Housing Innovations in Energy Efficiency (HIEE) Funds -

Performance and Documentation Requirements

Webinar
September 1, 2021
Noon – 1:00 pm
Announcement

• If you or someone you know is having difficulty in making rent payments, please assess eligibility for the Virginia Rent Relief Program (RRP)

• To find out more details on RRP eligibility, please visit [www.dhcd.virginia.gov/eligibility](http://www.dhcd.virginia.gov/eligibility) or dial 2-1-1 from any phone
Agenda Outline

I. Welcome and introductions

II. Overview – RGGI, HIEE development and requirements

III. DHCD Affordable and Special Needs Housing (ASNH) - Program updates and application timeline

IV. HIEE new construction project requirements - Zero Energy Ready Homes (ZERH) program (presenter: Jamie Lyons, Newport Partners)

V. HIEE substantial rehab and adaptive reuse project requirements (presenter: Matt Waring, Viridiant)

VI. Q&A
What is HIEE funding?

• HIEE is DHCD’s “brand” for the Regional Greenhouse Gas Initiative (RGGI) funds allocated to DHCD

• 50% of net revenues from quarterly RGGI auctions are allocated to DHCD to support increasing energy efficiency in affordable housing and reducing energy burdens for low-income Virginians per HB 981 (2020)

• Major investments of HIEE funds to date are in DHCD’s Affordable and Special Needs (ASNH) program and Weatherization Deferral Repair (WDR) program
Regional Greenhouse Gas Initiative (RGGI)

- Regional market-based CO$_2$ reduction program, formed in 2005
  - Original 7 states (CT, DE, ME, NH, NJ, NY, VT)
  - MD, MA, and RI joined in 2007

- Cap-and-Invest
  - Fossil fuel power plants need an allowance for each ton of CO$_2$
  - Total # of allowances based on declining annual CO$_2$ budgets
  - First auction – Fall 2008
  - States determine how allowance revenues are invested

- January 1, 2021 – Virginia became 11$^{th}$ participating state in RGGI

- March 3, 2021 - First RGGI auction in which Virginia-based entities participated
Virginia’s Objectives for HIEE (RGGI) Funds

• Deep energy retrofits - Exceed code requirements in ways that complement existing affordable housing construction and rehabilitation programs, to ensure lowest-income population benefits from long-term cost savings

• Incorporate innovative approaches - Overcome traditional barriers to building and retrofitting affordable housing at scale

• Prioritize long-term sustainability/durability and occupant health - Improve ventilation and indoor air quality, prevent moisture issues, along with energy efficiency upgrades
HIEE Stakeholder Advisory Group

- Fifteen members, representing advocacy groups, affordable housing developers, housing development authorities, weatherization agencies and building energy consultants
- Seven Advisory Group meetings to date, starting in December, 2020
- Two Working Groups:
  - Historically Economically Disadvantaged Communities (HEDC)
  - Energy Data
HIEE Energy Workgroup Members

- KC Bleile, Virdiant
- Janaka Casper, Community Housing Partners
- Chelsea Harnish, VA Energy Efficiency Council
- Sunshine Mathon, Piedmont Housing Alliance
- Adam Stockmaster, TMA Development

Agency partners:
- Stephanie Flanders, Virginia Housing
- Bettina Bergoo, DMME
<table>
<thead>
<tr>
<th>Project Type</th>
<th>VA Housing LIHTC Requirement</th>
<th>HIEE Requirement**</th>
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<tbody>
<tr>
<td>New Construction</td>
<td>ENERGY STAR v3.0</td>
<td>Zero Energy Ready Homes</td>
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<tr>
<td>Substantial Rehab</td>
<td>30% improvement in HERS index or HERS index 80 (or below)</td>
<td>40% improvement in HERS index, or average of HERS index of 70 or below across all units</td>
</tr>
<tr>
<td>Adaptive Reuse</td>
<td>HERS index 95 (or below)</td>
<td>Average of HERS index of 80 or below across all units</td>
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**Additional HIEE requirements: Green building certification; Manual J calculation for HVAC; fresh air ventilation; dehumidification; duct leakage testing and sealing; Architect cost certification; HERS Rater plan review and preliminary rating**
Additional HIEE Requirements

• Green building certification: Same as LIHTC program requirements (LEED, Earth Craft Gold, National Green Building Standard, Enterprise Green Communities)

• Dehumidification strategy/equipment shall maintain interior RH in 40-60 percent range

For substantial renovation and adaptive reuse projects:

• If building/unit envelopes are tightened to new construction standards (5 ACH50), ventilation system(s) shall provide fresh air supply per most current version of ASHRAE 62.1 or 62.2, or the most current version of USBC, whichever is more stringent.

• Existing ductwork shall be sealed and tested to be ≤10 percent total duct leakage; if HVAC system/ductwork is newly-installed, duct leakage shall meet new construction USBC residential energy code requirements (≤4 percent total duct leakage).
ASNH Documentation for HIEE requirements

- Preliminary HERS Rating on representative sample of units, showing:
  - ZERH compliance for new construction
  - HERS 70 target for substantial rehab (or 40% improvement in HERS index)
  - HERS 80 target for adaptive reuse
- Green building certification checklist
- Brief narrative describing how project team will achieve HIEE performance requirements (ventilation/dehumidification, duct sealing) across building systems and dwelling units
- To extent feasible, provide additional incremental costs associated with meeting HIEE reqs.
HIEE Funds Offered through ASNH

- April 2021 ASNH round
  - $7.2m in HIEE funds requested across 14 projects (out of $8.7m available)
  - 11 projects received HIEE awards; about $5.9m HIEE funds obligated; 705 dwelling units to be produced or preserved meeting HIEE requirements

- October 2021
  - $27.0m in HIEE funding available
  - Includes 60% of June 2 and projected Sept. 8 revenue (~$42m) plus $2m carryover from Spring round
ASNH How-to-Apply Webinar

- September 14, 1:00pm to 3:00pm; link to be distributed soon
- Walk through application process in DHCD’s Centralized Application Management System (CAMS)
- Other funding sources available include HOME, National Housing Trust Fund, and Virginia Housing Trust Fund
- Total ASNH funding for Fall 2021 round (applications due on October 31) will be $84m
- Projects must achieve fundable score for VHTF, NHTF, or HOME funds to access HIEE funds
Today’s Presenters

Jamie Lyons, Newport Partners

- Jamie conducts research and analysis on building performance and energy efficient design. In his role as the Technical Director for the U.S. Department of Energy’s Zero Energy Ready Homes program, he supports builders, Raters, architects, building owners, and utilities to help them achieve solutions for high performance homes and buildings. He is a Professional Engineer in the state of Maryland.

Matt Waring, Viridiant

- Matt is Technical Director for Viridiant. Matt has been working in the construction field for more than a decade. He has experience as a superintendent on both single family and multifamily construction projects in both Virginia and South Carolina. Matt has served in several roles for Viridiant, and is now on the Technical Management team overseeing Viridiant’s Technical Advisors and Project Managers working with a broad array of clients. He has been a Certified Home Energy Rater since 2011.
U.S. DOE Zero Energy Ready Homes for the Virginia HIEE Program
September 2021

JAMIE LYONS, P.E.
Newport Partners (DOE Contractor)
Specifications:
The Easy Lift from ENERGY STAR
Eligible Building Types

- SFD and SFA dwellings
- MF buildings up to 5 stories
- Central HVAC & DHW allowed
- For 4-5 story MF buildings, dwelling units must occupy ≥ 80% of the occupiable square footage of the building
ENERGY STAR Multifamily New Construction (ESMFNC) program eligible building types:

- Any MF building with dwelling or sleeping units that is **not** a two-family dwelling;
- Mixed-use buildings (see limits on common space)
- Townhouses meeting specific requirements

**ESMFNC can serve as the ENERGY STAR Prerequisite for DOE ZERH**

**Note:** DOE ZERH will release Multifamily-specific program requirements mid- to late-2022. There will be a transition period to move projects to this new spec.
## DOE ZERH Compared to Code & ENERGY STAR Homes

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### SolarReady
- **Eff. Comps. & H₂O Distrib.**
- **EPA Indoor Air Package**
- **Optimized Duct Location**
Based on 1800, 2400, and 3600 ft² prototypes on climate-appropriate foundations.
Market Ready for ZERH

- 299,000+ HERS Ratings
- 58 Avg. HERS Index
- ~10,000 Homes Ready for ZERH

Source: RESNET Data for CY2020
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## 2015 IECC Insulation

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<th>CZ 4</th>
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<td>Walls</td>
<td>R-20 or R-13+5</td>
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<td>Ceiling</td>
<td>R-49</td>
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<tr>
<td>Floor</td>
<td>R-19</td>
<td>R-30</td>
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<tr>
<td>Basement</td>
<td>R-10/13</td>
<td>R-15/19</td>
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<tr>
<td>Crawl Space</td>
<td>R-10/13</td>
<td>R-15/19</td>
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<tr>
<td>Slab</td>
<td>R-10 for 2’ Deep</td>
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### High Performance Windows

<table>
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<tr>
<th>ENERGY STAR Window Specs to Apply to DOE Zero Energy Ready Home Projects¹</th>
<th>Hot Climates IECC CZ 1-2</th>
<th>Mixed Climates IECC CZ 3-4 except Marine</th>
<th>Cold Climates IECC CZ 5-8 and 4 Marine²</th>
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<td>U-Value</td>
<td>SHGC</td>
<td>U-value</td>
<td>SHGC</td>
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<td>0.40</td>
<td>0.25</td>
<td>[CZ 3] 0.30</td>
<td>[CZ 3] 0.25</td>
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1. DOE Zero Energy Ready Home offers multiple compliance paths including area weighting and allowances for passive solar design. See the National Program Requirements, Exhibit 1 with footnotes, for details.

2. These U & SHGC values are based on the ENERGY STAR v5.0 Window Specifications. DOE ZERH will review the feasibility of adopting ENERGY STAR v6.0 Window Specifications, which entail lower U values, periodically. Any program update to require the v6.0 window specs will be announced with a minimum 1-year phase-in.
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Pre-requisite for DOE ZERH

✓
## Duct Performance Importance

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<th>95% Condensing Furnace</th>
<th>80% Furnace</th>
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<tr>
<td>X</td>
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<tr>
<td>60% Efficient Duct Distribution</td>
<td>90% Efficient Duct Distribution</td>
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| 57% System Efficiency | 72% System Efficiency |
Optimized Duct Location Options

**Ducts in Conditioned Space**
- Ducts Between Floors
- Dropped Ceiling
- Modified Attic Truss
- Unvented Crawl Sp./Basement
- Ducts in Unvented Attic

**Ductless Systems**
- Mini-split Systems

**Buried Ducts**
- Ducts in Vented Attic
### Stepping up to ZERH...

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Comprehensive IAQ

**ENERGY STAR + Indoor airPLUS**

- **Envelope**
- **HVAC**
- **Moisture**
- **CO**

+ **Radon**
+ **Pests**
+ **Materials**
+ **CO +**
+ **HVAC +**
+ **Moisture +**

= **Comprehensive Indoor Air Quality Protection**
Radon Resistant Construction

Required for Moisture Control:

A. Gas Permeable Layer  
(min. 4” clean gravel)

B. Plastic Sheeting  
(under slab)

C. Sealing and Caulking  
(all openings in concrete floor)

D. Vent Pipe  
(3 or 4 inch PVC pipe)

E. Junction Box  
(if fan needed later)

Radon Test Kits Not Required
Note: these maps indicate average risk by county. However, **High levels of Radon can be found in any home.**

Surgeon General’s Warning: Radon Causes Lung Cancer
Screened Openings for Pests

Corrosion-proof rodent/bird screens for openings (e.g., copper or stainless steel mesh)

**Exception:** clothes dryer vent
Low Emission Materials

- Low formaldehyde pressed wood
- Low formaldehyde cabinets
- Low VOC paints
- Low VOC carpet, padding, adhesives
• Low emission materials and products are rapidly evolving

• Labels & certifications can be challenging to navigate

• To help partners identify sources and spec products, a new IAP resources is available:

How to Find Indoor airPLUS Compliant Low-Emission Products

Cabinetry

Requirement: Use Cabinetry made with component materials (plywood, particleboard, MDF) that are certified to comply with the appropriate standards above; OR registered brands or products produced in plants certified under the Kitchen Cabinet Manufacturers Association’s (KCMA) Environmental Stewardship Certification Program (ESP 05-12); OR GREENGUARD or GREENGUARD Gold Certification for Cabinetry.

<table>
<thead>
<tr>
<th>Meet at least one standard below</th>
<th>How to find compliant products</th>
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<tbody>
<tr>
<td>KCMA’s Environmental Stewardship Program (ESP 05-12)</td>
<td>Look for the KCMA-ESP label on cabinets (often sink bases), product packaging, and/or spec sheets. For a list of KCMA certified manufacturers that produce compliant cabinets, visit: <a href="http://www.kcma.org/Members/ESP_Certified_Manufacturers">http://www.kcma.org/Members/ESP_Certified_Manufacturers</a></td>
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Note: Manufacturers listed in the link above can be used as a resource, but partners should request confirmation from the manufacturer or supplier that the product lines they are using are indeed compliant.
Certified CO Alarms & ETS

CO Alarm in each bedroom area

CO Alarm

Combined CO & Smoke Alarm

Enforceable policy in Multi-family buildings
Attached Garage Isolation

No Air Handler in the Garage

Source: Construction Instruction
HVAC Duct Design & Materials

No Building Cavity Ducts
High-MERV HVAC Filter

8 MERV Filter Minimum
### Stepping up to ZERH…

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- EPA Indoor Air Package
- Optimized Duct Location
- Pre-requisite for DOE ZERH
Components and MEL’s are increasingly larger part of total energy use in low-load homes (~50%).
Zero Energy Ready Home requires:

- **ENERGY STAR Certified Appliances**: refrigerators, dishwashers, clothes washers
- **ENERGY STAR Certified Fans**: bathroom ventilation, ceiling fans
- **ENERGY STAR Certified Lighting**: Min. 80% of fixtures or lamps (CFL or LED)
- **Efficient Hot Water Systems**:
  - A. Efficient Distribution
  - or
  - B. Efficient Water Heater + Fixtures

*Only where installed by builder*
Option A: Efficient Hot Water Distribution

- Mandatory
- Based on EPA WaterSense Specifications:
  - ≤ 0.5 gallons of water in any piping/manifold between hot water source and any hot water fixture.
  - By the time the flow at the furthest fixture has +10°F temp increase, no more than 0.6 gallons of water has been delivered.
Hot Water Distribution Options

1. Core Plumbing Layout (wet wall)
2. Manifold System
3. Demand Pumping System

In multifamily with central domestic hot water:
• On-demand recirculation based on loop temp and a demand indicator
• Storage volume ≤ 1 gallon recommended
Option B: Efficient Water Heater & Fixtures

High Efficiency Water Heater
- Gas water heater with an Energy Factor $\geq 0.90$ or a Uniform Energy Factor $\geq 0.87$
- Electric water heater with an Energy Factor $\geq 2.2$ or a Uniform Energy Factor $\geq 2.2$

Water Efficient Fixtures
- All showerheads and bathroom sink faucets shall be WaterSense labeled

Stored Hot Water Volume
- Hot water distribution system stores $\leq 1.2$ gallons between the hot water source and the furthest fixture
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Documentation of the maximum allowable dead load and live load ratings of the existing roof (Rec DL.: +6 lbs./sq. ft.)

**Conduit** to run DC wire from roof to inverter

**Dedicated Area** for installing inverter and balance of system

**Conduit** to run AC wire from inverter location to electric panel

**Circuit Breaker** designated and/or installed for use by the PV system in the electric panel
PV-Ready Checklist Applicability

Average Daily Solar Radiation Per Month

**ANNUAL**

- **Solar Ready Encouraged**
- **Solar Ready Required**

Map of the United States showing regions with different solar radiation levels, indicating where PV systems are recommended or required based on the amount of solar radiation. The map highlights areas where high solar radiation is expected, indicating regions where solar energy systems can be more effectively utilized.
PV Ready features are not required if solar resources are limited:
- Tree Shading
- Tall Buildings
- Not enough South Facing Roof area

Projects using an exception to the PV Ready features may still be ZERH certified

Multifamily Building Allowances:
- PV-ready features may be provided for the common space instead of at the dwelling level
Stepping up to ZERH…

| Solar Ready | ✓ |
| Eff. Comps. & H₂O Distrib. | ✓ |
| EPA Indoor Air Package | ✓ |
| Optimized Duct Location | ✓ |

<table>
<thead>
<tr>
<th>HVAC QI with WHV</th>
<th>HVAC QI with WHV</th>
<th>HVAC QI with WHV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Management</td>
<td>Water Management</td>
<td>Water Management</td>
</tr>
<tr>
<td>Independent Verification</td>
<td>Independent Verification</td>
<td>Independent Verification</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Verification</td>
<td>Independent Verification</td>
<td>Independent Verification</td>
<td>Independent Verification</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HERS 70-80</th>
<th>HERS 65-75</th>
<th>HERS 55-65</th>
<th>HERS 48-55</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisite for ZERH</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IECC 2012</th>
<th>ENERGY STAR v3</th>
<th>ENERGY STAR v3.1</th>
<th>ZERH</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Relationship to Green and Efficiency Programs
Enterprise Green Communities Criteria 2020 Version:

- New Construction projects must meet Mandatory criteria & gain 40 “optional” points to achieve EGC Certification

- DOE ZERH qualifies a project for 12 optional points under 5.2B in the Energy Efficiency section

- DOE ZERH also assures that SF and low-rise MF projects achieve the Mandatory ENERGY STAR Homes certification

- DOE ZERH certification automatically qualifies a project for Enterprise Green Communities Plus
DOE ZERH*:

- **26.5 points min.**
  For ZERH (and Indoor airPLUS)

- **Most prerequisites**
  for Energy and Atmosphere and Indoor Environmental Quality

- **Additional points**
  with HERS Index ≤ 56 typ. for ZERH

- **40 points min.**
  to meet LEED Certified level.

* ZERH points explained in LEED Interpretation ID# 10431.
Why Zero Energy Ready Home is Affordable

Getting Started
• Same rater network
• Same modeling software (at least 3 different options)
• Same plan review & site inspection protocol
ZERH Partner Process

- Become a partner online (builder/developer or rater)
- Identify potential verifier partners at ZERH website
- No pre-registration of projects
- No program certification fees
- Recommend integrated design process (MEPs)
- Rater: plan review & site inspections
- Project Certification – generated by the Rater’s modeling report, once it is uploaded to the RESNET Registry
- Builder credited with certified home on DOE website
Resources and Next Steps

www.buildings.energy.gov/zero/

- Become a Partner
- Program Specs
- DOE Tour of Zero (project examples)
- 24+ Recorded Webinars
- Marketing Tool Kit

Thank You!

Contact: zero@newportpartnersllc.com
Housing Innovations in Energy Efficiency

Funding Requirements 2021 - Rehab/Adaptive Reuse

September 1st, 2021
INTRODUCTION

Matt Waring  
Technical Director  
Viridian

► Former Superintendent  
► Certified Home Energy Rater since 2011  
► PHIUS+ Verifier  
► Former RESNET QAD
Baseline QAP Requirements for Renovations

Renovation:
30% improvement in HERS

or
HERS \leq 80

Adaptive reuse:
HERS \leq 95
Baseline HIEE Requirements

Renovation:

\[ \text{40\%} \text{ improvement in HERS} \]

or

\[ \text{HERS} \leq 70 \text{ across ALL Units} \]

Adaptive reuse:

\[ \text{HERS} \leq 80 \text{ across ALL Units} \]
Optional QAP - 10 points, chose 1

Renovation

earthcraft

NGBS GREEN

Enterprise green communities®
1. HIEE Requirements – Green Building Program

- Gold / 30% HERS Improvement / Points and Requirements

- Energy and Water, Prescriptive or Performance, 15% - 45% Improvement

- HERS 80 for Moderate and Substantial Rehabs, Required and Recommended Items

- Pathway for Historic Building Reuse, Required and Optional Credits
ACCA Manual J calculations for heating/cooling loads

- ACCA Approved Software
### Total Building Summary Loads

<table>
<thead>
<tr>
<th>Component Description</th>
<th>Area Quan</th>
<th>Sen Loss</th>
<th>Lat Gain</th>
<th>Sen Gain</th>
<th>Total Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>28/26: Glazing, outdoor insect screen with 50% coverage, U-value 0.28, SHGC 0.26</td>
<td>114.2</td>
<td>1,664</td>
<td>0</td>
<td>2,046</td>
<td>2,046</td>
</tr>
<tr>
<td>11P: Door-Metal - Polyurethane Core, U-value 0.29</td>
<td>21</td>
<td>317</td>
<td>0</td>
<td>171</td>
<td>171</td>
</tr>
<tr>
<td>12D-Obw: Wall-Frame, R-15 insulation in 2 x 4 stud cavity, no board insulation, brick finish, wood studs, U-value 0.086</td>
<td>988.8</td>
<td>4,423</td>
<td>0</td>
<td>1,192</td>
<td>1,192</td>
</tr>
<tr>
<td>18A1-21o: Roof/Ceiling-Roof Joists Between Roof Deck and Ceiling or Foam Encapsulated Roof Joists, Spray Foam Insulation, Dark or Bold-Color Asphalt Shingle, Dark Metal, Dark Membrane, Dark Tar and Gravel, R-21 open cell 1/2 lb. spray foam, 5.5 inches in 2 x 6 joist cavity, 1 inch on joist, U-value 0.047</td>
<td>977</td>
<td>2,389</td>
<td>0</td>
<td>1,286</td>
<td>1,286</td>
</tr>
<tr>
<td>19C-0sp-v: Floor-Over enclosed crawl space, R-11 insulation on exposed walls, sealed crawl space, passive, no floor insulation, carpet or hardwood, vinyl covering, U-value 0.368</td>
<td>977</td>
<td>1,234</td>
<td>0</td>
<td>403</td>
<td>403</td>
</tr>
<tr>
<td><strong>Subtotals for structure:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>People</td>
<td>4</td>
<td>600</td>
<td>920</td>
<td>1,720</td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td></td>
<td></td>
<td>0</td>
<td>1,200</td>
<td>1,200</td>
</tr>
<tr>
<td>Lighting</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Ductwork</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Infiltration: Winter CFM: 6, Summer CFM: 0</td>
<td>315</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Ventilation: Winter CFM: 40, Summer CFM: 40</td>
<td>2,274</td>
<td>1,059</td>
<td>744</td>
<td>1,803</td>
<td></td>
</tr>
<tr>
<td><strong>Total Building Load Totals:</strong></td>
<td>12,616</td>
<td>1,859</td>
<td>7,962</td>
<td>9,821</td>
<td></td>
</tr>
</tbody>
</table>
If they oversize in NC, then....

1 Bedroom Unit

765 Sq. Ft.

2.5 Ton System Spec’d

306 Sq. Ft. per Ton

1.5 Ton Unit = 510 Sq. Ft. per Ton, Still Significantly Oversized
HIEE Requirements - Fresh Air Ventilation

For renovations and adaptive reuse projects, if building/unit envelopes are tightened to new construction standards (5 ACH50), ventilation system(s) shall provide fresh air supply per the most current version of ASHRAE 62.1 or 62.2, or the most current version of USBC, whichever is more stringent.
Dehumidification strategy/equipment shall provide for occupant comfort and health by maintaining interior RH in 40-60 percent range.
HIEE Requirements - Duct Testing

Existing ductwork shall be sealed and tested to be ≤10 percent total duct leakage; if HVAC system/ductwork will be newly-installed, duct leakage shall meet new construction energy code requirements (≤4 percent total duct leakage).
HIEE Requirements - Duct Sealing

Measured vs. Modeled Duct Leakage

- Tested Total (CFM)
- Tested Leakage Out (CFM)
- Modeled Total (CFM)
- Modeled Leakage Out (CFM)
HIEE Requirements – Plan Review & Prelim Rating

**Pre-Review**
- Online project registration
- Preliminary Spec Sheet
- Drawings
- Flat Review Fee

**Pre-Construction**
- Online Registration for Scheduling Design Review
- Submit ECMF workbook, plans, HVAC load calcs
- Design Review Meeting

**Construction**
- Kick-Off Meeting with TA
- TA makes regular site visits to verify program items & test units
- Team coordinates documentation with TA

**Project Closeout**
- TA completes final diagnostic testing
- TA submits documentation package Viridiant
- PM & QAD review
- Certification
Operations and Maintenance

- High Performance Buildings need Careful, Consistent Maintenance
## Modeling Scenarios

### Average Energy Cost and HERS Savings

<table>
<thead>
<tr>
<th>Measure</th>
<th>% Improvement</th>
<th>HERS</th>
<th>Annual Energy Costs</th>
<th>Annual savings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline Condition</strong></td>
<td>N/A</td>
<td>160</td>
<td>$1,449.14</td>
<td></td>
</tr>
<tr>
<td>Fresh Air Ventilation (Exhaust - 50 CFM / 17.5 W / 12 hr. per day)</td>
<td>-3.9%</td>
<td>154</td>
<td>$1,476.14</td>
<td>$27.00</td>
</tr>
<tr>
<td>Dehumidification - Ultra Aire MD33 (req. by HEE)</td>
<td>-0.7%</td>
<td>159</td>
<td>$1,451.57</td>
<td>$2.43</td>
</tr>
<tr>
<td>9 ACH50</td>
<td>-9.3%</td>
<td>145</td>
<td>$1,333.86</td>
<td>$115.29</td>
</tr>
<tr>
<td>7 ACH50</td>
<td>-11.8%</td>
<td>141</td>
<td>$1,306.29</td>
<td>$142.86</td>
</tr>
<tr>
<td>5 ACH50</td>
<td>-12.1%</td>
<td>141</td>
<td>$1,278.71</td>
<td>$170.43</td>
</tr>
<tr>
<td>8% Total/5% Duct Leakage to Outside (% of CFA)</td>
<td>-6.5%</td>
<td>151</td>
<td>$1,376.29</td>
<td>$72.86</td>
</tr>
<tr>
<td>U-Value 0.36 / SHGC .51 - Interior/Exterior Storm</td>
<td>-11.8%</td>
<td>141</td>
<td>$1,380.71</td>
<td>$68.43</td>
</tr>
<tr>
<td><strong>New Baseline</strong></td>
<td>-30.3%</td>
<td>112</td>
<td>$1,231.57</td>
<td>$217.57</td>
</tr>
<tr>
<td>.93 UEF 50 Gal. Electric Water Heater (Unit &amp; Laundry)</td>
<td>-33.1%</td>
<td>107</td>
<td>$1,180.00</td>
<td>$269.14</td>
</tr>
<tr>
<td>.93 UEF 50 Gal (Unit) &amp; .88 UEF Demand Gas (Laundry)</td>
<td>-34.1%</td>
<td>105</td>
<td>$1,188.86</td>
<td>$260.29</td>
</tr>
<tr>
<td>16 SEER / 10 HSPF (SEZ-KD12NA4 / SUZ-KA12NA)</td>
<td>-39.3%</td>
<td>97</td>
<td>$1,138.29</td>
<td>$310.86</td>
</tr>
<tr>
<td>18 SEER / 12.1 HSPF (SVZ-KP18NA / SUZ-KA18NA2)</td>
<td>-41.5%</td>
<td>93</td>
<td>$1,119.57</td>
<td>$329.57</td>
</tr>
<tr>
<td>26 SEER / 12.5 HSPF (MSZ-FS12NA &amp; MUZ-FS12NA)</td>
<td>-45.3%</td>
<td>88</td>
<td>$1,086.86</td>
<td>$362.29</td>
</tr>
<tr>
<td>.93 UEF 50 Gal (Unit) &amp; .88 UEF Demand Gas (Laundry), 16 SEER / 10 HSPF (SEZ-KD12NA4 / SUZ-KA12NA), 7 ACH50, 8% Total / 5% Duct Leakage to Outside (% of CFA), U-Value 0.36 / SHGC .51 - Interior/Exterior Storm, Exhaust Ventilation, Unit Level Mechanical Ventilation and Unit Level Dehumidification</td>
<td>-45.0%</td>
<td>88</td>
<td>$1,078.86</td>
<td>$369.29</td>
</tr>
</tbody>
</table>

*All Measures below 'New Baseline' Assume: 7 ACH50, 8% Total/5% Leakage to Outside (where applicable), window U-Value 0.36 / SHGC 0.51, Exhaust Ventilation, Unit Level Mechanical Ventilation and Unit Level Dehumidification*
• Additional soft loan cap of 5 percent of Total Construction Costs (TCC), or $7,000 per dwelling unit (whichever is greater, up to $1.5 million)

• Reduced Operational costs for central/common spaces

• Better IAQ and Health for

• Utility Allowance Incentives
Families Served in 2019

- EarthCraft House: 64 homes
- EarthCraft House with ENERGY STAR®: 6 homes
- ENERGY STAR®: 3 homes
- Certified HERS® only: 42 homes

- EarthCraft New Construction: 2,120 units
- EarthCraft Renovation: 986 units
- 23 projects
- 8 projects

**Single Family**
- Total homes: 115
- Total units: 3,143
- Total projects: 31
- Families served in 2019: 3,221
- Families served through 12/31/19: 27,884

**Multifamily**
- Total homes: 3,106
- Total units: 24,741
- Total projects: 346

Equates to elimination of:
- 10.5 gigawatt hours of energy
- 4,167 tons of carbon dioxide

- 4,591,462 pounds of coal burned
- 158,303 incandescent lamps switched to LEDs
- 68,902 tree seedlings grown for 10 years
- 9,647 barrels of oil conserved
- 900 passenger vehicles driven for one year
- 705 homes’ electricity used for one year

Total annual savings: $1,429,815