Cost-effective package savings potential in Rhode Island single-family homes

- **$206.8 million** dollars per year utility bill savings
- **8.5 trillion** Btu per year gas, propane, and fuel oil savings
- **204.1 million** kWh per year electricity savings
- **180,107** cars of pollution reduction

**Rhode Island Residential Energy Efficiency Potential**

- 25% Energy used by Rhode Island single-family homes that can be saved through cost-effective improvements
- 10,606 Rhode Island existing jobs in energy efficiency (2016)

**Rhode Island Top 10 Improvements**

<table>
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<tr>
<th>Improvement</th>
<th>Statewide Annual Consumer Savings</th>
<th>Average Annual Savings per Household</th>
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<tbody>
<tr>
<td><strong>$20</strong></td>
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<td><strong>$80</strong></td>
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- **Enclosure**
  - Drill-and-fill wall cavity insulation: $665
  - R-10 basement wall insulation: $267
  - R-5 insulated wall sheathing (at siding replacement): $516
  - R-60 attic insulation: $1,432
  - Air sealing: $115
  - Low-E storm windows (DIY install): $144
  - LED lighting: $131
  - ENERGY STAR boiler (oil): $166

- **HVAC**
  - High-efficiency heat pump (replace oil furnace at wear out): $1,432
  - Smart thermostat: $158
  - ENERGY STAR boiler (oil): $166

- **Lighting**
  - LED lighting: $131

- **Analysis**
  - Pays back in less than 5 years for most households

**Notes**

2. An interactive version of this factsheet is available at resstock.nrel.gov.
4. This work was supported by the U.S. Department of Energy Building Technologies Office and the Office of Energy Policy and Systems Analysis. Point of contact: Erin.Boyd@hq.doe.gov
Analysis approach and input assumptions

The analysis results presented here used the following assumptions. Differences in assumptions or format of results may make comparisons to other efficiency potential analyses invalid. More details on the methodology and assumptions can be found in the NREL technical report, Energy Efficiency Potential in the U.S. Single-Family Housing Stock.

• Definition of energy efficiency potential: The energy efficiency potential is presented as annual energy savings specific to each state, assuming full turnover of the stock of equipment and appliances at wear out, which could take 15–30 years, depending on the type of equipment. Full uptake of applicable and cost-effective enclosure improvements was also assumed. Thus, the savings presented are the economic potential, as opposed to market potential which might be informed by historical adoption rates. Policy and programs could be implemented to lower other market barriers and reduce the difference between market potential and economic potential.

• Energy savings: The energy savings estimates were calculated using ResStock™, a highly granular model that uses 350,000 physics-based building energy models (OpenStudio®/EnergyPlus™) to statistically represent the diversity of the U.S. single-family housing stock (80 million homes) across a range of climates (216 climate regions), vintages, sizes, fuel types, equipment, insulation, occupancy, etc. For heating/cooling equipment and appliance upgrades considered at wear out, only the incremental savings and cost over the reference replacement scenario (e.g., federal minimum standards) is counted. Detailed descriptions of each improvement scenario are provided in the technical report. The analysis did not account for state/local codes and standards.

• Packages/measure interaction: The statewide savings potential values presented in the upper right box are based on simulated packages of cost-effective improvements, including the state’s top 10 improvements listed and other, lower priority, improvements. The packages are tailored to maximize the net present value (NPV) in each of the 350,000 representative home models. The packages account for any diminished returns due to interaction between heating/cooling equipment and enclosure upgrades, as well as the potential for reduced upfront cost through heating/cooling equipment downsizing. The green bar graph shows the statewide economic potential energy savings of the top 10 individual improvements, not accounting for interactions between them.

• Cost-effectiveness perspective: The presented energy efficiency potential aggregates savings across all homes in which the improvement or package has a positive NPV, evaluated using costs and benefits from the building owner’s perspective rather than a utility or societal perspective. Health and safety benefits were not quantified.

• Economic assumptions: For NPV calculations, 30 years of future cash flows (utility bill savings, equipment replacement at end of life, and residual value) are brought to the present using a 3% real discount rate. The technical report provides additional results using an alternative (more stringent) cost-effectiveness criterion of simple payback period less than five years.

The ResStock software can be used to analyze additional scenarios with different assumptions, for additional technologies, or with additional input data for specific city, state, or utility territories. ResStock is free, open source, and publicly available, with the large-scale simulations running on Amazon cloud computing. See resstock.nrel.gov for more information on using the software, and to learn how to partner with NREL or third-party consultants on additional analyses.