may not be achieved.

6.2 Product Innovation

Our two visionary pathways assume a low-cost integrated PV and roofing product is available by 2030, which would significantly reduce supply chain, installation labor, and permitting costs as the PV and roofing materials are shipped, installed, and permitted in unison. Whether integrated PV products can achieve lower costs and greater market share is uncertain at this time. If such a low-cost product does not materialize by 2030, our cost-reduction pathways would change.

Research and development of integrated PV products has been ongoing for years (James et al. 2011), and today there is renewed interest in integrated PV as new products come to market. Interviewees noted that early technology adopters are being drawn to new, integrated PV roofing materials at a price premium for the aesthetic value they provide. However, although many non-cost considerations affect the consumer decision-making process, integrated products must also be low-cost to appeal to a broad market.

Innovation will be required to develop low-cost integrated PV products. Interviewees noted that these custom products currently are produced on a smaller scale, require manufacturing process changes, and require more skill and time to install—all of which add costs. The lower efficiency of current integrated products also makes these products more expensive than conventional PV modules, because more integrated product is required to generate an equivalent amount of electricity. Robust design innovation that addresses these issues likely will be critical if integrated products are to capture significant market share through 2030.

6.3 Business Model Integration

Across both visionary pathways, business model integration is assumed to provide significant sales and marketing, overhead, labor, and PII cost savings that result in lower installed PV system prices. However, business model integration presents unique challenges for PV installed at the time of roof replacement and PV installed on new home construction.

6.3.1 Roof Replacement Market

Interviewees noted that the business models of solar and roofing companies are well aligned and that collaboration between these types of companies likely will increase. However, the need to have experienced solar sales professionals on staff can pose a barrier to roofing companies that want to sell PV directly to consumers. Several interviewees noted that the expertise required to sell PV effectively is significantly different from the expertise required to sell roofs. For example, solar sales professionals may be trained in residential utility rate structures and consumer load profiles, whereas roofers may not be trained in these areas. Therefore, roofing companies must train existing sales staff, or hire solar sales professionals, to sell PV and roofing products together effectively. At the same time, incorporating PV into a roof replacement may cost more than a roof replacement alone. Therefore, PV sales are not guaranteed, despite these investments.

Interviewees also suggested that improved PII processes are needed for solar-roofing companies to realize the full cost savings of business model integration. For example, under most authorities having jurisdiction (AHJs), a new roof and accompanying PV installation are treated as two individual projects for the purposes of permitting and inspection (even for integrated products). AHJs commonly require that, before commencement of PV installation, all permitting and inspection requirements for the new roof be completed, resulting in two distinct permitting packages and inspections. Combining the permitting and inspection processes for the new roof and PV installation would enable more timely and cost-efficient project completion. In addition, the lack of standardization in PV permitting, interconnection requirements, and fees across more than 18,000 AHJs and 3,000 utilities impedes installers' ability to deploy PV rapidly across numerous jurisdictions and utility territories (Grow Solar 2017, APPA 2017). Some states, including Vermont and Rhode Island, have adopted standardized PV permitting processes.

Others, such as New York and California, have directed AHJs to enact model standards. Despite this state-level progress, interviewees suggested that roofing companies may consider the lack of PV PII standardization as a financial risk, thereby deterring the expansion of product offerings to include PV.

6.3.2 New Construction Market

For solar companies that install PV on new housing developments, the target customer is the homebuilder, rather than the end user. This can result in significant sales and marketing savings over current business practices, because homebuilders likely will retain the same solar contractor across multiple developments. To date, most homebuilders do not incorporate PV into all new housing developments. Interviewees suggested that increased business model integration could be spurred by consumer interest, positing that, as homebuyers become familiar with PV's benefits, market demand for PV on new construction will increase. The effectiveness of this approach may be limited, however, because PV might compete with other home upgrades that provide higher revenue to homebuilders.

Interviewees suggested that favorable policy could enhance customer demand and foster more business model integration, highlighting various policy options that could achieve this goal. One common example was California's amended energy efficiency regulations under Title 24, which requires every new home be built to net-zero energy standards by 2020. Effective January 1, 2017, this amendment provided a compliance credit for PV that homebuilders can use to meet Title 24 net-zero energy requirements. Interviewees cited California's Title 24 amendment as a catalyst for PV on new construction, because PV can be more cost-effective than certain energy efficiency measures.

The presence of favorable policy alone, however, is unlikely to capture the full savings potential of business model integration. In California, when homebuilders incorporate PV into new construction as a Title 24 compliance measure, the PV can be included in the master building permit. Interviewees cited PII challenges with this approach. In this scenario, the master building permit serves as an umbrella permit for the entire house, so delays in PV PII can slow construction of the entire project. Similarly, changes made to the PV system design after the master building permit has been submitted would require revision and resubmittal of the entire permitting package. Interviewees suggested that allowing more flexibility for PV systems in the master building permit could address these concerns.

In addition, interviewees noted that solar partners often are not involved in the design of housing developments, which can impede the solar and new construction industries from realizing the full potential of collaboration. For example, when the PV installer is excluded from the housing development planning process, it has limited ability to co-optimize system design and roof layout, or take advantage of streamlined wiring and conduit with PV-ready housing designs. As PV becomes more common on new housing developments and consumers request maximum solar benefits, builders may be more inclined to consider solar exposure in building designs.

Finally, in the new construction market, PV engineers must design and size systems without the benefit of homeowner electricity-use data, which could result in standard system designs that are smaller than would otherwise be installed for a residential retrofit.[10] These smaller system sizes may not maximize consumer benefits, but they may enable PV installers to meet strict building construction and permitting timelines. Interviewees suggested that the development and widespread use of software to model plug loads may help engineers size systems more effectively.[11] This and other innovations in the new construction market will likely be necessary to capture all of the cost savings associated with business model integration.

6.4 Economies of Scale

Although our pathways consider cost reductions associated with economies of scale only for the new construction market, the roof replacement market might see some benefits from this approach by 2030. For example, some interviewees suggested that a company could offer customers the option to defer a PV installation and roof replacement for several weeks at a reduced price to enable the pooling of customers in a particular area, thus maximizing the efficiency of crew logistics and truck rolls. However, many individuals requiring roof maintenance may not be able to wait for roof replacement, which limits this option.

In the new construction market, the modeled cost savings from economies of scale are highly uncertain. Alternative business models, construction timelines, project sizes, and workforce management may diminish or enhance our projected cost savings. Furthermore, company size can greatly influence a homebuilder's ability to maximize the benefits of economies of scale. For example, companies that construct fewer than 20 homes annually are unlikely to achieve the same level of process and pricing efficiencies as a company that builds hundreds of homes each year. There may also be increased costs associated with permitting challenges and delays when adopting PV on multiple properties, which would impact modeled savings. Conversely, economies of scale could influence more cost categories than installation labor, sales and marketing, and PII costs as modeled in this analysis (see Appendix B). Therefore, although the industry is likely to experience some benefit from economies of scale, the scope and timeline of these savings are unclear.

[10] Interviewees cited PV system sizes of 2kW–3 kW as common for new housing construction, smaller than NREL's assumed average U.S. residential retrofit size of 5.7 kW.
[11] Future home energy demand may be influenced by increasing energy efficiency and electrification. Given the uncertainty surrounding these countervailing trends, optimizing PV systems according to a standard size will likely pose a challenge through 2030.

7 Conclusion

We project that 3.3 million residential roofs will be replaced or built each year in the continental United States from 2017–2030, representing a significant market opportunity for residential rooftop PV installers. These two market segments also present considerable rooftop PV cost-reduction opportunities, including four key opportunities that we analyze: market maturation, product innovation, business model integration, and economies of scale.

We apply various combinations of these cost-reduction opportunities to model four pathways to low-cost residential PV in 2030: less-aggressive and visionary pathways in the roof replacement market, and less-aggressive and visionary pathways in the new home construction market. We find that the two visionary pathways—which maximize the savings potential from the four cost-reduction opportunities—could meet or nearly meet the SETO 2030 residential PV target. Specifically, the new construction visionary pathway achieves the 5 ¢/kWh LCOE target, and the roof replacement visionary pathway almost achieves it.

Our analysis has two key implications. First, because installed-system soft cost reductions account for about 65% of the LCOE reductions in 2030 for both visionary pathways, residential PV stakeholders may need to emphasize these soft cost reductions to achieve the 2030 target. Second, capturing these savings will likely require considerable innovation in the technologies and business practices employed by the PV industry.

There are various challenges to achieving the necessary innovations. For example, business model integration, particularly across solar and roofing companies, is critical to reducing the significant sales, marketing, labor, and overhead costs associated with the current PV retrofit business model. This type of business model integration will likely require increased education and cross-training for PV installers, roofers, and homebuilders. At the same time, homebuilders, PV installers, and roofing companies will likely require clear examples of the benefits of business model integration before embracing it widely.

Extensive use of fully integrated PV and roofing products is also crucial to our modeled pathways. However, although integrated products have been, or are being developed, significant investments in research, development, time, and effort will be required to produce the type of low-cost integrated product envisioned in our analysis.

Finally, achieving economies of scale throughout the PV supply-installation chain is important for achieving our pathways. Additional research is needed to clarify the cost savings that economies of scale could provide, especially because of the considerable PII hurdles that must be addressed to realize these benefits.

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Appendix A: Quantifying Residential PV Potential from 2017–2030

The technical potential for residential rooftop PV from 2017–2030 in the rooftop replacement and new construction markets will be influenced by a wide variety of factors, such as population growth and consumer decisions. Our analysis is meant to generate plausible estimates of PV potential for the two segments by state, but we acknowledge the uncertainties related to market development over the analysis period.

Determining the technical potential of the roof replacement market is the most challenging owing to the impacts of roofing materials and climate on roof replacement timelines. For example, asphalt and composite shingles have an average lifetime of 25 years, whereas a properly maintained ceramic tile roof may last 70 years in a dryer climate, or 35 years in a wetter climate, before needing substantial maintenance (Table 4).

As a result, quantifying rooftop PV potential in this segment requires attention to the age of the home, its roofing material, and its location. The U.S. Energy Information Administration (EIA 2017b) tracks the type and age of residential housing stock by census region in the 2015 Residential Energy Consumption Survey (RECS). The focus of this analysis is on the single-family detached home market, which represents 73.9 million homes or about 63% of residential buildings in the United States (EIA 2017b). RECS tracks the age of this housing stock by census sub-region and decade from 1950–2015. These data are disaggregated into yearly builds using a time-series approach. There are 20.8 million homes, or about 28% of single-family detached housing, built before 1950. To incorporate this housing stock into our analysis, we assume that all these older houses were built between 1940 and 1949; much of this housing was likely built earlier than 1940, but this assumption enables us to consider older homes in our analysis of roof replacement schedules.

RECS tracks the market penetration of certain residential roofing materials by census region, and we use these data and the age of housing stock to estimate roof replacement schedules. Overall, shingles (composite or asphalt) are the most common residential roofing material used in the United States, followed by metal, wood, and ceramic or clay tiles (Figure 8). The percentage of the market captured by each roofing material varies regionally, and this variation relates to the impact different climates can have on roofing materials. For example, in very hot and dry climates, clay tiles perform better and can last much longer than asphalt or composition shingles. Thus, although ceramic or clay tiles cost more than traditional shingles do, they capture a larger market share in the West than in other regions (Figure 8).

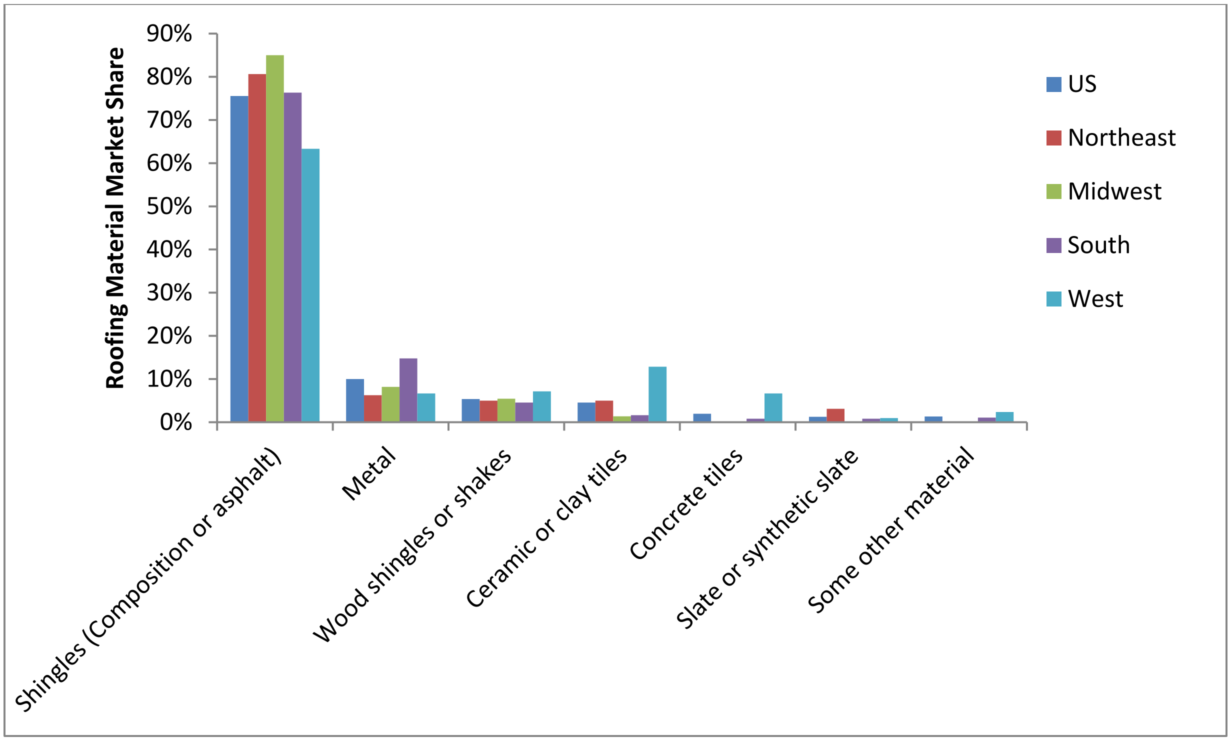

Figure 8. Residential roofing material market penetration nationally and by census region, 2015 (adapted from EIA 2017b)

Although RECS tracks roofing material penetrations regionally, it does not break out roofing material by housing type (single-family homes vs. apartment buildings, etc.). Thus, we apply the regional roofing material market penetrations (as reflected in Figure 8) proportionally to all single-family detached homes by state. In addition, RECS does not track roofing material penetrations based on building stock age. Finally, EIA does not have historical data on roofing material composition prior to 2009. This is problematic because roofing material composition and lifetimes have evolved over time, which can impact when existing homes are likely to require roof replacement. Nevertheless, to provide an estimated timetable for roof replacement, we assume that every home has had the same roofing material composition reflected in the 2015 RECS survey throughout its life. We then assume each roof is replaced in accordance with the current roofing material lifetimes listed in Table 4, which are based on InterNACHI (2017) and interviewee input.

Table 4. Vetted Estimates of Roofing Material Lifetimes by Type and, in Some Instances, Region

Roofing Material	Vetted Lifetime (years)	Regional Variation
Shingles (Asphalt or Composition)	25	
Metal	60	
Wood	25	
Ceramic or Clay	35 or 70	In wet climates (Northeast, South, and Midwest), underlayment likely needs to be replaced about every 35 years; in dryer climates (West), 70 years.
Concrete	35 or 70	In wet climates (Northeast, South, and Midwest), underlayment likely needs to be replaced about every 35 years; in dryer climates (West), 70 years.
Slate	100+	
Synthetic Slate	70	
Other Material*	25	

* "Other material" roof lifetimes can vary by region. For this analysis, roofs on all homes with this material are assumed to last 25 years. In general, roofing lifetimes can vary significantly based on installation quality, material quality, proper maintenance, climate, and homeowner decision-making.

We use this method to estimate a roof replacement schedule for each single-family detached home by state. Not all existing homes are suitable for PV owing to shading or lack of sufficient roof space, among other barriers. Gagnon et al. (2016) estimate the percentage of unsuitable homes by state, and we remove these homes from our analysis accordingly. We then tally the remaining homes expected to require a roof replacement from 2017–2030 and average them to provide an annual estimate by state.

We apply two approaches to translate roof replacements into residential PV technical potential by state. The first is the most aggressive and assumes that each roof replacement maximizes PV deployment; for this we use the estimates of maximum residential PV potential by state made by Gagnon et al. (2016). Although maximizing PV capacity and thus generation may become more common in the future, today residential PV system sizes are smaller, at about 5 kW. Therefore, we include a second estimate based on this smaller system size to offer a more conservative estimate of PV potential. We average the estimated potential capacities across the study period to calculate an annual average market potential in GW. To estimate generation, we apply average PV capacity factors by state.

Because our analysis makes several important assumptions that likely do not reflect the true roof replacement market, the results should only be considered a rough approximation. Table 5 shows our key assumptions for the roof replacement market by state.

Table 5. Key Assumptions for the Roof Replacement Market by State (2017–2030)

State	Potential Retrofits	PV Suitability	Suitable Retrofits	Annual Average Retrofits	Annual Capacity (GW) Conservative	Annual Capacity (GW) Aggressive
AK*						
AL	608,912	83%	507,630	36,259	0.18	0.36
AR	341,961	83%	284,902	20,350	0.10	0.20
AZ	738,185	81%	599,087	42,792	0.21	0.42
CA	3,862,123	88%	3,391,722	242,266	1.21	2.44
CO	691,011	74%	510,763	36,483	0.18	0.27
CT	466,030	75%	350,999	25,071	0.13	0.23
DC	79,004	81%	63,699	4,550	0.02	0.04
DE	110,424	79%	86,936	6,210	0.03	0.06
FL	2,390,697	91%	2,174,105	155,293	0.78	1.69
GA	1,195,830	80%	956,628	68,331	0.34	0.64
HI*						
IA	510,506	82%	419,613	29,972	0.15	0.28
ID	209,919	74%	154,377	11,027	0.06	0.10
IL	2,005,142	83%	1,655,400	118,243	0.59	1.09
IN	1,038,954	83%	859,804	61,415	0.31	0.59
KS	473,472	83%	393,260	28,090	0.14	0.26
KY	555,533	80%	445,691	31,835	0.16	0.29
LA	535,747	89%	477,248	34,089	0.17	0.36
MA	887,611	73%	648,125	46,295	0.23	0.47
MD	697,807	82%	570,428	40,745	0.20	0.36
ME	173,499	73%	126,369	9,026	0.05	0.10
MI	1,555,098	79%	1,225,989	87,571	0.44	0.80
MN	898,962	76%	682,085	48,720	0.24	0.41
MO	992,286	83%	823,450	58,818	0.29	0.54
MS	374,205	85%	317,710	22,694	0.11	0.22
MT	130,022	72%	94,250	6,732	0.03	0.07
NC	1,176,857	80%	946,927	67,638	0.34	0.64
ND	123,438	75%	92,841	6,632	0.03	0.07
NE	310,587	82%	254,375	18,170	0.09	0.16
NH	173,931	73%	126,429	9,031	0.05	0.10
NJ	979,361	78%	762,692	54,478	0.27	0.49

NM	221,636	84%	186,465	13,319	0.07	0.13
NV	313,127	73%	228,637	16,331	0.08	0.12
NY	2,161,981	79%	1,714,884	122,492	0.61	1.17
OH	1,819,193	81%	1,472,236	105,160	0.53	0.95
OK	448,993	87%	392,149	28,011	0.14	0.29
OR	402,789	80%	322,603	23,043	0.12	0.23
PA	1,399,790	80%	1,125,999	80,429	0.40	0.78
RI	137,658	77%	106,555	7,611	0.04	0.06
SC	575,406	83%	477,911	34,137	0.17	0.33
SD	140,945	81%	113,771	8,127	0.04	0.08
TN	832,766	81%	675,044	48,217	0.24	0.47
TX	3,188,461	89%	2,852,544	203,753	1.02	2.04
UT	380,544	72%	275,728	19,695	0.10	0.18
VA	975,628	80%	776,724	55,480	0.28	0.51
VT	81,388	74%	60,446	4,318	0.02	0.05
WA	717,125	75%	535,318	38,237	0.19	0.38
WI	905,136	79%	719,496	51,393	0.26	0.48
WV	212,377	76%	160,544	11,467	0.06	0.11
WY	73,023	79%	57,610	4,115	0.02	0.04
Total	39,275,078		32,258,199	2,304,157	11.52	22.13

* Alaska and Hawaii are not included in this analysis, because there were insufficient data to determine PV capacity potential in the Gagnon et al. (2016) data set.

Estimating the PV potential for the new construction market relies on a different methodology. EIA (2015) models new single-family detached housing builds by census region across five scenarios in the 2015 Annual Energy Outlook. Of the five scenarios, the reference case is considered the base case, and we use this case to determine the total new, single-family detached homes built across each state.[12]

As we do for the roof replacement market, we assume that not all new homes will be suitable for PV,[13] and we use the same suitability rates for the existing housing market to determine PV potential through 2030. We sum the total suitable homes by state and average them to calculate yearly builds. Then we apply the same capacity and generation methods used in the roof replacement analysis. Table 6 shows our key assumptions for the new construction market by state.

[12] The Annual Energy Outlook reference case data were disaggregated to each state using the University of Virginia's state population projections http://demographics.coopercenter.org/national-population-projections/, and then the growth was projected through 2030 using a time-series approach.
[13] It is possible that all new homes could be designed to maximize PV access, thereby increasing the market estimate for this sector.

Table 6. Key Assumptions for the New Construction Market by State (2017–2030)

State	New Homes	PV Suitability (%)	Suitable Homes	Annual Average Builds	Annual Capacity (GW) Conservative	Annual Capacity (GW) Aggressive
AK*						
AL	294,539	83%	245,547	17,539	0.09	0.17
AR	255,608	83%	212,958	15,211	0.08	0.15
AZ	505,167	81%	409,977	29,284	0.15	0.29
CA	1,358,154	88%	1,192,733	85,195	0.43	0.86
CO	378,232	74%	279,571	19,969	0.10	0.15
CT	117,358	75%	88,390	6,314	0.03	0.06
DC	37,286	81%	30,062	2,147	0.01	0.02
DE	64,885	79%	51,084	3,649	0.02	0.04
FL	1,428,220	91%	1,298,827	92,773	0.46	1.01
GA	724,527	80%	579,600	41,400	0.21	0.39
HI*						
IA	143,830	82%	118,222	8,444	0.04	0.08
ID	116,789	74%	85,888	6,135	0.03	0.06
IL	394,359	83%	325,574	23,255	0.12	0.21
IN	202,878	83%	167,895	11,992	0.06	0.11
KS	141,906	83%	117,866	8,419	0.04	0.08
KY	264,373	80%	212,100	15,150	0.08	0.14
LA	375,928	89%	334,880	23,920	0.12	0.25
MA	214,412	73%	156,562	11,183	0.06	0.11
MD	406,993	82%	332,700	23,764	0.12	0.21
ME	44,019	73%	32,062	2,290	0.01	0.02
MI	297,961	79%	234,902	16,779	0.08	0.15
MN	270,072	76%	204,917	14,637	0.07	0.12
MO	298,758	83%	247,924	17,709	0.09	0.16
MS	180,362	85%	153,132	10,938	0.05	0.11
MT	68,828	72%	49,892	3,564	0.02	0.03
NC	700,127	80%	563,339	40,239	0.20	0.38
ND	31,571	75%	23,745	1,696	0.01	0.02
NE	89,718	82%	73,480	5,249	0.03	0.05
NH	46,194	73%	33,578	2,398	0.01	0.03
NJ	205,013	78%	159,657	11,404	0.06	0.10

NM	151,803	84%	127,714	9,122	0.05	0.09
NV	222,332	73%	162,341	11,596	0.06	0.09
NY	439,413	79%	348,542	24,896	0.12	0.24
OH	347,958	81%	281,596	20,114	0.10	0.18
OK	326,080	87%	284,797	20,343	0.10	0.21
OR	137,101	80%	109,808	7,843	0.04	0.08
PA	284,704	80%	229,018	16,358	0.08	0.16
RI	34,138	77%	26,425	1,888	0.01	0.02
SC	332,674	83%	276,307	19,736	0.10	0.19
SD	40,175	81%	32,429	2,316	0.01	0.02
TN	405,016	81%	328,308	23,451	0.12	0.23
TX	2,385,145	89%	2,133,861	152,419	0.76	1.53
UT	211,120	72%	152,969	10,926	0.05	0.10
VA	576,842	80%	459,239	32,803	0.16	0.30
VT	20,978	74%	15,580	1,113	0.01	0.01
WA	246,959	75%	184,349	13,168	0.07	0.13
WI	179,334	79%	142,553	10,182	0.05	0.09
WV	115,236	76%	87,111	6,222	0.03	0.06
WY	38,660	79%	30,500	2,179	0.01	0.02
Total	16,228,560		13,430,512	959,322	4.80	9.31

* Alaska and Hawaii are not included in this analysis, because there were insufficient data to determine PV capacity potential in the Gagnon et al. (2016) data set.

Appendix B: Detailed Cost Modeling Results and Assumptions

To understand the opportunity for achieving ultra-low PV system costs by 2030, we model four cost-reduction pathways. Each pathway was developed by adjusting system cost inputs based on the four key cost-reduction opportunities. Table 7 compares the system costs for each of the four modeled pathways in relation to the Q1 2017 benchmark.

Three of the 11 categories are not impacted by the cost-reduction pathways referenced in this study, including module, inverter, and electrical BOS. Nevertheless, we model savings from the Q1 2017 benchmark in 2030 for each of these categories. The cost savings for hardware (i.e., module and inverter price reductions) are driven by expected savings from technology advances through 2030 as outlined in Woodhouse et al. (2016). Electrical BOS is also reduced 15% to represent assumed incremental savings in wiring and electrical equipment needed for PV through 2030.

Six of the 11 categories are influenced directly by the cost-reduction opportunities envisioned in this report, and the key assumptions behind these modeled savings are discussed in turn here. Structural BOS costs for both less-aggressive pathways see a 10% reduction from current costs due to incremental improvements in racking. In contrast, the visionary pathways see a 64% reduction in these costs, because racking costs are eliminated with use of an integrated product.

Supply chain costs are reduced by 69% in both less-aggressive scenarios due to eliminating module price and inventory markups. The visionary pathways provide additional savings totaling 87% lower than the Q1 2017 benchmark due to removing shipping costs associated with PV, which are expected to be absorbed by shipping an integrated roofing and PV product.

Direct labor installation costs are reduced by 28%–59% from the Q1 2017 benchmark. The lower end of the savings spectrum is based on incremental installation labor savings paired with collaboration between roofing and PV contractors. The higher end assumes that a PV division is integrated with a homebuilder, enabling one team to install PV and roofs on new construction, with additional savings from economies of scale.

PII cost savings for the roof replacement market result from streamlining permitting fees from $400 in the Q1 2017 Benchmark to $200 in 2030. Economies of scale savings further reduce PII costs for both pathways in the new construction market; these two pathways see slight variation in savings resulting from the assumption that, in the visionary case, a company installs PV on all new homes and thereby maximizes economies of scale, whereas, in the less-aggressive case, a company distributes PII costs across fewer installations. Even so, this savings is so small it is lost in rounding.

The sales and marketing category is most heavily influenced by the business model integration opportunity. In the roof replacement market, the less-aggressive pathway represents a scenario in which a solar company partners with a roofing company to conduct some sales and marketing. For the visionary pathway, the expectation is that all sales and marketing costs are integrated with an existing marketing budget from the roofing company. The new construction market is generally similar. In the less-aggressive pathway, savings are associated with a solar company partnering with a homebuilder. In the visionary pathway, PV is integrated, or closely aligned with, a homebuilder's core business. However, the sales and marketing costs for both new construction pathways are lower than the costs for both roof replacement pathways, because the new construction market pathways benefit from reduced design costs due to PV installers having upfront involvement in new home design. The cost variation between the two new construction pathways reflects the higher economies of scale benefit in the visionary pathway compared with the less-aggressive pathway.

The overhead category is predominantly influenced by business model integration. The two less-aggressive pathways leverage the benefit of partnerships with roofing companies as well as incremental cost savings. The two visionary pathways realize the largest overhead savings, because PV is integrated into or closely aligned with a roofing or housing company, requiring little additional overhead.

Finally, the sales tax and profit categories vary by pathway. These values are fixed percentages of the previous cost categories. Thus, this variation results from the method employed as opposed to any direct impact from the cost-reduction pathways.

Table 7. Comparison of Modeled Costs by Category and Pathway in $/Wdc (Percentage Reduction from Q1 2017 Benchmark)

Cost Category	Q1 2017 Benchmark	Roof Replacement Market		New Construction Market	
		Less Aggressive	Visionary	Less Aggressive	Visionary
Module price	$0.35	$0.30 (-14%)	$0.30 (-14%)	$0.30 (-14%)	$0.30 (-14%)
Inverter price	$0.13	$0.10 (-23%)	$0.10 (-23%)	$0.10 (-23%)	$0.10 (-23%)
Structural BOS	$0.11	$0.10 (-10%)	$0.04 (-64%)	$0.10 (-10%)	$0.04 (-64%)
Electrical BOS	$0.20	$0.17 (-15%)	$0.17 (-15%)	$0.17 (-15%)	$0.17 (-15%)
Supply chain costs	$0.39	$0.12 (-69%)	$0.05 (-87%)	$0.12 (-69%)	$0.05 (-87%)
Sales tax	$0.08	$0.06 (-25%)	$0.05 (-38%)	$0.06 (-25%)	$0.05 (-38%)
Direct installation labor	$0.32	$0.23 (-28%)	$0.16 (-50%)	$0.22 (-31%)	$0.13 (-59%)
Permitting, inspection, and interconnection (PII)	$0.10	$0.05 (-50%)	$0.05 (-50%)	$0.04 (-60%)	$0.04 (-60%)
Sales & marketing (customer acquisition)	$0.34	$0.26 (-24%)	$0.09 (-74%)	$0.07 (-79%)	$0.01 (-97%)
Overhead (general & administrative)	$0.31	$0.22 (-29%)	$0.04 (-87%)	$0.22 (-29%)	$0.04 (-87%)
Profit (%)	$0.32	$0.22 (-31%)	$0.18 (-44%)	$0.22 (-31%)	$0.18 (-44%)
Total	$2.66	$1.82 (-32%)	$1.21 (-55%)	$1.62 (-39%)	$1.10 (-59%)

PERMIT POWER

As Cheap as Our Peers

How cutting red tape can lower the cost of rooftop solar and offset rising utility bills

AUTHOR: Talor Gruenwald

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Permit Power is a nonprofit organization making it cheap and easy for American families to power their lives. We do research, education, and advocacy to break down the bureaucratic barriers that get in the way of American families installing rooftop solar, home batteries, and other energy upgrades.

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Executive Summary

In the US, the price tag of residential rooftop solar and batteries is expensive relative to other countries. At a median of $28,000 for a 7 kilowatt (kW) system[1], solar in the US is up to seven times more costly to install than Australia and Germany at $4,000[2] and $10,000[3], respectively, resulting in a difference of $18,000 to $24,000 per project. These prohibitively high costs serve as a significant impediment to adoption, where less than one in ten families in the US have rooftop solar[4] compared to one in three in Australia.[5]

At the same time, Americans are facing a growing energy affordability crisis. Utility bills have risen faster than inflation since 2022[6], and are set to continue to rise as utilities request record increases in rates from regulators.[7] As a result, 1 in 7 households are living in energy poverty.[8] Yet today, most Americans are unable to afford rooftop solar to help them cut their energy costs, even though rooftop solar could reduce electricity bills by over 80 percent.[9]

Bureaucratic barriers are some of the primary drivers of high residential rooftop solar costs. In particular, the onerous rooftop solar permitting, inspection and interconnection processes in many areas in the US can add tens of thousands of dollars in direct and indirect costs to each installation.[10]

Bureaucratic barriers driving high residential solar costs

If rooftop solar was as cheap as our peers. By 2040:

18.2m
more families installing solar

$1,600
average annual bill savings

$1.2t
lifetime savings across all households installing solar

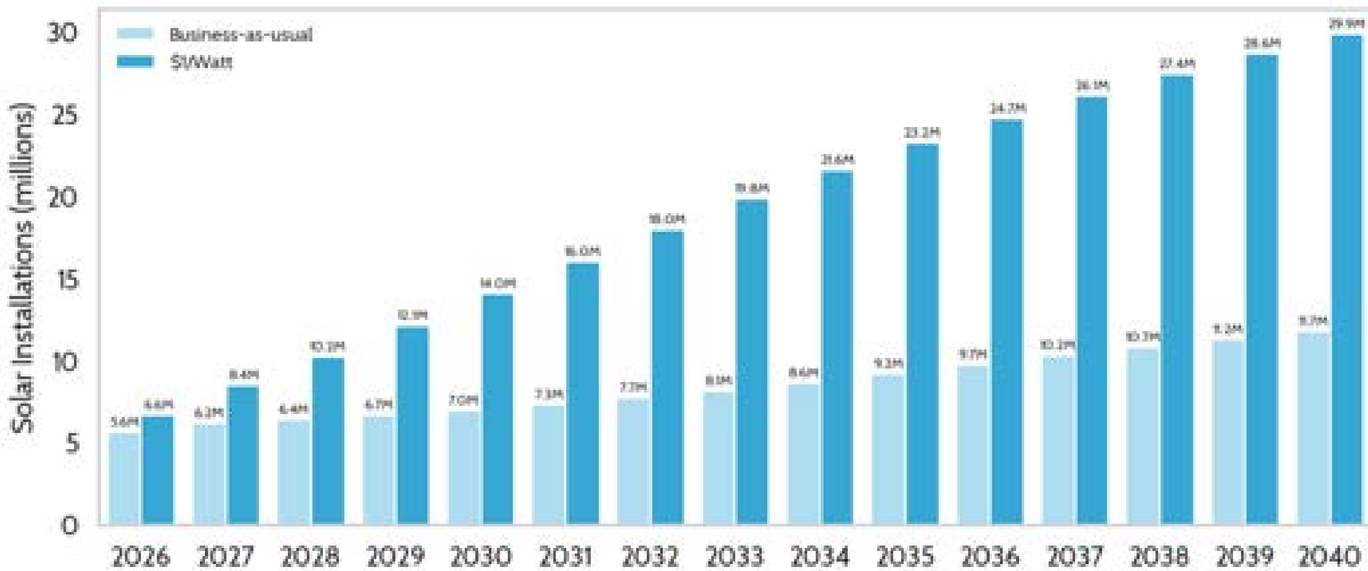
198.2GW
more installed residential rooftop solar capacity

With the passage of the One Big Beautiful Bill Act (OBBBA), residential rooftop solar will become even more expensive after the investment tax credit ends in 2027, putting these cost-saving investments out of reach for even more American families. Wood Mackenzie projects residential solar installs will fall by 46 percent through 2030[11]. This market context makes it all the more imperative to find ways to lower costs and enable households to install rooftop solar.

This report models the additional installations, utility bill savings, and generating capacity that would be realized if decision-makers took action to cut red tape and bring the cost of solar down to where it stands in peer countries. This report finds that, by 2040, total installed prices at levels seen in other countries around the world would yield the following over a business-as-usual scenario:

- 18.2 million more families installing solar – a 155 percent increase
- Annual bill savings of $1,600 for the average family
- An average of $56,000 in savings over the 25-year lifetime of a solar PV system, translating into $1.2 trillion in savings across all households installing solar
- 198.1 GW more installed residential rooftop solar capacity[12]

Figure 1. Solar adoption almost triples by 2040



To lower the price tag for home solar and realize these benefits, policymakers should streamline the permitting, inspection, and utility interconnection processes, including:

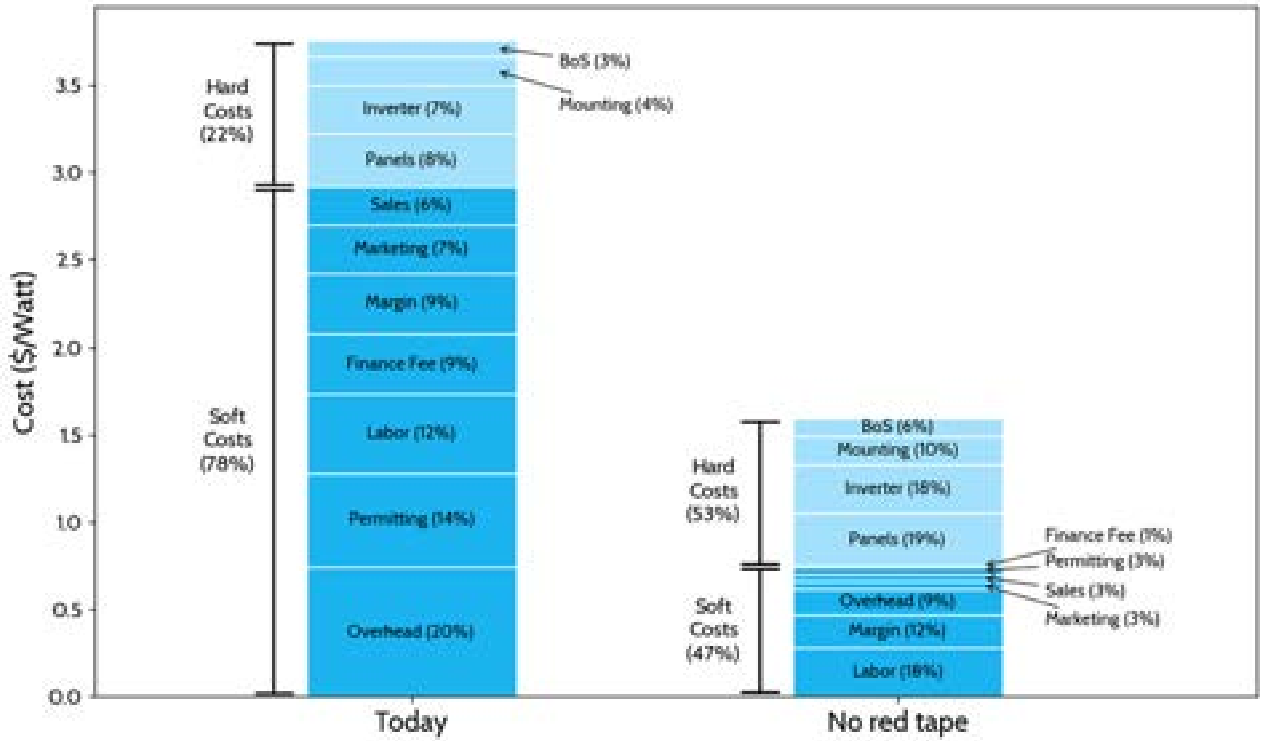
- Adoption of **instant permitting** software or qualified third party permitting to issue instant permits for standard residential solar and battery projects.
- Use of **remote inspection protocols** that allow code compliance to be verified through photos or video submissions for routine residential installations.
- Implementation of **automatic utility interconnection** approvals for qualifying residential systems that use smart inverters and meet established technical screens.
- Updating outdated local government and utility requirements that mandate the installation of unnecessary and expensive hardware, and prevent the use of modern cost-saving technology.

These and other policies to **cut red tape would provide the foundation to allow costs to fall into line with peer countries and 23 percent of US households to get rooftop solar by 2040** compared to 7 percent today.[13] These additional families adopting cheap solar would see their bills decline by 61% on average, an enduring relief from electricity rates that have risen and are projected to continue rising in many areas of the country.

Background: How red tape increases costs

78% of the total installed cost for residential rooftop solar is soft costs

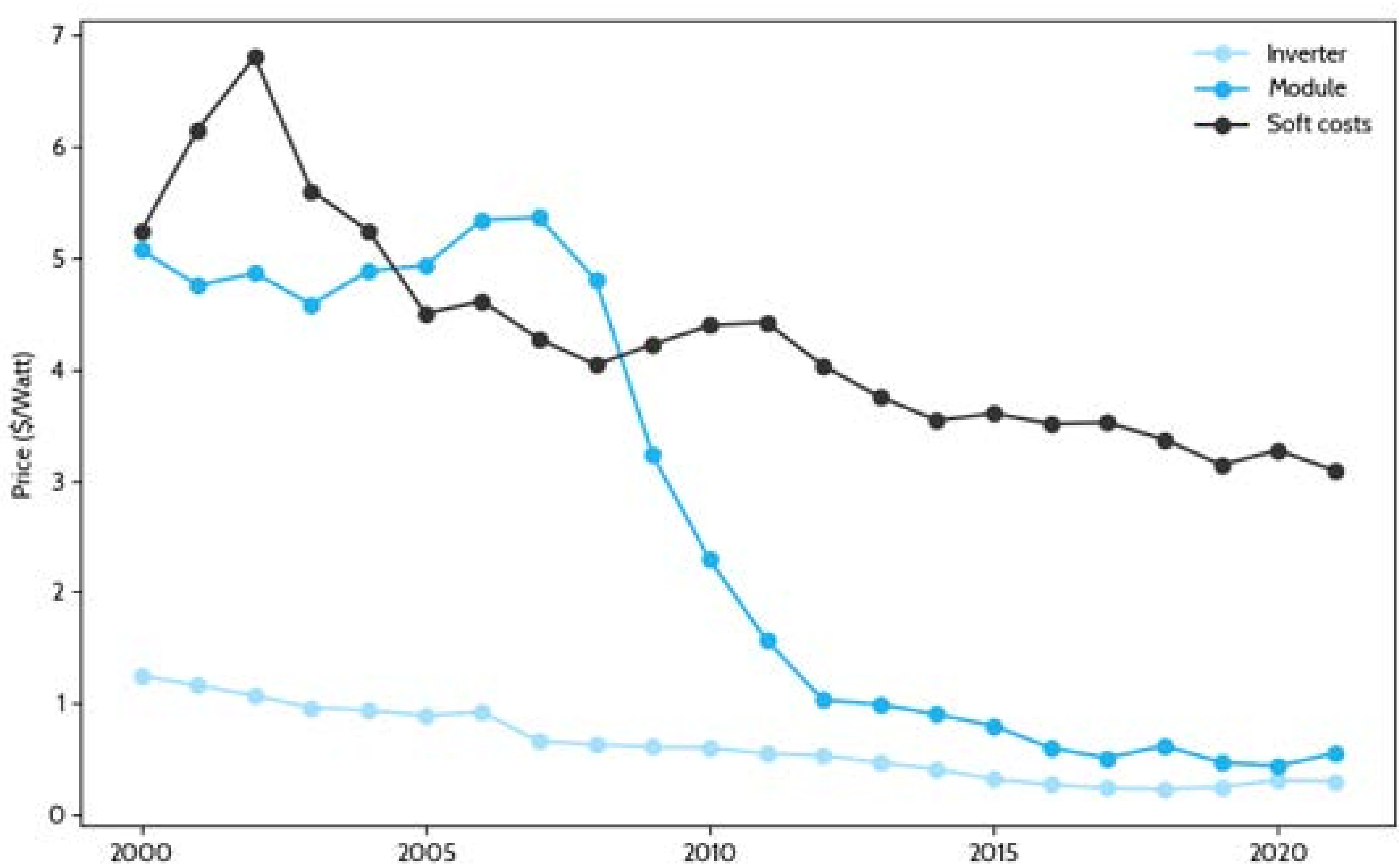
Figure 2. Residential Rooftop Solar Installation Cost Breakdown[14]



Despite hardware costs falling precipitously in recent decades, the share of U.S. residential rooftop solar system prices attributable to non-hardware components—design, project management, sales, permitting, inspections, and interconnection—has grown.

According to OpenSolar, soft costs account for 78 percent of the total installed cost for residential rooftop solar. The direct fees for permits are a small piece; the larger effects come from costs and delays associated with outdated and cumbersome approval processes, such as varying and convoluted permitting requirements across localities, differing requirements between plan reviewers and inspectors within the same jurisdiction, and unresponsive and bureaucratic utility interconnection processes that can stop projects being turned on for months after they have been completed.

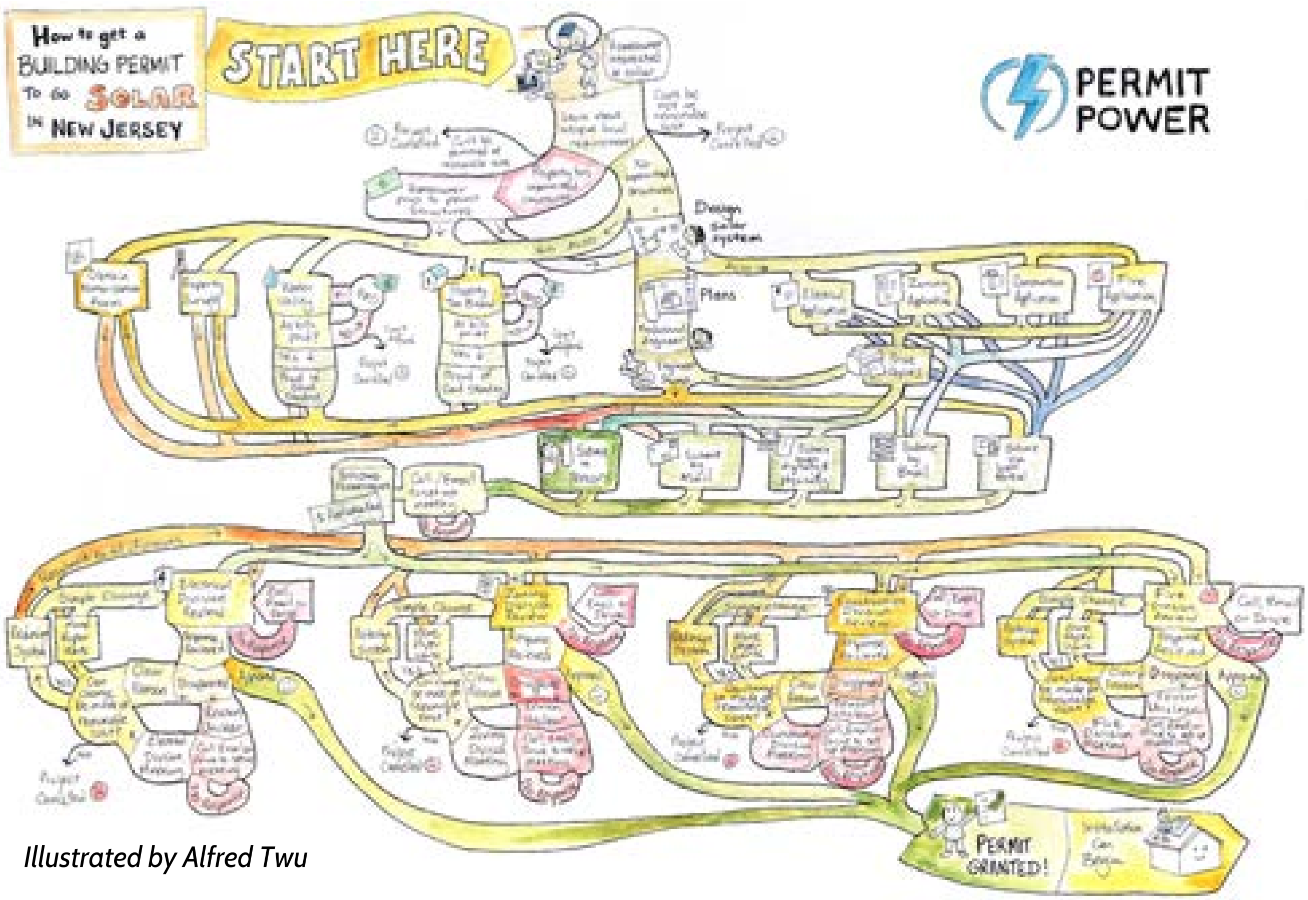
Figure 3. PV system component prices[15]



These delays lead to cancellations that increase costs for all households aiming to get solar, as installers face higher costs of doing business overall. Indeed, installers report rising cancellations as weeks accrue between sale and construction, with industry data suggesting a roughly **10 percent increase in cancellations for each additional week of permitting-related delay.** [16]

The aggregate impact of permitting alone—counting both direct and indirect costs—was estimated at one dollar per watt for residential systems in 2019 and has not changed much since.[17] With total installed cost estimates ranging from $3 to $5 per watt, this represents 20 to 33 percent of the cost of the system, or $6,000 to $7,000 for an average residential system.[18]

Evidence from states



Illustrated by Alfred Twu

Descriptions of byzantine permitting, inspection, and interconnection processes from states help to demonstrate how bureaucracy increases delays and adds costs:

- **Illinois:** Paper submissions of permitting and inspection documents, sequential approvals across departments, and differing documentation requirements for each local government all serve to delay timelines and drive costs.[19]
- **Minnesota:** In-person submission requirements and monthly township meetings for zoning approval delay the start of construction.[20]
- **New York:** Survey requirements, architectural reviews in certain areas, and restrictive battery practices in some localities impede deployment.[21]
- **Colorado:** Bespoke file-naming conventions and mixed paper/digital formats complicate submissions and lead to increased corrections, resubmissions, and delays.[22]
- **New Jersey:** Sequential approvals across different departments and slow, inconsistent processes lead to cancellations and foregone savings.[23]

Results

The analysis uses NREL's Distributed Generation Market Demand (dGen)[24] model to translate a change in total installed price into residential rooftop solar and battery adoption over time. The model compares a business-as-usual U.S. residential price of $4 per watt[25] with a peer-country price case of $1 per watt. $1 per watt represents a rough mid-point between recent estimates of prices in Australia[26] and Germany,[27] and serves as an aspirational cost of residential rooftop solar in the US that could be achieved based on a foundation of eliminating red tape. The model calculates system economics based on install costs, estimates market potential based on those economics, and predicts adoption following typical patterns of market growth.

Top Line Findings

Under the $1 per watt scenario, the modeling projects:

- **18.2 million additional residential solar installations**
- **198.1 gigawatts of additional residential PV capacity**
- **46.2 gigawatt-hours of additional residential behind-the-meter batteries,**
- **$245 billion in additional cumulative savings by 2040 compared to the business-as-usual scenario.**

Over the 25-year lifetime of their rooftop solar system, the average family will save $56,000, resulting in $1.2 trillion in savings across all families installing solar.

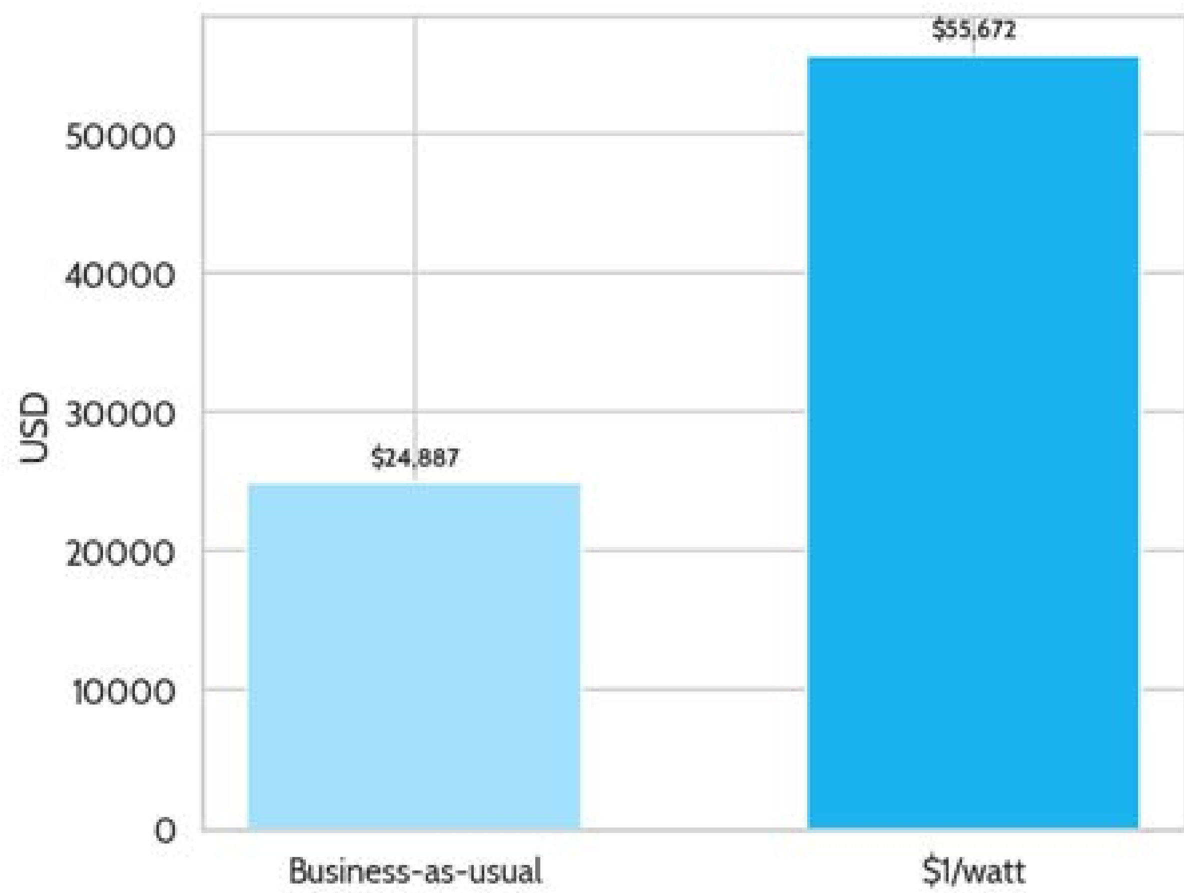
These results indicate that relatively simple bureaucratic reforms can help unlock tens of thousands of dollars in potential savings for households around the country. This is especially relevant in an era where utilities are requesting record rate increases from regulators.

Since 2022, utility rates have increased faster than inflation[28], which exceeded 12 percent between 2022 and 2024.[29] Additionally, in the first half of 2025, utilities requested $29 billion in rate increases[30], which will translate into sharply higher costs for families in the months and years that follow. The Energy Information Administration (EIA) forecasts that rates will be 18 percent higher in 2026 relative to 2022[31], a price shock that can be mitigated with affordable rooftop solar.

Improved household economics

This magnitude of bill savings is enabled by vastly improved project economics for individual households. By 2040, one dollar per watt residential rooftop solar costs yield average payback periods of less than six years, while in the business-as-usual case, average payback periods remain high at 13 years. In addition, households installing solar will save $31,000 more in bills over the 25-year lifetime of their systems by 2040, after taking into account the upfront cost of the system.

Figure 4. Net lifetime savings per household installing solar



Rooftop solar is more economically beneficial in states with higher electricity prices, like California and New York, leading to some of the lowest payback periods by 2040 in the modeling. Aside from shorter payback periods, on average, a family installing solar and batteries will see their annual bills decline 61% by 2040.

Peak demand reductions

Widespread adoption of residential rooftop solar and batteries can help mitigate evening spikes in electricity demand from the residential sector. By storing excess electricity generated from solar panels during the day, batteries enable households to reduce their consumption from the grid in the evening when demand in the residential sector is typically at its highest, contributing to overall reductions in peak demand.

This analysis finds that, if home batteries continue to be paired with rooftop solar at the same rate as they are today, **the additional solar and battery capacity reduces residential sector peak demand by about 21 GW in 2040.** These results demonstrate that distributed solar and batteries can make a substantial contribution to peak demand reduction, supporting reliability and capacity adequacy, and helping reduce costs for all ratepayers.

Certain states, such as Texas and California, see higher battery adoption and thus higher peak demand reductions. Specific dynamics within these states incentivize greater battery adoption and manifest in higher attachment rates.

California

In California, recent reductions in compensation for electricity generated from solar panels have incentivized self-consumption from home batteries to avoid retail electricity purchases during periods with higher prices. This has led to 66 percent of rooftop solar systems in California being installed with a battery between the second quarter of 2024 and the first quarter of 2025.[32]

Texas

In Texas, the ability for residential households to participate in virtual power plants (VPP), or aggregations of home batteries across many households that can then be used as a reliable source of power, is more widespread. Households are compensated for their participation in VPPs. This, coupled with periods where the compensation for exporting electricity generated from panels and stored in home batteries to the grid can exceed $1 per kWh, leads to over 30 percent of rooftop solar systems in Texas being installed with a battery over 30 percent over the same period.

Peak demand reductions are important because increases in peak load drive spending on the electricity transmission and distribution infrastructure that all households will pay for through higher electricity rates. Electricity provided at peak times is also the most expensive. To the extent that adoption of rooftop solar and batteries can reduce peak loads, additional infrastructure investments can be minimized, purchases of expensive peak electricity can be avoided, and upwards pressure on future electricity prices can be reduced.

Policy path: making cheap solar possible

Policy Options

The policy path to cheap solar and batteries focuses on streamlining the bureaucracy that impedes residential adoption of solar and batteries. First, enable instant online permitting for standard residential systems. A rules-based plan check issues a permit immediately when the design meets code, while non-standard projects continue to a manual review. Local governments using SolarAPP+ report fewer back-and-forth cycles and faster starts, reducing median permitting timelines by over two weeks, or 31 percent.[33]

Second, allow remote inspections of completed projects using structured photo or video evidence for routine items. This can reduce repeat visits and truck rolls while reserving in-person time for higher-risk jobs.

Additionally, standardize inspections to focus on components most important for safe operation of the solar and battery system. This approach addresses common friction points documented in state reports, such as sequential approvals across departments and varying document requirements, without reducing safety.

Third, streamline interconnection for standard residential projects to require that households only or processed in parallel with permitting and standard systems can receive permission to operate without extended queues. Pursuing interconnection approval concurrently with permitting and inspection shortens timelines and reduces cancellations linked to long waits after installation.

Pathway to cheap solar and batteries

1. Enable instant online permitting
2. Allow remote inspections
3. Streamline interconnection

Industry changes

These policy reforms can have a material impact on the bureaucratic barriers to residential rooftop solar adoption, but they must be coupled with industry changes to realize more complete cost compression.

Providers have to redesign sales and delivery around digital, self-serve, low-touch motions that the above policies enable. As an example, a report by Tesla on soft costs of residential solar installs points to reductions of $0.57 per watt achievable through customer acquisition and labor improvements—$0.30 from AI implementation that halves commissions and automates project communications, $0.08 from education and transparent, up-front pricing that grows the qualified funnel, $0.09 from tighter install productivity targets, and $0.10 from safety engineering that reduces insurance burden.[34]

Beyond direct soft-cost savings, making rooftop solar and home battery installations cheap and fast unlocks system-wide benefits this analysis does not fully monetize. Distributed generation reduces the cost drivers behind rising retail rates—generation, transmission, and distribution—by shaving peaks, easing transmission congestion, and deferring local capacity upgrades, especially when paired with batteries that make energy available in high-value hours.

Cheaper rooftop solar also improves the economics of electrification: heat pumps, heat pump water heaters, and electric vehicles can utilize midday solar production, cutting household bills. Batteries add resiliency by keeping critical loads powered during outages and, through neighborhood programs or microgrid arrangements, can support nearby homes and essential services.

At the system edge, these resources help serve new loads—from data centers and advanced manufacturing to new housing—without waiting on long-lead central infrastructure. And because solar displaces fossil generation at the margin, particularly peakers, it reduces local air pollution and carbon emissions in communities that often bear the highest exposure. Taken together, these public benefits strengthen the case for policy implementation that cuts red tape impeding solar adoption, even when they are not fully captured in a per-watt cost ledger.

Methodology

Building energy simulations

The foundation of NREL's dGen model is a set of approximately 25,000 building energy simulations sampled from NREL's ResStock database that statistically represent all US households.[35] Each simulation uses location-specific building attributes, weather data, and socio-economic characteristics to model energy consumption for all household end-uses over all 8760 hours of a typical meteorological year. Each simulation also represents the universe of households that can potentially adopt solar based on their roof area, azimuth, tilt, occupancy status, and tenure, with only single-family and small multi-family, owner-occupied homes included. Simulated energy consumption is then calibrated using real world load profiles drawn from utility data. Building and socio-economic characteristics are primarily drawn from the American Community Survey (ACS) Public Use Microdata and the Energy Information Administration's (EIA) Residential Energy Consumption Survey (RECS). More information on ResStock's building energy simulations can be found on NREL's ResStock page and related publications.[36]

Rooftop solar system size and performance

Each building energy simulation utilized by dGen represents between 3,000 and 7,000 households in the real world. Within dGen, rooftop solar system configurations are sized for each building energy simulation to yield the configuration with the highest net present value (NPV). System performance and bill impacts are simulated using NREL's System Advisor Model (SAM)[37], which takes as inputs system size in kW, efficiency in kW per square foot, annual PV degradation, and economic inputs such as total installed costs, utility tariffs, debt fractions of total installed cost, loan interest rates, loan terms, inflation rates, taxes, any incentives, and discount rates to model the hourly generation of a rooftop solar system, resulting electricity bill savings, net present value, and system payback. dGen utilizes Python's SciPy optimize library to search over solar system sizes that vary between 80% and 125% of a given building energy simulation's maximum load to find the NPV-maximizing configuration.

Technology diffusion based on economics

Based on the total installed price input into the model, the optimal configuration estimated by dGen will shift to maximize the NPV of the system. dGen converts these changing project-level economics into adoption over time using a Bass diffusion process. For each building energy simulation (which in turn represents thousands of households in the real world), dGen first translates the project-level economics into a maximum market potential: the fraction of similar households that would ultimately install solar if the given project economics stayed fixed. The specific economic metric used is system payback, which is mapped to maximum market potential from curves drawn from empirical studies.[38] This step sets the ceiling for adoption among the households represented by each building energy simulation.

The model then governs the pace of movement toward that ceiling with a Bass S-curve for technology adoption. Two parameters in the S-curve's mathematical function influence this pace: an "innovation" term (capturing early adopters who move based on economics alone) and an "imitation" term (capturing adopters who move as rooftop solar systems become visible in the peer group). After each year and associated input installed price changes, dGen recomputes economics, updates the maximum market potential, and advances diffusion for every representative building energy simulation. The result is an S-shaped path in which adoption is slow at first, accelerates as visibility rises, and tapers as the representative household approaches its maximum share over time.

Because project economics change over time (for example, as total installed price falls or electricity prices rise), the model must move from one adoption trajectory to another without creating artificial jumps. dGen does this by finding the "equivalent year" on the new trajectory defined by the S-curve—the point that yields the same cumulative market share achieved so far—and then stepping forward one modeling interval from that point. In practice, this means an improvement in economics raises the ceiling and steepens the S-curve, but the adoption path remains continuous rather than spiking in the year of change. dGen also enforces a "no backsliding" rule: cumulative market share cannot fall from one step to the next.

Battery energy storage

After dGen has determined the number of households that will install solar in a given year, the model assigns battery energy storage based on average state-level battery attachment rates between the second quarter of 2024 and the second quarter of 2025, weighted by the number of battery installations in each quarter. Battery attachment rates are drawn from Ohm Analytics data.[39] Batteries are sized according to fixed ratios relative to the rooftop solar system: battery power in kW is equal to the rooftop solar system size in kW. Battery energy storage in kWh is equal to twice the rooftop solar system size in kW. After sizing, the model simulates behind-the-meter dispatch for those households assigned batteries to capture bill savings and peak demand reductions. The model does not take into account VPPs, wholesale market participation, capacity payments, ancillary services, or explicit resilience value for batteries.

Modeled scenarios

Given the above framework, this analysis models two scenarios: business-as-usual, where prices start at $4 per watt and decline at the same rate as NREL's 2024 Annual Technology Baseline for residential rooftop solar[40], and the peer-country price scenario, where prices start at $1 per watt and decline two percent per year thereafter. $4 per watt represents the median installed price according to Lawrence Berkeley National Lab's *Tracking the Sun*[41] data for the year 2024.

In both scenarios, residential rooftop solar project economics were evaluated based on 70 percent debt financing, an interest rate of seven percent, a discount rate of five percent, and an inflation rate of 2.5 percent. The investment tax credit under 25D is applied to rooftop solar in 2026 and 2027 in this analysis. Electricity rates are assumed to increase by three percent annually through 2040.

Bill savings

Each building energy simulation in dGen is assigned a specific utility tariff based on the county associated with the simulation.[42] The tariff is applied to the hourly profile for each simulation under the business-as-usual and $1 per watt scenarios. The hourly charges are aggregated to the annual level, and the difference between the annual aggregations plus the value of all electricity exported to the grid represents the utility bill savings. Export compensation is calculated at an hourly level using county-level hourly wholesale electricity prices prepared by Sun et al. (2025)[43] based on data from the EIA. For each household adopting solar and/or batteries, PySAM projects forward the annual utility bill savings for the 25-year lifetime of the system, taking into account inflation and increases in electricity prices. As "cohorts" of households represented by each building energy simulation adopt solar and batteries over time, the model carries forward their savings based on the projected annual savings output by PySAM.

Peak demand reductions

To calculate peak demand reductions, the model first aggregates the hourly load profiles at the state level under the business-as-usual scenario and the $1 per watt scenario, subtracting any self-consumption from the solar and battery system to produce a net hourly load time series. Batteries are assumed to charge exclusively from rooftop solar generation. The hour with maximum demand from the residential sector in GW is then identified for each state in the business-as-usual scenario. The model then subtracts the demand in GW from the same hour in the $1 per watt scenario state-level net hourly load time series to produce a reduction in peak demand. This describes the reduction in coincident peak for the residential sector alone; the peak hour at the system level may differ from that of the residential sector, depending on electricity consumption patterns in the commercial and industrial sectors, though the residential sector usually drives peak electricity consumption at the system level.

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Can cutting rooftop solar costs make up for losing tax credits?

Slow and complex permitting and interconnection rules drive up U.S. rooftop solar “soft” costs. With tax credits going away, fixing them may be existential.

By **Jeff St. John**
23 July 2025

(Justin Sullivan/Getty Images)

Rooftop solar costs way more in the United States than it does elsewhere in the world. That’s long been a headache for the sector to navigate. But now with Republicans in Congress killing off the decades-old tax credit for rooftop solar, it’s a life-or-death problem.

navigating complex permitting and interconnection processes that differ from city to city and from utility to utility.

Those costs rise when solar systems are accompanied by batteries, something that is becoming increasingly common as households look for backup power and respond to new incentive structures that prioritize storage, as is the case in California, the nation's largest rooftop solar market.

Big upfront costs are the No. 1 reason Americans decide not to put solar panels on their rooftops. The forthcoming spike in installation costs created by the new GOP megabill will only make that hurdle higher. After this year, households will lose access to tax credits for 30% of the cost of solar, batteries, and other home clean-energy equipment, and companies that offer solar systems under third-party ownership models will face a set of uncertain restrictions that could choke off that part of the market.

In order for the U.S. to keep installing rooftop solar at a healthy rate – something that's key to combatting climate change and helping people manage rising electricity costs and electrify their cars and homes – the industry needs to figure out how to prevent costs from ballooning once the incentives disappear.

"We're now being forced to operate as an industry without subsidies," Birch said. That puts the onus on the industry to both tighten its belt in areas that are under its control and press state lawmakers, local government officials, and utility regulators to reform their parts of the equation.

"We can survive and thrive – if we can reduce soft costs," he said.

Birch, a native Australian known as "Birchy" in the solar world, is working on just that himself.

There's plenty of evidence that lowering these costs is possible: The soft-cost problem is a bit of a uniquely American phenomenon. In other places with high rooftop solar penetration, like Australia, the world's rooftop solar leader, these costs are far lower.

Solar companies in Australia can quote, sell, and install a 7-kilowatt solar system with a 7 kilowatt-hour battery for about $14,000 in a matter of days, Birch estimated. In the U.S., that same system costs about $36,000, and getting permits and interconnections can take months – long enough to kill a fair number of installs before they can be completed, he said.

Streamlining permitting at cities and counties

When it comes to cutting soft costs, local permitting reform is a big target.

Permitting regulations and processes vary widely across the roughly 23,000 city, county, and other local authorities that have jurisdiction over building permits, electrical code enforcement, and other must-haves for a solar or battery installation. Permitting can add roughly $1 per watt to the cost of a typical solar installation, according to the industry trade group Solar Energy Industries Association (SEIA).

Some do a good job of making the process smooth and straightforward. Others can be far less helpful and efficient. Slow or cumbersome permitting takes a toll on solar installers, stretching the time it takes to complete current projects and move on to the next.

"If you can ensure you're making it through in three weeks versus three months, you're operating much more efficiently," said Barry Cinnamon, CEO of Northern California solar and battery installation firm Cinnamon Energy Systems. On the other hand, "in cities where the permitting is slow, you inevitably get them coming back in two weeks saying, 'You're missing a dash in that form – send it back,' and then two or three weeks later saying, 'We're not sure the battery can go in that spot. Try again.'"

It's hard to standardize permitting across local authorities, which range from well-staffed big-city departments to tiny towns with one or two people working on it. But software that can dramatically sped up permitting without sacrificing quality, the platform was made available at large.

Automated permitting turns multiple back-and-forth processes into a "one- to two-page digital form," Birch said. Code standards groups like Underwriters Laboratories and the International Code Council have signed off on SolarAPP+, and similar automated platforms from startups and from city permitting departments are now providing similar same-day options.

The advantages of instant permitting are so great, Cinnamon said, that he's stopped doing projects in cities and counties that don't offer some form of it. With less than six months to finish projects that can secure tax credits, "we don't have the time" to spend elsewhere, he said.

The next step is to expand instant permitting from hundreds to thousands of cities and counties by taking on statewide permitting reforms, said Nick Josefowitz, CEO of Permit Power, a nonprofit advocacy group.

Over the past several years, states including Democratic strongholds like California and Maryland as well as Republican redoubts like Florida and Texas have adopted solar permitting reform laws, he said. New Jersey lawmakers passed a bill this summer that now awaits Gov. Phil Murphy's signature.

Reform looks different in every state. California set mandates for cities and counties to use instant permitting, while Texas and Florida required cities and counties to allow licensed and credentialed third parties to issue permits and conduct inspections on homeowners' behalf. Colorado's law backed off on mandates but offered incentives for local authorities to deploy

Greenhouse Institute found that streamlined and instant permitting in Arizona, Colorado, Illinois, Minnesota, New Jersey, New York, and Texas could result in an additional 2 million home solar installations between now and 2030, saving households a collective $100 billion.

The results are good not just for households and solar installers but for cash-strapped municipalities, said Elowyn Corby, mid-Atlantic regional director for nonprofit group Vote Solar, which advocated for New Jersey's newly passed reform bill.

"When you put the onus on municipalities to process these permit applications, that's an enormous drain on their resources as well, especially in lower-income communities where there isn't as much municipal infrastructure," she said. "We're hoping this brings capacity back to local governments."

Streamlining utility interconnection processes

Permits aren't the only solar roadblocks. Utilities also need to approve solar and battery systems at homes connected to their grids before they're allowed to be turned on. Solar installers have long complained that slow or costly interconnection processes are a significant drag on their bottom lines.

"I've heard from some of our installers – and some of the bigger ones – that the interconnection approval process is more of a challenge and a bigger cost than the permitting side," said Ravi Mikkelsen, CEO of Atmos Financial, a financial technology company that connects lenders with solar installers and customers. "Some utilities are better than others, but across the board, this is a major issue."

Interconnection rules are complicated, and utilities apply them differently. But reports from solar installers over the years have highlighted problems ranging from lengthy waiting times and restrictions on new solar hookups to exorbitant costs assessed on homes wanting to interconnect.

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technology advances into account. A 2023 ranking from Vote Solar and the nonprofit Interstate Renewable Energy Council assessed state adoption of interconnection "best practices." The groups gave only New Mexico an A grade and six other states B grades, while marking 13 with an F for lacking any statewide standards.

"We need [regulator] rules about when projects can be fast-tracked, what types of systems when and where can be automated and approved by software," Josefowitz said.

Extreme amounts of rooftop solar can cause problems on power grids designed to carry electrons from big substations to customers.

"But batteries totally change the game on this," he said, enabling homes to store solar power when utility grids don't need it and release it when they're in short supply.

That's why solar companies ranging from nationwide players like Sunrun to regional and local installers are recasting their business approach to include becoming "virtual power plant" providers – active providers of energy and grid resources that help augment the resources that utilities can bring to bear.

Opportunities to earn money for these services are relatively scarce today. But with Republicans in Congress and the Trump administration making it much more expensive and difficult to build more renewable energy to meet the growing demand for electricity, utilities may be well advised to reduce the barriers to installing solar and batteries that can provide it, Mikkelsen pointed out.

"At $2 a watt, you can bring down the cost of your power, and you can save money on electrification," he said. But also, "your battery can be used economically much more frequently and becomes super-valuable to the grid. You want to unlock the power of batteries? You fill them with cheaper electrons."

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Jeff St. John is chief reporter and policy specialist at Canary Media. He covers innovative grid technologies, rooftop solar and batteries, clean hydrogen, EV charging, and more.

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Paul Tobiason

G **Greg Ballantyne**
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Very interesting. My own two stage solar generation and storage residential system installation experience over the last couple of years would make me estimate one third "soft cost" impact that could be eliminated by addressing permitting, utility and /or grid operator "slow walking" and "stiff arming" delays and costs, and local government culture war grandstanding. Coincidently, about the same as the tax credits my projects yielded. But I am aware that community solar and small commercial solar projects face a much higher wave of this sort of idiocy. It would be great to find a path toward accelerating the renewable energy transition in the US in spite of the biosphere killing efforts currently underway.

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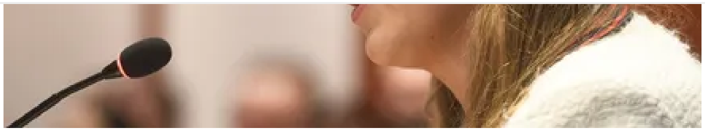

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EXECUTIVE SUMMARY

Between rising home energy consumption and the growth of data centers across the state, Virginia's demand for electricity is threatening to outpace a consistent and affordable supply. As Virginia's energy needs increase, solar and battery systems in homes are going to be ever more valuable for reducing grid strain and improving energy affordability, resiliency and reliability, while protecting our environment. By reducing peak demand and creating a much-needed local energy supply, residential solar and storage technologies are a cost-effective part of a community-oriented grid modernization effort. Many local governments across the country are not set up to efficiently enable this solution, however, and governments in Virginia are no exception. Antiquated steps required at the local level to obtain approval to begin installation add costs to home solar and energy storage systems and increase administrative costs for governments.

Higher costs result in fewer families going solar than otherwise would. In Virginia, 16 percent of residential solar projects that begin the permitting process are canceled before they are completed,[1] largely due to permitting barriers.[2] Households that do install solar likely end up paying more. A recent report by the International Renewable Energy Agency found that the price for residential solar in the United States is roughly double the price in Europe, where permitting barriers have been effectively eliminated.[3] The panels, wires, inverters and batteries being installed in the United States are similar to those used in Europe — much of the difference in cost lies in how these systems are handled by local governments.

2X

Residential solar in the U.S. costs roughly double what it costs in Europe

1-in-6

One-in-six (16%) of residential solar projects in Virginia are canceled before completion, largely due to permitting barriers

Modernizing local government through the use of automated permitting will allow more Virginians to reap the benefits of rooftop solar and energy storage while reducing administrative burdens for localities.

This report relies on firsthand accounts of company representatives currently installing solar across Virginia to uncover some of the common problems facing residential solar and battery storage permitting. It finds that these problems can be resolved through straightforward steps, many of which require few resources for local jurisdictions to implement:

- **Align application submission requirements across jurisdictions and regions.** Installers in Virginia typically operate in several counties at a time and must therefore coordinate with many different jurisdictions, each with its own processes, requirements and preferences. Learning to navigate these systems and tailoring plans to each set of requirements takes staff time and raises costs for customers.
- **Make code interpretations consistent within jurisdictions and across regions.** Interpretations of code requirements can differ among local governments, requiring installers to adapt the content of permit applications to varying sets of rules. Sometimes, even officials within the same jurisdiction disagree with each other about how a code should be interpreted. The multiple resubmissions and project modifications resulting from this ambiguity raise costs and extend timelines.
- **Improve transparency and communication during application review.** Permitting departments are busy, and at times, communication issues leave solar installers in the dark as to the status of their applications and steps required to obtain a permit, exacerbating other problems that may arise during permit review.
- **Shorten review timelines.** It can take a long time to permit residential solar and storage in Virginia. The median wait for obtaining a permit in the Commonwealth is nine business days, with an additional 13 business days to get through an inspection, amounting to a month in all.[4] This is the median — actual timelines can be much longer. In some cities and counties, the typical permitting wait time is 18 to 24 business days.[5]
- **Right-size permitting fees.** Rooftop solar permit fees vary widely in Virginia but can reach several hundred dollars. While high fees are a barrier in themselves, fee variations between governments also present challenges, making it difficult for solar companies to plan and set expectations for the customer.
- **Update third-party inspection programs**. Building department inspections can be time-consuming, resource-intensive and out of line with the requirements set by plan reviewers. Third-party inspection programs in Virginia address some of these issues, but the programs receive little use due to limited access, shortcomings in program design and high variation between building department requirements.

Streamlining the solar permitting process is an easy, local and rapidly scalable solution for getting more clean energy into our communities while saving families and local governments time and money.

POLICY RECOMMENDATIONS

State and local governments should make it easier, faster and cheaper for families to install code-compliant rooftop solar and energy storage systems while protecting health and safety.

One of the most effective ways to do so is to issue permits through an automated permitting platform that expedites the process without compromising quality or safety. Automated permitting platforms ask the contractor a series of questions to verify that the solar system's design is up to code and then approve the permit application automatically, allowing installation to begin.

The most common automated permitting platform is Solar Automated Permit Processing+ (SolarAPP+), which was developed by the U.S. Department of Energy's National Renewable Energy Laboratory in 2019 and is now run by the nonprofit SolarAPP+ Foundation.[6] Since SolarAPP+ launched in 2021, 277 cities and counties in 16 states across the country have adopted the platform.[7] Many other cities and counties offer automated solar permitting using private-sector platforms such as Symbium or by building their own software.[8]

Virginia should also update its third-party inspection program for solar. Local governments should allow contractors to use qualified third parties at their discretion, and the Commonwealth should set the qualification requirements for third parties. Third parties should also be able to use remote inspection tools.

DELAYS IN VIRGINIA'S PERMITTING

MEDIAN WAIT TIMES

2 weeks
for a permit

2.5 weeks
for inspection

1+ month
total for for permitting + inspection

INTRODUCTION

Virginia's electric system is experiencing unprecedented load growth in the 2020s, but the Commonwealth lacks a clear plan for how to meet the demand for additional energy. In 2023, the Commonwealth had more net imported electricity than any other state in terms of megawatt-hours.[9] A 2024 report from the Joint Legislative Audit and Review Commission projected that unrestricted data center growth would double Virginia's electricity demand within a decade, a projection in line with analysis from the regional grid operator PJM.[10] Nine of the 13 states within the PJM region are net importers of electricity, indicating a level of reliance on out-of-state electricity that is not sustainable.

VIRGINIA HAD MORE NET IMPORTED ELECTRICITY IN 2023 THAN ANY OTHER STATE IN THE U.S.

Virginia's peak demand is also rising. In 2024, Dominion Energy recorded six new all-time peak demand records across its service territory in the Commonwealth.[11] In the first month of 2025, it set records three more times. In traditional grid planning, energy flows in only one direction (from power plants to consumers). As peak demand increases, the grid must expand its ability to serve, often with more and larger power lines.

Local distributed energy resources (DERs), such as residential solar and battery storage, can help the Commonwealth address its energy challenges. In contrast to other ways to generate electricity, DERs offer affordable, reliable energy[12] while helping to offset peak demand and reducing the need for ratepayers to fund expensive electric grid expansion projects. Additionally, by alleviating grid congestion, DERs further help defer, reduce or eliminate distribution-system upgrade costs. DERs can come online more quickly than fossil fuel–based generation systems, and depending on how they are set up, they provide resiliency benefits in the event of an electrical outage. A new Virginia law created a virtual power plant pilot program: a network of decentralized DERs that can provide capacity and services to the grid to lower ratepayer costs in other ways. Residential solar and energy storage systems are expected to play a major role in this program.[13] For Virginia to fully harness the benefits of virtual power plants, the Commonwealth needs to have ample distributed solar and storage capacity installed.

The cost of solar technology has fallen dramatically over the last 15 years, making it a more viable option for consumers. But permitting remains a significant obstacle to widespread residential solar and battery deployment in Virginia. Cumbersome and uncertain permitting processes discourage the adoption of solar and increase costs.

The Solar Energy Industries Association (SEIA) estimates that permitting and related bureaucratic costs, such as in-person inspections, add $6,000 to $7,000 to the typical residential solar system.[14]

Wait times of multiple weeks and months also deter families looking to install solar and battery systems and lead to cancellations, which total more than one in seven projects (16 percent) once the permitting process begins.[15] The median wait time for a solar permit in Virginia is nine business days, meaning that half of all solar customers in the Commonwealth wait longer than two weeks for a permit.[16] Some jurisdictions have even longer wait times. In Loudoun County, for example, the median timeline is 16 business days — more than three weeks. One in four permit applicants in the county wait more than 24 business days. In Loudoun, approximately 31 percent of homeowners who begin the solar permitting process end up cancelling the project. In Carroll County, 34 percent are cancelled. SEIA estimates that a one-week delay in system installation due to permitting, inspection, and interconnection processes increases the cancellation rate by 10 percent.[17] It is possible to improve these processes — to reduce costs, speed up timelines, and help more families go solar — while also supporting the integrity of permit review and inspection.

During the permitting process, the plan review of residential solar and battery storage installation ensures that the project is built to code and doesn't create health or safety risks. However, this review can be slow. Approval might be contingent on arcane clerical specifications that have no bearing on the function of the system. It might include requirements unrelated to health and safety. Frequently, the processes and rules are unclear. In some cases, different reviewers may have a different understanding of the same code. Inconsistent permit review processes among or between jurisdictions can add costs and delays. Accelerated adoption of solar in recent years is straining the capacity of local jurisdictions to process permit applications efficiently. As solar and storage systems become more common in homes, local governments can adapt to this growing preference, just as they have with other appliances and technologies in decades past.

Widespread adoption of new technologies often requires local governments to take a different approach. By automating the review of residential solar and storage installations, jurisdictions can streamline the permitting process for solar consumers and installers. Automated permitting allows installers to instantly verify whether an installation meets electrical and building codes and receive a permit immediately. It also reduces staff time at local jurisdictions by removing the need for individual permit reviews. All this can be done without changing the rigor of the application review, ensuring that safety remains a guiding principle of the permitting process.

The most commonly used automated permitting solution is SolarAPP+, a platform developed by the National Renewable Energy Laboratory with funding from the U.S. Department of Energy and now administered by the nonprofit SolarAPP+ Foundation. There are other automated permitting software options on the market as well, such as Symbium, and some local governments have developed their own. A handful of Virginia jurisdictions have already streamlined their solar permitting process using these platforms. Culpeper County and the city of Harrisonburg currently use SolarAPP+.[18] Prince William County, a jurisdiction with which the solar industry engaged early on to update the permitting process, adopted the platform in late 2024.[19]

Updating automated solar permitting processes can allow for faster installations, reduce the cost of a solar system by thousands of dollars and increase homeowner satisfaction. More efficient processes also benefit local building departments, as staff can shift their attention to more complex projects.

AN OVERVIEW OF PERMITTING IN VIRGINIA

There are two phases to the traditional permit approval process for a residential solar system in Virginia. First, the installer contracted to build the system submits plans to the city or county in which the property is located for review, generally to the building department. Reviews are designed to ensure that solar panels and batteries are installed safely and do not pose a threat to homeowners or others. Plan reviewers typically take into account whether the solar contractor has the correct licenses to perform the work, whether the project complies with applicable building and electrical codes and whether the project is properly designed in relation to the electrical grid.

Most cities and counties have their own processes and requirements, though the fundamental standards are rooted in the state's electrical and building codes. When a reviewer determines that a plan does not meet the code or fails to fulfill some other requirement, the plan is sent back to the installer for revision. This back and forth can be time-consuming, driving up costs in both staff time and fees for resubmission. Some small governments outsource the plan review process to a third party. The permit is issued when the system is approved by reviewers, with turnaround times ranging from one day to several weeks. The contractor pays the permitting fee.

After receiving the permit, the installer is cleared to install the system, which typically takes only one to three days. In the second phase of the approval process, the installer must coordinate with the local government to schedule an inspection. The role of the inspector is to verify that the installation conforms with the plan and meets building codes. While the inspection itself takes only around an hour, the total timeline for this phase can be several weeks. In Virginia, the median wait time between the request for an inspection and the inspection itself is 13 business days.[20]

Automated permitting allows localities to automate the plan review phase. The installer submits information pertaining to the system to an online portal that contains all the safety codes and standards required. If any item in the plan is out of compliance, the portal instantly informs the installer and gives them the opportunity to revise and resubmit. If a submission is compliant, the installer receives approval immediately.

The most common automated permitting platform, SolarAPP+, also provides checklists to help inspectors verify installation procedures and adherence to the approved design.[21] This process has the potential to make inspections far more consistent and standardized.

In addition to obtaining a permit and system approval from the local government, the installer needs to go through a parallel process with the local utility to obtain approval for interconnection with the electrical grid.

COMMON PERMITTING ISSUES AND PROPOSED SOLUTIONS

This report considers common issues that local solar installers encounter through the residential solar and battery storage permitting process and explores how automated systems can improve this process. In the development of this report, the authors consulted solar installers and local permitting authorities to discuss the issues that impact their ability to help families in Virginia efficiently and affordably obtain solar systems. While some governments in Virginia have already adopted automated permitting, the following discussion focuses primarily on those still employing traditional permitting processes. We propose solutions to some of the most common problems reported in the Commonwealth.

Align application submission requirements across jurisdictions and regions

Residential solar and storage installers in Virginia typically operate in several counties at a time and must therefore coordinate with many different jurisdictions. One installer said he worked with 95 different jurisdictions. Each of these governments has its own processes, requirements and preferences, making the permitting landscape difficult to navigate. In some cases, project managers spend more time preparing plans to upload for review than they do actually designing the system.[22]

Nearly every local government has its own permitting software, portal (or paper forms) and permit applications. For solar installers, this means managing scores of different logins, systems and jurisdiction-specific requirements. Frederick County, for instance, requires a mail-in application and in-person pickup, which for many installers turns a seemingly simple administrative task into a four- to five-hour round-trip drive.[23] Spotsylvania and Rappahannock require plans to be saved to a thumb drive and sent in the mail.[24] While most jurisdictions require an electrical permit application, some jurisdictions, such as Loudoun County,[25] require a building permit application as well. Others require only a solar permit application.[26]

Jurisdiction-specific administrative requirements present other challenges. For instance, while most Virginia jurisdictions require a structural engineering stamp on plan submissions, the city of Lynchburg requires a stamp from an electrical engineer as well.[26] Henrico County does not require any engineering stamps.[28]

Permitting variability hampers the growth of solar generally by increasing compliance costs and permitting timelines. Learning to navigate permitting systems takes time, as does preparing the plans to meet highly detailed specifications. Standardizing these requirements would save homeowners money.

Make code interpretations consistent within jurisdictions and across regions

Just as clerical requirements differ among local governments, so do interpretations of code requirements, so installers must adapt the content of each permit application to varying sets of rules. For example, some jurisdictions require critter guards to keep birds, squirrels and other animals from entering the spaces between solar panels and a roof; other jurisdictions have no such requirement.[29]

Sometimes, plan reviewers and inspectors working within the same jurisdiction disagree with each other about how a code should be interpreted, which results in inconsistent feedback and can be frustrating for installers. "Some solar interpretation issues are so misunderstood that officials across the state disagree with each other on whether certain installation methods are mandatory or prohibited," said an installer based in Falls Church.[30]

In especially thorny cases, resolving disagreements over code interpretation requires an appeal to the Virginia State Building Code Technical Review Board (SBCTRB).[31] Once issued, the SBCTRB's interpretations are legally binding for all jurisdictions. The Falls Church installer recalled an inter-jurisdictional dispute about a grounding and bonding issue that was ultimately resolved by the SBCTRB.[32] He noted that one jurisdiction said, "You have to bond the ground in the neutral. You must do it." Other jurisdictions said, "I forbid you from doing it." The SBCTRB issued an interpretation to settle the issue.

Plan reviewers and inspectors might disagree as well. Another installer remarked, "Inspectors don't always agree with the reviewers, or they'll add in additional things from the code that the reviewer has already approved. There's a disconnect there, and they don't usually pick up the phone and talk to one another."[33] The installer added that some inspectors will fail an inspection if stickers aren't placed in certain ways, even if a reviewer has already approved the plan. In other cases, inspectors dispute previously approved electrical wiring plans, claiming they are not up to code.[34] In these situations, the installer is stuck in the middle and is responsible for talking to both parties to reach a resolution.

Sometimes an installation involves a system product that is not commonly used or known in the area. In such cases, the contractor or manufacturer and the permit reviewers might not agree on whether the product is compliant with the current code. The delays and resubmissions that result from these misunderstandings generally add costs. They can also be very frustrating on the customer side and on the installer side. One installer explained that he had a plan rejected because the reviewer was not familiar with the racking included and assumed it was not a code-compliant product.[35] In fact, the racking was code compliant, and the manufacturer had to step in to resolve the issue.

"We were sitting for like seven weeks trying to submit and paying these $90 fees over and over again, not knowing what the heck they were talking about," the installer recounted.[36] "It turned out that they just didn't know what that trademarked product was, and they assumed it was something different and weren't giving us good feedback." He added, "Code-enforcing officials are oftentimes not adequately confident in their ability to determine a proposed solar system's compliance with the Virginia Uniform Statewide Building Code (USBC), which can result in failed reviews, requirements to use a third-party inspector or requirements to hire a third-party engineer."

Multiple installers reported that they occasionally deal with a plan reviewer who seems to be resistant to rooftop solar altogether.[37] One installer reported that in 2022, his Fairfax-based company drew up a plan for a customer with a home in Prince William County and submitted it to the county's building development division for review.[38] The structural plan reviewer sent it back for corrections multiple times, claiming that the solar panel spacing and attachments were unsafe. Despite what the installer believed were conservative numbers used to calculate various load factors (such as snow load), reflecting a structurally safe installation method, the plan was not approved and the project was never completed. The customer's neighbor, meanwhile, had no trouble with getting a permit for his solar installation. According to the installer, the primary difference between these two projects was the particular plan reviewer involved.

Improve transparency and communication during application review

Communication issues can also cause aggravation. "One of the largest frustrations is when communication is in the dark," explained one installer. "If you're applying for a permit and you have to mail it in and then two weeks later you haven't heard anything and you have to leave voicemails or play phone tag and you don't know the status of the permit — that's probably my biggest frustration."[39]

Sometimes feedback is unclear, making it hard to make proper corrections. Some plan reviewers issue corrections in the form of difficult-to-understand dropdown or copy and paste comments rather than supplying clear feedback specific to the design in question.[40] Some use opaque language when communicating corrections that installers struggle to understand.[41] Miscommunication can result in high fees, project delays and in some cases cancellations.

Shorten review timelines

All of the challenges detailed so far add delays to what is already, in many cases, a lengthy timeline. The median wait for obtaining a permit in Virginia as a whole is nine business days, with an additional 13 business days to get through an inspection.[42] These are only averages — timelines for local governments and individual projects vary widely. In the cities of Manassas and Waynesboro and the county of Spotsylvania, the median permit timeline is between 16 and 25 business days.[43] Installation and utility approval add additional time.

One installer, whose company works in multiple states, said it takes an average of around 30 days for her company to pull a rooftop solar permit in Virginia, even longer than the statewide average reported by Ohm Analytics.[44] The longest timeline her company experienced was 163 days in Prince William County.

An installer with offices in both Falls Church and Bumpass claimed that reviews in Fairfax County can be lengthy, even though the jurisdiction places an emphasis on quick turnaround. One application in early 2024 was in review for more than two months. Online portal records show that it took four days for the application to move from "plans received" to "accepted for plan review" and another two months to make its way through "review distribution," "building review," "review coordination," and, finally, "permit issuance."[45]

Long timelines can be the result of a high volume of permit applications, staffing issues or both. The review itself takes only around an hour — it's waiting for someone to get around to doing it that slows the process. When asked why the turnaround time for a permit is four to six weeks in her jurisdiction, a representative from Franklin County Development Services said the department was short-staffed.[46] Complicated processes and multiple stages of review also add time.

Tom Grimes, a plan reviewer, is one of around half a dozen staffers at the Loudoun County Department of Building and Development who process solar permit applications.[47] He explained that the permitting process involves multiple steps and multiple departments: It starts with intake by the county's permit coordinators and then moves to the building, electrical, and zoning departments. The county gives each department 10 business days to complete its review. Grimes, who works in the building department, said he tries to expedite solar permit reviews because they are relatively straightforward. He said he typically completes his part of the process within five business days. Still, due to the need for multiple departmental reviews, the median time for permit approval in Loudoun County is 16 business days.[48]

Right-size permitting fees

Rooftop solar permit fees vary widely in Virginia and can reach up to several hundred dollars. High fees are a barrier in themselves, but the variation and lack of transparency also present challenges, making it difficult for solar companies to plan and set expectations for the customer.

At the low end, Blacksburg charges a flat fee of around $30.[49] Permitting fees in Alexandria, by contrast, average $475, and in Manassas, $517.[50] These are median totals, so the actual permitting fees can be much higher. Some governments charge additional fees for every plan correction, and these fees can add up quickly. "I paid $1,350 for a permit in Prince William County," said the Falls Church–based installer. "In South Hill, in the same week, I paid 70 bucks for an electrical permit to put up an equivalent or a similar-sized system." In 2024, Prince William supervisors approved a plan to spend $1.2 million to establish a temporary solar fee reduction program,[51] but the program expired and does not appear to have been renewed.[52]

Update third-party inspection programs

Once the contractor installs the solar system, most building departments send an inspector to the job site to verify that the system is up to code and matches the approved plans. Inspectors generally give a multiple-hour window for their arrival time. If the job site is far from the contractor's office or traffic is heavy, a qualified installation crew member might have to spend half a workday or more on a single inspection. Communication between the contractor and inspector to schedule the inspection can also be poor, and many inspectors do not climb onto rooftops to assess the panels, racking, and mounting hardware due to balance or liability concerns.

Some jurisdictions have too few inspectors. One solar installer reported that the city of Hampton has a single inspector for solar projects. If the inspector is out of the office, the homeowner can wait several extra weeks with the panels on their roof, unable to turn the system on. For some homeowners, the inspection has been delayed three or four times.[53]

As previously noted, plan reviewers and inspectors don't always agree on the requirements for a solar system. During inspection, the plan reviewer is not at the job site, so if the inspector has an issue with the installation, even though the plan reviewer approved it, the installer might have no option but to alter the installation to conform with the inspector's preferences. This can involve significant additional resources.

To alleviate these problems, some Virginia jurisdictions have qualified third parties conduct solar inspections, but these programs have shortcomings. Third-party inspection programs in some jurisdictions do not pertain to solar. When they do, there is often an added net cost. Local rather than state building departments set the qualifications for the third parties, creating a lack of statewide uniformity and consistency. Finally, after the third party inspects the installation, the building department will conduct a review of the third party's assessment, adding a layer of bureaucracy and duplication.[54]

Prince William County SolarAPP+ Success Story

Within Virginia, one jurisdiction stands out from the others for its history of solar permitting obstacles: Prince William County. After years of barriers stymieing the adoption of rooftop solar, the county took initiative to update its review process.

In 2022, Solar United Neighbors, an advocacy organization with roots in Virginia, and the Chesapeake Solar and Storage Association, a Mid-Atlantic trade group, began working with Prince William to simplify its permitting requirements and boost transparency.[55] County officials implemented a series of changes aimed at making the permitting process faster, more efficient and easier for residents, developers and contractors.[56] As part of this initiative, the building department launched a SolarAPP+ pilot program in February 2024. It announced the county's official adoption of SolarAPP+ at the end of October 2024, albeit only for solar (not storage) and with additional requirements.[57]

The county's stated goals include shorter permitting times, reduced costs, process improvements, reduced staff time per project, and faster service.[58] The adoption of SolarAPP+, plus a simplified review process for applications that don't go through SolarAPP+ and greater process transparency, is set to address the past challenges installers faced in applying for residential solar permits in the jurisdiction.

CONCLUSION

Residential solar going mainstream will benefit all Virginians. Getting there will require an "All of Virginia" approach, including updating local permitting processes into a more modern paradigm. Reducing the time and the cost involved in moving a solar project through the permitting process, from application through inspection, is critical to expanding residential solar usage in Virginia. Allowing installers to obtain permits for code-compliant solar systems through an automated permitting platform and to receive a remote inspection from a qualified third party would help this expansion.

Solar installers and localities across the Commonwealth recognize the need for a more efficient system. One installer, when asked what she would do differently, said, "Mandate automated solar [permitting], because the nature of roof-mounted solar tends to be pretty standard." Another installer pointed to application standardization, expedited review times, reduced product confusion, uniform code interpretation, increased code confidence and uniform professional opinions — nearly all of which would be included with the adoption of automated permitting. "It would be great if we could standardize how inspections work too," he added.

Cutting through the red tape of the solar permitting process and allowing for automated permitting will make it easier for solar installers to understand the process, follow the steps, and receive approval of their plans instantly, without the risk of costly delays. It will help more Virginia families enjoy the freedom of going solar, saving them money and reducing air pollution. It will save local governments time and money and help relieve permitting backlogs that can limit the growth of new construction and other industries. Streamlining solar permitting in Virginia will also free up resources to process more solar projects, bringing more energy into the grid to meet demand. The bottom line is that by making residential solar and storage adoption easier, Virginia can realize local grid and energy benefits while reducing harmful pollution at a time when energy affordability and availability are needed the most.

METHODOLOGY AND ACKNOWLEDGEMENTS

Research for this report relied on video and phone interviews with representatives from nine solar companies, whose residential photovoltaic operations together cover the majority of geographical regions in Virginia. Interviewees were typically those most familiar with an organization's permitting practices — usually the company's permitting coordinator. Researchers also reached out to eight local governments with additional questions stemming from discussions with installers (five responded) and reviewed those governments' websites. Representatives who gave feedback included permit technicians, city planners, and electrical inspectors. Interviews took place from October 2024 through September 2025. All names of solar installers interviewed have been omitted from this report.

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CHESSA is the Chesapeake Solar and Storage Association. We are a solar and energy storage trade association committed to an effective and equitable clean energy transition across Maryland, Virginia, and the District of Columbia. A 100% clean energy transition that sees mainstream adoption of local solar, large-scale solar, and battery storage throughout the electric grid will realize a stable and affordable grid for all consumers.

Environment Virginia has one mission: to protect the natural world. We advocate ideas and actions to guide our country onto a greener, healthier path. Our network of 30 state environmental groups promotes clean air, clean water, clean energy, wildlife and open spaces, and a livable climate. Our members put grassroots support behind our research, public education, advocacy and litigation.

Permit Power is a nonprofit organization making it easy for American families to power their lives cheaply. We do research, education, and advocacy to break down the bureaucratic barriers that get in the way of American families installing rooftop solar, home batteries, and other energy upgrades.

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40. Zoom interview with president of a Falls Church–based solar company, November 1, 2024
41. Google Meet interview with former director of shared services at a Fairfax-based solar company, November 15, 2024
42. Clean Code, Ohm Analytics. https://cleancode.ohmanalytics.com
43. Data compiled by Ohm Analytics
44. Zoom interview with operations manager for a Maryland-based solar company, October 23, 2024
45. Screenshot of Fairfax County permit review portal, shared via email by president of a solar company based in Falls Church, November 14, 2024
46. Phone call with Franklin County Development Services, November 14, 2024
47. Phone interview with Tom Grimes, building inspector with Louden County, November 15, 2024
48. Data compiled by Ohm Analytics
49. Phone interview with Blacksburg building official, November 12, 2024
50. NREL, "SolarTrace," https://maps.nrel.gov/solarTRACE/
51. Max Marcilla, "Prince Willam Co. Approves Plan to Waive Fees for Residential Solar Panel Installation," DC News Now, August 4, 2023
52. Residential Solar, Prince William County, https://www.pwcva.gov/residentialsolar
53. Phone interview with a national solar provider that has operations in Virginia, July 28, 2025
54. 2021 Virginia Residential Code, Section 113.7
55. Elizabeth McGowan, "Can Cutting Fees and Red Tape Help Lure Solar Companies Back to This Virginia County?," Energy News Network, August 17, 2023
56. Prince William County, "Permitting Process Improvements Initiative" https://pwcworks.pwcva.gov/permitting-process-improvements-initiative
57. "Prince William County Launches SolarAPP+ for Home Solar Energy Systems" (press release), Prince William County, October 24, 2024
58. Prince William County, "Permitting Process Improvements Initiative," https://pwcworks.pwcva.gov/permitting-process-improvements-initiative

B113.6-24

VCC: 113.6

Proponents: Andrew Clark, representing Home Builders Association of Virginia (aclark@hbav.com)

2021 Virginia Construction Code

Revise as follows:

113.6 Approval or notice of defective work. The building official shall either approve the work in writing or give written notice of defective work to the *permit holder*. ~~Upon request of the *permit holder*, the~~ The written notice shall reference the USBC section that serves as the basis for the defects and such defects shall be corrected and reinspected before any work proceeds that would conceal such defects. A record of all reports of inspections, tests, examinations, discrepancies and approvals issued shall be maintained by the building official and shall be communicated promptly in writing to the *permit holder*. Approval issued under this section may be revoked whenever it is discovered that such approval was issued in error or on the basis of incorrect information, or where there are repeated violations of the USBC. Notices issued pursuant to this section shall be permitted to be communicated electronically, provided the notice is reasonably calculated to get to the *permit holder*.

Reason Statement:

Section 113.6 requires the building official to approve completed work in writing or issue a written notice of defective work. If requested by the permit holder, the written notice of defective work must cite the specific USBC section serving as the basis for the deficiency. This proposal removes the phrase “upon request of the permit holder”, requiring all notices of defective work to cite specific section(s) of the USBC serving as the basis for the deficiency.

The intent of this proposal is to provide builders with the information needed to efficiently make necessary corrections and minimize uncertainty or miscommunication that can lead to multiple inspections or project delays.

Cost Impact: The code change proposal will decrease the cost

This proposal is expected to result in a modest reduction in cost. By requiring defect notices to include the applicable USBC section automatically, builders can identify and correct issues more efficiently, reducing time spent on clarification and follow-up inspections. The change also lessens administrative workload for both builders and building officials by minimizing back-and-forth communication and repeat site visits. Overall, it streamlines the inspection process without imposing any new compliance or reporting costs on localities.

B113.7-24

VCC: 113.7, 113.7.1, 113.7.2

Proponents: Andrew Clark, representing Home Builders Association of Virginia (aclark@hbav.com)

2021 Virginia Construction Code

Revise as follows:

113.7 Approved inspection agencies. The building official ~~may~~ is authorized to accept reports of inspections and tests from individuals or inspection agencies approved in accordance with the building official’s written policy required by Section 113.7.1 . ~~The individual or inspection agency shall meet the qualifications and reliability requirements established by the written policy.~~ The building official shall accept reports of inspections and tests for review when ~~Under circumstances where~~ the building official is unable to ~~make~~ complete the inspection or test required by Section 113.3 or 113.4 within 2 *working days* of a request or ~~an~~ a mutually agreed upon date or if authorized for other circumstances in the building official’s written policy~~, the building official shall accept reports for review~~. The building official shall accept reports and tests for review of rooftop-mounted photovoltaic (PV) systems installed on one- and two-family dwellings or accessory structures when the building official is unable to complete the inspection or test required by section 113.3 or 113.4 with photographs or videotapes. The building official shall approve the report from such approved individuals or agencies unless there is cause to reject it. Failure to approve a report shall be in writing within 2 *working days* of receiving it stating the reason for the rejection. Reports of inspections conducted by approved third-party inspectors or agencies shall be in writing, shall indicate if compliance with the applicable provisions of the USBC have been met and shall be certified by the individual inspector or by the responsible officer when the report is from an agency. Photographs, videotapes, and other sources of pertinent data or information shall be considered as constituting such reports and tests and be incorporated into the third-party inspection policy pursuant to 113.7.1. Reports of inspections conducted for the purpose of verifying compliance with the requirements of the USBC for elevators, escalators, and related conveyances shall include the name and certification number of the elevator mechanic performing the tests witnessed by the third-party inspector or agency.

> **Exception:** The licensed mechanical contractor installing the mechanical system shall be permitted to perform duct tests required by Section R403.3.5 of the IECC or Section N1103.3.5 of the IRC. The contractor shall have been trained on the *equipment* used to perform the test.

> ~~**Note:** Photographs, videotapes or other sources of pertinent data or information may be considered as constituting such reports and tests.~~

113.7.1 Third-party inspectors. Each building official charged with the enforcement of the USBC shall have a written policy establishing the minimum acceptable qualifications for third-party inspectors. The policy shall include the format and time frame required for submission of reports, any prequalification or preapproval requirements before conducting a third-party inspection and any other requirements and procedures established by the building official. The written policy shall also provide for acceptance of inspection and test reports for rooftop-mounted photovoltaic (PV) systems installed on one- and two-family dwellings or accessory structures. Applications for prequalification, preapproval, or other procedures required prior to conducting a third-party inspection shall be reviewed and acted upon by the building official within three (3) working days of receipt of a complete application.

113.7.2 Qualifications. In ~~determining~~ establishing third-party inspector qualifications, the building official ~~may~~ shall consider such items as *DHCD* inspector certification, licensure as a Registered Design Professional (RDP) in the Commonwealth of Virginia, other state or national certifications, state professional registrations, related experience, education and any other factors that would demonstrate competency and reliability to conduct inspections.

Reason Statement:

Many local building departments across Virginia are experiencing staffing shortages that affect their ability to complete required inspections within statutory timeframes. These delays extend project schedules, increase carrying costs, and slow the construction of new housing and the installation of rooftop-mounted photovoltaic (PV) systems. This proposal seeks to expand the use of qualified third-party inspectors to supplement local inspection capacity, ensure timely project completion, and maintain consistent enforcement of the

Uniform Statewide Building Code.The proposal revises Section 113.7 of the 2021 Virginia Residential Code (VRC) to clarify and expand the use of qualified third-party inspectors, including:

- Editorial changes to existing provisions related to the local building officials authority of accept report from approved third-party inspectors and timeframe in which the local building official must accept a third-party inspectors report for review.
- Clarifies that local policies must allow for the acceptance of inspection and test reports for rooftop-mounted photovoltaic (PV) systems installed on one- and two-family dwellings or accessory structures.
- Requires local building officials to act on prequalification or preapproval applications within three working days of receipt.
- Provides that photographs, videos, and similar documentation may serve as valid inspection evidence.
- Expands qualification criteria by recognizing Registered Design Professionals (RDPs) licensed in Virginia as eligible third-party inspectors, along with DHCD-certified and other credentialed individuals.

Proponents: Permit Power (Trieste Lockwood) and Home Builders Association of Virginia (Andrew Clark)

Cost Impact: The code change proposal will decrease the cost

This proposal will reduce construction costs by an indeterminate amount through improved inspection efficiency and reduced project delays.

B119.5(1)-24

VCC: 119.5

Proponents: Eric Mays, representing Prince William County (emays@pwcgov.org)

2021 Virginia Construction Code

Revise as follows:

119.5 Right of appeal; filing of appeal application. Any person aggrieved by the *local building department's* application of the USBC or the refusal to grant a modification to the provisions of the USBC may appeal to the *LBBCA*. The applicant shall submit a written request for appeal to the *LBBCA* within 30 calendar days of the receipt of the decision being appealed. <u>When the local governing body has established a fee for the filing of an appeal, the building department shall establish a written policy for the process and methods of payment. The written request for appeal is not considered to be complete and filed until the fee is paid.</u> The application shall contain the name and address of the *owner* of the *building* or *structure* and, in addition, the name and address of the person appealing, when the applicant is not the *owner*. A copy of the building official's decision shall be submitted along with the application for appeal and maintained as part of the record. The application shall be marked by the *LBBCA* to indicate the date received. Failure to submit an application for appeal within the time limit established by this section shall constitute acceptance of a building official's decision.

> **Note:** To the extent that a decision of a building official pertains to amusement devices there may be a right of appeal under the *VADR*.

Reason Statement:

The Code Change Proposal is to clarify the requirements related to the timely filing of an appeal. The Virginia Construction Code requires appeals to be submitted within 30 days of the code official's decision and to be heard by the local appeals board within 30 days. The State Technical Review Board recently held a preliminary hearing to determine if an appeal was submitted in a timely manner. The appeal application fee was not paid until approximately 3 months after the filing of the written request to appeal; thereby delaying the appeal process. The current Code does not address any linkage between the appeal application and the payment of an appeal application fee. For consistency, the Code Change Proposal address the VCC, VRC, VMC and SFPC.

DHCD Staff Note: This proposal was initially submitted to include similar changes to the VPMC and SFPC. DHCD Staff split the initially submitted proposal into three separate proposals:

B119.5(1)-24: VCC portion of original proposal (this proposal)
FP112.1-24: SFPC portion of original proposal
PM107.5-24: VPMC portion of original proposal

Cost Impact: The code change proposal will not increase or decrease the cost
The code change provides an administrative clarification and does not impact cost.

B202-24

VCC: SECTION 202 (New)

Proponents: Allison Cook, representing Arlington, Virginia (acook1@arlingtonva.us); Eric Mays, representing Prince William County (emays@pwcgov.org); Ron Clements, Chesterfield, representing Building Inspection Department (clementsro@chesterfield.gov)

2021 Virginia Construction Code

Add new text as follows:

DEAD END. A portion of a corridor in which the travel to an exit is in one direction only.

Reason Statement: At the national level, there are multiple interpretations of what is a dead end and how to measure it because is no definition in the code currently. This code change seeks to add to the code the way dead-ends have been consistency reviewed across Virginia to ensure ongoing consistent reviewed and inspected.

Cost Impact: The code change proposal will not increase or decrease the cost

This is an existing view of how dead-ends have been reviewed since BOCA. So, there should not be an increase or decrease in cost.

B302.1-24

VCC: 302.1, 304.1.1

Proponents: Kenney Hackworth, representing City of Newport News

2021 Virginia Construction Code

Revise as follows:

302.1 Occupancy classification. Occupancy classification is the formal designation of the primary purpose of the building, structure or portion thereof. Structures shall be classified into one or more of the occupancy groups specified in this section based on the nature of the hazards and risks to building occupants generally associated with the intended purpose of the building or structure. An area, room or space that is intended to be occupied at different times for different purposes shall comply with all applicable requirements associated with such potential multipurpose. Structures containing multiple occupancy groups shall comply with Section 508. Where a structure is proposed for a purpose that is not specified in this section, such structure shall be classified in the occupancy it most nearly resembles based on the fire safety and relative hazard. Occupied roofs shall be classified in the group that the occupancy most nearly resembles, according to the fire safety and relative hazard, and shall comply with Section 503.1.4.

1. Assembly (see Section 303): Groups A-1, A-2, A-3, A-4 and A-5.
2. Business (see Section 304 and 313 for *State Regulated Care Facilities* (SRCFs)): Group B.
3. Educational (see Section 305): Group E.
4. Factory and Industrial (see Section 306): Groups F-1 and F-2.
5. High Hazard (see Section 307): Groups H-1, H-2, H-3, H-4 and H-5.
6. Institutional (see Sections 308 and 313 for ~~*State Regulated Care Facilities* (SRCFs).~~ SRCFs).
7. Mercantile (see Section 309): Group M.
8. Residential (see Sections 310 and 313 for *SRCF*s): Groups R-1, R-2, R-3, R-4 and R-5.
9. Storage (see Section 311): Groups S-1 and S-2.
10. Utility and Miscellaneous (see Section 312): Group U.

~~**304.1.1 Day support and day treatment facilities.** Day support and day treatment facilities licensed by the Virginia Department of Behavioral Health and Developmental Services shall be permitted to be classified as Group B occupancies provided all of the following conditions are met:~~

1. ~~Participants who may require physical assistance from staff to respond to an emergency situation shall be located on the level of exit discharge.~~
2. ~~Any change in elevation within the exit access on the level of exit discharge shall be made by means of a ramp or sloped walkway.~~
3. ~~Where the facilities are located more than two stories above grade, an automatic sprinkler system shall be provided throughout the *building* in accordance with Section 903.3.1.1 .~~

313.6 Day support and day treatment facilities.
Day support and day treatment facilities licensed by the Virginia Department of Behavioral Health and Developmental Services shall be permitted to be classified as Group B occupancies provided all of the following conditions are met:

1. Participants who may require physical assistance from staff to respond to an emergency situation shall be located on the level of exit discharge.

2. Any change in elevation within the exit access on the level of exit discharge shall be made by means of a ramp or sloped walkway.

3. Where the facilities are located more than two stories above grade, an automatic sprinkler system shall be provided throughout the *building* in accordance with Section 903.3.1.1 .

Reason Statement: To place all state regulated care facilities into Section 313. This specific code section was not listed there, but is a SRCF regulated by the VDBHDC

Cost Impact: The code change proposal will not increase or decrease the cost

The proposed change has no impact on the cost, it is clerical in nature

B406.2.7-24

IBC: 406.2.7.1 (New), 406.2.7.2 (New), 406.2.7.3 (New)

Proponents: Ernest Little, Retired Prince William County Department of Fire and Rescue, representing Myself (prwmfm4@aol.com)

2024 International Building Code

Add new text as follows:

406.2.7.1 Emergency disconnecting means. Electric vehicle charging systems shall be provided with the disconnecting means required by NFPA 70 and that device or an additional disconnecting means shall also comply with the following as an emergency disconnect except where located at one and two family dwellings:

1. The emergency disconnect shall be installed in a readily accessible location no less than 20 feet (6.0m.) nor more than 100 feet (30.0 m.) from the electric vehicle charging station(s) and in a clear line of sight of the equipment. Where additional charging stations are more than 100 feet (30.0 m.) away, signage shall be provided to indicate the location of the associated emergency disconnect(s).
2. The emergency shutoff shall be marked "EV CHARGER EMERGENCY DISCONNECT" AND "ELECTRIC VEHICLES WILL REMAIN ENERGIZED".
3. The emergency disconnect shall immediately disconnect power to all electric vehicle charging stations within sight of the emergency disconnect or identify which charging stations are controlled.
4. The emergency disconnect shall be of a manual reset type and permitted to be lockable open in accordance with NFPA 70.

406.2.7.2 Impact protection. Where subject to motor vehicle impact, or other physical damage, electric vehicle charging systems shall be protected in accordance with Section 312 of the International Fire Code.

406.2.7.3 Emergency procedures. Emergency procedures shall be posted on an approved sign at an approved and conspicuous location at the electric charging station(s) and shall read:

IN CASE OF FIRE

1. IF POSSIBLE, SHUT OFF AND UPLUG THE VEHICLE

2. USE THE EV CHARGER EMERGENCY DISCONNECT TO DISCONNECT POWER

3. REPORT THE INCIDENT TO THE FIRE DEPARTMENT

FIRE DEPARTMENT PHONE NUMBER:____________________________________

4. FACILITY ADDRESS: ____

Reason Statement:
The Virginia Construction (VCC) and Virginia Statewide Fire Prevention Code (SFPC) lack an emergency disconnecting requirement similar to that required by NFPA 30A at motor fuel dispensing facilities. Charging stations supplying DC power to electric vehicles (EVs) are available to the general public along major highways and have become more available in public parking garages, public parking lots, and workplace parking lots. When an emergency occurs at one of these EV charging stations, first responders need a quick means to disconnect power in order to mitigate the emergency safely. The proposed amendments are intended to correct a previously unknown existing hazard.Theproposedamendmentsintendtoofferthepublicabenefitthatwouldlessenarecognized (known) hazard or ameliorate a continuing dangerous condition or situation.

The 2024 International Fire Code references the National Fire Protection Association (NFPA) 2023 National Electrical Code (NEC) which had a tentative interim amendment (TIA) regarding vehicle impact protection and emergency shutoffs. This TIA was considered by the National Fire Protection Association in development of the 2026 NEC) and emergency disconnects for electric vehicle charging stations were added to the code requirements. The 2026 NEC will be published in October of 2025 however will not be the referenced NEC for the VCC thus the reference to this 2026 code section is not contained in the amendment to avoid the need to reference two different editions of the NEC. The impact protection provision of the amendments brings an existing requirement of the NEC for electrical equipment exposed to vehicle impact into the VCC to make the requirement easier to access for installers of electric vehicle charging equipment.

Currently, shut down controls are required for both refueling stations and DC charging stations; however, access to these shutdowns is quite different and create unnecessary and potentially lethal intervention hazard delays for first responders who are called to address emergencies at DC charging stations.

Concerns:

(1) First responders, who respond to emergencies at DC Charging stations do so in an electrical energy environment that can exceed normal household voltages. These first responders are not trained, nor equipped, to operate in electrical hazard areas without a shut off or lock out device being available.

(2) First responders do not have tools capable of ensuring that the DC energy hazard has been controlled.UnlikeAChazards,wheretoolshavebeenmadeavailabletofirstrespondersthat allow them to gather some information about the energy status of electrical equipment, there are very few tools available to first responders for ascertaining DC energy status.

(3) While not required at EV charging stations, some vendors are installing emergency shut offs and they are being installed in locations that are not safe or readily accessible for first responders. Some are being installed at the actual charging device location rather than at a safe location away from the hazard area. While well intended, the installation of these devices requires first responders to work in the hazard area to operate them. NFPA 30A requires that the e-stop be located at least 20 feet away from the hazard.

(4) EV Charging station electrical shut offs are not labelled and are not readily accessible and Energy disconnects (per code) are allowed to be in locked cabinets which are often not labeled. This creates confusion and frustration for first responders attempting to address the electrical hazards present. Since emergency shut offs have been present at refueling stations since1984, first responders look for emergency shut offs where they have seen at refueling stations.

Cost Impact: The code change proposal will increase the cost

There will be cost associated with the installation of impact protection, disconnecting means, and the required materials. The cost could be offset by the reduction in damaged components due to vehicle impact and the possible injury to first responders due to exposure to live electrical components in mitigating events associated with malfunction or misuse of electric vehicle charging equipment.

Attached Files

- **commercial-ev-charging-station.jpg**
  https://va.cdpaccess.com/proposal/1381/1970/files/download/944/
- **IMG_3797.jpg**
  https://va.cdpaccess.com/proposal/1381/1970/files/download/943/
- **TOIBIB97Q7aDANnGZA0xeQ - no impact protection provided.jpeg**
  https://va.cdpaccess.com/proposal/1381/1970/files/download/942/
- **burning-electric-car-after-catching-fire-while-charging-at-a-station.png**
  https://va.cdpaccess.com/proposal/1381/1970/files/download/941/
- **charging-station-damaged-1100x825.jpg**
  https://va.cdpaccess.com/proposal/1381/1970/files/download/940/

B406.2.7(1)-24

IBC: 406.2.7, NFPA Chapter 35 (New), UL Chapter 35 (New)

Proponents: Andrew Milliken, representing Stafford County Fire Marshal's Office (amilliken@staffordcountyva.gov)

2024 International Building Code

Revise as follows:

406.2.7 Electric vehicle charging stations and systems. Where provided, electric vehicle charging systems shall be installed in accordance with NFPA 70. Electric vehicle charging system equipment shall be *listed* and *labeled* in accordance with UL 2202 or UL2750. Electric vehicle supply equipment shall be *listed* and *labeled* in accordance with UL 2594. Accessibility to *electric vehicle charging stations* shall be provided in accordance with Section 1107. Parking garages with electric vehicle charging stations shall comply with sections 6.4 and 6.5 of NFPA 88A.

Add new text as follows:

NFPA

National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471

88A-23	Standard for Parking Structures

Revise as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook, IL 60062

2750-23	Wireless Power Transfer Equipment for Electric Vehicles

Reason Statement:

DHCD Staff Note: UL 2750-23 is a new standard, although the proposal states "Revise as Follows".

This proposal provides additional installation requirements for certain electric vehicle charging stations to address emerging fire safety concerns identified in a recent Fire Protection Research Foundation reports.

First, the proposal adds a reference to UL 2750 which is the standard related to wireless power transfer equipment for electric vehicles. It is essential that the building code reference standards keep pace with the rapidly evolving technology for electric vehicle charging systems. Second, the proposal adds a requirement to ensure that fire protection features (fire sprinklers and standpipes) are provided when electric vehicle charging stations are provided in parking garages. The new language simply references requirements found in the latest edition of NFPA88A (National Fire Protection Association Standard for Parking Structures) which was recently updated to address concerns identified in recent research reports. Specifically, this proposal ensures that fire sprinkler systems are present (NFPA 88A, 6.4) and that standpipes (NFPA 88A, 6.5) are available for fire department operations below grade. The full text of these sections is provided below for reference.

https://www.nfpa.org/news-blogs-and-articles/blogs/2024/07/12/parking-garages-and-evs

Although the frequency of electric vehicle fires has not been shown to be significantly different than other vehicle fires, the impact of these fires to the fire service and ultimately the community is exponentially different. For example, where the water required to extinguish a traditional internal combustion engine vehicle fire is approximately 500 gallons typically from a single fire apparatus and concluded in about 30 minutes, the water needed for an electric vehicle fire is measured in thousands of gallons involving multiple apparatus for at least 60-90 minutes and often much more. Electric vehicle fires, particularly within parking garages, present challenges to containment and control of the incident. Depending on the circumstances, it often can be best practice to let an electric vehicle fire continue to burn once the batteries are in thermal runaway however this is almost never an option within parking garages due to exposure of the structure, adjacent vehicles and limited ventilation. Also, electric vehicle fires can require the vehicle to be rotated or relocated to allow firefighters to direct hose streams on the batteries or to avoid the fire spreading to other adjacent vehicles and combustible materials but that is usually difficult or even impossible within parking garages. If you haven't experienced a typical electric vehicle fire, the following video provides an excellent perspective on these types of incidents.

https://youtu.be/J0gRFIbsx1E

As the installation of electric vehicle charging stations continues to grow throughout Virginia, it is critical that fire safety concerns, particularly those associated with parking garages, be adequately addressed.

NFPA 88A (2023) Standard for Parking Structures:
6.4 Sprinkler Systems.
6.4.1 Automatic sprinkler systems shall be installed in all parking structures in accordance with NFPA 13 and NFPA 13R as applicable.
6.4.2 Automatic sprinkler systems shall be inspected, tested, and maintained in accordance with NFPA 25.
6.5 Standpipes.
6.5.1 Parking structures exceeding a height of 50 ft (15 m) or having parking levels below grade shall be provided with a Class I standpipe system in accordance with NFPA 14.
6.5.2 Class I standpipe systems of the manual dry type shall be permitted in open parking structures.
6.5.3 Standpipe systems shall be inspected, tested, and maintained in accordance with NFPA 25.

Cost Impact: The code change proposal will increase the cost

Although this proposal may increase the overall cost of installation of some electric vehicle charging stations when located within parking garages, many if not most new parking garage projects will already likely comply with these fire protection requirements. For example, nearly all enclosed or below grade parking garages require fire sprinklers and even open parking garages already require fire sprinklers when the total [fire] area exceeds 48,000 square feet.

B407.4.1.1-24

VCC: 407.4.1.1; IBC: [BE] 407.4.1.1; VCC: 1010.2.14; IBC: 1010.2.13

Proponents: Eric Mays, representing Prince William County (emays@pwcgov.org)

2021 Virginia Construction Code

Delete without substitution:

~~**407.4.1.1 Special locking arrangement.** Means of egress doors shall be permitted to contain locking devices restricting the means of egress in areas in which the clinical needs of the patients require restraint of movement, where all of the following conditions are met:~~

1. ~~The locks release upon activation of the fire alarm system or the loss of power.~~
2. ~~The *building* is equipped with an approved automatic sprinkler system in accordance with Section 903.3.1.1 .~~
3. ~~A manual release device is provided at a nursing station responsible for the area.~~
4. ~~A key-operated switch or other manual device is provided adjacent to each door equipped with the locking device. Such switch or other device, when operated, shall result in direct interruption of power to the lock—independent of the control system electronics~~
5. ~~All staff shall have keys or other means to unlock the switch or other device or each door provided with the locking device.~~

2024 International Building Code

[BE] 407.4.1.1 Locking devices. Locking devices that restrict access to a care recipient's room from the *corridor* and that are operable only by staff from the corridor side shall not restrict the *means of egress* from the care recipient's room.

Exceptions:

1. This section shall not apply to rooms in psychiatric treatment and similar care areas.
2. Locking arrangements in accordance with Section 1010.2.13.

2021 Virginia Construction Code

Delete without substitution:

~~**1010.2.14 Controlled egress doors in Groups I-1 and I-2.** (Section deleted.)~~

2024 International Building Code

1010.2.13 Controlled egress doors in Groups I-1 and I-2. Controlled egress electrical locking systems where egress is controlled by authorized personnel shall be permitted on doors in the means of egress in Group I-1 or I-2 occupancies where the clinical needs of *persons* receiving care require their containment. Controlled egress doors shall be permitted in such occupancies where the *building* is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or an *approved automatic smoke detection system* installed in accordance with Section 907, provided that the doors are installed and operate in accordance with all of the following:

1. The door's electric locks shall unlock on actuation of the *automatic sprinkler system* or *automatic smoke detection system* allowing immediate free egress.

2. The door's electric locks shall unlock on loss of power to the electrical locking system or to the electric lock mechanism allowing immediate free egress.

3. The electrical locking system shall be installed to have the capability of unlocking the electric locks by a switch located at the *fire command center*, a nursing station or other *approved* location. The switch shall directly break power to the electric lock.

4. A *building* occupant shall not be required to pass through more than one door equipped with a controlled egress locking system before entering an *exit*.

5. The procedures for unlocking the doors shall be described and *approved* as part of the emergency planning and preparedness required by Chapter 4 of the *International Fire Code*.

6. All clinical staff shall have the keys, codes or other means necessary to operate the controlled egress electrical locking systems.

7. Emergency lighting shall be provided at the door.

8. The electromechanical or electromagnetic locking device shall be *listed* in accordance with either UL 294 or UL 1034 .

Exceptions:

1. Items 1 through 4 shall not apply to doors to areas occupied by *persons* who, because of clinical needs, require restraint or containment as part of the function of a psychiatric or cognitive treatment area.

2. Items 1 through 4 shall not apply to doors to areas where a *listed* egress control system is utilized to reduce the risk of child abduction from nursery and obstetric areas of a Group I-2 *hospital*.

Reason Statement:

Virginia added section 407.4.1.1 to the 2003 Virginia Construction Code (VCC) because the IBC had not yet addressed this condition. In the 2009 IBC the condition was addressed by adding Section 1008.1.9.6. However, Virginia did not revisit the 2009 IBC code change, and the new IBC section continued to be deleted from Virginia's base documents during the last four code adoption cycles.

This code change proposal is intended to remove the 2003 VCC amendment, and return to the 2024 IBC code language. It is also important to note that the IBC's current language more fully addresses the clinical needs for facilities providing care for mental illness, dementia, and Alzheimer's disease by providing for the occupant restraint and containment when medically required to keep the patient and others safe from harm.

Clarification Notes:

#1 The 2021 VCC, Section 407.4.1.1 Special Locking Arrangement is being proposed to be replaced by the 2024 IBC, Section 407.4.1.1 Locking Devices (included in the proposal for context).

#2 The 2021 VCC, Section 1010.2.14 Controlled Egress Doors in Groups I-1 and I-2 is being proposed to be replaced by the language found in the 2024 IBC Section 1010.2.13 Controlled Egress Doors in Groups I-1 and I-2 (included in the proposal for context).

Cost Impact: The code change proposal will not increase or decrease the cost

Repealing or removing the 2003 Virginia Construction Code Amendment and moving forward with 2024 IBC requirements has negligible impact on cost.

B706.3-24

IBC: 706.3

Proponents: Shahriar Amiri, representing Arlington County, VA (samiri@arlingtonva.us)

2024 International Building Code

Revise as follows:

706.3 Materials. *Fire walls* shall be of any approved ~~noncombustible materials.~~ materials permitted by the building type of construction.
~~Exception: Buildings of Type V construction~~

Reason Statement:

This language is consistent with other code references that define approvable types of materials permitted in rated partitions and barriers. It also allows firewalls to be constructed with the materials permitted with a building's construction type improving building constructability by allowing consistent construction materials with equivalent expansion and contraction properties.

Cost Impact: The code change proposal will decrease the cost

This will reduce the cost of construction by allowing Type III and IV fire walls to be constructed with the same materials used for the building type of construction.

B907.5.2.1.2-24

IBC: [F] 907.5.2.1.2

Proponents: Richard Gordon, Hanover County, representing Self (rtgordon@hanovercounty.gov)

2024 International Building Code

Revise as follows:

[F] 907.5.2.1.2 Maximum sound pressure. The total sound pressure level produced by combining the ambient sound pressure level with all audible notification appliances operating shall not exceed 110 dBA at the minimum hearing distance from the audible appliance. Where <u>the average ambient noise in an A occupancy exceeds 105 dBA, a system arranged to stop or reduce ambient noise shall be provided in accordance with NFPA 72. In all other occupancies, where</u> the average ambient noise is greater than 105 dBA, *visible alarm notification appliances* shall be provided in accordance with NFPA 72 and *audible alarm notification appliances* shall not be required.

Reason Statement:

Theaters, arenas and other A occupancies have amplified sound and distracting lighting that could obscure notification appliances. This issue is exacerbated in large A occupancies that use voice communication – the audible signal is indistinguishable from the ambient noise. Rather than simply omitting audible signals, NFPA 72 has guidance that would allow alarm designers to incorporate sound attenuation into the alarm design, and make the alarm notification devices effective. Many designers already include this function in spaces dedicated to musical performances and similar uses.

As stated in NFPA 72 explanatory material:

Reducing the background noise is a viable alternative to providing a fire alarm system with a high level of audio output. In venues such as nightclubs, concert halls, and theaters, stopping the background noise and controlling the lighting to create a sudden and noticeable change in the environment that will get people’s attention is advised.

Cost Impact: The code change proposal will increase the cost

The addition of relays and associated wiring to turn off sources of amplified sound will increase construction cost for assembly occupancies where designers have not already incorporated this system into the design.

B917.1.1-24

IBC: SECTION 202 (New), SECTION 917, [F] 917.1, 917.1.1 (New)

Proponents: Gregg Black, representing George Mason University (gblack2@gmu.edu)

2024 International Building Code

Add new text as follows:

SECTION 202 DEFINITIONS.
EMERGENCY MANAGEMENT COORDINATOR. Professional responsible for developing, implementing, and coordinating an emergency management program.

SECTION 917
MASS NOTIFICATION SYSTEMS

[F] 917.1 College and university campuses. Prior to construction of a new *building* requiring a *fire alarm system* on a multiple-*building* college or university campus having a cumulative *building occupant load* of 1,000 or more, a mass notification risk analysis shall be conducted in accordance with NFPA 72. Where the risk analysis determines a need for mass notification, an *approved* mass notification system shall be provided in accordance with the findings of the risk analysis.

917.1.1 Coordination. The Building code official shall consult with the emergency management coordinator when a mass notification system is required.

Reason Statement:
College and university campuses have long been required to have distributed recipient mass notification systems since the Jeanne Clery Act was passed by the federal government. Further, Virginia institutions are required by the Code of Virginia to have emergency broadcast systems on campus (23.1-803). This building code requirement for additional of mass notification does not take into account the other legal requirements and current mass notification systems that are already in place at institutions across the commonwealth. The risk assessment that is required for compliance with this code needs to be coordinated with the emergency manager coordinator which every state institution is required to have per Executive Order 41 (2019), and private institutions have also appointed.

With different architects being used on different projects, university's run the risk of risk assessments that don't align with each other or take into account the emergency planning that is done by the Emergency Managers at their respective institutions. This code modification would require that the risk assessments be coordinated with the experts at the various institutions who best understand the unique idiosyncrasies of emergency response at their particular institutions.

Cost Impact: The code change proposal will not increase or decrease the cost
There is no expectation that it will change the cost of the building.

Attached Files

- **Code Change Letter of Support.docx**
  https://va.cdpaccess.com/proposal/1528/2225/files/download/1014/

B918.1-24

VCC: 918.1, 918.1.1, 918.1.3, 918.2, 918.1.2

Proponents: Matthew J. Bonifant, representing BXP, Inc. (mbonifant@bxp.com)

2021 Virginia Construction Code

Revise as follows:

918.1 General. For localities utilizing public safety wireless communications, dedicated infrastructure to accommodate and perpetuate continuous in-building *emergency communication equipment* to allow *emergency public safety personnel* to send and receive emergency communications shall be provided in new *buildings* and structures in accordance with this section.

Exceptions:

1. *Buildings* of Use Groups A-5, I-4, within dwelling units of R-2, R-3, R-4, R-5, and U.
2. *Buildings* of Types IV and V construction without basements, that are not considered unlimited area buildings in accordance with Section 507 .
3. Above grade single story *buildings* of less than 20,000 square feet (1858 m^2).
4. *Buildings* or leased spaces occupied by federal, state, or local governments, or the contractors thereof, with security requirements where the building official has approved an alternative method to provide *emergency communication equipment* for *emergency public safety personnel*.
5. Where the *owner* provides technological documentation from a qualified individual that the structure or portion thereof does not impede emergency communication signals.
6. *Buildings* in localities ~~that do not provide the additional communication equipment required for the operation of the system~~ where the *localities* do not have in-building communications requirements.

~~918.1.1~~ 918.2 Installation. In-building two-way emergency responder communication coverage systems shall comply with Sections 510.4 and 510.5 of the *International Fire Code*, except that the acceptance testing procedure required by ~~Section 510.5.4 of the *International Fire Code* and~~Section 918.4 shall be the responsibility of the ~~locality~~ *owner*. The building *owner* shall install cable, donor antenna, Bi-directional Amplifier (BDA), Distribution Antenna System (DAS), and all other required system components. The cable shall be installed in dedicated conduits, raceways, plenums, attics, or roofs, compatible for these specific installations as well as other applicable provisions of this code. ~~The *locality* shall be responsible for the installation of any additional communication equipment required for the operation of the system.~~

~~918.1.3~~ 918.3 Inspection. In accordance with Section 113.3, all installations shall be inspected prior to concealment.

~~918.2~~ 918.4 Acceptance test. Upon completion of installation, ~~after providing reasonable notice to the owner or their representative, emergency public safety personnel shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct~~
field tests to verify that the required level of radio coverage is present in accordance with the criteria in section 510.5.4 of the *International Fire Code* shall be conducted by the owner or owner's representative. A copy of the acceptance testing results and report shall be provided to the locality upon request. ~~Any noted deficiencies in the installation of the radiating cable, operational space, or other required emergency communications equipment shall be provided in an inspection report to the owner or the owner's representative.~~

~~918.1.2~~ 918.5 Operations. The ~~*locality*~~ *owner* will assume all ~~responsibilities~~ responsibility ~~for the operation~~ to ensure compliance with the Federal Communications Commission (FCC) requirements ~~maintenance of~~ for the *emergency communication equipment*. The building *owner* shall provide sufficient operational space within the *building* to allow the *locality* access to and the ability to operate in-building *emergency communication equipment*. The *owner shall be responsible for the emergency communication equipment and ongoing periodic inspection and testing as mandated by the International Fire Code.*

Reason Statement:

Many modern buildings are constructed with concrete, steel, or low-emissivity glass that can block or degrade the radio signals resulting in areas within a building where the radio signals are weak or there is no signal. Typically, these issues only arise on the lower and sublevels of buildings resulting in many buildings only needing partial coverage. Wireless systems ensure coordination, communication, and certainty that radio signals are transmitted and received. The use of this modern communication technology provides effective and reliable communication, which is one of the most important aspects of any emergency response: the ability to communicate in any part of a building without fear of losing radio contact. The loss of radio coverage can result in critical messages not communicated or received, not only endangering emergency responders, but endangering building occupants. This code change has not eliminated the option for hard-wired fire department communications; it has added an option.

The change in code exception #6 grants relief where the locality does not intend to provide the wireless equipment. However, many developers and building owners have willingly paid for and installed these systems recognizing the benefits to the occupants and all emergency responders. In addition, developers and building owners recognize that many localities are only requesting systems to be installed where needed. This makes it easier and more time efficient for the owner to install a system.

Having the option to install a wireless system in a high-rise or other non-exempt building or structure provides the owner with a code path to utilize the technology. Outdated hardwired communications systems are overall, more expensive to purchase, install, and maintain, and less effective than a wireless system in coverage and flexibility because they are in specific and limited locations within a building that may not be easily accessible. A wireless communications system is monitored through the fire alarm system for integrity, thus providing public safety with a more reliable system to operate during emergency and non-emergency events. When a wireless system is installed, it is a more reliable system that provides better protection to those in the building for not only the firefighters trained to use hardwired communications systems, but for law enforcement and other agencies who are not trained or have access to hardwired communications systems. The reality is, hardwire communication systems are highly unlikely to be used by any emergency responder.

In addition, the parts of Section 918 were rearranged to reflect a more logical sequence of events that will occur.

Cost Impact: The code change proposal will increase the cost

In circumstances where the installation of a wireless communication system is not offset by the removal of a hardwired system, project costs will increase. In instances where the hardwire system is no longer required because of the installation of a wireless system, there will be a substantial cost saving to developers and building owners from installation through the life of the building. The cost benefit is especially apparent in high-rise buildings when installing a wireless communication system in lieu of two-way fire department communication equipment. The initial estimated cost to install a hardwired system in a 20-story building is $180K-$300K whereas the wireless system cost is estimated at $90K-$180K. In high-rise buildings, the elimination of hardwired two-way fire department communications systems more than covers the cost of designing and installing a wireless communication system.

The elimination of hardwired two-way fire department communication equipment provides not only cost savings related to design and installation, but it eliminates the recurring inspection, testing, maintenance and service costs to ensure these hardwired systems are operational. Over the life of the building, the building owner could incur tens of thousands of dollars in costs related to inspecting, testing, and maintaining two-way fire department communication equipment. However, the inspection, testing, and maintenance costs related to a wireless communication system are significantly less because the number of system components and potential problems are greatly reduced. Although the cost to maintain the wireless communication equipment is the responsibility of the building owner, the locality must monitor the operation, compliance, and system integrity. In other words, the locality must ensure the operational integrity of the system in accordance with FCC regulations and requirements, and if determined there is an issue, the owner must engage their wireless contractor to take the appropriate action.

Attached Files

- **NAIOP Letter Modifications to VCC Section 918.pdf**
  https://va.cdpaccess.com/proposal/1477/2132/files/download/953/

NAIOP
COMMERCIAL REAL ESTATE
DEVELOPMENT ASSOCIATION
NORTHERN VIRGINIA CHAPTER

October 8, 2025

Mr. Louie Berbert, Chair
Board of Housing and Community Development
600 East Main Street, Suite 300
Richmond, Virginia 23219

Subject: Support for Proposed Modifications to VCC Section 918
In-Building Emergency Communications Coverage

Dear Chair Berbert and Board Members:

I am writing on behalf of NAIOP Northern Virginia. We respectfully submit this letter in support of either of the proposed options to modify Section 918 of the 2024 Virginia Construction Code, included herein as Exhibit A and B, respectively. NAIOP is an association that represents commercial real estate developers, owners, investors and asset managers. Our members have touched the majority of the buildings, both private and public, in Northern Virginia through development, ownership, design, construction, etc., as well as a number of buildings throughout the Commonwealth.

These proposed changes reflect a forward-thinking approach to emergency communications infrastructure in new buildings and structures. Wireless systems offer distinct advantages over traditional hardwired fire department communication systems, including broader and more reliable coverage, reduced installation and maintenance costs, and greater adaptability to modern building designs. The revisions maintain the option for hardwired systems while introducing a viable alternative that aligns with current technology and emergency response needs. By clearly defining responsibilities for installation, inspection, and maintenance, the proposed code ensures accountability and system integrity without placing undue burden on localities or building owners. These updates will enhance public safety, support innovation in building design, and provide meaningful cost savings to developers and owners across Virginia.

We commend the proponents for their thoughtful and practical approach to improving emergency communications coverage. These changes will enhance public safety and provide meaningful cost savings to developers and owners across the Commonwealth.

NAIOP urges the adoption of these modifications to Section 918. Thank you for your continued commitment to improving Virginia's building codes.

Sincerely,

Martha Marks

President

1729 King Street, Suite 410, Alexandria, Virginia 22314 Tel: 703-845-7080 Fax: 703-845-7081

B918.2-24

VCC: 918.1.1, 918.2.1 (New), 918.1.3, 918.2, 918.4.1 (New), 918.1.2, 918.5.1 (New)

Proponents: Matthew J. Bonifant, representing BXP, Inc. (mbonifant@bxp.com)

2021 Virginia Construction Code

Revise as follows:

~~918.1.1~~ 918.2 Installation. In-building two-way emergency responder communication coverage systems shall comply with Sections 510.4 and 510.5 of the *International Fire Code*, except that the acceptance testing procedure ~~required by Section 510.5.4 of the *International Fire Code* shall be the responsibility of the *locality*~~ shall be in accordance with Section 918.4. The building *owner* shall install cable. The cable shall be installed in dedicated conduits, raceways, plenums, attics, or roofs, compatible for these specific installations as well as other applicable provisions of this code. The *locality* shall be responsible for the installation of any additional communication *equipment* required for the operation of the system.

Add new text as follows:

918.2.1 Voluntary wireless in-building emergency communications coverage. Voluntary installation of a wireless communications system by the *owner* or their representative shall be coordinated with and approved by the *locality*. In accordance with Sections 510.4 and 510.5 of the *International Fire Code* the system shall include the installation of cable, donor antenna, Bi-Directional Amplifier (BDA), and Distribution Antenna Systems (DAS), and any other required system components by the *owner*.

Revise as follows:

~~918.1.3~~ 918.3 Inspection. In accordance with Section 113.3 , all installations shall be inspected prior to concealment.

~~918.2~~ 918.4 Acceptance test. Upon completion of installation, after providing reasonable notice to the *owner* or their representative, *emergency public safety personnel* shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the *owner*. Any noted deficiencies in the installation of the radiating cable ~~or~~ , operational space, or other required *emergency communications equipment* shall be provided in an inspection report to the *owner* or the *owner's* representative.

Add new text as follows:

918.4.1 Voluntary wireless in-building communications coverage. When installed by the *owner*, the *owner* shall be responsible for the acceptance testing of the system in accordance with the *International Fire Code*.

Revise as follows:

~~918.1.2~~ 918.5 Operations. The *locality* will assume all ~~responsibilities~~ responsibility for the operation and maintenance of the *emergency communication equipment*. The building *owner* shall provide sufficient operational space within the *building* to allow the *locality* access to and the ability to operate in-building *emergency communication equipment*.

Add new text as follows:

918.5.1 Voluntary wireless in-building communications coverage. When installed by the *owner*, the *owner* shall be responsible for the *emergency communication equipment* and ongoing periodic inspection and testing as mandated by the *International Fire Code*.

Reason Statement:

Many modern buildings are constructed with concrete, steel, or low-emissivity glass that can block or degrade the radio signals resulting in areas within a building where the radio signals are weak or there is no signal. Typically, these issues only arise on the lower and sublevels of buildings resulting in many buildings only needing partial coverage. Wireless systems ensure coordination, communication, and certainty that radio signals are transmitted and received. The use of this modern communication technology provides effective and reliable communication, which is one of the most important aspects of any emergency response: the ability to communicate in any part of a building without fear of losing radio contact. The loss of radio coverage can result in critical messages not communicated or received, not only endangering emergency responders, but endangering building occupants. This code change has not eliminated the option for hard-wired fire department communications; it has added an option.

Having the option to install a wireless system in a high-rise or other non-exempt buildings or structures provide the owner with a code path to utilize the technology. Outdated hardwired communications systems are overall, more expensive to purchase, install, and maintain, and less effective than a wireless system in coverage and flexibility because they are in specific and limited locations within a building that may not be easily accessible. A wireless communications system is monitored through the fire alarm system for integrity, thus providing public safety with a more reliable system to operate during emergency and non-emergency events. When a wireless system is installed, it is a more reliable system that provides better protection to those in the building for not only the firefighters trained to use hardwired communications systems, but for law enforcement and other agencies who are not trained or have access to hardwired communications systems. The reality is, hardwire communication systems are highly unlikely to be used by any emergency responder.

In addition, the parts of Section 918 were rearranged to reflect a more logical sequence of events that will occur.

Cost Impact: The code change proposal will not increase or decrease the cost

This is a voluntary program that owner's are not required to participate in. Below summarizes the cost impacts (and potential savings) if owner's opt in:

Installation of a wireless communication system instead of hardwired two-way fire department communications equipment provides a substantial cost saving to developers and building owners from installation through the life of the building. The cost benefit is especially apparent in high-rise buildings when installing a wireless communication system in lieu of two-way fire department communication equipment. The initial estimated cost to install a hardwired system in a 20-story building is $180K-$300K whereas the wireless system cost is estimated at $90K-$180K. In high-rise buildings, the elimination of hardwired two-way fire department communications systems more than covers the cost of designing and installing a wireless communication system.

The elimination of hardwired two-way fire department communication equipment provides not only cost savings related to design and installation, but it eliminates the recurring inspection, testing, maintenance and service costs to ensure these hardwired systems are operational. Over the life of the building, the building owner could incur tens of thousands of dollars in costs related to inspecting, testing, and maintaining two-way fire department communication equipment. However, the inspection, testing, and maintenance costs related to a wireless communication system are significantly less because the number of system components and potential problems are greatly reduced. Although the cost to maintain the wireless communication equipment is the responsibility of the building owner, the locality must monitor the operation, compliance, and system integrity. In other words, the locality must ensure the operational integrity of the system in accordance with FCC regulations and requirements, and if determined there is an issue, the owner must engage their wireless contractor to take the appropriate action.

Attached Files

- **NAIOP Letter Modifications to VCC Section 918.pdf**
  https://va.cdpaccess.com/proposal/1479/2134/files/download/954/

www.naiopva.org

NAIOP
COMMERCIAL REAL ESTATE
DEVELOPMENT ASSOCIATION
NORTHERN VIRGINIA CHAPTER

October 8, 2025

Mr. Louie Berbert, Chair
Board of Housing and Community Development
600 East Main Street, Suite 300
Richmond, Virginia 23219

Subject: Support for Proposed Modifications to VCC Section 918
In-Building Emergency Communications Coverage

Dear Chair Berbert and Board Members:

I am writing on behalf of NAIOP Northern Virginia. We respectfully submit this letter in support of either of the proposed options to modify Section 918 of the 2024 Virginia Construction Code, included herein as Exhibit A and B, respectively. NAIOP is an association that represents commercial real estate developers, owners, investors and asset managers. Our members have touched the majority of the buildings, both private and public, in Northern Virginia through development, ownership, design, construction, etc., as well as a number of buildings throughout the Commonwealth.

These proposed changes reflect a forward-thinking approach to emergency communications infrastructure in new buildings and structures. Wireless systems offer distinct advantages over traditional hardwired fire department communication systems, including broader and more reliable coverage, reduced installation and maintenance costs, and greater adaptability to modern building designs. The revisions maintain the option for hardwired systems while introducing a viable alternative that aligns with current technology and emergency response needs. By clearly defining responsibilities for installation, inspection, and maintenance, the proposed code ensures accountability and system integrity without placing undue burden on localities or building owners. These updates will enhance public safety, support innovation in building design, and provide meaningful cost savings to developers and owners across Virginia.

We commend the proponents for their thoughtful and practical approach to improving emergency communications coverage. These changes will enhance public safety and provide meaningful cost savings to developers and owners across the Commonwealth.

NAIOP urges the adoption of these modifications to Section 918. Thank you for your continued commitment to improving Virginia's building codes.

Sincerely,

Martha Marks

President

1729 King Street, Suite 410, Alexandria, Virginia 22314 Tel: 703-845-7080 Fax: 703-845-7081

B1006.3.4(1)-24

IBC: 1006.2.1, 1006.3.4, TABLE 1006.3.4(1), 1006.3.4.2 (New)

Proponents: Andrew Clark, representing Home Builders Association of Virginia (aclark@hbav.com)

2024 International Building Code

Revise as follows:

1006.2.1 Egress based on occupant load and common path of egress travel distance. Two *exits* or *exit access doorways* from any space shall be provided where the design *occupant load* or the *common path of egress* travel distance exceeds the values *listed* in Table 1006.2.1. The cumulative *occupant load* from adjacent rooms, areas or spaces shall be determined in accordance with Section 1004.2.

Exceptions:

1. The number of *exits* from foyers, lobbies, vestibules or similar spaces need not be based on cumulative *occupant loads* for areas discharging through such spaces, but the capacity of the *exits* from such spaces shall be based on applicable cumulative *occupant loads*.
2. *Care suites* in Group I-2 occupancies complying with Section 407.4.
3. Unoccupied mechanical rooms and *penthouses* are not required to comply with the common path of egress travel distance measurement.
4. Single exit six-story buildings complying with Section 1006.3.4.2.

1006.3.4 Single exits. A single *exit* or access to a single *exit* shall be permitted from any *story* or *occupiable roof* where one of the following conditions exists:

1. The *occupant load*, number of *dwelling units* and exit access travel distance do not exceed the values in Table 1006.3.4(1) or 1006
2. Rooms, areas and spaces complying with Section 1006.2.1 with *exits* that discharge directly to the exterior at the *level of exit disch* have one *exit* or access to a single *exit*.
3. Parking garages where vehicles are mechanically parked shall be permitted to have one *exit* or access to a single *exit*.
4. Group R-3 and R-4 occupancies shall be permitted to have one *exit* or access to a single *exit*.
5. Individual single-story or multistory *dwelling units* shall be permitted to have a single *exit* or access to a single *exit* from the *dwellin* both of the following criteria are met:
   5.1. The *dwelling unit* complies with Section 1006.2.1 as a space with one *means of egress*.

   5.2. Either the exit from the *dwelling unit* discharges directly to the exterior at the *level of exit discharge*, or the *exit access* outside entrance door provides access to not less than two *approved* independent *exits*.

6. The building is not a *high-rise* building and contains only R-2 occupancies above the *level of exit discharge* and all of the following

6.1. There shall be no more than four dwelling units on any floor and the net floor area of each floor shall not exceed 4,000 square feet.

Exception: Up to six dwelling units shall be permitted on any floor if the net floor area of each floor does not exceed 3,000 square feet.

6.2. The building construction shall be limited to types I, II-A, and IV.

Exception: If the building does not exceed six stories *above grade plane*, construction type shall not be limited further than elsewhere in this code. For the purposes of this exception, *mezzanine* spaces shall be counted as additional stories.

6.3. A *corridor* shall separate each *dwelling unit* entry/exit door from the door to an interior exit stairway, including any related *exit passageway*, on each floor. *Dwelling unit* doors shall not open directly into an interior exit stairway. *Dwelling unit* doors are perm

6.4. An exterior stairway or interior exit stairway shall be provided. If an interior exit is provided, its doors must be automatic-closing, smoke-activated doors with clearly labeled hold-open devices in accordance with Section 716.2.6.6.

6.5. There shall be no more than 20 feet (6096 mm) of travel to the exit stairway from the entry/exit door of any dwelling unit.

6.6. Travel distance measured in accordance with Section 1017 shall not exceed 125 feet.

6.7. The building does not contain a *boarding house*.

6.8. Other occupancies are permitted in the same building provided they comply with all the requirements of this code. Other occupancies shall not communicate with the Group R occupancy portion of the building or with the single-exit stairway.

Exception: Parking garages and occupied roofs accessory to the Group R occupancy are permitted to communicate with the exit stairway.

6.9. The exit serving the Group R occupancy shall not discharge through any other occupancy, including an accessory parking garage.

6.10. There shall be no openings within 10 feet (3048 mm) of unprotected openings into the stairway other than required exit doors having a one-hour fire-resistance rating.

6.11. The emergency power illumination requirements in section 1008.3 shall be provided regardless of there being only one means of egress under this section.

TABLE 1006.3.4(1) STORIES AND OCCUPIABLE ROOFS WITH ONE EXIT OR ACCESS TO ONE EXIT FOR R-2 OCCUPANCIES

STORY	OCCUPANCY	MAXIMUM NUMBER OF DWELLING UNITS	MAXIMUM EXIT ACCESS TRAVEL DISTANCE
Basement, first, second ~~or~~ third, forth, fifth, sixth story above grade plane and occupiable roofs over the first, ~~or~~ second, third, forth, or fifth story above grade plane	R-2[a, b, c, d]	4 dwelling units	125 feet
~~Fourth~~ Seventh story above grade plane and higher	NP	NA	NA

For SI: 1 foot = 304.8 mm.

NP = Not Permitted.

NA = Not Applicable.

a. Buildings classified as Group R-2 equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 and provided with emergency escape and rescue openings in accordance with Section 1031.

b. This table is used for Group R-2 occupancies consisting of dwelling units. For Group R-2 occupancies consisting of sleeping units, use Table 1006.3.4(2).

c. This table is for occupiable roofs accessed through and serving individual dwelling units in Group R-2 occupancies. For Group R-2 occupancies with occupiable roofs that are not accessed through and serving individual units, use Table 1006.3.4(2).

d. 6-story buildings and 5-story buildings with an occupiable roof above the fith story shall also comply with Section 1006.3.4.2.

Add new text as follows:

1006.3.4.2 Single exit six-story buildings with Group R-2 dwelling units. Six-story buildings with a single exit for Group R-2 dwelling units shall comply with Table 1006.3.4(1) and all of the following:
1. The net floor area of each floor shall not exceed 4,000 square feet (418.5 m).

2. Doors opening into the exit stairway must open in the direction of egress travel.

3. Electrical receptacles shall be prohibited in exit stairway.

4. In addition to the requirements for emergency escape and rescue openings in Section 1031.2, sleeping rooms on the fourth story above grade plane shall have not fewer than one emergency escape and rescue opening in accordance with Section 1031.

5. For interior exit stairways:

a. Openings to the interior exit stairway enclosure shall be limited to those required for exit access into the enclosure from normally occupied spaces, those required for egress from the enclosure, and openings to the exterior. Elevators shall not open into the interior exit stairway enclosure. Dwelling unit doors shall not open into the interior exit stairway enclosure.

b. A manual fire alarm system and automatic smoke detection system that activates the occupant notification system in accordance with Section 907.5 shall be provided. Smoke detectors shall be located in common spaces outside of dwelling units, including but not limited to gathering areas, laundry rooms, mechanical equipment rooms, storage rooms, interior corridors, interior exit stairways, and exit passageways.

c. Regardless of the stairway construction type, automatic sprinkler locations in interior exit stairways shall comply with the requirements of NFPA 13 for combustible stairways.

6. Exterior exit stairways must be constructed of noncombustible materials or fire-retardant-treated wood framing and sheathing complying with Section 2303.2.

7. The emergency power illumination requirements in section 1008.3 shall be provided regardless of there being only one means of egress under this section.

Reason Statement: A proposal to allow six-story residential buildings to be served by a single exit aims to help increase housing supply by making it more feasible to design and build mid-rise multifamily projects, especially on constrained urban infill sites where traditional two-stair configurations are impractical or cost-prohibitive. By modernizing egress requirements, this code change could enable more efficient use of available land and facilitate the delivery of additional housing units in areas facing housing shortages.

This proposal creates a new pathway under the IBC to permit single-stair, six-story residential buildings, expanding upon the four-story single-exit proposal (B1006.3.4-24) marked Consensus Approval from the general stakeholder workgroup earlier this year. It incorporates the same safety measures and design safeguards developed and supported by fire-services and other stakeholder groups, including enhanced fire protection, travel distance limits, emergency lighting, and restricted floor area and unit counts. These measures maintain an equivalent level of life safety while allowing more flexible, space-efficient, and attainable multifamily design.
Building on those provisions, this proposal adds further protections appropriate for six-story construction, ensuring equal or greater levels of occupant safety through strengthened fire-resistance, detection, and egress requirements.

This draft has not yet been presented to fire service or other stakeholder groups for review. We welcome their feedback and are committed to working to refine the proposal and reach common ground on both safety and design objectives.

Cost Impact: The code change proposal will not increase or decrease the cost

The cost impact of this proposal has not been definitively established; however, its added design flexibility can unlock new development opportunities on constrained or irregular infill sites. By permitting a single-stair configuration under clearly defined safety provisions, the change allows for more efficient building layouts, recovers valuable floor area that would otherwise be dedicated to a second stair and corridor, and creates additional options for family-sized units or shared amenities. Studies suggest this flexibility can reduce construction costs by 6% to 13% in typical mid-rise projects and support the creation of additional housing units in markets where land and development costs are high, thereby helping address local housing shortages.

B1110.4-24

IBC: 1110.4, 1110.4.1, 1110.4.2, 1110.4.3, 1110.4.4, 1110.4.5 (New), 1110.4.6 (New), (New)

Proponents: Kim Kirkwood and Monika Thrower, representing Changing Spaces Virginia

2024 International Building Code

1110.4 Adult changing stations.. Where provided, adult changing stations shall be accessible. Where required, adult changing stations shall be accessible and shall comply with Sections 1110.4.1 through 1110.4.4.

Revise as follows:

1110.4.1 Where required. Not fewer than one adult changing station shall be provided in the following locations:

1. In assembly and mercantile occupancies, where family or assisted-use toilet or bathing rooms are required to comply with Section 1110.2.1. In mercantile occupancies where an aggregate of six or more water closets is required or where eight or more water closets is provided for public use, an adult changing station shall be provided. Where adult changing stations are provided in separate sex toilet rooms, an adult changing station shall be provided in each toilet room or in a family or assisted-use toilet room complying with Section 1110.2.1.2.

2. In Group B occupancies providing educational *facilities* for students above the 12th grade, where an aggregate of 12 or more male and female water closets are required to serve the classrooms and lecture halls.

3. In Group E ~~occupancies, where~~ occupancies:

   a. Where a room or space used for assembly purposes requires an aggregate of six or more male and female water closets for that room or space.

   b. Where specialized learning spaces are provided and designed for students with disabilities who require assistance in toileting is provided and is served by a toilet room primarily for the occupants of such learning spaces.

4. In highway rest stops and highway service plazas.

5. State park campgrounds provided with plumbing and electricity at toileting locations.

6. State park visitor centers provided with plumbing and electricity at toileting locations.

7. In hospitals and ambulatory care facilities, where an aggregate of six or more male and female water closets are required to serve public visitors and outpatient visitors.

1110.4.2 Room. Adult changing stations shall be located in toilet rooms that include only one water closet and only one lavatory. The assistive tables shall comply with IAPMO Z1390. Fixtures located in such rooms shall be included in determining the number of fixtures provided in an occupancy. The occupants shall have access to the required adult changing station at all times that the associated occupancy is occupied.

Exception: Adult changing stations shall be permitted to be located in family or assisted toilet rooms required in Section 1110.2.1.

1110.4.3 Prohibited location.. The *accessible route* from separate-sex toilet or bathing rooms to an accessible adult changing station shall not require travel through security checkpoints.

1110.4.4 Travel distance.. The adult changing station shall be located on an *accessible route* such that a *person* is not more than two *stories* above or below the *story* with the adult changing station and the path of travel to such *facility* shall not exceed 2,000 feet (609.6 m).

Add new text as follows:

1110.4.5 Directional signage. The locations of the adult changing stations are to be identified on any directional graphic of the facility used to orient the public visitor.

1110.4.6 Room designation signage. Signs identifying toilet rooms and bathing rooms shall indicate when adult changing tables are provided in that room.

Revise as follows:

Chapter 35. Add new standard promulgator and standard, as follows:

IAPMO	International Association of Plumbing and Mechanical Officials
	4755 E. Philadelphia St.; Ontario, CA 91761

IAPMO Z1390-2024e1

Reason Statement:

For Virginia to adopt building code regarding adult changing stations so that new buildings will include an adult changing station. The scope and specifications we would like to adopt in VA are the 2024 IBS I-codes, Chapter 11, Accessibility, Sections 110.4 - 110.4.4, and ICC A117.1 2017 with Supplement 1: Standard for Accessible and Useable Buildings and Facilities, section 613: Adult Changing Stations. This supplement provides a pathway to compliance with accessible adult changing stations in the 2024 I-codes.

This is important because, according to the ICC Adult Changing Facilities work group: “Limiting access to those who need adult changing stations decreases the community size dramatically. Nationally, the Centers for Disease Control and Prevention (CDC) reports 61 Million adults (26% of the US population) have some form of disability, with 24.1% affected in the areas of mobility, independent living, and selfcare. Further, each of those folks need assistance, and likely travel with additional family members. Once this population is taken out of the community, businesses are also losing a large potential of support and income. Providing our citizens more opportunities to participate in the community and patronize local establishments strengthens communities, allowing all family members to engage or travel together as one family nucleus. Currently many families have to make the choice to participate in activities outside of the home with only a portion of their family.

Individually, families from many states are pushing for the adult changing facilities. A national campaign, Changing Spaces, has been activated, with chapters in at least 10 states, advocating for height adjustable changing tables to be required in public places.
Many states are working on or have already enacted legislation that will require adult changing stations in their states. Accepting this proposal will show wide-spread acceptance of the need along with a consistent set of standards across the country for users to rely on.
We are all part of an aging population, and the elderly still want to be able to attend family gatherings and travel in a car to be with relatives. These adult changing facilities would be valued not only by families with adult disabled children but also be aging adult family members.

Without appropriate changing facilities, families cannot travel more than 30-40 miles from home. Additionally, trips that involve more than a few hours of time are also a risk.
As a result, vacations, trips to zoos, aquariums, museums, concerts, and similar events are eliminated.

The addition of adult changing tables will present a tremendous change in the quality of life for so many people who were unable to get out and participate in many activities before due to the lack of adequate facilities.

Cost Impact: The code change proposal will not increase or decrease the cost

Although building cost will be slightly higher due to installing the adult changing table, which also requires a larger family bathroom, businesses will profit from an increased customer base. Our state will experience increased tourism and travel once people with disabilities and medical conditions can stop at rest stops to use the adult changing table. Businesses will increase revenue by accommodating an underserved population that has disposable income.

According to an AIR report, (https://www.air.org/resource/report/hidden-market-purchasing-power-working-age-adults-disabilities) working-age individuals with disabilities wield substantial economic clout. They have access to approximately $504 billion annually; comparable to major consumer segments such as African Americans ($501 billion) and Hispanics ($582 billion).
The discretionary income of individuals with disabilities stands at approximately $21 billion, surpassing the combined discretionary income of African American and Hispanic populations.

Attached Files

- **Reason Statement and Cost Impact.pdf**
  https://va.cdpaccess.com/proposal/1545/2255/files/download/1018/

Reason Statement and Cost Impact

Reason Statement:

For Virginia to adopt building code regarding adult changing stations so that new buildings will install an adult changing table according to the scope and specifications of E142-21 and ICC/ANSI A117.1. This is important because, according to the ICC Adult Changing Facilities work group:
“Limiting access to those who need adult changing stations decreases the community size dramatically. Nationally, the Centers for Disease Control and Prevention (CDC) reports 61 million adults (26% of the US population) have some form of disability, with 24.1% affected in the areas of mobility, independent living, and selfcare. Further, each of those individuals need assistance, and likely travel with additional family members. Once this population is taken out of the community, businesses are also losing a large potential of support and income. Providing our citizens more opportunities to participate in the community and patronize local establishments strengthens communities, allowing all family members to engage or travel together as one family nucleus. Currently many families have to make the choice to participate in activities outside of the home with only a portion of their family.

Individually, families from many states are pushing for the adult changing facilities. A national campaign, Changing Spaces, has been activated, with chapters in at least 10 states, advocating for height adjustable changing tables to be required in public places. Many states are working on or have already enacted legislation that will require adult changing stations in their states. Accepting this proposal will show wide-spread acceptance of the need along with a consistent set of standards across the country for users to rely on. We are all part of an aging population, and the elderly still want to be able to attend family gatherings and travel in a car to be with relatives. These adult changing facilities would be valued not only by families with adult disabled children but also by aging adult family members. Without appropriate changing facilities, families cannot travel more than 30-40 miles from home. Additionally, trips that involve more than a few hours of time are also a risk. As a result, vacations, trips to zoos, aquariums, museums, concerts, and similar events are eliminated before, due to the lack of adequate facilities.

Cost Impact

Cost Impact: The code change proposal will not increase or decrease the cost
Although building cost will be slightly higher due to installing the adult changing table, which also requires a larger family bathroom, businesses will profit from an increased customer base. Our state will experience increased tourism and travel once people with disabilities and medical conditions can stop at rest stops to use the adult changing table. Businesses will increase revenue by accommodating an underserved population that has disposable income.

According to an AIR report, (https://www.air.org/resource/report/hidden-market-purchasing-power-working-age-adults-disabilities) working-age individuals with disabilities wield substantial economic clout. They have

access to approximately $504 billion annually; comparable to major consumer segments such as African Americans ($501 billion) and Hispanics ($582 billion).
The discretionary income of individuals with disabilities stands at approximately $21 billion, surpassing the combined discretionary income of African American and Hispanic populations.

B1110.20-24

IBC: 1110.4, 1110.4.1, 1110.4.1.1 (New), 1110.4.2, 1110.4.3, 1110.4.4, 1110.4.5 (New)

Proponents: Elizabeth Bennett-Parker, representing Virginia House of Delegates District 5 (delebennett-parker@house.virginia.gov)

2024 International Building Code

Revise as follows:

1110.4 Adult and baby changing stations. Where provided, adult changing stations shall be accessible. Where required, adult and baby changing stations shall be accessible and shall comply with Sections 1110.4.1 through ~~1110.4.4~~ 1110.4.5.

1110.4.1 Where required - adult changing stations. Not fewer than one adult changing station shall be provided in the following locations:

1. In assembly and mercantile occupancies, where family or assisted-use toilet or bathing rooms are required to comply with Section 1110.2.1.
2. In Group B occupancies providing educational *facilities* for students above the 12th grade, where an aggregate of 12 or more male and female water closets are required to serve the classrooms and lecture halls.
3. In Group E occupancies, where a room or space used for assembly purposes requires an aggregate of six or more male and female water closets for that room or space.
4. In highway rest stops ~~and highway service plazas~~.

Add new text as follows:

1110.4.1.1 Where required - baby changing stations. No occupancy required under 1110.41 to provide an adult changing station, excluding highway rest stops, shall be required to also provide a baby changing station. Not fewer than one baby changing station shall be provided in the following locations that is accessible to both male and female occupants:

1. In assembly and mercantile occupancies that are not required to have a family or assisted-use toilet or bathing rooms to comply with Section 1110.2.1.
2. In Group B occupancies providing educational facilities for students above the 12th grade, where an aggregate of fewer than 12 male and female water closets are required to serve the classrooms and lecture halls.
3. In Group E occupancies, where a room or space used for assembly purposes requires an aggregate of fewer than six male and female water closets for that room or space.
4. In Group R-1 hotels and motels on each floor level containing a public toilet facility.
5. In highway rest stops.

Revise as follows:

1110.4.2 Room. Adult changing stations shall be located in toilet rooms that include only one water closet and only one lavatory. Baby changing stations may be located in toilet rooms that include more than one water closet and one lavatory, provided that at least one baby changing station is accessible to both male and female occupants. However, where public toilet facilities containing only one water closet and one lavatory are provided, baby changing stations shall be located within such facilities. Fixtures located in such rooms shall be included in determining the number of fixtures provided in an occupancy. The occupants shall have access to the required ~~adult~~

changing station at all times that the associated occupancy is occupied.

Exception: Adult changing stations shall be permitted to be located in family or assisted toilet rooms required in Section 1110.2.1.

1110.4.3 Prohibited location. The *accessible route* from separate-sex toilet or bathing rooms to an accessible adult or baby changing station shall not require travel through security checkpoints.

1110.4.4 Travel distance. The adult and baby changing station shall be located on an *accessible route* such that a *person* is not more than two *stories* above or below the *story* with the adult changing station and the path of travel to such *facility* shall not exceed 2,000 feet (609.6 m).
Baby changing stations: baby changing stations shall comply with operable parts and Section 902 of ANSI A117.1. Baby changing stations shall not be located in wheelchair accessible toilet compartments. Baby changing stations located in single-user or family or companion toilet rooms shall not overlap the maneuvering clearance around the water closet or the accessible route to the transfer space when in the useable position.

Exceptions:

1. Self-closing baby changing stations shall be permitted to be measured in the stowed position.
2. In alterations, when provided, baby changing stations shall be permitted outside the maneuvering clearance around the water closet in wheelchair accessible toilet compartments.

Add new text as follows:

1110.4.5 Baby changing stations. Baby changing stations shall comply with operable parts and Section 902 of ANSI A117.1. Baby changing stations shall not be located in wheelchair accessible toilet compartments. Baby changing stations located in single-user or family or companion toilet rooms shall not overlap the maneuvering clearance around the water closet or the accessible route to the transfer space when in the useable position.

Exceptions:

1. Self-closing baby changing stations shall be permitted to be measured in the stowed position.

2. In alterations, when provided, baby changing stations shall be permitted outside the maneuvering clearance around the water closet in wheelchair accessible toilet compartments.

Reason Statement:

This proposal would require some new construction buildings to provide baby changing stations in restrooms that are accessible to all caregivers. This proposal works in concert with the requirements for adult or universal diaper changing stations included in the 2024 International Construction Code Standards that Virginia plans to adopt in this code cycle. Any building that would be required to provide an adult changing station would *not* have to also provide a baby changing station, with the exception of highway rest stops.

Parents and caregivers need access to safe, sanitary diaper changing facilities in public spaces. Babies require frequent diaper changes, averaging six per day and roughly 3,000 in their first year. Despite this, studies show that only a small fraction of public restrooms include changing stations: a 2021 survey of restaurants found that only 16.7% had diaper changing stations. Similarly, a University of Illinois survey found that only 2% of campus restrooms had changing stations. In their absence, parents are often forced to improvise. In a Munchkin poll of 1,000 parents, 94% reported changing a diaper in their car (which only works if you have a car), 58% in a dressing room, and 22% said they had skipped plans due to lack of facilities. Additionally, the issue is greater for fathers. According to a survey by Pampers, 90% of dads have not been able to access a diaper changing station.

The absence of appropriate diaper changing facilities poses real health and safety risks. Without designated changing areas, caregivers may be forced to change infants on restroom floors, sinks, tables, or other unsanitary surfaces, increasing the risk of falls, contamination, and the spread of disease. Research published in Pediatrics found that access to high-quality diaper changing equipment is associated with fewer diarrheal episodes in children and fewer sick days among childcare staff. Public health organizations including the Centers for Disease Control and Prevention (CDC) and the Partnership for Food Safety Education have warned that improper diaper changing practices can contribute to the spread of pathogens such as E. coli, norovirus, and rotavirus. Providing safe, dedicated facilities helps protect both children and the public by reducing these risks.

A growing number of states including Arizona, Nevada, New Mexico, Utah, Wisconsin, Oregon, California, New York, Connecticut, Delaware, Illinois, Rhode Island, and Washington, D.C. have already adopted similar requirements. Moving forward with this proposal would align Virginia with national trends while advancing family accessibility, public health, and safety.

Finally, this proposal benefits both families and businesses. Families are more likely to visit and remain in establishments where changing facilities are reliably available, with 74% of parents reporting that they prefer to frequent businesses that provide such amenities. Ensuring safe, sanitary, and equitable diaper changing access supports caregivers, improves hygiene, and helps create a more inclusive built environment across the Commonwealth.

Cost Impact: The code change proposal will increase the cost

This proposal may lead to very minimal cost increases for the construction of new buildings as it would require the addition of baby changing tables in restrooms in some occupancies.

B1210.1.1-24

IBC: 1210.1.1 (New)

Proponents: Tanya Pettus, representing Self/Public Interest

2024 International Building Code

Add new text as follows:

1210.1.1 Required public restroom fixtures.

All public restrooms, whether a separate room or water closet compartment, must be equipped with a mounted hook or hook-like fixture capable of securely holding up to ten pounds, and reasonably accessible from the toilet.

Reason Statement:

Mounted hooks should be required in all public restroom facilities, whether single toilet rooms or water closet compartments, to accommodate those who need to carry medical equipment but are otherwise mobile or ambulatory. Necessary medical equipment should not be placed in a public restroom floor in the absence of a hook or fixture that can hold the equipment, and this is not a problem handicap accessible stalls can solve, as hooks are not always present and grab bars are not designed or installed in such a way as to be used for makeshift shelving.

As an example, a portable oxygen machines that can be carried over the shoulder typically weigh about ten pounds. Without a hook, a person connected to this type of machine will have to steady or hold this additional ten pounds while navigating the restroom or be forced to place the machine on a public restroom floor. An oxygen machine is connected to its user by a cannula that could potentially bring bacteria from a public restroom floor directly into an already ailing person's nose.

Consider requiring hooks in all public restrooms, not only for the millions of people who use supplemental oxygen or other required medical equipment, but for general public safety and wellbeing to prevent contamination of personal items. Trends in Lung Disease | American Lung Association: https://www.lung.org/research/trends-in-lung-disease

Cost Impact: The code change proposal will not increase or decrease the cost

Costs of coat/utility hooks are minimal, with the consumer retail price beginning at less than $1.00.

Amazon.com: 25 Pack Coat Hooks Wall Hooks for Hanging, Heavy Duty Double Prong Metal Hook Wall Mounted for Living Room, Bathroom, Kitchen, Bedroom for Coat, Bag, Scarf, Towel, Hat, Key, Cup (Black) : Home & Kitchen
Zinc, 2 1/4 in x 1 3/8 in x 3 in, Coat Hook and Bumper - 1ECL2|1ECL2 - Grainger

Coat - Hardware - Wall Mounted - Individual Hooks - Hooks - The Home Depot

B2403.6-24

VCC: 2403.6 (New), 2403.6.1 (New), Chapter 35 (New)

Proponents: William Penniman, representing Northern Virginia Bird Alliance (wpenniman@aol.com); Thomas Blackburn, Northern Virginia, representing Northern Virginia Bird Alliance (tomlblackburn@gmail.com); Sonal Shah, Northern Virginia, representing Northern Virginia Bird Alliance (moiforte@gmail.com)

2021 Virginia Construction Code

Add new text as follows:

2403.6 Bird-Friendly Design and Construction. Within the Bird Activity Zone of any new building construction and other High-Risk Building Features and High-Risk Auxiliary Structures, not less than 85% of all exterior envelope material including Glass and Reflective and/or Transparent Non-Glass Materials as calculated at each of the facades of buildings shall be of Bird Friendly Material as defined in 2403.6.1.

2403.6.1 Definitions.
Bird Activity Zone. The zone from zero to 75 feet above grade (using the average between lowest to highest grade along slopes).
Bird-Friendly Material. Bird-Friendly Glass and exterior envelope materials that are non-transparent (such as traditional outside walls of wood, brick, concrete) and not highly reflective or have a Threat Factor Rating of 30 or less as determined and published by the American Bird Conservancy. See www.birdsmartglass.org for Threat Factor database.
Bird-Friendly Glass. Glass, other glazing materials or screening that meet any of the following conditions:

- Frosted or opaque glass or glass with exterior surface (surface 1) obstructed and effectively covered by building-integrated structures that do not have gaps larger than 12” in any dimension, including non-glass double-skin facades, metal screens, fixed solar shading, exterior insect or unglazed solar screens, grilles, child guards and other features that meet these conditions.
- Un-tinted glass with an outer total reflectance of ≤15% that contains a pattern of visual markers that conforms to the following rules: (i) dots or other isolated solid shapes that are ≥¼” in diameter and are either ≤ two-inches (2”) apart in horizontal lines and ≤ two inches (2”) apart in vertical lines or ≤ (ii) two-inches (2”) apart if randomly distributed or (iii) horizontal lines that are ≥⅛” in width and spaced ≤2” apart or (iv) vertical lines that are ≥⅛” in width and spaced ≤2” apart.
- Any glass or glazing product with a Threat Factor Rating of 30 or less as determined and published by the American Bird Conservancy. See www.birdsmartglass.org for Threat Factor database; or that follows American Bird Conservancy's Prescriptive Rating Criteria. abcthreatfactor.org.

High-Risk Building Features. Transparent or highly reflective external surfaces of any of the following building features: skyways/skywalks; building connectors; outside corners where a bird can see in one side of the building and out the other (“fly through conditions”), within 30 feet of the corner; parallel glass walls less than 50 feet apart; courtyards, including atria, open to bird entry; 20 feet of glazing adjacent to and above green roofs.

High-Risk Auxiliary Structures. Structures with glazing that pose significant collision risks to birds wherever they are found, including but not limited to:

- Transparent or highly reflective railings or barriers, including along balconies; noise or wind barriers (including parking structures) or weather shelters.
- Small, stand-alone buildings that present conditions that can be either transparent or reflective such as gazebos and external ticket booths.
- Any other free-standing glass, plexiglass, or other clear, transparent, or highly-reflective free-standing structure.

Glass. All glass, including spandrel glass.

Reflective and/or Transparent Non-Glass Materials. Any non-glass materials that are transparent or highly reflective, including but not limited to plexiglass and polished metal.

Revise as follows:

Chapter 35 Referenced Standards. Add new standard promulgator and new standard, as follows:

ABC American Bird Conservancy

P.O. Box 249, The Plains, VA 20198

Threat Factor Rating System for bird-safe windows (https://abcbirds.org/wp-content/uploads/2025/06/What-is-a-Threat-Factor-6-9-25.pdf)

Reason Statement:

This proposal is supported by the Northern Virginia Bird Alliance.

Collisions with buildings kill up to1 billion birds per year in the United States primarily due to the "invisibility" of clear glass to birds and due to reflections that appear to be attractive places to fly into. https://abcbirds.org/glass-collisions/why-birds-hit-glass/ This high annual loss of birds to building collisions has contributed to the significant decline that has been recorded in many bird populations during recent decades.

The danger to birds exists for the full height of buildings, since migratory birds can hit a building at any level. While taller buildings pose a greater danger on a per-building basis,

most collisions involve glass on homes and buildings up to 10 stories because of the prevalence of such buildings. https://abcbirds.org/glass-collisions/why-birds-hit-glass/ The amount of glass is the strongest predictor of bird collisions. The choice of design and glass can reduce collisions by a significant amount. https://abcbirds.org/glass-collisions/architecture-planning/

Clear glass is a threat whether it is part of the building envelope or an extension of glass above the building walls or incorporated into skyways or balconie

Although the risks extend to the tops of the tallest buildings, the American Bird Conservancy proposes defining the "bird activity zone" as being up to 100 feet above grade where both local flights and migrations occur. This proposal is generally modeled upon ABC's proposal with some effort to simplify the language and moderate the requirements including reducing the height requirement to 75 feet above grade. It is important to note that portions of structures without glazing, other transparent or high-reflective cladding are not affected. Above-grade parking structures without glass, for example, are not affected.

Bird-friendly solutions may involve building design, the glass itself (e.g., frits or printed patterns, coatings, frosting) or physical structures (as simple as window screens, grills, shades or less glazing). See https://abcbirds.org/glass-collisions/architecture-planning/ ("Bird Friendly Design Guide"); https://abcbirds.org/glass-collisions/why-birds-hit-glass/ ; https://abcbirds.org/glass-collisions/photo-gallery/ ; https://www.collidescape.org/

As illustrated by the Javits Center window replacement, the choice of bird-friendly glass can reduce collisions by over 90%. https://abcbirds.org/glass-collisions/architecture-planning/

The range of bird-friendly glazing and designs is growing as architects, builders and glass companies make concerted efforts to minimize building threats to birds. See, for example:

https://abcbirds.org/glass-collisions/products-database/

https://nationalaudubon.app.box.com/s/lmf7vijbohuds6j92igzl1dzy8398ckj

https://www.featherfriendly.com/commercial?hsLang=en ;

https://www.birdsavers.com/

A simple, collision-deterrence rule for spacing of markings on glass is the so-called "2X2" standard: two-inch spacing horizontally and vertically based upon the physical profile of a bird in flight. Current research has established the appropriate maximum module dimensions of 2"high X2"wide. Some solutions, such as films meeting the 2"X2" standard, can be applied to windows as an alternative to fritting/etching.

Depending on designs and materials chosen, the solutions may be essentially invisible to occupants (e.g. UV patterns) or fit with the overall design pattern (e.g. insect screens on windows) or be such (e.g. frits) that occupants quickly get used to and see beyond the faint patterns.

The American Bird Conservancy maintains and continuously updates a list of tested bird-friendly materials, which can be used for compliance in order to provide flexibility for builders and architects. The ABC lists bird-friendly materials and rates products based on the hazard they pose for birds ("ThreatFactor"). https://abcbirds.org/glass-collisions/threat-factor-rating/ The data base is available in printed form or found at https://abcbirds.org/glass-collisions/products-database/; www.birdsmartglass.org. As of August 2025, there were nearly190 bird-friendly glazing products that had been tested and found to pass the ABC's "threat" standard.

Government bodies around the country have begun to address the issue of fatal bird collisions with mandatory standards for bird-friendly construction. The ABC Threat Factor Rating is based upon testing and is commonly cited (e.g. by NYC, D.C. and GSA) as a source of acceptable compliance standards.

This proposal will enhance the resiliency and survival of both local and migratory birds, which are currently killed and injured by impacts to windows and ot rise buildings. Bird populations have declined substantially in the United States in the past 50 years, in significant part due to buildings and increased quantities of glass used in construction.

By implementing the requirements for Bird-Friendly Materials in new construction, adoption of the proposal will substantially reduce bird injuries and mortality. As illustrated by the 90% reduction of bird mortality by installing bird-friendly glazing on the Javits building, experience indicates that the reduction of bird injury and mortality could be huge with full implementation.

Cost Impact: The code change proposal will increase the cost

The proposed provision may, but need not, increase building costs. See https://abcbirds.org/glass-collisions/architecture-planning/ ("Bird Friendly Design Guide": "New construction can incorporate from the beginning bird-friendly design strategies that are cost neutral.").

Some approaches can raise costs of construction, since bird-friendly glass is somewhat more costly than traditional glass. However, patterns on glass are only one solution. Design decisions for new buildings can mitigate or eliminate increased costs. For example, design changes to reduce the glass areas can result in reduced construction costs and also save operational costs with a more efficient building envelope and lower energy consumption. Many non-glass solutions, such as screens, sunshades or less glass, are cheaper and have other benefits.

Additional costs related to bird-friendly glass are incurred only at the product level, there are no additional installation or labor costs involved. Recent cost data received from regional general contractors for two (2) mid-rise (10 - 12 stories) commercial construction projects is listed below:

Project 1:

Total project size and cost: 544,000 GSF, $140 million

Total glazing costs: $7.75 million

Total additional costs for Bird-Friendly frit design: $610,000 or 0.43% on overall project costs and 7.87% on overall glazing costs.

Project 2:

Total project size and cost: 380,000 GSF, $128 million

Total glazing costs: $15.7 million

Total additional costs for Bird-Friendly frit design: $1.14 million or a premium of 0.89% on overall project costs and 7.26% on overall glazing costs.

In another example, construction of a building with 9,500SF of glass incurred higher building costs of "less than a fifth of a percent of total construction costs".https://livingbuilding.kendedafund.org/2019/04/26/kended buildings-bird-safe-glass-shockingly-huge-issue/.

The manufacturing market for bird-friendly glass andother bird-friendly solutions has become more competitive and therefore cost effective. All major manufacturers have a range of Bird-Friendly glass options available and several products are in late research and development stage with market readiness only a few months away.

We believe this allows designers and owners to choose from a range of options that help realize aesthetic, budget or performance goals or all of the above.

B3104.1.1-24

IBC: 3104.1.1, Chapter 35: (New)

Proponents: Mekonnen Gebresillasie, Fairfax county, VA, representing Land development services (mekonnen.gebresillasie@fairfaxcounty.gov)

2024 International Building Code

Revise as follows:

3104.1.1 Application. *Pedestrian walkways* shall be designed and constructed in accordance with Sections 3104.2 through ~~3104.9.~~ 3104.9 or per AASHTO LRFD Bridge Design Specifications. Tunnels shall be designed and constructed in accordance with Sections 3104.2 and 3104.10.

Chapter 35: Referenced Standards. Add new promulgator and standard, as follows:

AASHTO American Association of State Highway and Transportation

555 12Th Street NW, Suite 1000

Washington, DC 20004

AASHTO LRFD Bridge Design Specifications, 10th Edition

Reason Statement:

Most retaining walls, pedestrian bridges, and wingwalls associated with these structures are designed using the AASHTO standard as a reference. However, because AASHTO is not listed in Chapter 35 of the Virginia Construction Code (VCC), many jurisdictions require a formal code modification to demonstrate equivalency with the VCC.

Incorporating the AASHTO standard into the referenced codes section of the VCC would streamline the permitting process. Designers could proceed without needing a separate code modification, resulting in faster approvals and reduced costs for both jurisdictions and applicants.

Cost Impact: The code change proposal will decrease the cost

The current process for obtaining code modifications is time-consuming and project-specific. Each time a customer submits a design based on AASHTO standards, a separate code modification must be approved. This not only delays permitting but also incurs additional fees for the applicant.

B3105.2-24

IBC: 3105.2

Proponents: Mekonnen Gebresillasie, Fairfax county, VA, representing Land development services (mekonnen.gebresillasie@fairfaxcounty.gov)

2024 International Building Code

Revise as follows:

3105.2 Design and construction. *Awnings* and *canopies* shall be designed and constructed to withstand wind or other lateral *loads* and *live loads* as required by Chapter 16 with due allowance for shape, open construction and similar features that relieve the pressures or loads. Structural members shall be protected to prevent deterioration. *Awnings* *and canopies* shall have frames of noncombustible material, *fire-retardant-treated wood*, heavy timber complying with Section 2304.11 or 1-hour construction, and shall be fixed, retractable, folding or collapsible.

Reason Statement: This section is about awnings and canopies. The intent of the proposed code change is to establish a minimum construction type requirement for canopies, aligning it with that already specified for awnings

Cost Impact: The code change proposal will not increase or decrease the cost

There is no cost impact. Some Jurisdictions are using the construction type of canopies similar to awnings. This is just to create consitency.

B3500(1)-24

VCC: ASTM Chapter 35

Proponents: William Hinson, Jr. PE, ECS Mid-Atlantic LLC, representing Self (whinson@ecslimited.com)

2021 Virginia Construction Code

ASTM

,

~~E329—02:~~ E329-21:	Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

Reason Statement:

This specification defines the minimum requirements for inspection agencies personnel or testing agency laboratory personnel or both, and the minimum technical requirements for equipment and procedures utilized in the testing and inspection of construction and materials used in construction. This specification defines the minmum requirements for agencies and personnel engaged in any of the following.

a. Inspection of specified methods and materials used in construction

b. Special Inspection

c. Testing of materials used in construction

The current edition of the ASTM E329 standard has not changed in several code change cycles and in the 2021 code cycle was specified as the 2002 edition (ASTM E329-02) Since that edition, the standard has been updated and revised and is now in its 2021 edition. Since materials have changed with time, such as the addition of Mass or Tall Wood structures, the reference standard should also be updated. The 2021 edition of ASTM E329 was last updated in December of 2023.

Cost Impact:

No cost impact is expected, this is limited to a reference standard edition update.

EB102.2-24

VEBC: 102.2

Proponents: Allison Cook, Arlington, Virginia, representing VBCOA VEBC Committee (acook1@arlingtonva.us); Ron Clements, Chesterfield, representing Building Inspection Department (clementsro@chesterfield.gov)

2021 Virginia Existing Building Code

Revise as follows:

102.2 Scope. The provisions of this code shall govern the repair, alteration, change of occupancy, addition, relocation of, ~~construction~~ and *rehabilitation* activities in *existing buildings* and *structures*.

Reason Statement: This change in language is more accurate and aligns with the IEBC.

Cost Impact: The code change proposal will not increase or decrease the cost

This language change is a clarification, it should not impact cost.

EB102.2.2-24

VEBC: 102.2.2, 304.3, 304.3.1, 307 (New), 307.1 (New), 307.2 (New), 705.3.3

Proponents: Allison Cook, Arlington. Virginia, representing VBCOA VEBC Committee (acook1@arlingtonva.us); Ron Clements, Chesterfield, representing Building Inspection Department (clementsro@chesterfield.gov); Mark Graver, City of Waynesboro, representing VBCOA - Region III (gravermj@ci.waynesboro.va.us)

2021 Virginia Existing Building Code

Revise as follows:

102.2.2 Reconstruction, alteration, or repair in Group R-5 occupancies. Compliance with this section shall be an acceptable alternative to compliance with this code at the discretion of the owner or owner's agent. The VCC may be used for the reconstruction, *alteration*, or repair of Group R-5 *buildings* or *structures* subject to the following criteria:

1. Any reconstruction, *alteration* or repair shall not adversely affect the performance of the *building* or *structure*, or cause the *building* or *structure* to become unsafe or lower existing levels of health and safety.

2. Parts of the *building* or *structure* not being reconstructed, altered, or repaired shall not be required to comply with the requirements of the VCC applicable to newly constructed *buildings* or *structures*.

3. The installation of material or equipment, or both, that is neither required nor prohibited shall only be required to comply with the provisions of the VCC relating to the safe installation of such material or equipment.

4. Material or equipment, or both, may be replaced in the same location with material or equipment of a similar kind or capacity.

5. In accordance with § 36-99.2 of the Code of Virginia, installation or replacement of glass shall comply with Section R308 or Chapter 24 of the VCC.

6. Compliance with Section 307.2 of this code is required as applicable.

   ~~**Exceptions:**~~

   ~~1.~~ 7. ~~This section shall not be construed to permit noncompliance with any~~ Compliance with applicable flood load or flood-resistant construction requirements of the VCC is required.

   ~~2.~~ 8. Reconstructed decks, balconies, porches, and similar *structures* located 30 inches (762 mm) or more above grade shall meet the current code provisions for structural loading capacity, connections, and structural attachment. This requirement excludes the configuration and height of handrails and guardrails.

   ~~3.~~ 9. Repair or replacement of smoke alarms shall be with devices listed in accordance with UL217 and that are no more than 10 years from the date of manufacture. Battery-only powered devices shall be powered by a 10-year sealed battery.

304.3 ~~Replacement window emergency~~ Emergency escape and rescue openings. Emergency escape and rescue openings shall be in compliance with Section 307. ~~Where windows are required by the VCC or *International Residential Code* to provide emergency escape and rescue openings in Groups R-2 and R-3 occupancies and one-family and two-family dwellings and townhouses regulated by the *International Residential Code*, replacement windows shall be exempt from the requirements of Sections 1031.2.1 and 1031.3 of the VCC or Sections R310.1.1, R310.2.1, R310.2.3, R310.4.1, R310.4.2, R310.4.2.1, R310.4.2.2 and R310.4.3 of the *International Residential Code*, provided the replacement window meets the following conditions:~~

~~1. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window shall be permitted to be of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.~~

~~2. The replacement of the window is not part of a *change of occupancy*.~~

Delete without substitution:

~~**304.3.1 Operational constraints.** Where bars, grilles, grates, or similar devices are installed over emergency escape and rescue openings as permitted by Section 1031.2.1 of the VCC, smoke alarms shall also be provided in accordance with Section 907.2.11 of the VCC. In R-5 occupancies, bars, grilles, grates, or similar devices are permitted to be installed over emergency escape and rescue openings in accordance with section R310.4.4 of the VRC.~~

Add new text as follows:

307
Emergency Escape and Rescue Openings

307.1 Replacement window emergency escape and rescue openings. Where an emergency escape and rescue opening is required to be provided in Groups R-2 and R-3 occupancies by the VCC and for one-family and two-family dwellings and townhouses regulated by the VRC, replacement windows shall be exempt from the requirements of Sections 1031.2.1 and 1031.3 of the VCC or Sections R319.1.1, R319.2.1, R319.2.3, R319.4.1, R319.4.2, R319.4.2.1, R319.4.2.2 and R319.4.3 of the VRC, provided the replacement window meets the following conditions:

1. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window shall be permitted to be of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.

2. The replacement of the window is not part of a *change of occupancy*.

307.1.2 Operational constraints. Where bars, grilles, grates, or similar devices are installed over emergency escape and rescue openings as permitted by Section 1031.2.1 of the VCC, smoke alarms shall also be provided in accordance with Section 907.2.11 of the VCC. In R-5 occupancies, bars, grilles, grates, or similar devices are permitted to be installed over emergency escape and rescue openings in accordance with section R319.4.4 of the VRC.

307.2 Alterations, Additions, and Change of Occupancy. Where an alteration, addition, or change of occupancy creates a new room or space or changes the occupancy of a room or space such that an emergency escape and rescue opening is required to be provided in Groups R-2 and R-3 occupancies by the VCC and for one-family and two-family dwellings and townhouses regulated by the VRC, then a new emergency escape and rescue opening shall be provided in accordance with the Section 1031 of the VCC or Section 319 of the VRC.
Exception: An existing operable window with clear opening area not less than 4 square feet (0.38 m2) and minimum opening height and width of 22 inches (559 mm) and 20 inches (508 mm), respectively, shall be accepted as an emergency escape and rescue opening.

Revise as follows:

705.3.3 Emergency escape and rescue openings. Emergency escape and rescue openings shall be in compliance with Section 307. ~~An existing operable window with clear opening area not less than 4 square feet (0.38 m2) and minimum opening height and width of 22 inches (559 mm) and 20 inches (508 mm), respectively, shall be accepted as an emergency escape and rescue opening.~~

Reason Statement:

As currently written, the VEBC only requires EEROs to be provided when there is a change of occupancy to a higher hazard. The VEBC does not require alterations or additions that create conditions requiring an EERO in new construction (such as creating a new bedroom) to provide an EERO for the new room or space. Nor does it require a change of occupancy that is within the same or lower hazard to provide EEROs. So, an A, E, or M space could change to R-2 without requiring EEROs in any newly created apartments.

This change looks to move the requirements for EEROs into chapter 3 for easier understanding and application of the code, while also providing a means to ensure newly created bedrooms have a minimum level safety through appropriate means of egress. It also maintains the existing exception to allow a smaller sized EERO if there is an existing window that will meet those requirements.

The "new" sections 307.1 and 307.1.2 are both exact copies of the existing code sections for replacement EEROs (sections 304.3 and 304.3.1) and it has only been relocated.

Cost Impact: The code change proposal will increase the cost

While there will likely be a minor increase in cost to add EEROs to some buildings or will limit designs to use existing windows and spaces, the requirement ensures a minimal level of safety is maintained in existing buildings.

EB103.9-24

VEBC: 103.9

Proponents: Allison Cook, Arlington, Virginia, representing VBCOA VEBC Committee (acook1@arlingtonva.us); Ron Clements, Chesterfield, representing Building Inspection Department (clementsro@chesterfield.gov)

2021 Virginia Existing Building Code

Revise as follows:

103.9 Construction documents. Construction documents shall be submitted with the application for a permit. The work proposed to be performed on an *existing building* or *structure* shall be classified on the construction documents as repairs, *alterations, change of occupancy, addition, historic building,* or *moved building*. *Alterations* shall further be classified as Level 1 or Level 2. Any required elevation certificate shall be prepared by a Virginia certified land surveyor or Virginia registered design professional ~~civil engineer licensed in Virginia~~.

Exception: Construction documents or classification of the work does not need to be submitted when the building official determines the proposed work does not require such documents, classification or identification.

Reason Statement:

This is a simple language change to more closely align the code with the language in DPOR and other regulatory requirements such as FEMA.

In addition, there is not a "civil engineer" licensed by DPOR, it is only engineer, and the term should reflect "Registered Design Professional" (RDP).

Cost Impact: The code change proposal will not increase or decrease the cost

This clarification in language does not change the existing requirement for the professional to be licensed by DPOR, it is simply a cleaning up of the language.

EB202(1)-24

VEBC: SECTION 202

Proponents: Allison Cook, Arlington, Virginia, representing VBCOA VEBC Committee (acook1@arlingtonva.us); Ron Clements, Chesterfield, representing Building Inspection Department (clementsro@chesterfield.gov)

2021 Virginia Existing Building Code

Revise as follows:

CHANGE OF OCCUPANCY. Either of the following shall be considered a *change of occupancy* where the current VCC requires a greater degree of structural strength, fire protection, means of egress, ventilation or sanitation than is existing in the current *building* or *structure*:

1. Any change in the occupancy classification of a *building* or *structure*
2. Any change in the purpose of, or a change in the level of activity within, a *building* or *structure.*
3. A *change of use*.

Note: The use and occupancy classification of a *building* or *structure*, shall be determined in accordance with Chapter 3 of the VCC.

Reason Statement: The addition of "change of use" is to apply the existing definition to one of the options for the change of occupancy. While this has been a long standing practice in Virginia, including it in the definition of change of occupancy should help minimize confusing and differing application of the VEBC within Virginia.

Cost Impact: The code change proposal will not increase or decrease the cost

There is not a cost impact, this is existing practice / application of the code. This change only seeks to provide a clarification, not change existing practices.

EB307-24

VEBC: 307 (New), 308 (New), 309 (New)

Proponents: Allison Cook, Arlington. Virginia, representing VBCOA VEBC Committee (acook1@arlingtonva.us); Ron Clements, Chesterfield, representing Building Inspection Department (clementsro@chesterfield.gov)

2021 Virginia Existing Building Code

Add new text as follows:

307 Electrical. (RESERVED)

308 Mechanical. (RESERVED)

309 Plumbing. (RESERVED)

Reason Statement: There are multiple existing code sections as well as some code change proposals that are more appropriate in Chapter 3 where it applies to all methods. These place holders are to help this code cycle as well as future provisions.

Cost Impact: The code change proposal will not increase or decrease the cost

This is a proposal for formatting the code, it does not increase nor decrease costs.

EB401.1-24

VEBC: 401.1

Proponents: Allison Cook, Arlington. Virginia, representing VBCOA VEBC Committee (acook1@arlingtonva.us); Ron Clements, Chesterfield, representing Building Inspection Department (clementsro@chesterfield.gov)

2021 Virginia Existing Building Code

Revise as follows:

401.1 Scope. The applicable provisions of this chapter shall apply to ~~all construction and *rehabilitation*~~ *repairs*, *alterations*, *additions, change of occupancy*, and *rehabilitation* to *existing buildings*, including those identified as *historic buildings*.

Reason Statement: This change aligns with other Virginia code change proposals to use the same language throughout the scoping in the VEBC. Similar language is in the 2024 IEBC.

Cost Impact: The code change proposal will not increase or decrease the cost

This is editorial in nature so it does not impact cost.

EB403.1-24

VEBC: 403.1, 404.1

Proponents: Allison Cook, Arlington. Virginia, representing VBCOA VEBC Committee (acook1@arlingtonva.us); Ron Clements, Chesterfield, representing Building Inspection Department (clementsro@chesterfield.gov)

2021 Virginia Existing Building Code

Revise as follows:

403.1 Additions. Accessibility provisions for new construction shall apply to *additions*. An *addition* that affects the accessibility to, or contains an area of, a *primary function* shall comply with the requirements in Section 404.3, as applicable. An addition that decreases or has the effect of decreasing accessibility of a building, facility or element thereof, below the requirements for new construction at the time of the addition is prohibited. Accessibility requirements for sites, buildings, structures, facilities, elements and spaces are not required to exceed that required by the VCC for new construction at the time of the addition.

404.1 General. An *alteration* of an existing facility shall not impose a requirement for greater accessibility than that which would be required for new construction. ~~*Alterations* shall not reduce or have the effect of reducing accessibility of a facility or portion of a facility.~~ An alteration that decreases or has the effect of decreasing accessibility of a building, facility or element thereof, below the requirements for new construction at the time of the alteration is prohibited. Accessibility requirements for sites, buildings, structures, facilities, elements and spaces are not required to exceed that required by the VCC for new construction at the time of the alteration.

Reason Statement:

This closely matches language in the 2024 IEBC. The intent is to recognize that an existing building may exceed the accessibility requirements of the VCC and should be allowed to remove or alter accessible elements in that circumstance.

For example, an existing building may undergo a change of occupancy and alteration such that it only requires one means of egress, but the existing building has two ramps (two accessible means of egress). The code should allow one of the two accessible means of egress to be removed since it would not be required if built new today. However, as written, no reduction in accessibility is permitted.

Cost Impact: The code change proposal will not increase or decrease the cost

This code change proposal isn't likely to decrease or increase costs, since removing existing accessible elements that exceed the code minimum is a design decision. It is intended to ensure that alterations and additions to existing buildings are not held to a higher requirement than a new building built today.

EB506.2-24

VEBC: 506.2

Proponents: Allison Cook, Arlington. Virginia, representing VBCOA VEBC Committee (acook1@arlingtonva.us); Ron Clements, Chesterfield, representing Building Inspection Department (clementsro@chesterfield.gov)

2021 Virginia Existing Building Code

Revise as follows:

506.2 Maximum flow and water ~~closet replacement~~ consumption. The maximum water flow and consumption ~~flow rates and quantities~~ for all replaced ~~water closets~~ plumbing fixtures shall comply with the Virginia Plumbing Code or Virginia Residential Code as applicable. ~~be 1.6 gallons (6 L) per flushing cycle~~.

Exception: ~~Blowout-design water closets 3.5 gallons (13 L) per flushing cycle.~~

Reason Statement:

This proposal was part of the ICC 2027 code change process and will appear in the 2027 IEBC.

This only applies to replacement fixture. The VPC and VRC provides consumption flow rates and quantities for a number of plumbing fixtures. This requirement should cover all fixtures with consumption and flow rates requirements, not just water closets.

In addition, it isn't possible to obtain new fixtures today that do not meet these flow consumptions.

Cost Impact: The code change proposal will not increase or decrease the cost

This clarifies the pointer to the VPC and VRC for all plumbing fixtures instead of just water closets.

EB602.3.4-24

VEBC: 602.3.4 (New)

Proponents: Allison Cook, Arlington, Virginia, representing VBCOA VEBC Committee (acook1@arlingtonva.us); Ron Clements, Chesterfield, representing Building Inspection Department (clementsro@chesterfield.gov)

2021 Virginia Existing Building Code

Add new text as follows:

602.3.4 Tanks abandoned or removed.. All exterior above-grade fill piping shall be removed when tanks are abandoned or removed. Tank abandonment and removal shall be in accordance with Section 5704.2.13 of the *International Fire Code*.

Reason Statement: This is existing language in section 1301.5, adding it to the VEBC is means to ensure this requirement is captured in the correct place for existing buildings

Cost Impact: The code change proposal will not increase or decrease the cost

This is an existing requirement, the only purpose is to add it into the VEBC for easier use of the codes.

EB702.2-24

VEBC: 702.1, 702.2 (New), 702.2

Proponents: Allison Cook, Arlington. Virginia, representing Arlington, Virginia (acook1@arlingtonva.us); Ron Clements, Chesterfield, representing Building Inspection Department (clementsro@chesterfield.gov)

2021 Virginia Existing Building Code

702.1 Compliance with the building code. Where a *building* undergoes a *change of occupancy* to one of the special use or occupancy categories described in Chapter 4 of the VCC, the *building* shall comply with all of the requirements of Chapter 4 of the VCC applicable to the special use or occupancy.

Add new text as follows:

702.2 Alterations or additions. Alterations or additions to buildings that convert the building to types, or create building features, within the scope of Chapter 4 of the VCC shall conform to the applicable requirements for the work as classified in this code and as modified by this chapter.

Revise as follows:

~~**702.2**~~ **702.3 Incidental uses.** Where a portion of a *building* undergoes a *change of occupancy* to one of the incidental uses listed in Table 509 of the VCC, the incidental use shall comply with the applicable requirements of Section 509 of the VCC.

Reason Statement:

Existing section 702.1 is intended to apply to occupancies in VCC Chapter 4 that are occupancies, not building types or building features such as high rise or malls that require some alteration or addition to create the building type or feature. The addition of new Section 702.3 is to address circumstances where there is an addition or alteration that creates a building type of feature addressed in Ch. 4 of the VCC and direct the code user to the applicable provisions of the VEBC for the class of work, which will then get to you Ch. 4 of the VCC as applicable.

This has not been the interpretation in all Virginia jurisdictions. So, the intent is to provide clarification and consistency.

One example of this would be an existing auditorium that does not have a stage, adding the stage would be a building feature. Another example is a vertical addition (adding floors or an occupied roof to an existing building) which creates a high-rise building.

Cost Impact: The code change proposal will not increase or decrease the cost

This is being interpreted differently across Northern Virginia, with many already requiring code modification related to compliance with VCC Chapter 4 for high-rise buildings. This code change may cause some jurisdictions to be more restrictive and others to be less restrictive.

EB706.2-24

VEBC: TABLE 706.2

Proponents: Allison Cook, Arlington. Virginia, representing VBCOA VEBC Committee (acook1@arlingtonva.us); Ron Clements, Chesterfield, representing Building Inspection Department (clementsro@chesterfield.gov)

2021 Virginia Existing Building Code

Revise as follows:

TABLE 706.2 HEIGHTS AND AREAS HAZARD CATEGORIES

RELATIVE HAZARD	OCCUPANCY CLASSIFICATIONS
1 (Highest Hazard)	H
2	A-1, A-2, A-3, A-4, I, R-1, R-2[a], R-4
3	E, F-1, S-1, M
4 (Lowest Hazard)	B, F-2, S-2, A-5, R-3, R-5, U

a. A building or portion of a building undergoing a change of occupancy classification to a Group R-2 occupancy shall be classified as category 3 where the building is protected throughout with an automatic sprinkler system in accordance Section 903.3.1.1 of the International Building Code.

Reason Statement:

This proposal was part of the ICC 2027 code change process and will appear in the 2027 IEBC.

For a Group E, F-1, M, or S-1 to Group R-2 change of occupancy classification, this proposed code change will reduce requirements to evaluate the existing building height, building area, and construction type where either: (1) the existing building is protected throughout by an NFPA 13-compliant automatic sprinkler system, or (2) a full-building NFPA 13 automatic sprinkler system is installed as part of the project.

Because a full-building NFPA 13 automatic sprinkler system provides significant life safety benefits to residential occupants, it is appropriate to allow greater non-conformity with new construction limits on building height and building area compared to the requirements for the same change of occupancy classification in a building with only a partial sprinkler system.

This change does **not** apply to NFPA 13R systems.

Cost Impact: The code change proposal will decrease the cost
This would make it more affordable for adaptive re-use from E, F-1, S-1, and M uses to be converted to R-2 use.

EB801.2-24

VEBC: 801.2

Proponents: Allison Cook, Arlington. Virginia, representing Arlington, Virginia (acook1@arlingtonva.us); Ron Clements, Chesterfield, representing Building Inspection Department (clementsro@chesterfield.gov)

2021 Virginia Existing Building Code

Revise as follows:

801.2 Creation or extension of nonconformity. An *addition* shall not create or extend any nonconformity in the *existing building* to which the *addition* is being made with regard to accessibility, structural strength, fire safety, means of egress, or the capacity of mechanical, plumbing, or electrical systems. Alterations to the *existing building* or *structure* shall be made so that the *existing building* or *structure*, together with the addition, are no less conforming to the provisions of the VCC than the existing building or *structure* was prior to the addition.

Exceptions:

1. Existing buildings that are less than four stories above or less than four stories below grade plane are required to comply with Section 3002.4 of the VCC when the addition causes the building to be more than four stories above or more than four stories below grade plane.

2. Existing buildings that are four or more stories above, or four or more stories below grade plane and do not have elevators sized to accommodate an ambulance stretcher, compliance with Section 3002.4 of the VCC is required only for the addition for fire department emergency access to all floors of the addition where two or more stories are added.

Reason Statement:

The Existing Building Code was written with horizontal additions in mind, it does not account for vertical additions. As a result of adaptive reuse, Northern Virginia is seeing more and more additions to add floors and / or an occupied roof to existing buildings.

This code change is to provide consistency in the interpretation of "create" or "extend" a nonconformity when it comes to vertical additions and when an ambulance stretcher elevator is required. It also helps to ensure that additions will not be cost prohibitive or technically infeasible while maintaining minimum life safety standards.

Cost Impact: The code change proposal will decrease the cost

This code change proposal allows existing buildings that already exceed four or more stories above or below grade to not have to "retrofit" an ambulance stretcher elevator where the existing shaft cannot accommodate it. That is a cost savings.

EB801.3-24

VEBC: 801.3 (New), 801.3

Proponents: Allison Cook, Arlington. Virginia, representing Arlington, Virginia (acook1@arlingtonva.us); Ron Clements, Chesterfield, representing Building Inspection Department (clementsro@chesterfield.gov)

2021 Virginia Existing Building Code

Add new text as follows:

801.3 Compliance with the building code.. Alterations or additions to buildings that convert the building to types, or create building features, within the scope of Chapter 4 of the VCC shall conform to the applicable requirements for the work as classified in this code and as modified by this chapter.
Exceptions:

1.In existing buildings where the highest occupied floor or occupied roof is less than the height for a *high-rise building* compliance with section 403 of the VCC is required when the alteration or addition causes the building to become a *high-rise building*.

2.In existing buildings that are a *high-rise building* and do not have elevators sized to accommodate a fire service access elevator, compliance with section 403.6.1 of the VCC is required only for the addition where two or more stories are added for fire department emergency access to all floors of the addition.

Revise as follows:

~~**801.3**~~ **801.4 Other work.** Any repair or alteration work within an *existing building* to which an addition is being made shall comply with the applicable requirements for the work as classified in this code.

Reason Statement:

The Existing Building Code was written with horizontal additions in mind, it does not account for vertical additions.

As a result of adaptive reuse, Northern Virginia is seeing more and more additions to add floors and / or an occupied roof to existing buildings. This code change is to provide consistency in the interpretation of "create" or "extend" a nonconformity when it comes to vertical additions associated with high-rise buildings.

It also helps to ensure that additions will not be cost prohibitive or technically infeasible while maintaining minimum life safety standards for existing buildings that are not currently a high-rise but the addition of another story or an occupied roof would create a high-rise.

Cost Impact: The code change proposal will not increase or decrease the cost

This is being interpreted differently across Northern Virginia, with many already requiring code modification related to compliance with VCC Chapter 4 for high-rise buildings. This code change may cause some jurisdictions to be more restrictive and others to be less restrictive.

EB805.2.1.1-24

VEBC: 805.2.1.1

Proponents: Allison Cook, Arlington. Virginia, representing VBCOA VEBC Committee (acook1@arlingtonva.us)

2021 Virginia Existing Building Code

Revise as follows:

805.2.1.1 Building envelope. New *building* envelope assemblies that are part of the addition shall comply with Sections R402.1, R402.2, R402.3.1 through R402.3.5, and R402.4 of the VECC.

~~Exception:~~ Exceptions:

1. The building envelope of the addition shall be permitted to comply through a Total UA analysis, as determined in Section R402.1.5 of the VECC, where the *existing building* and the addition, and any alterations that are part of the project, is less than or equal to the Total UA generated for the *existing building*.

2. Building envelope of the addition tightness shall be considered acceptable when the items listed in Table N1102.5.1.1 (R402.5.1.1) of the VRC, applicable to the method of construction, are field verified with visual inspection(s). Where required by the building official, an approved party, independent from the installer, shall inspect the air barrier.

Reason Statement: Existing buildings are unlikely to be able to pass a blower door test due to the nature of the changing standards increasing building envelope tightness. This helps housing affordability because it does not requirement potentially costly retrofit requirements to the existing building to meet the blower door test for an addition. The language for visual inspections come from the 2015 VRC with sections updated to the 2024 IRC.

Cost Impact: The code change proposal will decrease the cost

This code change allows for a visual inspection of the addition to ensure compliance with the energy code requirements while not requiring costly retrofits to the existing building that would be needed to pass a blower door test.

EB901.1-24

VEBC: 901.1

Proponents: Allison Cook, Arlington. Virginia, representing VBCOA VEBC Committee (acook1@arlingtonva.us); Ron Clements, Chesterfield, representing Building Inspection Department (clementsro@chesterfield.gov)

2021 Virginia Existing Building Code

Revise as follows:

901.1 Scope. ~~It is the intent of this chapter to provide means for the preservation~~ The repair, alteration, addition, change of occupancy, rehabilitation and relocation of *historic buildings* shall comply with this chapter. The provisions of this code relating to construction involving *historic buildings* shall not be mandatory unless such construction constitutes a life safety hazard. Accessibility shall be provided in accordance with Section 405.

Reason Statement: This proposal was part of the ICC 2027 code change process and will appear in the 2027 IEBC, with the addition of the word "rehabilitation" to align with the proposed change to scoping language for the VEBC generally.

Cost Impact: The code change proposal will not increase or decrease the cost

This is editorial in nature

RB311-24

VRC: SECTION R311, R311.1

Proponents: Kyle Kratzer, Fairfax County, representing VBCOA (kyle.kratzer@fairfaxcounty.gov)

2021 Virginia Residential Code

Revise as follows:

SECTION ~~R311~~ R318 MEANS OF EGRESS

~~R311.1~~ R318.1 Means of egress. *Dwellings*, ~~and each~~ each *dwelling unit* in a *two-family dwelling*, and detached *accessory structures* with *habitable space* shall be provided with a means of egress in accordance with this section. The means of egress shall provide a continuous and unobstructed path of vertical and horizontal egress travel from all portions of the *dwelling* to the required egress door without requiring travel through a garage. The required egress door shall open directly into a public way or to a yard or court that opens to a public way.

Reason Statement: This change clarifies that all habitable spaces must include a means of egress that complies with Section R311. The added language eliminates ambiguity, ensuring consistent enforcement of this requirement.

Cost Impact: The code change proposal will not increase or decrease the cost

This change clarifies existing requirements and is not expected to impact construction costs.

RB314.3-24

VRC: R314.3, R328.7

Proponents: Kyle Kratzer, Fairfax County, representing VBCOA (kyle.kratzer@fairfaxcounty.gov)

2021 Virginia Residential Code

Revise as follows:

R314.3 Location. Smoke alarms shall be installed in the following locations:

1. In each sleeping room.
2. Outside each separate sleeping area in the immediate vicinity of the bedrooms.
3. On each additional story of the *dwelling*, including *basements* and *habitable attics* and not including crawl spaces and uninhabitable *attics*. In *dwellings* or *dwelling units* with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full *story* below the upper level.
4. Not less than 3 feet (914 mm) horizontally from the door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a smoke alarm required by this section.
5. In the hallway and in the room open to the hallway in *dwelling units* where the ceiling height of a room open to a hallway serving bedrooms exceeds that of the hallway by 24 inches (610 mm) or more.
6. In rooms and areas within *dwelling units*, basements and attached garages in which *Energy Storage Systems* are installed.

   Exception: A heat detector, listed and interconnected to the smoke alarms, shall be installed in locations within *dwelling units* and attached garages where smoke alarms cannot be installed based on their listing.

R328.7 Fire detection. ~~Rooms and areas within *dwelling units*, basements and attached garages in which *ESS* are installed shall~~ *ESS* shall be protected by smoke alarms in accordance with Section ~~R314 . A heat detector, *listed* and interconnected to the smoke alarms, shall be installed in locations within *dwelling units* and attached garages where smoke alarms cannot be installed based on their listing.~~ R314.

Reason Statement:

This change relocates the required smoke alarm provision for Energy Storage Systems from Section R328 to Section R314. This adjustment improves code readability and ensures alignment with the current structure.

Cost Impact: The code change proposal will not increase or decrease the cost

This change is editorial in nature and has no bearing on the cost of construction.

RB318.7.6-24

IRC: R318.7.6

Proponents: Andrew Clark, representing Home Builders Association of Virginia (aclark@hbav.com)

2024 International Residential Code

Revise as follows:

R318.7.6 Landings for stairways. There shall be a floor or landing at the top and bottom of each *flight* of stairs. The width perpendicular to the direction of travel shall be not less than the width of the *flight* served. For landings of shapes other than square or rectangular, the depth at the walk line and the total area shall be not less than that of a quarter circle with a radius equal to the required landing width. Where the *stairway* has a straight run, the depth in the direction of travel shall be not less than 36 inches (914 mm).

Exceptions:

1. The top landing of an interior *stairway*, including those in an enclosed garage, shall be permitted to be on the other side of a door located at the top of the *stairway* , provided that the door does not swing over the stairs.
2. At an enclosed garage, the top landing at the *stair* shall be permitted to be not more than $7^{3}/_{4}$ inches (197 mm) below the top of the threshold.
3. Where there are not more than two risers at ~~At~~ an exterior ~~doors~~ door, and the door does not swing over the tread a top landing is not required ~~for an exterior stairway of not more than two risers, provided that the door does not swing over the *stairway*~~.
4. An exterior flight of stairs ~~Exterior *stairways*~~ to grade with three or fewer *risers* serving a deck, porch or patio shall have a bottom landing width of not less than 36 inches (914 mm), provided that the stairway is not the required access to grade serving the required egress door.

Reason Statement:

This proposal consolidates and clarifies the International Residential Code's (IRC) stairway landing requirements, as adopted during the 2024 IRC code development process, and incorporates consensus revisions from the ongoing 2027 code development process to further improve clarity and consistency.

The 2024 IRC reorganized and streamlined stairway landing provisions by consolidating all requirements and exceptions into a single location—Section R318.7.6. This structural revision eliminates redundancy, aligns related provisions, and clarifies application. Exceptions previously located in multiple sections of the 2021 IRC were relocated as follows:

- Section R311.7.6, Landings for stairways: Now R318.7.6, Exception 1
- Section R311.3.1, Floor elevations at required egress doors: Now R318.7.6, Exception 2
- Section R311.3.2, Floor elevations at other exterior doors : Now R318.7.6, Exception 3

The 2024 IRC added Section R318.7.6, Exception 4, which requires a landing at the base of short exterior stairs, such as those serving decks or porches. The new requirement improves safety by providing a stable, level transition surface where exterior steps are most frequently used.

Additionally, this proposal also incorporates clarifying revisions from a consensus proposal under consideration in the 2027 code development process:

- Exception 3 clarifies that a stair with two risers and no landing is not a stairway but a single tread, correcting misuse of the defined term and improving clarity through streamlined syntax.
- Exception 4 replaces stairway with flight of stairs to accurately apply the exception to stairways that include an intermediate landing and a bottom flight of three or fewer risers.

Cost Impact: The code change proposal will not increase or decrease the cost

The construction cost impact of this proposal is undetermined at this time.

RB324.7-24

VRC: R324.7 (New), R324.7.1 (New), Chapter 44 (New)

Proponents: William Penniman, representing Northern Virginia Bird Alliance (wpenniman@aol.com); Sonal Shah, Northern Virginia, representing Northern Virginia Bird Alliance (moiforte@gmail.com); Thomas Blackburn, Northern Virginia, representing Northern Virginia Bird Alliance (tomlblackburn@gmail.com)

2021 Virginia Residential Code

Add new text as follows:

R324.7 Bird Friendly Construction. All fenestration and other exterior glazing of new residential buildings larger than 2,500 sf above grade or supplementary structures (such as garages, sheds or greenhouses larger than 500 sf) shall use Bird-Friendly Glass as defined in section R324.7.1

R324.7.1 Definition.
Bird-Friendly Glass. Glass, other glazing materials (including spandrel glass or other transparent or highly reflective materials, such as plexiglas or polished metal) or obstructed glass that meet any of the following conditions:

1. Frosted or opaque glass or glass with exterior surface (surface1) obstructed and effectively covered by building-integrated structures that do not have gaps larger than 12-inches (12”) in any dimension, including metal screens, non-glass double-skin facades, fixed solar shading, exterior in sector solar screens, grilles, child-guards and other features that meet these conditions;

2. Un-tinted glass with an outer total reflectance of ≤15% that contains a pattern of visual markers that conforms to the following rules: (i) dots or other isolated solid shapes that are ≥¼” in diameter and are either ≤ two-inches (2”) apart in horizontal lines and ≤ two-inches (2") apart in vertical lines or ≤ two-inches (2") apart in any direction if randomly distributed or (ii) horizontal lines that are ≥ ⅛” in width and spaced ≤2” apart or vertical lines that are ≥⅛” in width and spaced ≤2” apart;

3. Any glazing product with a Threat Factor Rating of 30 or less as determined and published by the American Bird Conservancy. See www.birdsmartglass.org.

Revise as follows:

Chapter 44 Reference Standards. Add new standard promulgator and new standard, as follows:

ABC	American Bird Conservancy
	P.O. Box 249, The Plains, VA 20198

Threat Factor Rating System for bird-safe windows (https://abcbirds.org/wp-content/uploads/2025/06/What-is-a-Threat-Factor-6-9-25.pdf)

Reason Statement:

This proposal is supported by Northern Virginia Bird Alliance.

Collisions with buildings kill up to 1 billion birds per year in the United States primarily due to the “invisibility” of clear glass to birds and due to reflections that appear to be attractive places to fly. https://abcbirds.org/glass-collisions/why-birds-hit-glass/This high annual loss of birds to building collisions has contributed to the significant decline that has been recorded in many bird populations during recent decades. The danger to birds exists throughout the principle “bird activity zone” up to 100 feet above grade where both local flights and migrations occur. Local flights occur throughout the year and are generally from ground to tree tops. Most collisions actually occur with glass on homes and low-rise buildings even though taller buildings, pose a greater danger on a per-building basis. https://abcbirds.org/glass-collisions/why-birds-hit-glass/ The amount of glass is the strongest predictor of birdcollisions. https://abcbirds.org/glass-collisions/architecture-planning/ Clear glass is a threat whether it is part of the building envelope or an extension of glass above the building walls or incorporated into skyways or balconies or even smaller auxiliary structures. Bird-friendly solutions may involve building design, the glass itself (e.g., frits or printed patterns, coatings, frosting or films applied to glass) or physical structures (as simple as window screens, grills, shades or less glazing), https://abcbirds.org/glass-collisions/architecture-planning/ ("Bird Friendly Design Guide"); https://abcbirds.org/glass-collisions/why-birds-hit-glass/ ;https://abcbirds.org/glass-collisions/photo-gallery/ ; https://www.collidescape.org/ As illustrated by the Javits Center window replacement, the use of bird-friendly glass can reduce collisions by over 90%.https://abcbirds.org/glass- collisions/architecture-planning/

The range of bird-friendly glazing and design is growing as architects, builders and glass companies make concerted efforts to minimize building threats to birds. https://abcbirds.org/glass-collisions/products-database/ ; https://nationalaudubon.app.box.com/s/lmf7vijbohuds6j92igzl1dzy8398ckj ; https://www.featherfriendly.com/residential ; https://www.featherfriendly.com/commercial?hsLang=en ; https://www.birdsavers.com/
A simple rule is the "2X2" standard: the 2x2 Rule is defined as a collision deterrence module based up on the physical profile of a bird in flight. Current research has established maximum module dimensions of 2" high x 2" wide. Some solutions, such as films meeting the 2X2 standard, can be applied to windows and effectively reduce collisions. The American Bird Conservancy maintains and continuously updates a list of bird-friendly materials, which can be used for compliance in order to provide flexibility for builders and architects. The ABC rates products based on the hazard they pose for birds ("ThreatFactor"). https://abcbirds.org/glass-collisions/threat-factor-rating/ The data base is available in printed form or found at https://abcbirds.org/glass-collisions/products-database/ ; www.birdsmartglass.org .

As of August 2025, there were nearly 190 bird-friendly glazing products that had been tested and found to pass the ABC's "threat" standard.

Government bodies around the country have begun to address these issues with mandatory standards for bird-friendly construction. The ABC Threat Factor Rating is based upon testing and is commonly cited (e.g.,by NYC and GSA) as a source of acceptable compliance standards.

Depending on designs and materials chosen, the solutions may be essentially invisible to occupants (e.g.,UVpatterns) or fit with the overall design pattern (e.g.,insect screens on windows) or be such (e.g.,frits) that occupants quickly get used to and see beyond the patterns.

This proposal will enhance the resiliency and survival of both local and migratory birds, which are currently killed and injured by impacts to windows and other glazing of buildings. Buildings are the second leading cause of death to birds with up to1 billion birds killed annually by striking buildings, mainly windows and other glass. The problem exists for both residential and commercial buildings, including low-rise buildings. Bird populations have declined substantially in the UnitedStates in the past 50 years, in significant part due to buildings and increased quantities of glass used in construction.
By implementing the requirements for Bird-Friendly Materials in new construction, adoption of the proposal will substantially reduce bird injuries and mortality. Experience indicates that there could be a reduction of 90% or greater with full implementation.

Cost Impact: The code change proposal will increase the cost

The proposed provision may, but need not, increase building costs. See https://abcbirds.org/glass-collisions/architecture-planning/ ("Bird Friendly Design Guide": "New construction can incorporate from the beginning bird-friendly design strategies that are cost neutral.").

Some approaches can raise costs of construction, since bird-friendly glass is somewhat more costly than traditional glass. However, patterns on glass are only one solution. Design decisions for new buildings can mitigate or eliminate increased costs. For example, design changes to reduce the glass areas can result in reduced constructioncosts and also save operational costs with a more efficient building envelope and lower energy consumption. The manufacturing market for bird-friendly glass and other bird-friendly solutions has become more competitive and therefore cost effective and allows designers and owners to choose from a range of options that help realize aesthetic, budget or performance goals or all of the above. In one example, construction of a building with 9,500SF of glass incurred higher building costs of "less than a fifth of a percent of total construction costs". https://livingbuilding.kendedafund.org/2019/04/26/kendeda-buildings-bird-safe-glass-shockingly-huge-issue/ . Many non-glass solutions such as films, screens, sunshades or less glass, are more economical and have other benefits. These solutions perform well on a cost-of-product and installation basis to buildings of a residential scale.

RB339-24

IRC: SECTION R339 HEMP-LIME (HEMPCRETE) CONSTRUCTION) (New), 339.1 (New)

Proponents: Scott McStacy, Seed to Structure LLC, representing Self (scottmcstacy@gmail.com)

2024 International Residential Code

Add new text as follows:

SECTION R339 HEMP-LIME (HEMPCRETE) CONSTRUCTION)

339.1 General. Appendix BL may be used as an alternative to this code.

Reason Statement:

Statement of Purpose

This proposal seeks to adopt Appendix BL – Hemp-Lime (Hempcrete) Construction from the 2024 International Residential Code (IRC) into the Virginia Residential Code. Adoption will provide clear, prescriptive guidance for the use of hemp-lime as a nonstructural wall infill system in Virginia residential construction, ensuring consistency, safety, and innovation in sustainable building practices.

Problem Statement

Hemp-lime ("hempcrete") is an increasingly used construction material in Virginia and across the U.S. It provides superior insulation, moisture regulation, and carbon sequestration, while using locally grown agricultural products. Currently, hemp-lime construction in Virginia can only be approved through USBC §104.11 – Alternative Materials and Methods, which requires case-by-case approvals by local building officials. This creates unnecessary uncertainty, delays, and inconsistency for builders, homeowners, and code officials.

Since hemp-lime construction is now formally recognized in the 2024 IRC (Appendix BL)—the model code on which Virginia's USBC is based—Virginia should adopt Appendix BL into the VRC. This will align the state code with the latest national standards and provide clarity and predictability to the building community.

Supporting Information

- IRC 2024 Appendix BL provides prescriptive provisions for hemp-lime construction, including material requirements, fire safety, story limitations, and seismic scope.
- Hemp-lime has been demonstrated to meet or exceed fire resistance, durability, and thermal performance standards when used as designed.
- The appendix limits prescriptive use to one- and two-family dwellings up to two stories in low-seismic regions, with engineered design required outside these limits.
- This proposal does not create new regulatory burdens but instead aligns Virginia with national code standards already vetted and approved by the International Code Council (ICC).
- Recognized benefits of hemp-lime include:
  - Fire resistance (documented ASTM E84 performance).
  - Durability and moisture regulation (reduces mold/mildew risk).
  - Carbon sequestration, supporting Virginia's climate goals.
  - Local agricultural and economic benefits, supporting Virginia hemp farmers.

Economic Impact

- For Builders/Homeowners: Reduced cost and delay from not requiring alternative materials approval for each project.
- For Local Jurisdictions: Simplifies plan review and inspection by providing prescriptive standards.
- For Industry and Agriculture: Supports Virginia-grown hemp and the development of a local supply chain for sustainable building

materials.

Justification

Adopting Appendix BL ensures that Virginia:

1. Remains current with national model codes.
2. Supports safe, innovative, and sustainable construction.
3. Reduces administrative burdens on builders, homeowners, and code officials.
4. Encourages economic growth in both construction and agriculture.

Cost Impact: The code change proposal will decrease the cost
Costs will dramatically decrease with the adoption of this Appendix BL

Attached Files

- **Va Code Change Proposal.docx**
  https://va.cdpaccess.com/proposal/1423/2166/files/download/947/

RB408.4-24

VRC: R408.4

Proponents: Dean Bragg, Orange County VA Building department, representing Building inspector

2021 Virginia Residential Code

R408.4 Access. Access shall be provided to all under-floor spaces. Access openings through the floor shall be not smaller than 18 inches by 24 inches (457 mm by 610 mm). Openings through a perimeter wall shall be not less than 16 inches by 24 inches (407 mm by 610 mm). Where any portion of the through-wall access is below *grade*, an areaway not less than 16 inches by 24 inches (407 mm by 610 mm) shall be provided. The bottom of the areaway shall be below the threshold of the access opening. Through wall access openings shall not be located under a door to the residence. See Section M1305.1.3 for access requirements where mechanical *equipment* is located under floors.

Reason Statement:

DHCD Staff Note:

The proposal does not appear to make any changes to Section R408.4. Staff has made several attempts to reach the proponent over the course of several days, for clarification of intent, with no avail.

Justification for Prohibiting Self-Latching Crawl Space Doors Without an Internal Release

The proposed change to the building code, which prohibits self-latching mechanisms on crawl space doors unless they are equipped with a means to be opened from the inside, is a critical and necessary measure to protect human life and safety. This is not a matter of convenience, but a proactive step to prevent a foreseeable and potentially catastrophic hazard.

A crawl space, by its very nature, is a confined and often hazardous environment. It is a space where workers, such as HVAC technicians, plumbers, and electricians, must perform essential maintenance and inspections. The current widespread use of self-latching mechanisms, which secure the door upon closing, creates a grave risk of accidental entrapment. A worker could easily enter the space, have the door close behind them, and find themselves unable to exit due to a lack of an internal release.

The consequences of such an entrapment are severe. The confined, often unventilated space presents a risk of suffocation, and a trapped individual could suffer from dehydration, hypothermia, or panic. This risk extends beyond professional workers to anyone who might enter the space.

Furthermore, a significant and tragic risk exists for children. A crawl space can appear as an enticing and mysterious hiding place to a curious child. The self-latching mechanism, designed to secure the door, serves as a trap. Once inside, a small child would not have the strength or the understanding to manipulate an external latch. The silent nature of such an accident—a door closing and latching behind them—can mean that a child's absence goes unnoticed until it is too late. This code change directly addresses this severe and preventable risk, ensuring that homes are not outfitted with hidden hazards for the most vulnerable members of our families.

This principle of internal release is a well-established safety standard in other confined spaces, such as car trunks and refrigerators, where entrapment poses a known risk. Applying this proven safety measure to crawl spaces is a consistent and logical extension of existing public safety policy.
The addition of an interior release mechanism, whether it be a simple latch, a handle, or a push bar, provides a simple, inexpensive, and elegant solution to this life-threatening problem. This building code update represents a logical evolution of our safety standards. It acknowledges that a minor design change can avert a major tragedy. The minimal cost and effort required to implement an internal release mechanism are immeasurably outweighed by the value of a single human life. Therefore, we must stand in defense of this code change as a fundamental step toward ensuring the safety of our communities. This change would not require an entirely new code but rather a simple adjustment to code R408.4.

Cost Impact: The code change proposal will not increase or decrease the cost

This building code update represents a logical evolution of our safety standards. It acknowledges that a minor design change can avert a major tragedy. The minimal if any altered cost and effort required to implement an internal release mechanism are immeasurably outweighed by the value of a single human life.