NREL
NATIONAL RENEWABLE ENERGY LABORATORY






Using **ResStock** to evaluate emerging technologies across the U.S. housing stock

2017 BTO FOA Kick-off Meeting

Eric Wilson, National Renewable Energy Laboratory
December 12, 2017

ResStock ComStock

Housing stock characteristics database

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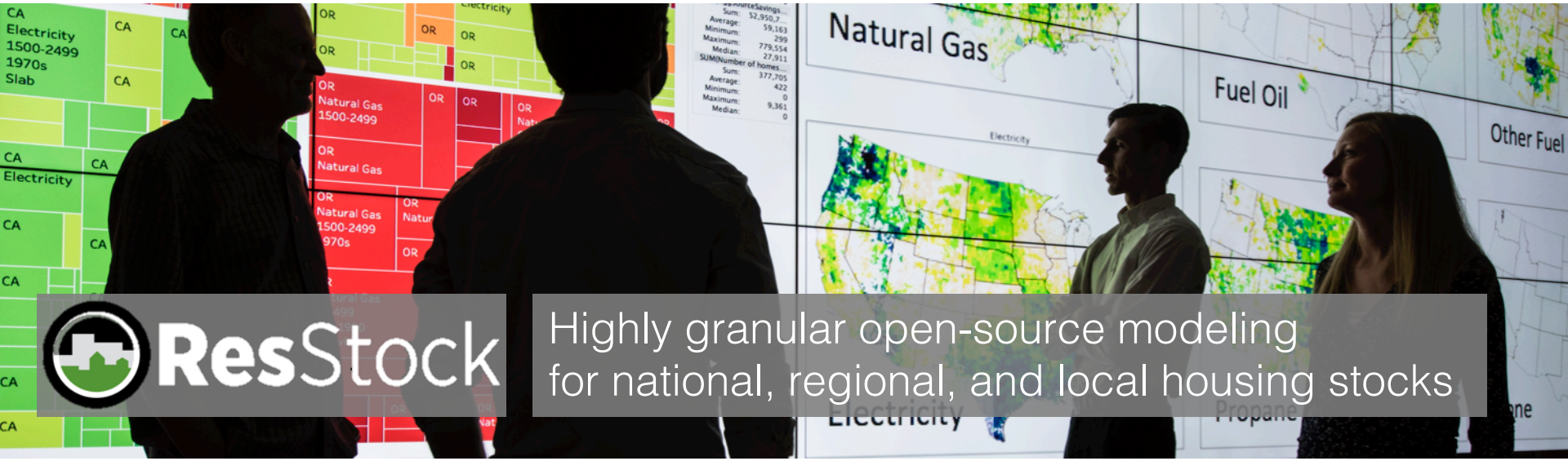
Physics-based computer modeling

+

High-performance computing



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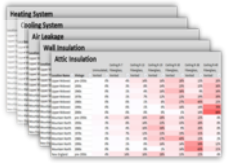
Building Characteristics



EIA	**Res. Energy Consumption Survey (RECS)**
NAHB	**Homebuilder Surveys**
IECC	**Historical Energy Codes**

Other national, regional, and local audit databases

Census Data

Census	**American Community Survey (ACS)**

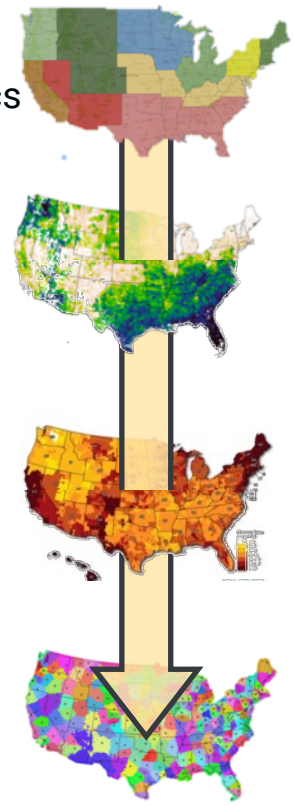
Costs

EIA	**Electricity and fuel costs**
NREL	**OpenEI.org Utility Rate Database**
NREL/Navigant	**Measure Cost Database**

Climate Locations

NREL	**TMY3 weather data**

Housing stock characteristics database + Physics-based computer modeling + High-performance computing



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Housing stock characteristics database

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Physics-based computer modeling

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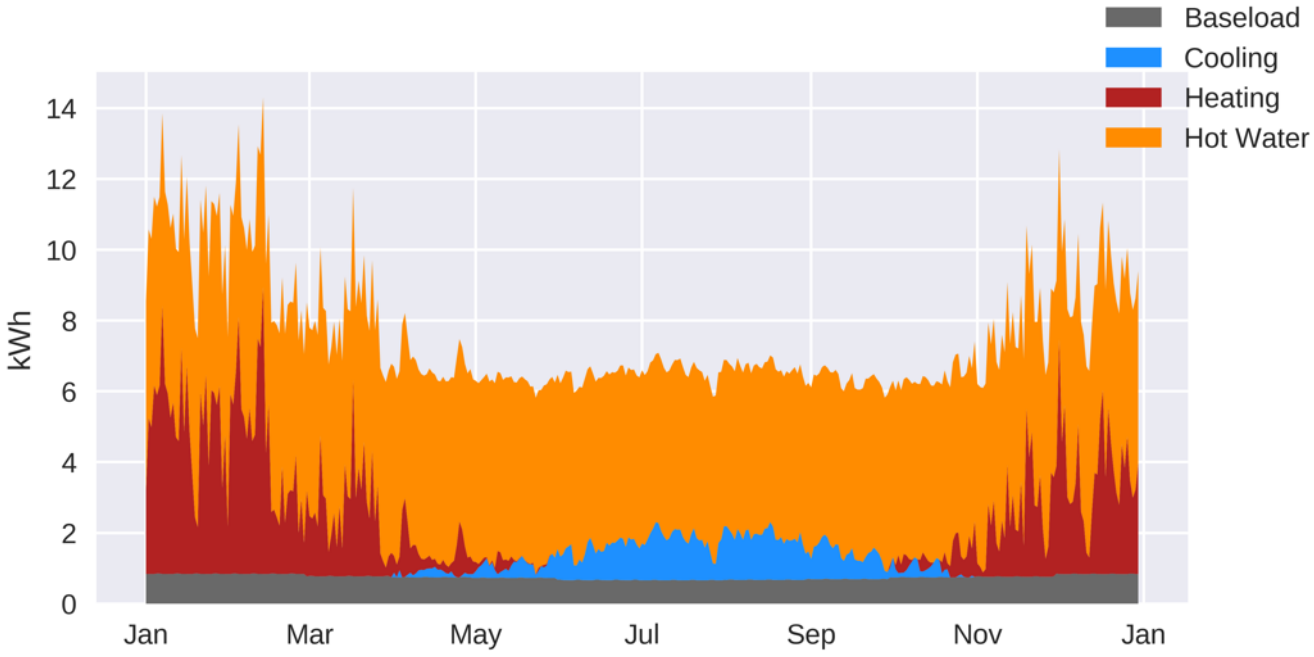
High-performance computing

U.S. DOE Tools

OpenStudio

EnergyPlus

Detailed sub-hourly energy simulations



Housing stock characteristics database

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Physics-based computer modeling

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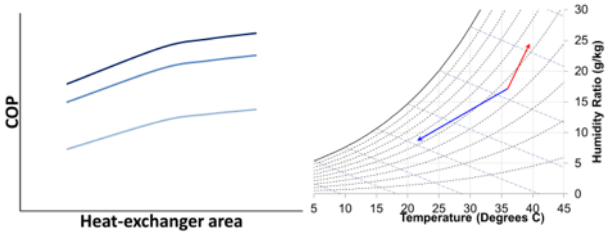
Ability to simulate emerging technologies

Emerging technology



System performance characterization

ResStock

Detailed open-source component models

Housing stock characteristics database

+

Physics-based computer modeling

+

High-performance computing

U.S. DOE Tools

OpenStudio

EnergyPlus

Many Partners: Shared Development Resources

Xcel Energy
Austin Energy
Performance Systems Development
State of California Energy Commission
nationalgrid
Group 14 Engineering
bigladder Software
EnergyTrust of Oregon, Inc.
Duke Energy
NORESCO
ambient energy
wrightsoft
Bonneville Power Administration
NYSERDA
SketchUp
Concept3D Location. Web. 3D.
Daikin
Johnson Controls
LG
CBEI Consortium for Building Energy Innovation
FLUX
ICF International
United Technologies Research Center
California Technical Forum
Carmel Software
Pacific Northwest
Berkeley Lab
Nexant
Mitsubishi Electric
NIST
Oak Ridge National Laboratory
Argonne National Laboratory
Natural Resources Canada
Genability
GARD Analytics

Housing stock characteristics database

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Physics-based computer modeling

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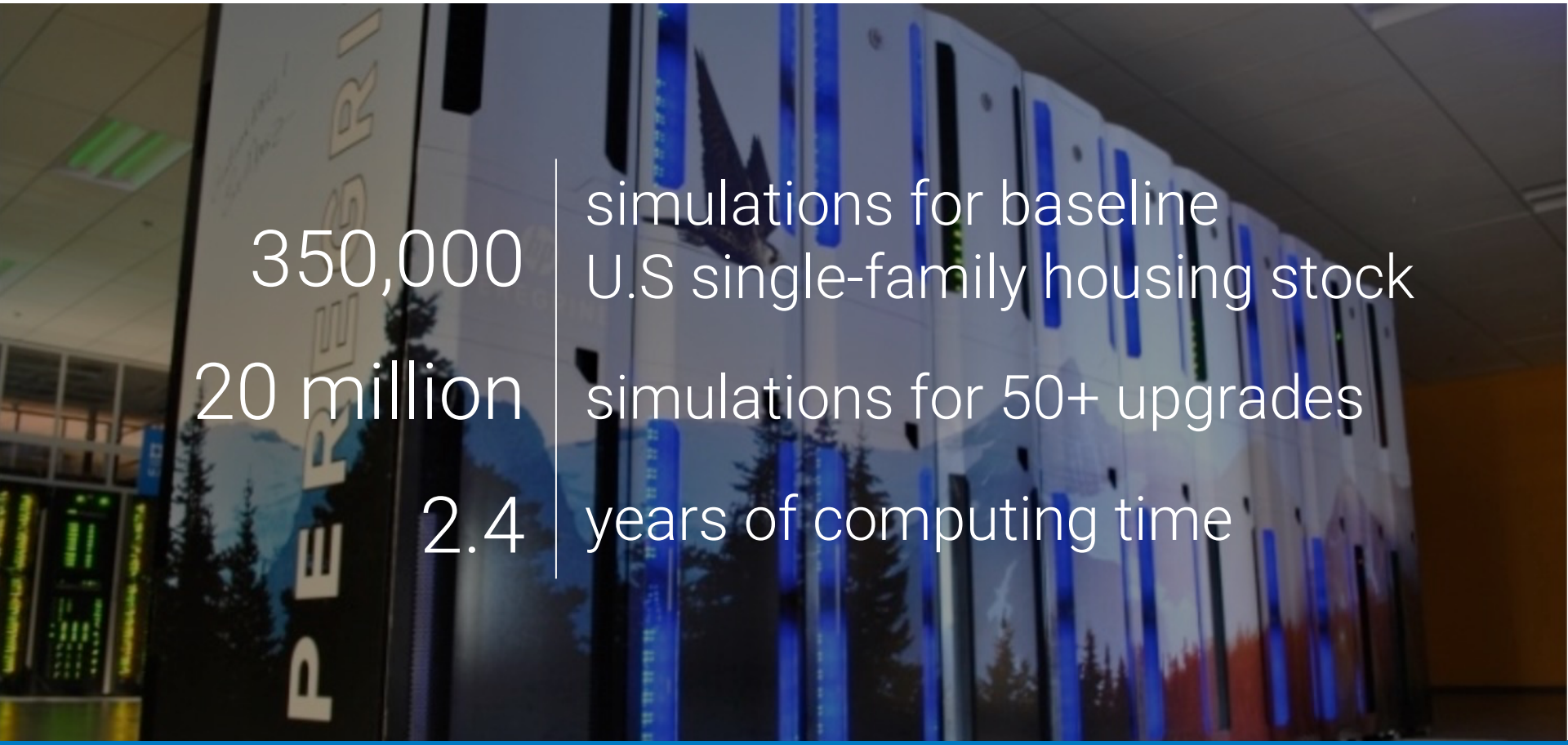
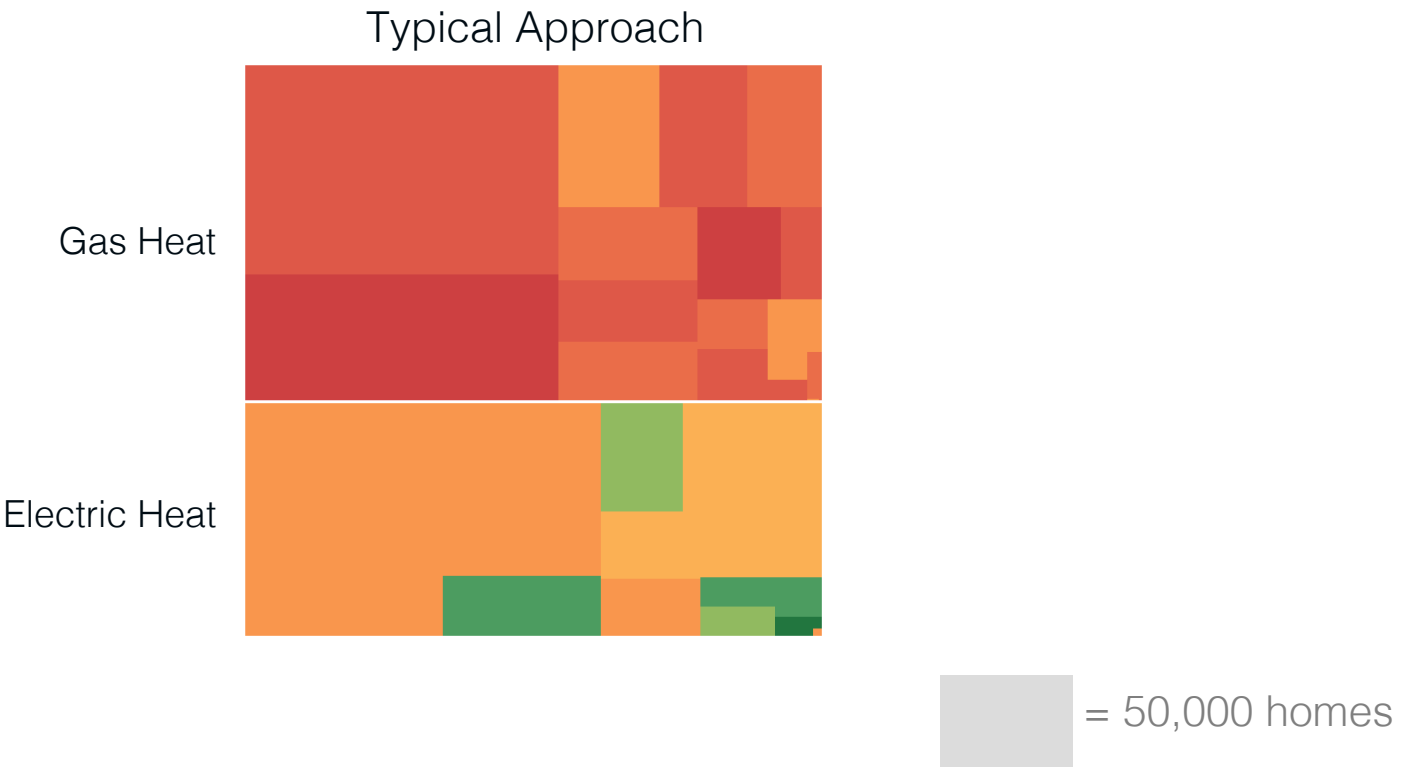
High-performance computing



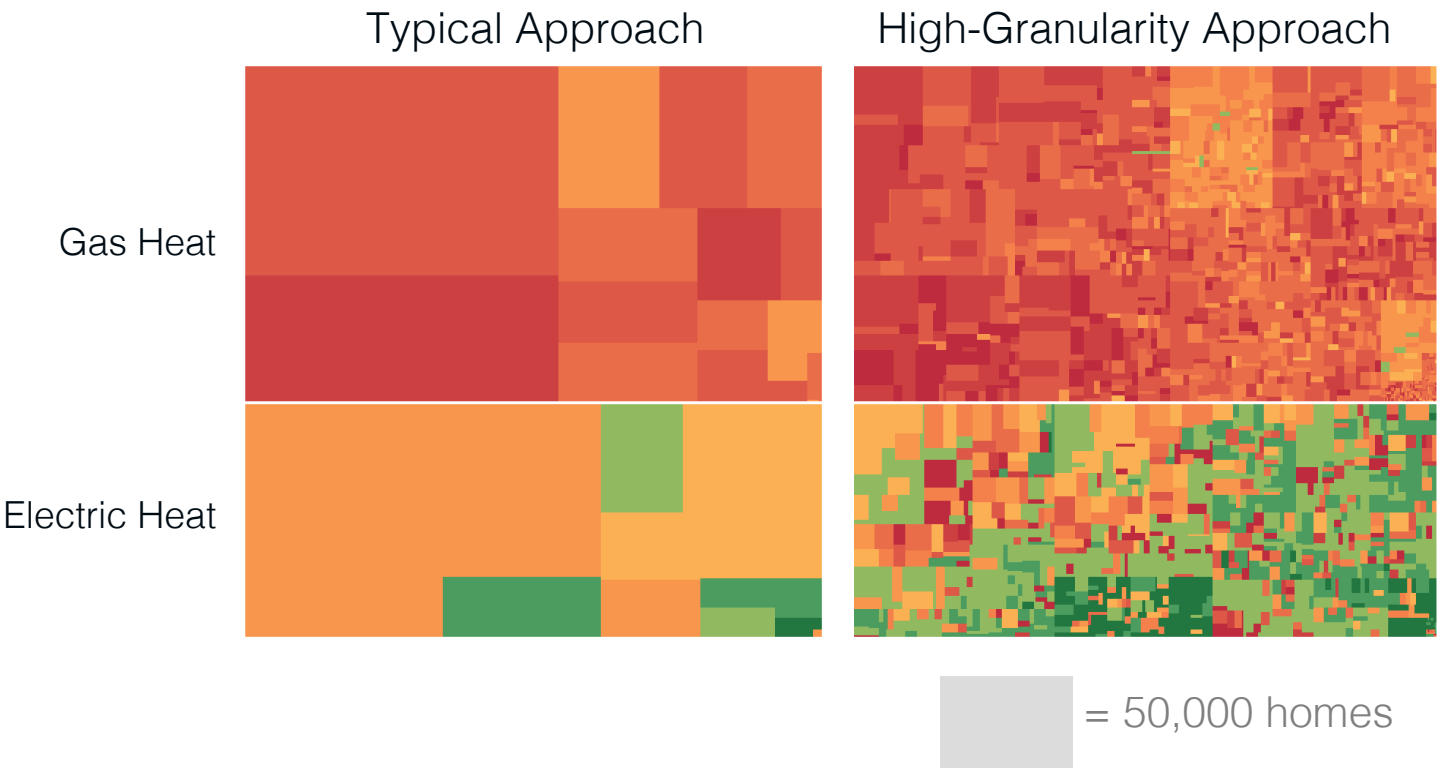
350,000	simulations for baseline U.S single-family housing stock
20 million	simulations for 50+ upgrades
2.4	years of computing time

A high-granularity approach to cost-effectiveness



Payback, in years, for drill-and-fill wall insulation in Washington and Oregon single-family homes

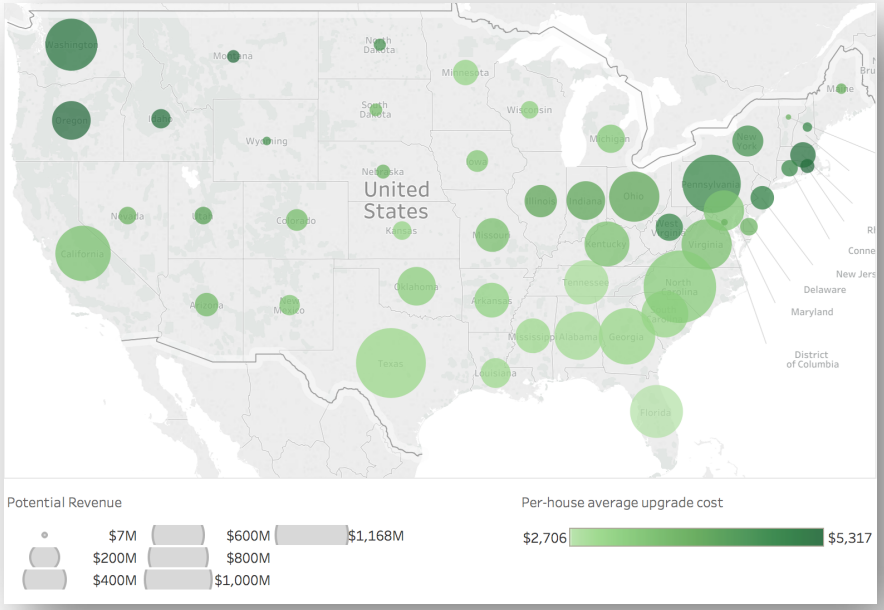
A high-granularity approach to cost-effectiveness



Payback, in years, for drill-and-fill wall insulation in Washington and Oregon single-family homes

Application: Product Design & Marketing

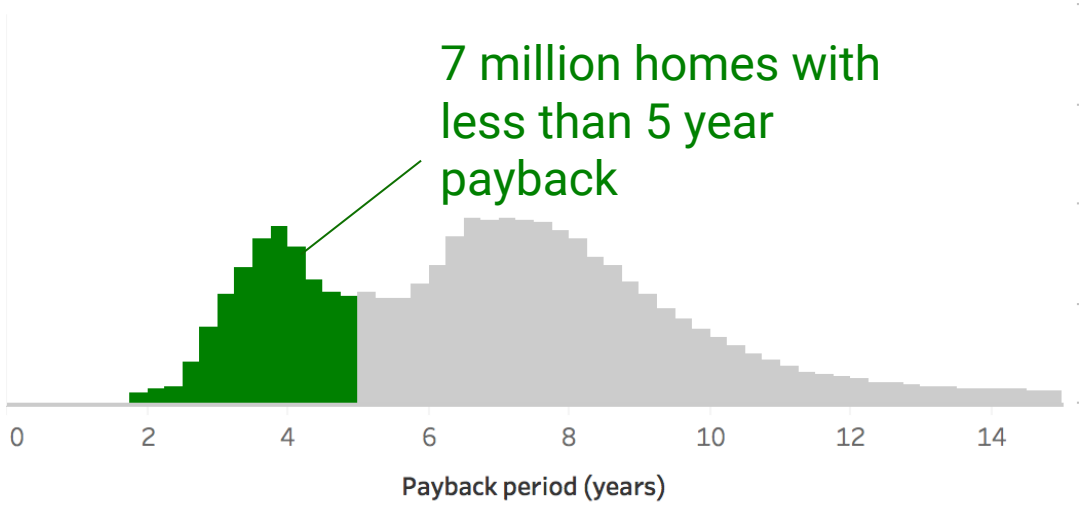
- Early-stage:
  What is the value proposition in different regions?
- Mid-stage:
  How can performance be optimized?
- Late-state:
  Target marketing for customer segments with most to save



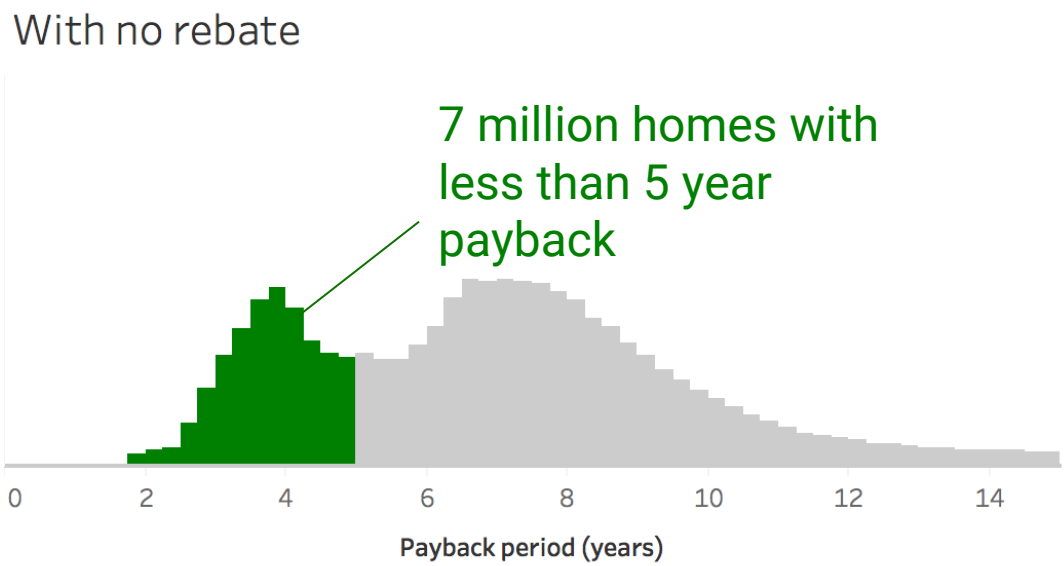
Potential revenue from **high-efficiency variable-speed heat pump** equipment sales and installation in households where the upgrade has a less than 5 year payback period.

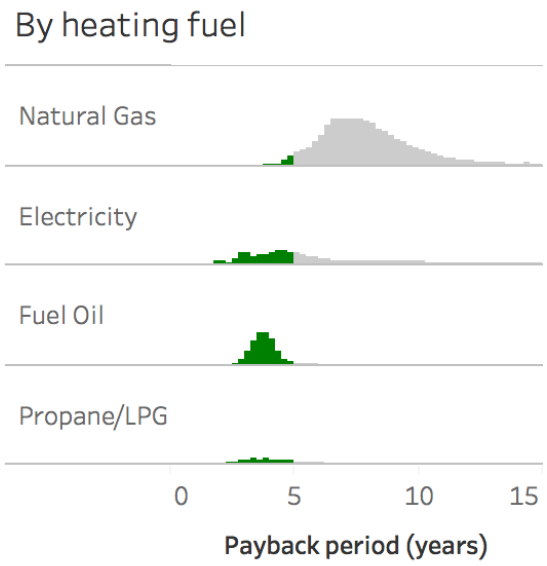
Evaluate Price Point – Drill-and-Fill Wall Insulation

With no rebate



Evaluate Price Point – Drill-and-Fill Wall Insulation





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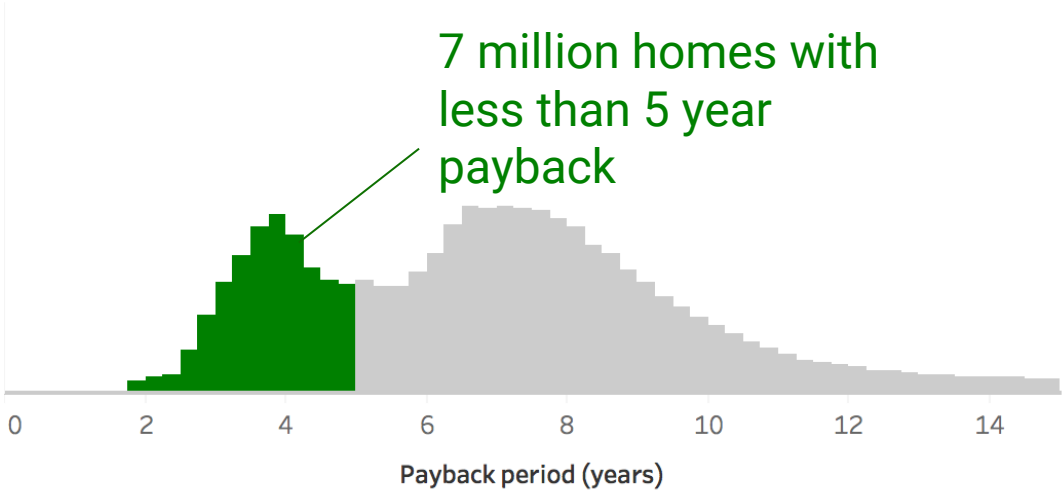
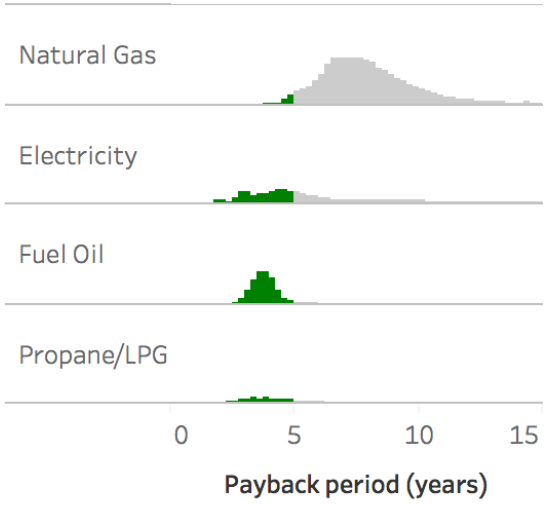
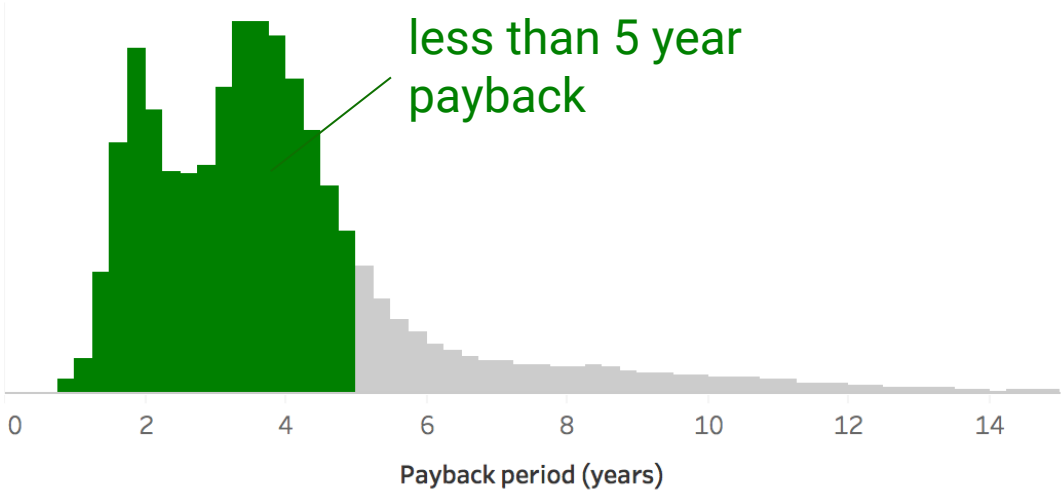
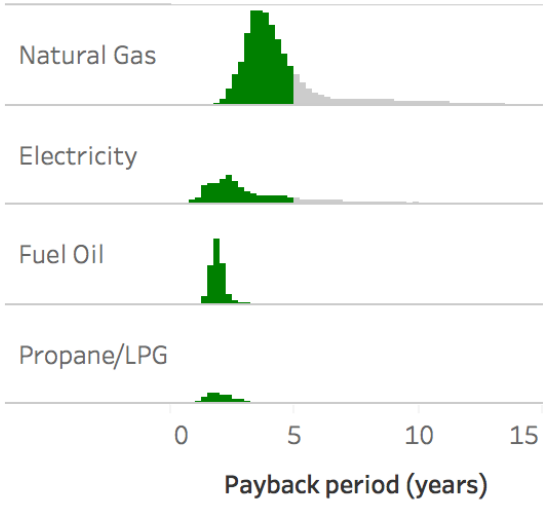


By heating fuel



With 50% rebate





Acknowledgements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EERE Office of Strategic Programs
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Regions 8 & 10


Bonneville POWER ADMINISTRATION


Building America U.S. Department of Energy


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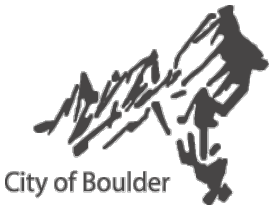
City of Boulder


Radiant Labs

Contact Eric.Wilson@nrel.gov

to learn how ResStock & ComStock can benefit your organization.


ResStock ComStock