VIRGINIA IRA ENERGY
REBATE PROGRAM

Market Assessment
May 2024
Thorough assessment of market potential is intended to identify opportunities and constraints in the market and make data-driven decisions on program delivery.

1. Which combination of measures and segments have the greatest potential for savings?
2. Are the incentives sufficient to make the measure install economically viable for participants? If so, which segments?
3. How would decisions around measured and modeled savings approach, braiding with utility and federal programs be beneficial to participants?
4. What incentive levels will make the measures and offerings viable to program participants [recognizing that below certain income levels, no out of pocket cost is the only viable path to customer adoption]?
5. How long will it take to exhaust all funds based on design and scenarios?
6. Is the level of uptake required to disburse all funds sustainable?

Answers to these questions will help Virginia Energy identify target markets, processes, measures, delivery channels, and market actors to inform program design.
VIRGINIA IRA ENERGY REBATE PROGRAM

MARKET ASSESSMENT - ECONOMIC AND TECHNICAL POTENTIAL ANALYSIS

INPUTS

- Building Stock and Segmentation
- Incentives and Costs
- Measures and Savings
- Density and Saturation

ANALYSIS

- Measure bundles
- Economic viability
- Stack up incentives
- Scale to building stock

RESULTS

- Identify target segments
- Implementation planning

SAMPLE OF ANALYSIS PARAMETERS

BUILDING STOCK SEGMENTATION
- Single-family detached
- Single-family attached
- Mobile home
- Multi-family 2-4 units
- Multi-family 5+ units

PROGRAMS AND INCENTIVES
- HOMES and HEAR
- Weatherization Assistance Program
- Increased rebates for low-income participants
- Measured and modeled rebates

MEASURE BUNDLES
- Space/water-heating electrification
- Whole-home electrification with and without building envelope
- Gas upgrades with and without building envelope (HOMES only)

ECONOMIC VIABILITY CHECK
- Positive bill savings
- Net benefit on a participant cost test
- Simple payback period <5 years

Data Sources: Building stock, energy savings, usage characteristics, applicability, and segmentation data available in the NREL ResStock database, EIA’s Residential Energy Consumption Survey (RECS) 2020, and American Community Survey 2022
**ASSUMPTIONS**

- WAP rebate is limited to full cost of weatherization upgrades for households with annual income less than 60% of AMI.
- Service upgrades and wiring costs are included by default for all upgrades involving heat pumps, except for households with electricity as heating fuel.
- Households are only considered qualified for the incentive if they have positive bill savings, payback-period less than 10 years and have net-benefit on participant cost test.
- Results are agnostic of programmatic interventions to target specific segments.
- Does not include installer incentives.
Virginia’s housing market is primarily single-family housing stock (attached and detached) and large multi-family buildings. 

Mobile homes and small multi-family are a small part of the market however each has a diversity of residents across the AMI spectrum.

Virginia IRA Energy Rebate Program
Market Assessment – Housing Market

DISTRIBUTION OF HOUSEHOLDS BY BUILDING TYPE AND AMI

- SINGLE-FAMILY DETACHED: 22% in 0-30%, 24% in 30-60%
- SINGLE-FAMILY ATTACHED: 5% in 0-30%, 3% in 30-60%
- MULTI-FAMILY WITH 2-4 UNITS: 1% in 0-30%, 2% in 30-60%
- MULTI-FAMILY WITH 5+ UNITS: 1% in 0-30%
- MOBILE HOME: 6% in 0-30%

Total Number of Households in Virginia: 3,353,035 (67% own the home they occupy)
Electricity and natural gas delivery 84% of heating fuel; 4% of single-family detached homes have no heating fuel.

Mobile homes and small multi-family are a small part of the market however each has a diversity of residents across the AMI spectrum.
Using market potential analysis, Guidehouse evaluated six program design scenarios to inform VA Energy market and implementation strategy.

<table>
<thead>
<tr>
<th>Scenario#</th>
<th>Modeled/Measured</th>
<th>Rebate Levels</th>
<th>Braiding</th>
<th>Limit Income-Eligibility</th>
<th>Programs Considered</th>
</tr>
</thead>
<tbody>
<tr>
<td>MO</td>
<td>All Modeled</td>
<td>Default, aligned with DOE</td>
<td>No braiding</td>
<td>No</td>
<td>HOMES &amp; HEAR</td>
</tr>
<tr>
<td>ME</td>
<td>All Measured</td>
<td>Default, aligned with DOE</td>
<td>No braiding</td>
<td>No</td>
<td>HOMES</td>
</tr>
<tr>
<td>Max LI</td>
<td>Single-Family/Mobile Homes - Modeled; Multi-Family - Measured</td>
<td>Maximize for Low-Income</td>
<td>No braiding</td>
<td>No</td>
<td>HOMES</td>
</tr>
<tr>
<td>Braid</td>
<td>Single-Family/Mobile Homes - Modeled; Multi-Family - Measured</td>
<td>Maximize for Low-Income</td>
<td>Braiding with utility and WAP rebates</td>
<td>No</td>
<td>HOMES</td>
</tr>
<tr>
<td>LIE</td>
<td>Single-Family/Mobile Homes - Modeled; Multi-Family - Measured</td>
<td>Maximize for Low-Income</td>
<td>Braiding with utility and WAP rebates</td>
<td>Yes, limited to 0-60% AMI</td>
<td>HOMES</td>
</tr>
<tr>
<td>LIE+</td>
<td>Single-Family/Mobile Homes - Modeled; Multi-Family - Measured</td>
<td>Maximize for Low-Income</td>
<td>Braiding with utility and WAP rebates</td>
<td>Yes, limited to 0-60% AMI for measured, not for modeled</td>
<td>HOMES &amp; HEAR</td>
</tr>
</tbody>
</table>

**Low-Income (0-80% AMI) Rebate Levels**

<table>
<thead>
<tr>
<th>Description</th>
<th>Modeled Incentive 20-34% savings</th>
<th>Modeled Incentive &gt;=35% savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default-DOE</td>
<td>$4,000</td>
<td>$8,000</td>
</tr>
<tr>
<td>Maximize</td>
<td>$10,000</td>
<td>$16,000</td>
</tr>
</tbody>
</table>
HOMES PROGRAM
Target Segments –
• Homes heated with Oil or Electricity which account for about 2 million (out of 3.2 million) households in the Commonwealth, are most likely to participate in the program.

Programmatic Interventions –
• Programmatic interventions, like specifically targeting marketing and outreach to multi-family buildings, leveraging categorical eligibility etc. would be crucial to meet the low-income multi-family target allocation

Measure Mix –
• Heat Pumps and Whole home electrification upgrades account for 90% of the total rebates.
• Gas measures e.g., gas furnace and gas water heater account for ~10% of the total rebates.

Limiting Eligibility for Maximizing Rebates –
• Limiting maximum rebate threshold to participants with income less than 60% of AMI can help deliver maximum benefits, lowest upfront costs and sharpest reduction in energy burden to households who need it the most.
• E.g., 0-60% at 100% of project cost, 60-80% at 80% of project cost and >80% at 50% of project cost

Braiding –
• Braiding has a big impact in lowering out of pocket costs for participants in the 0-60% AMI category.
• These benefits must be weighed against increased administrative burden and complexities.
• Program is likely to meet and outperform low-income allocation
• Limiting income eligibility to 0-60% could help improve program performance relative to target
• Modeled vs. measured approaches don’t have significant impact on low-income rebate levels

Challenges
• Based on NREL data, meeting low-income multi-family allocation would pose a challenge for most scenarios
• Programmatic interventions may be needed to offset imbalance
• About 54% of VA households use electricity for heating

• **Switching from electric resistance heating to heat pump could save significant energy and reduce bills**

• Households with fuel oil for heating fuel have a high likelihood of participating in the program
  - Savings relative to oil are substantially higher than gas
  - Oil rates are greater than electricity rates per unit of heating output

• **VA Energy could consider households with electric and oil heating as key target segments**

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### Incentive Levels Achieved by Heating Fuel

<table>
<thead>
<tr>
<th>Heating Fuel</th>
<th>Scenario 1A</th>
<th>Scenario 1B</th>
<th>Scenario 2C</th>
<th>Scenario 8C</th>
<th>Scenario alt8C</th>
<th>Scenario limit8C</th>
</tr>
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<tbody>
<tr>
<td>Electricity</td>
<td>77%</td>
<td>15%</td>
<td>24%</td>
<td>7%</td>
<td>67%</td>
<td>1%</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>10%</td>
<td>15%</td>
<td>25%</td>
<td>8%</td>
<td>45%</td>
<td>1%</td>
</tr>
<tr>
<td>None</td>
<td>10%</td>
<td>15%</td>
<td>25%</td>
<td>8%</td>
<td>45%</td>
<td>1%</td>
</tr>
<tr>
<td>Oil</td>
<td>21%</td>
<td>25%</td>
<td>35%</td>
<td>15%</td>
<td>45%</td>
<td>1%</td>
</tr>
<tr>
<td>Other Fuel</td>
<td>1%</td>
<td>10%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
</tbody>
</table>

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### Measure Mix

- Heat pump upgrades are likely to have the highest adoption rate. Ranging between 50% - 70% of the incentives could be due to heat pump upgrades.
- Whole home electrification is likely to have the second highest adoption rate. 24% - 42% of the incentives could be due to whole home electrification.
- Gas upgrades are likely to have low adoption. Ranging from 4% - 10%.
- Average incentives per participant for low-income households increase from modeled to measured but decrease when including braiding from WAP.
- Limiting income eligibility will help in increasing rebate levels for households with income less than 60% of AMI.
- Out of pocket costs decrease substantially with braiding especially for households with income less than 60% of AMI.
The HOMES program is expected to reduce energy burden by ~40% for households with income less than 60% of AMI and ~25% for households with income between 60% and 80% of AMI.

Households with electric resistance and oil heating could see the sharpest reduction in energy bills ~6 – 7% for households in the lowest AMI category.

Avg. Reduction in Energy Burden for Low-Income Households
VA Energy’s implementer will help in identifying the optimum design approach in line with your North Star.

While DOE’s guidance offers flexibility in design choices, some options may have conflicting impacts.

For example, braiding with utility, WAP and other programs could help reduce out-of-pocket costs, but it could also reduce the HOMES incentive and increase participation required to disburse all the funds.

<table>
<thead>
<tr>
<th>Description</th>
<th>Total</th>
<th>Year 2025</th>
<th>Year 2026</th>
<th>Year 2027</th>
<th>Year 2028</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Low-Income</td>
<td>8,970</td>
<td>1,794</td>
<td>2,243</td>
<td>2,243</td>
<td>2,691</td>
</tr>
<tr>
<td>Low-Income Multi-Family</td>
<td>1,810</td>
<td>362</td>
<td>453</td>
<td>634</td>
<td>362</td>
</tr>
<tr>
<td>Non-Low-Income</td>
<td>4,506</td>
<td>676</td>
<td>1,127</td>
<td>1,577</td>
<td>1,127</td>
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<tr>
<td>Total Participation</td>
<td>13,476</td>
<td>2,470</td>
<td>3,370</td>
<td>3,820</td>
<td>3,818</td>
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<tr>
<td>Total Rebate Funds</td>
<td>$75,641,409</td>
<td>$14,316,686</td>
<td>$18,912,907</td>
<td>$20,530,573</td>
<td>$21,881,243</td>
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<tr>
<td>Total Admin Funds</td>
<td>$18,895,701</td>
<td>$4,723,925</td>
<td>$4,723,925</td>
<td>$4,723,925</td>
<td>$4,723,925</td>
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<tr>
<td>Total Program Funds</td>
<td>$94,537,110</td>
<td>$19,040,611</td>
<td>$23,636,833</td>
<td>$25,254,498</td>
<td>$26,605,168</td>
</tr>
</tbody>
</table>

**EXPECTED HOMES PROGRAM PARTICIPATION FOR EACH SCENARIO**

- **LI Participation**
- **Total Participation**

**PROGRAM DESIGN SCENARIOS**

- LI Participation
- Total Participation

**NUMBER OF HOUSEHOLDS**

- 0
- 2,000
- 4,000
- 6,000
- 8,000
- 10,000
- 12,000
- 14,000
- 16,000

**EXPECTED HOMES PROGRAM PARTICIPATION FOR EACH SCENARIO**

- **MO**
- **ME**
- **MAX LI**
- **BRAID**
- **LIE**
- **LIE+**
Target Segmentation –
• Households with electricity and oil as heating fuel are expected to have the most benefit in terms of bill savings and as a result, have a high likelihood for participating in the program.

Programmatic Interventions –
• Programmatic interventions, like specifically targeting marketing and outreach to multi-family buildings, leveraging categorical eligibility etc. would be crucial to meet the low-income multi-family target allocation

Braiding –
• Braiding reduces out-of-pocket costs for households with income less than 60% of AMI.
• Braiding may also help increase the likelihood of households participating in the program e.g., some natural gas households may not experience a large dip in their bills post-upgrade. Reducing upfront costs further through braiding could increase the likelihood of participation for such homes.
• Additional programs and financing mechanisms may be required to reduce upfront costs.
• These benefits must be weighed against increased administrative burden and complexities.

Making Measures Cost-Effective –
• While estimating energy and bill savings is not a requirement for HEAR. It would be important to identify measure bundles that provides significant economic benefit and reduces bills for the household.
• Aligning with industry best practices of combining weatherization and HVAC would be an important pathway.
• Measures bundled with weatherization account for ~60% of the incentives.
• The HEAR program includes fewer levers and design options as compared to the HOMES program.
  • Rebate thresholds are already set to 100% of the project cost for low-income households.
  • Program is restricted to households with income levels less than 150% of AMI
  • No additional savings calculation or design approaches that would impact participation.

• Braiding significantly increases total incentive achieved for low-income multifamily households.

• Additional programmatic intervention may be required to offset imbalance and meet multi-family targets.
Like the HOMES program, households that use electricity or oil for heating are likely to see most uptake in the HEAR program.

These households are likely to have lower energy bills which increases their likelihood of participating in the program.

Braiding with other programs (e.g., WAP and utility) will make electrification upgrades more economically viable for households heated using Natural Gas.

VA Energy could consider households with electric or oil heating as key target segments covers

**Incentive Levels Achieved by Heating Fuel**

- Heat pump upgrades are likely to have the highest uptake ~74%
- Whole home electrification is likely to have the second highest uptake ~26%
Like the HOMES program, braiding helps in reducing the out-of-pocket costs for households with income less than 60% of AMI.

DOE’s guidance on braiding recommends using WAP to cover weatherization upgrades such as air sealing and insulation and appliance rebates to cover heat pumps, heat pump water heater and wiring.

Additional sources of funding or financing may be required to cover remaining out of pocket costs.
Similar to the HOMES program, HEAR is expected to reduce energy burden by ~40% for households with income less than 60% of AMI and ~25% for households with income between 60% and 80% of AMI.

Households with electric resistance and oil heating could see the sharpest reduction in energy bills ~6 – 8% for households in the lowest AMI category.

<table>
<thead>
<tr>
<th>Energy Burden Reduction by Fuel Type and Income Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating Fuel</td>
</tr>
<tr>
<td>0-30%</td>
</tr>
<tr>
<td>30-60%</td>
</tr>
<tr>
<td>60-80%</td>
</tr>
<tr>
<td>Electricity</td>
</tr>
<tr>
<td>Natural Gas</td>
</tr>
<tr>
<td>Oil</td>
</tr>
<tr>
<td>Other Fuel</td>
</tr>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

Avg. Reduction in Energy Burden for Low-Income Households

- Reduced Energy Burden
- Avg. Energy Burden

<table>
<thead>
<tr>
<th>Low Income AMI Categories</th>
<th>Reduced Energy Burden</th>
<th>Avg. Energy Burden</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30%</td>
<td>5%</td>
<td>13%</td>
</tr>
<tr>
<td>30-60%</td>
<td>2%</td>
<td>5%</td>
</tr>
<tr>
<td>60-80%</td>
<td>2%</td>
<td>4%</td>
</tr>
</tbody>
</table>
• We would expect close to 7.5k participants in the program assuming each household at a minimum installs a heat pump.
• Depending on the combinations of measures, the rebates may be range around $10k per participant.
• Some homes may need additional measures like service panel upgrades and wiring which may drive up incentive levels per participant.
• VA Energy would need to define program strategy and implementation forecast based on their goals. E.g., prioritize low-income participants first?

### Description Total Year 2025 Year 2026 Year 2027 Year 2028

<table>
<thead>
<tr>
<th>Description</th>
<th>Total</th>
<th>Year 2025</th>
<th>Year 2026</th>
<th>Year 2027</th>
<th>Year 2028</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Low-Income</td>
<td>5,809</td>
<td>1,162</td>
<td>1,452</td>
<td>1,452</td>
<td>1,743</td>
</tr>
<tr>
<td>Low-Income Multi-Family</td>
<td>608</td>
<td>122</td>
<td>152</td>
<td>213</td>
<td>122</td>
</tr>
<tr>
<td>Non-Low-Income</td>
<td>1,608</td>
<td>241</td>
<td>402</td>
<td>563</td>
<td>402</td>
</tr>
<tr>
<td>Total Participation</td>
<td>8,025</td>
<td>1,525</td>
<td>2,006</td>
<td>2,228</td>
<td>2,267</td>
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<tr>
<td>Total Rebate Funds</td>
<td>$75,181,421</td>
<td>$14,353,865</td>
<td>$18,792,707</td>
<td>$20,160,083</td>
<td>$21,874,765</td>
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<tr>
<td>Total Admin Funds</td>
<td>$18,806,009</td>
<td>$4,701,502</td>
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<td>Total Program Funds</td>
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<td>$19,055,368</td>
<td>$23,494,210</td>
<td>$24,861,585</td>
<td>$26,576,267</td>
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</tbody>
</table>

### EXPECTED HEAR PROGRAM PARTICIPATION FOR EACH SCENARIO

- **MO BRAID**
- LI Participation
- Total Participation

<table>
<thead>
<tr>
<th>LI Participation</th>
<th>Total Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,977</td>
<td>7,304</td>
</tr>
<tr>
<td>7,304</td>
<td>7,418</td>
</tr>
</tbody>
</table>
Households with electricity or oil as heating fuel are key target segments.

Braiding helps in lowering upfront costs but must be compared with the administrative complexity and burden.

Programmatic interventions may be required to specifically outreach and serve low-income multi-family segments.