



# End-Use Savings Shapes

Public Dataset Release for Residential Round 1

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NREL

Webinar

September 20, 2022

# Logistics

- We are recording the webinar.
- Because of the large number of participants everyone is **muted**.
- **Please use the Q&A box to send us questions** at any time during the presentation.
- We will put the link to the slides in the Q&A box. We will send links to the recording and slides to everyone that registered for the meeting a few days after the webinar.

- The **End-Use Load Profiles (EULP)** project
  - Created a public database of 900,000 individual building end-use load profiles
  - Load profiles were modeled to represent the U.S. building stock as it was in 2018, as nearly as possible based on the best available data
- The **End-Use Savings Shapes (EUSS)** follow-on project
  - Adds measure impact profiles for energy efficiency and electrification packages to the public dataset

Electrification Planning

IRPs

Decarbonization Analysis

Emissions Analysis

Policy and Rate Design

- The **End-Use Savings Shapes** (EUSS) follow-on project
  - Adds measure impact profiles for energy efficiency and electrification packages to the public dataset

10 Measure Packages of Energy Efficiency and Electrification • 48 states + DC

3 weather years - AMY 2018, AMY 2012, TMY3

15-minute resolution • 550,000 representative dwelling units for each run

End-use energy consumption & savings • Avoided emissions

- The **End-Use Savings Shapes** (EUSS) follow-on project
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# Today's Agenda

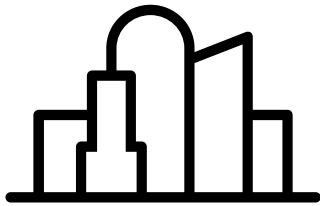
- Our Approach to Building Stock Energy Modeling
- End-Use Savings Shapes: Residential Round 1
- How to Access the Dataset
- Next Steps
- Q&A

# Our Approach to Building Stock Energy Modeling

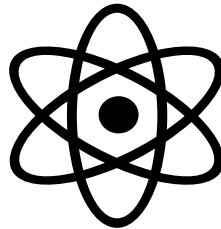
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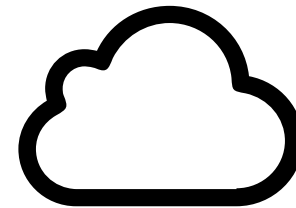
# 900,000 Physics-Simulation Models Statistically Representing the U.S. Building Stock



Building stock  
characteristics  
database



Physics-based  
computer modeling



High-  
performance  
computing

1. Describe the U.S. building stock quantitatively
2. Sample the description
3. Model the samples
4. Model changes to the samples – energy efficiency, electrification, etc.
5. Publish description, samples, models, results, aggregations, visualizations, and documentation



# 900,000 Physics-Simulation Models Statistically Representing the U.S. Building Stock

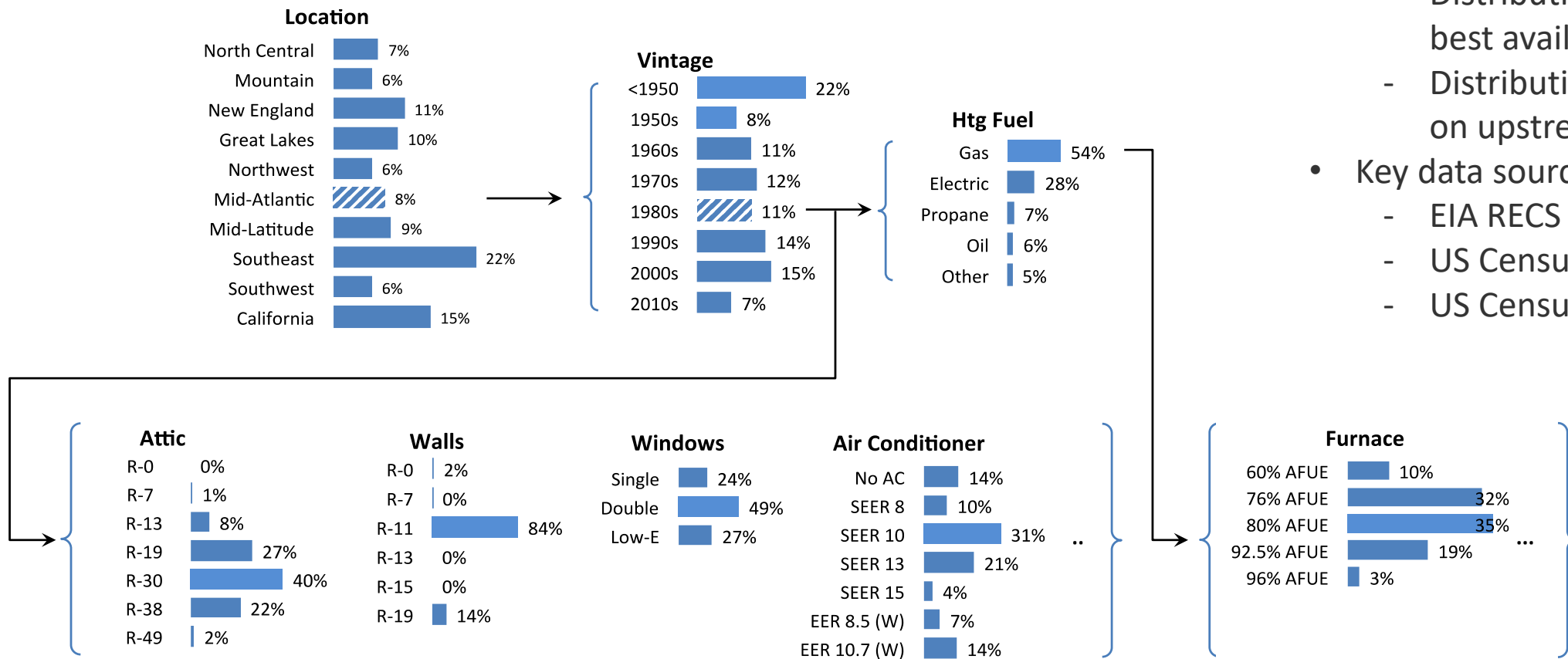
Simple, fast

Simple & fast enough

Complex, slow

1. Describe the U.S. building stock quantitatively
2. Sample the description
3. Model the samples
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5. Publish description, samples, models, results, aggregations, visualizations, and documentation

# Describe the U.S. Housing Stock Quantitatively

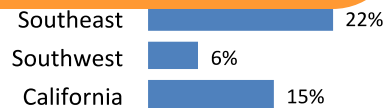


- 100+ home characteristics
  - Distributions based on best available data
  - Distribution varies based on upstream factors
- Key data sources:
  - EIA RECS
  - US Census AHS
  - US Census ACS

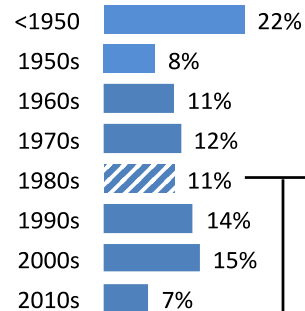
# Describe the U.S. Housing Stock Quantitatively

We sample 550,000 homes from these distributions.

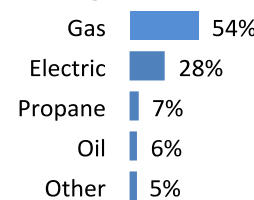
That's 1 for every 240 that exist in the U.S.



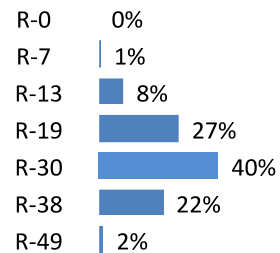
## Vintage



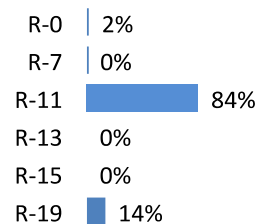
## Htg Fuel



## Attic



## Walls

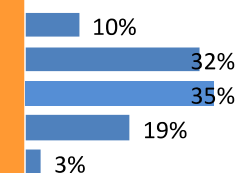


## Windows



Then we model them in EnergyPlus using HPC

## Furnace



- 100+ home characteristics
  - Distributions based on best available data
  - Distribution varies based on upstream factors
- Key data sources:
  - EIA RECS
  - US Census AHS
  - US Census ACS

# Illustrative Home Sampled From the Stock Description

<b>IECC Climate Zone</b>	5A	<b>Heating</b>	Natural gas furnace, 80% AFUE	<b>Wall type</b>	Wood stud
<b>City</b>	Cleveland, OH	<b>Cooling</b>	Central AC, SEER 13	<b>Wall insulation</b>	Uninsulated
<b>Building type</b>	Single-family detached	<b>Setpoints</b>	Heating: 70°F Cooling: 72°F	<b>Attic type</b>	Vented attic
<b>Occupants</b>	3	<b>Setpoint offsets</b>	Heating: 3°F Cooling: 2°F	<b>Attic insulation</b>	Uninsulated
<b>Vintage</b>	<1940	<b>Refrigerator</b>	EF 17.6	<b>Infiltration</b>	8 ACH50
<b>Floor area bin</b>	1500-1999	<b>Clothes washer</b>	EnergyStar, 123 rated kWh	<b>Foundation type</b>	Unheated basement
<b>Bedrooms</b>	3	<b>Dishwasher</b>	290 rated kWh	<b>Ducts</b>	10% Leakage, Uninsulated
<b>Stories</b>	2	<b>Cooking range</b>	Gas	<b>Windows</b>	Double, Clear, Non-metal, Air

Plus dozens of other characteristics

# EUSS Res Round 1

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10 Measure Packages of Energy Efficiency and Electrification • 48 states + DC

3 weather years - AMY 2018, AMY 2012, TMY3

15-minute resolution • 550,000 representative dwelling units for each run

End-use energy consumption & savings • Avoided emissions

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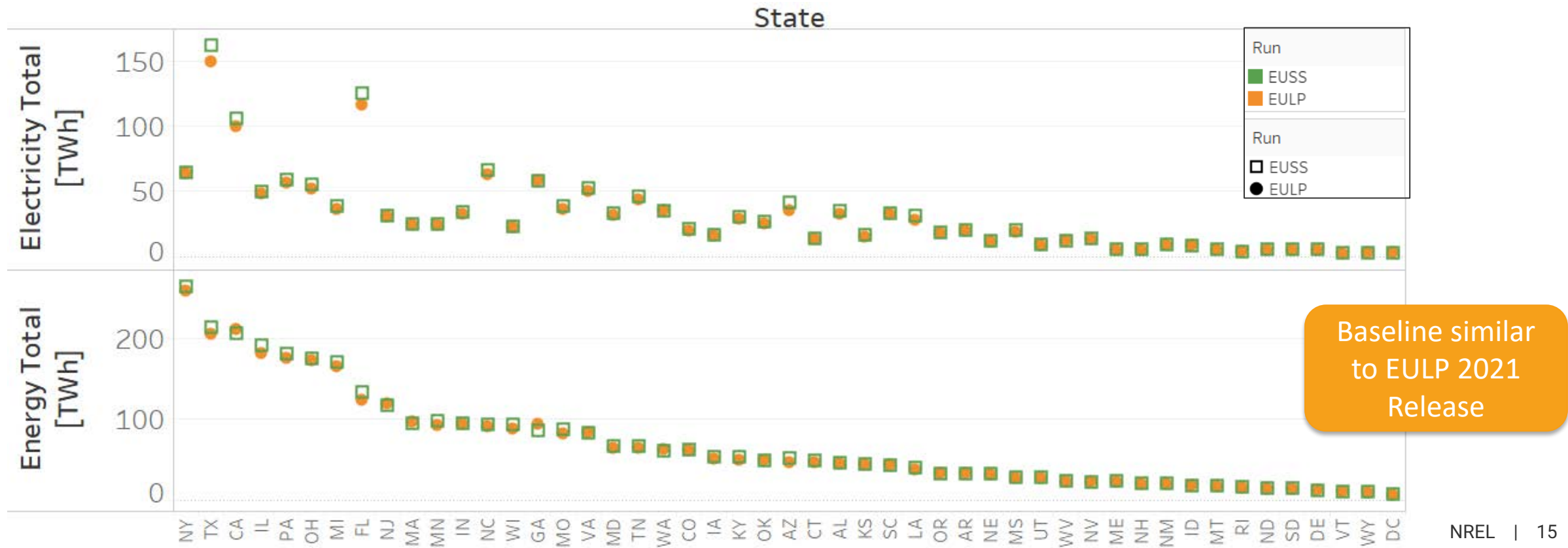
# Baseline Building Stock Representation

Major, 3-year improvement & validation process concluded last fall

- Technical report
- Published baseline dataset
- See project website for more information

Continuous improvements since then, including:

- HPXML-based modeling
- Select updates to PUMS & ACS 2015-2019
- Partial space conditioning for cooling
- Improved heat pump saturations & modeling



# Measure Packages in EUSS Res Round 1

1	Basic enclosure
2	Enhanced enclosure
3	Heat pumps, min-efficiency, electric backup
4	Heat pumps, high-efficiency, electric backup
5	Heat pumps, min-efficiency, existing heating as backup
6	Heat pump water heaters
7	Whole-home electrification, min-efficiency
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9	Whole-home electrification, high efficiency + basic enclosure package
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Selected by national labs & DOE based on EULP feedback and observed analysis support opportunities

*Not recommendations*



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## Attic Floor Insulation

- IECC levels
  - R-30 for homes in Climate Zone 1A with  $\leq$  R-13
  - R-49 for homes in Climate Zones 21, 2B, 3A, 3B, 3C with  $\leq$  R-30
  - R-60 for homes in other climate zones with  $\leq$  R-38

## General Air Sealing

- 30% total reduction in  $ACH_{50}$
- Applied to homes with greater than 10  $ACH_{50}$

## Duct Sealing

- Ducts improved to 10% leakage, R-8 insulation
- Applied to homes with leakier or less-insulated ducts

## Wall Insulation

- R-13 drill-and-fill insulation
- Applied to homes with wood stud walls and no insulation

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Everything in the *Basic enclosure* package



## Foundation Wall and Rim Joist Insulation

- Add R-10 interior insulation to foundation walls and rim joists
- Seal crawlspace vents

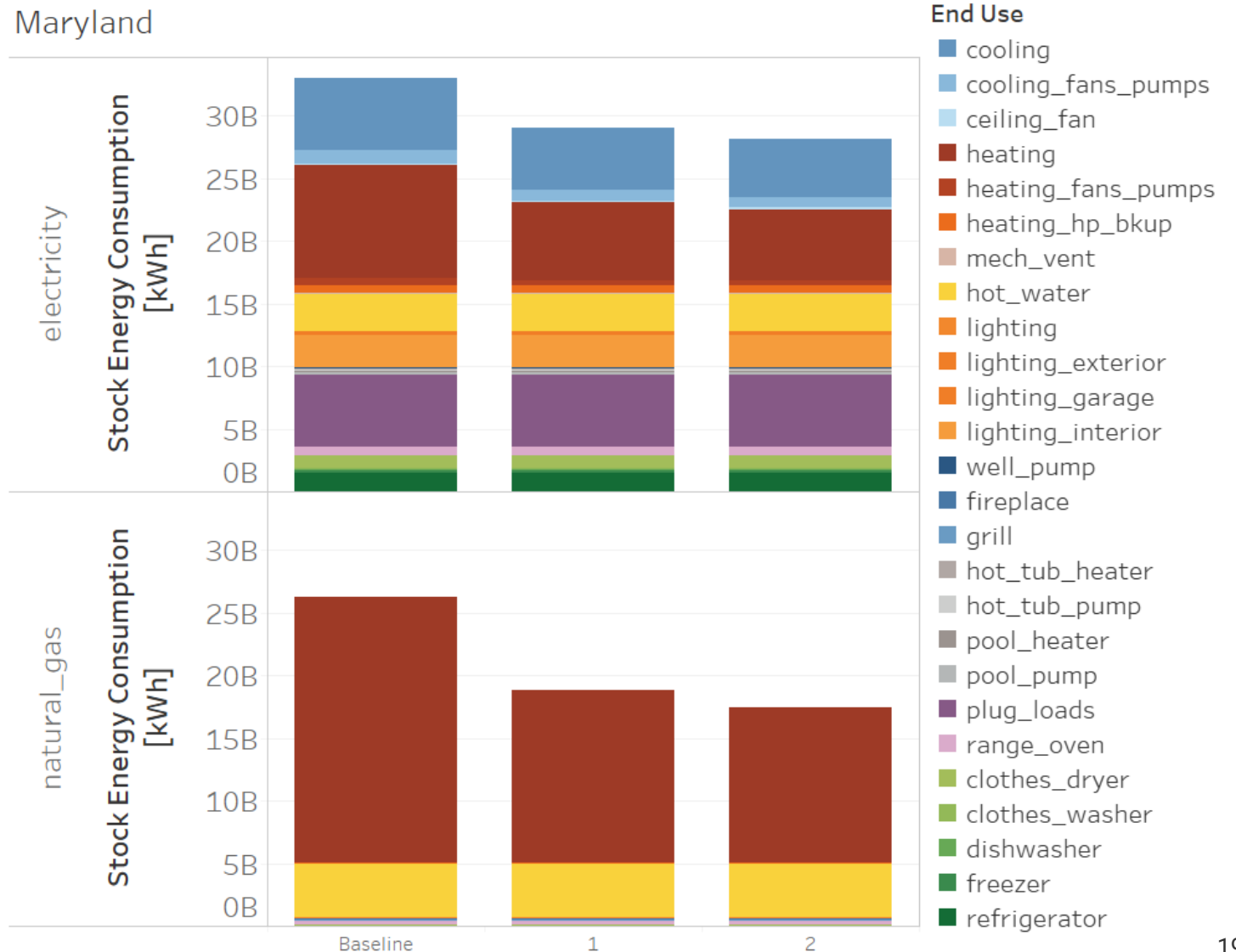
## Finished Attic and Cathedral Ceiling Insulation

- Insulate finished attics and cathedral ceilings to R-30

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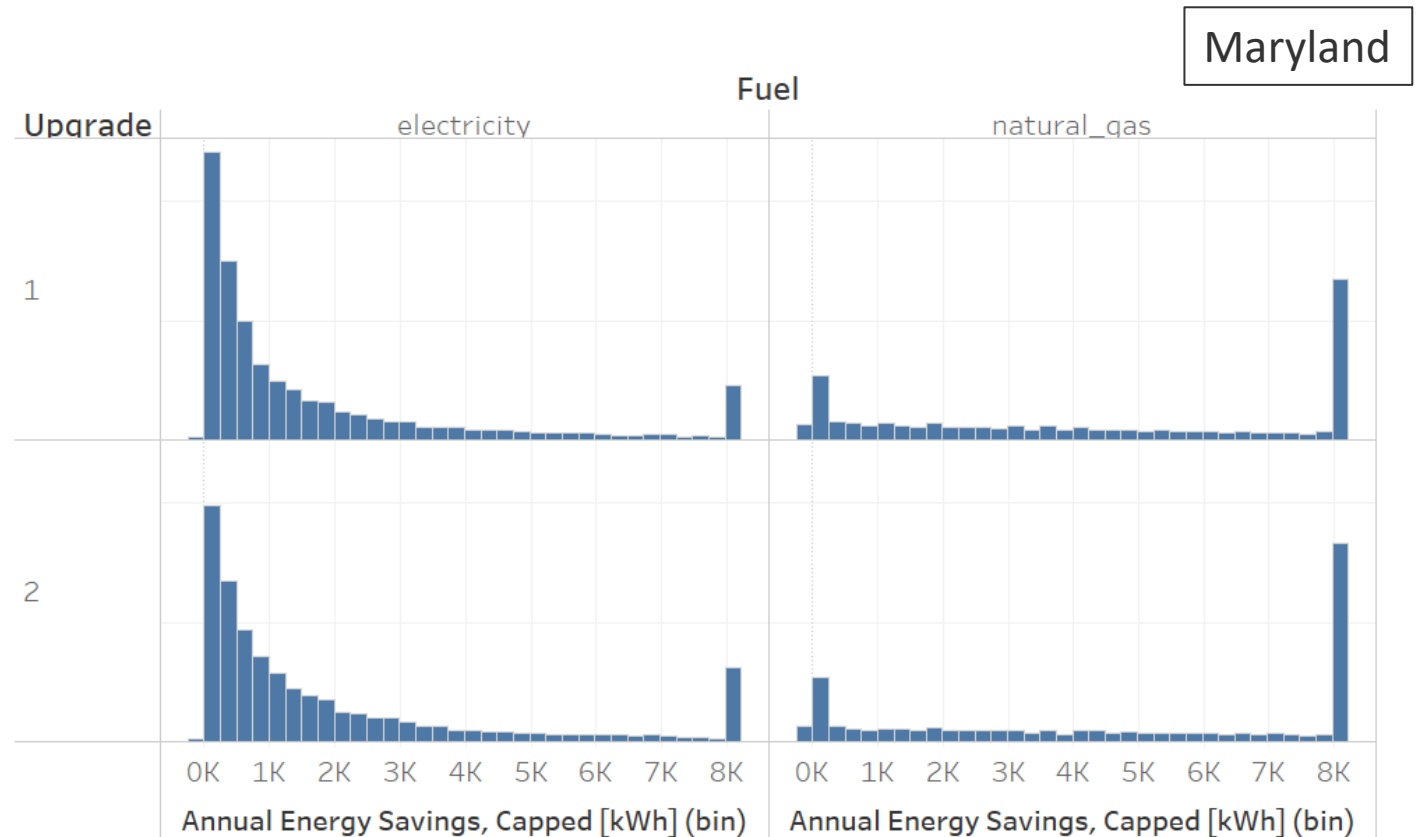
Maryland



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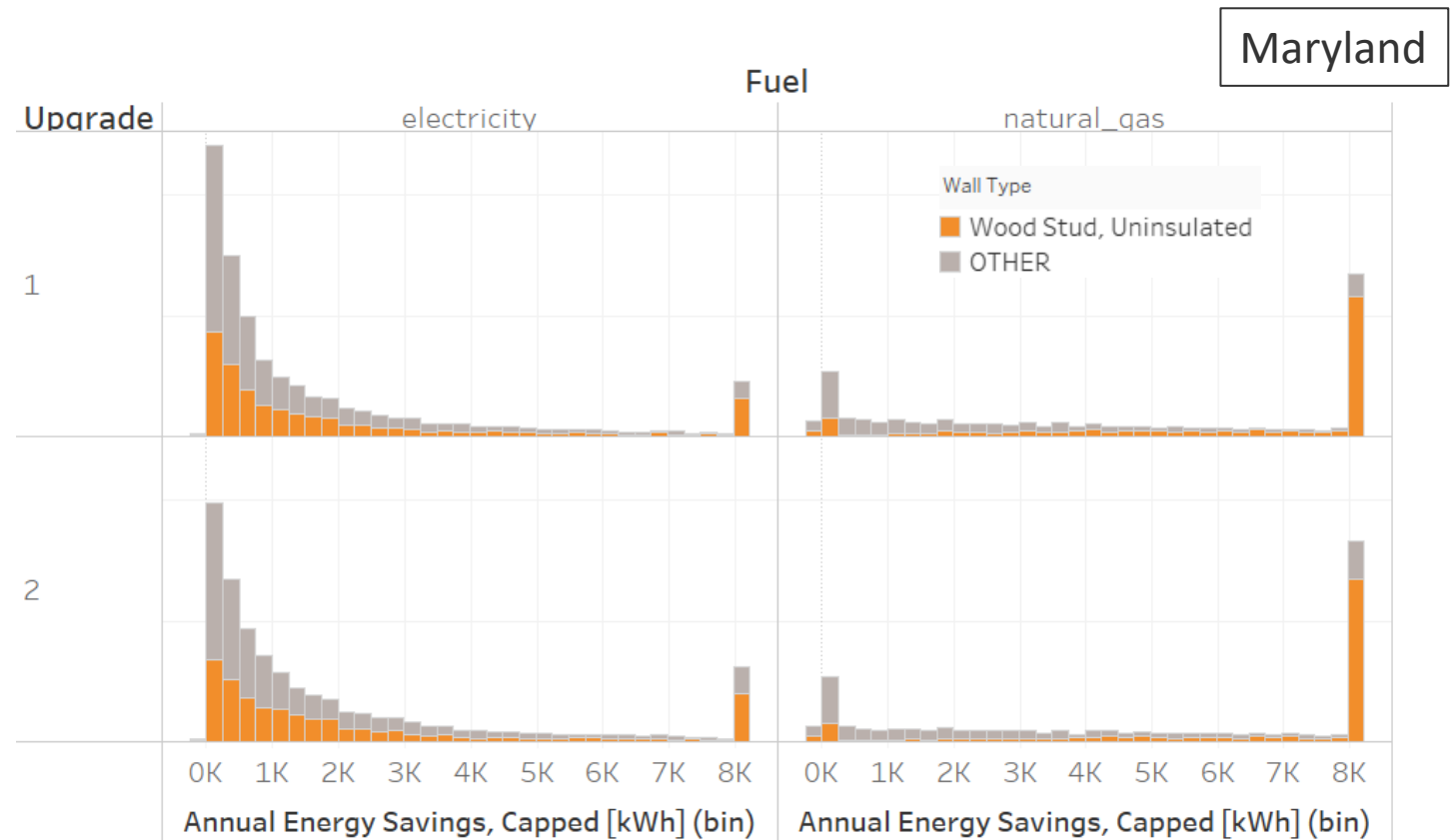
	electricity		natural_gas		fuel_oil		propane	
	Energy Change	No Energy Change	Energy Change	No Energy Change	Energy Change	No Energy Change	Energy Change	No Energy Change
1	9,648	325	4,882	5,091	842	9,131	384	9,589
2	9,697	276	4,909	5,064	843	9,130	384	9,589



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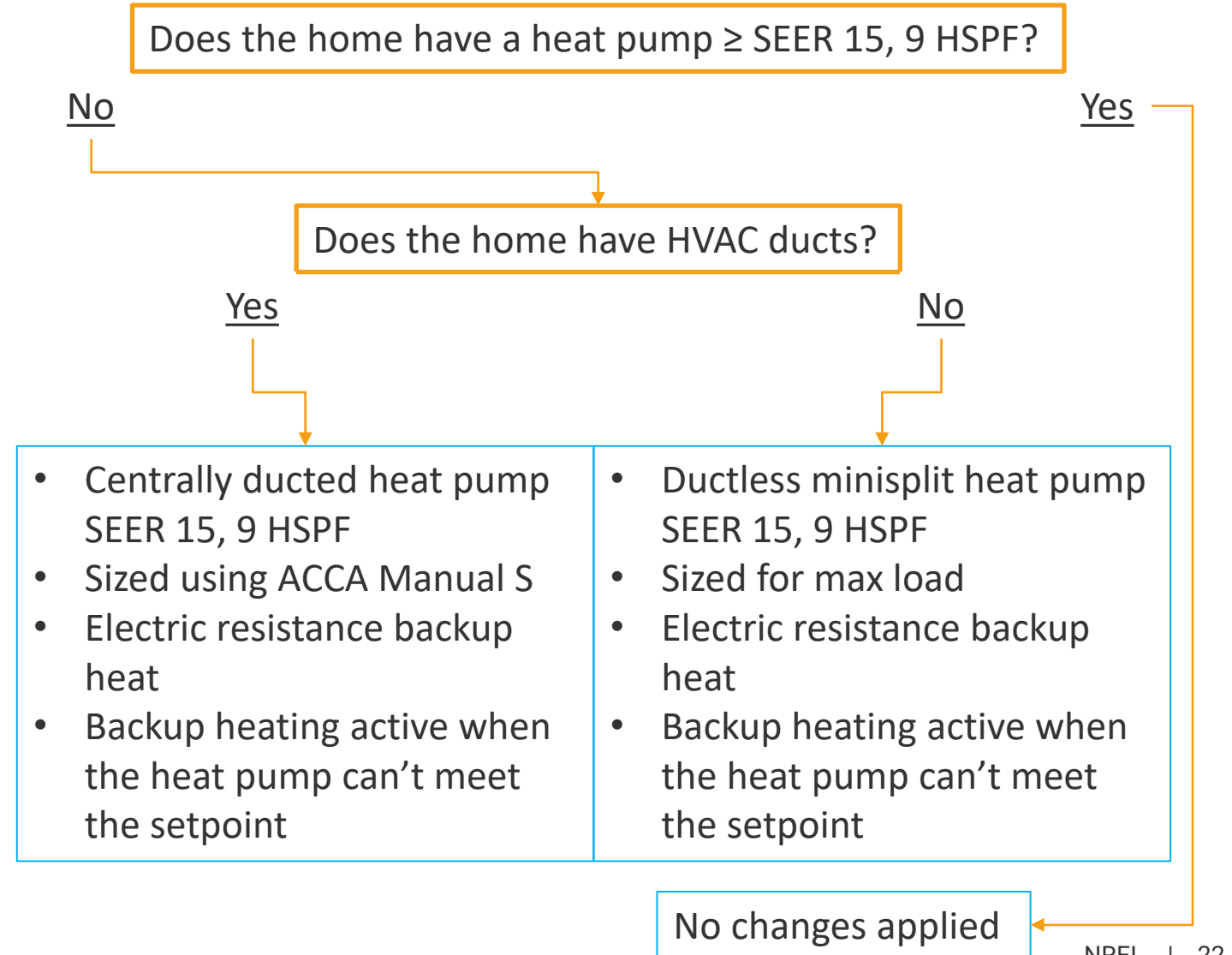
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Does the home have a heat pump  $\geq$  SEER 15, 9 HSPF?

No

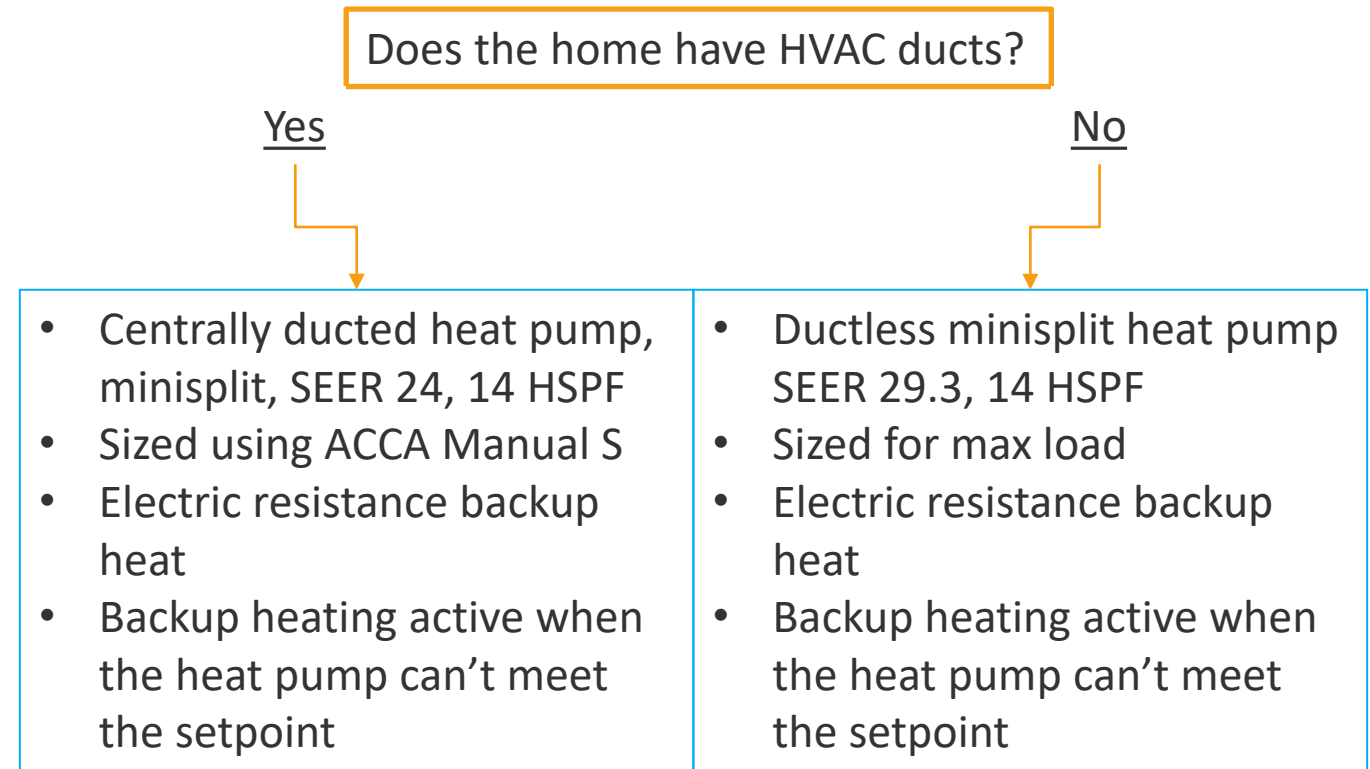
Yes

## A note on sizing

- Sizing for max load will set the heat pump to the largest calculated load between the cooling and heating load
- Sizing to ACCA Manual S includes:
  - Sizing focuses on cooling load
  - 15% oversizing allowance for single-stage heat pumps (Packages 3, 5, & 7)
  - 30% oversizing allowance for variable-speed heat pumps (Packages 4, 8-10)
  - + 1 ton in cold, dry climates

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Heat Pump  
Same as Measure Package 3

## Backup Heating

Baseline non-ducted heating:

- Existing heating system retained as backup
- Backup system used when heat pump can't meet the load

Baseline ducted non-electric heating:

- Existing heating system retained as backup
- Switchover temperature of 41°F
  - Heat pump used above
  - Backup used below

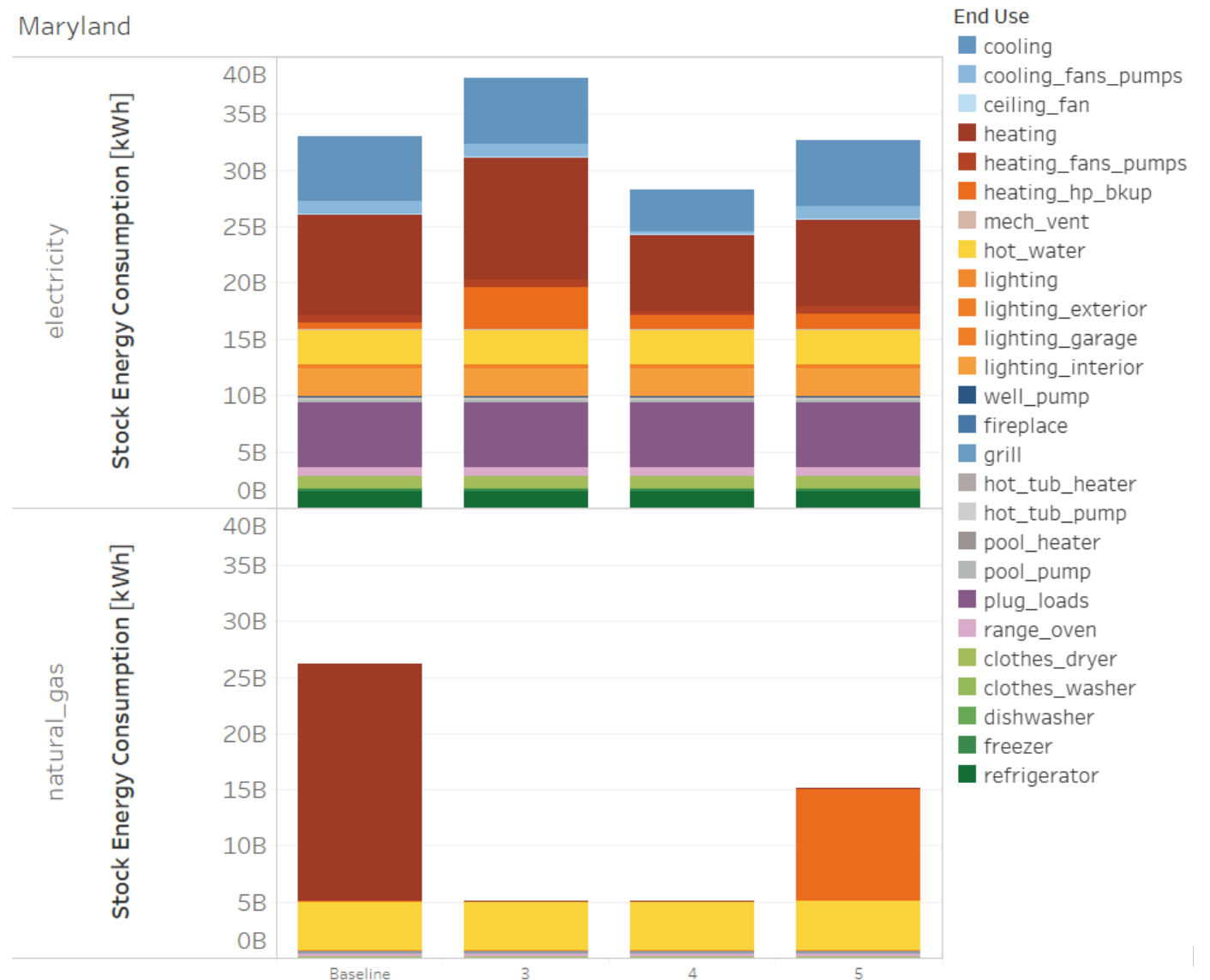
Baseline ducted electric heating:

- Electric resistance backup
- Backup system used when heat pump can't meet the load

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Maryland



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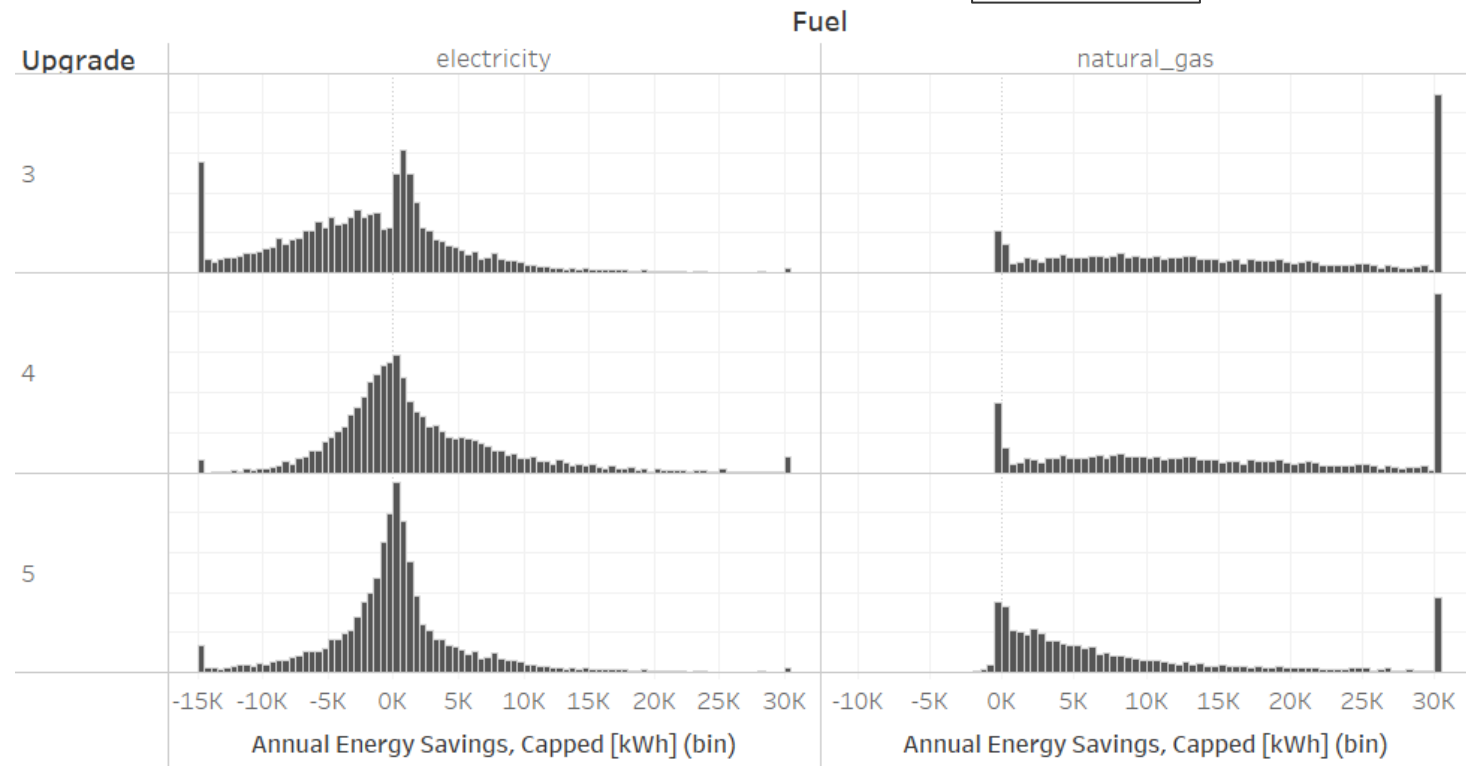
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Count of Models

	electricity		natural_gas		fuel_oil		propane	
	Energy Change	No Energy Change	Energy Change	No Energy Change	Energy Change	No Energy Change	Energy Change	No Energy Change
3	9,951	22	4,738	5,235	841	9,132	365	9,608
4	9,951	22	4,861	5,112	842	9,131	369	9,604
5	9,779	194	4,711	5,262	834	9,139	348	9,625

Energy Savings Distribution (Non-Zero)

Maryland



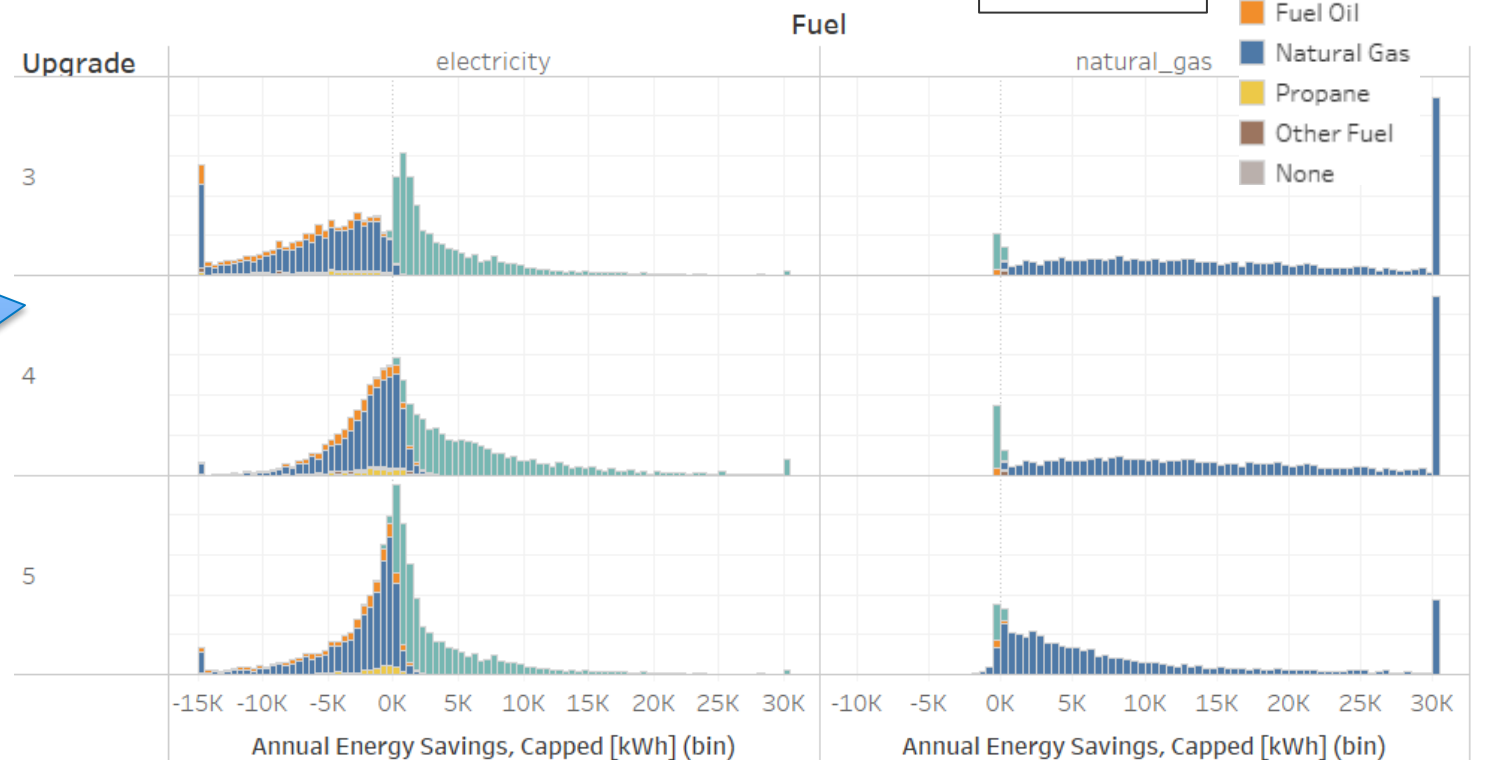
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- 7
- 8
- 9 + basic enclosure package
- 10 Whole-home electrification, high efficiency + enhanced enclosure package

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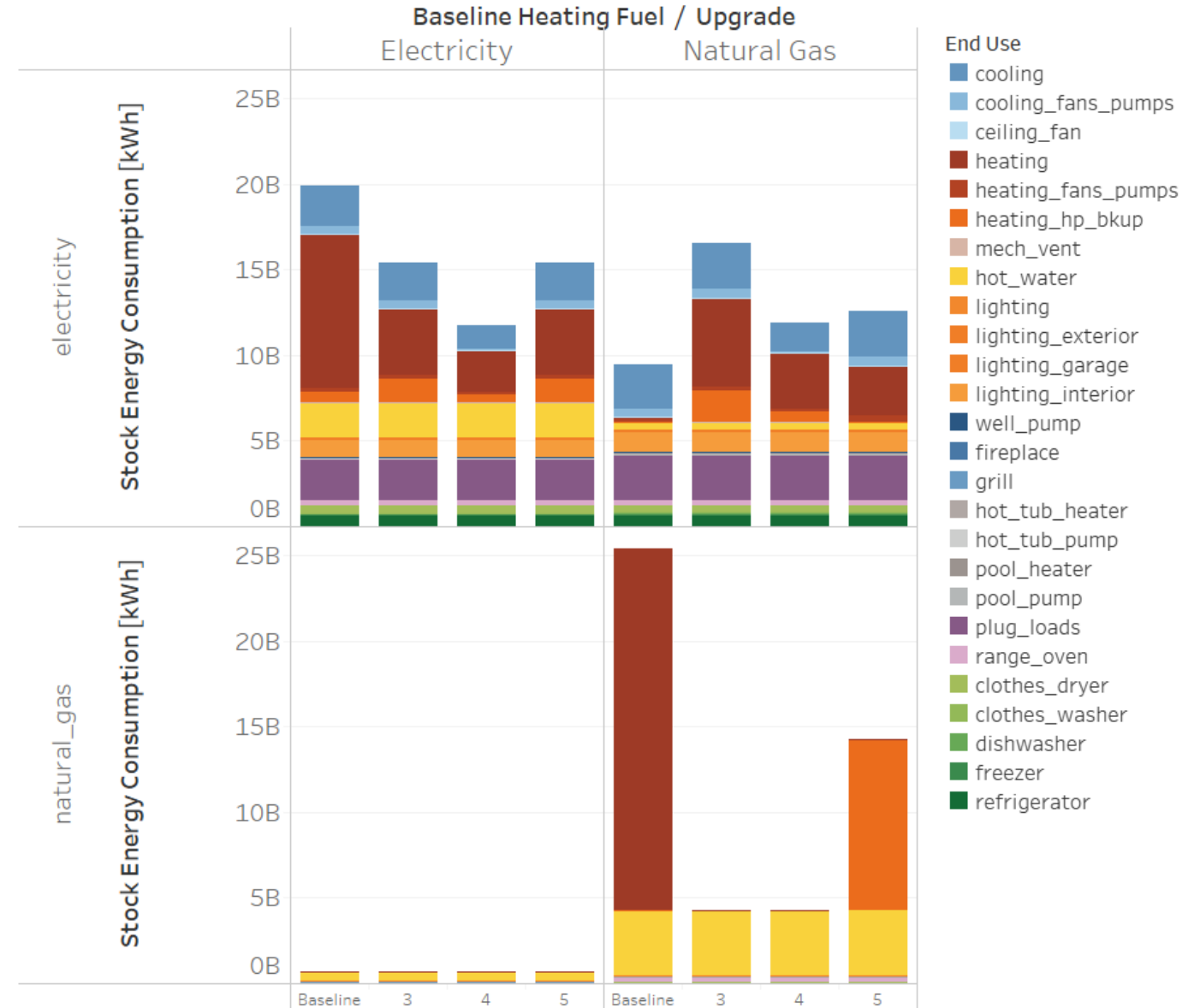
Energy Savings Distribution (Non-Zero)



Electricity consumption increases for homes with baseline non-electric heating, and decreases for homes with baseline electric heating

# Measure Packages in EUSS Res Round 1

- |    |  |
|----|--|
| 1  | Basic enclosure  |
| 2  | Enhanced enclosure   |
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50-Gallon, 3.45 UEF HPWH

- For 1-3 bedroom homes

66-Gallon, 3.35 UEF HPWH

- For 4 bedroom homes

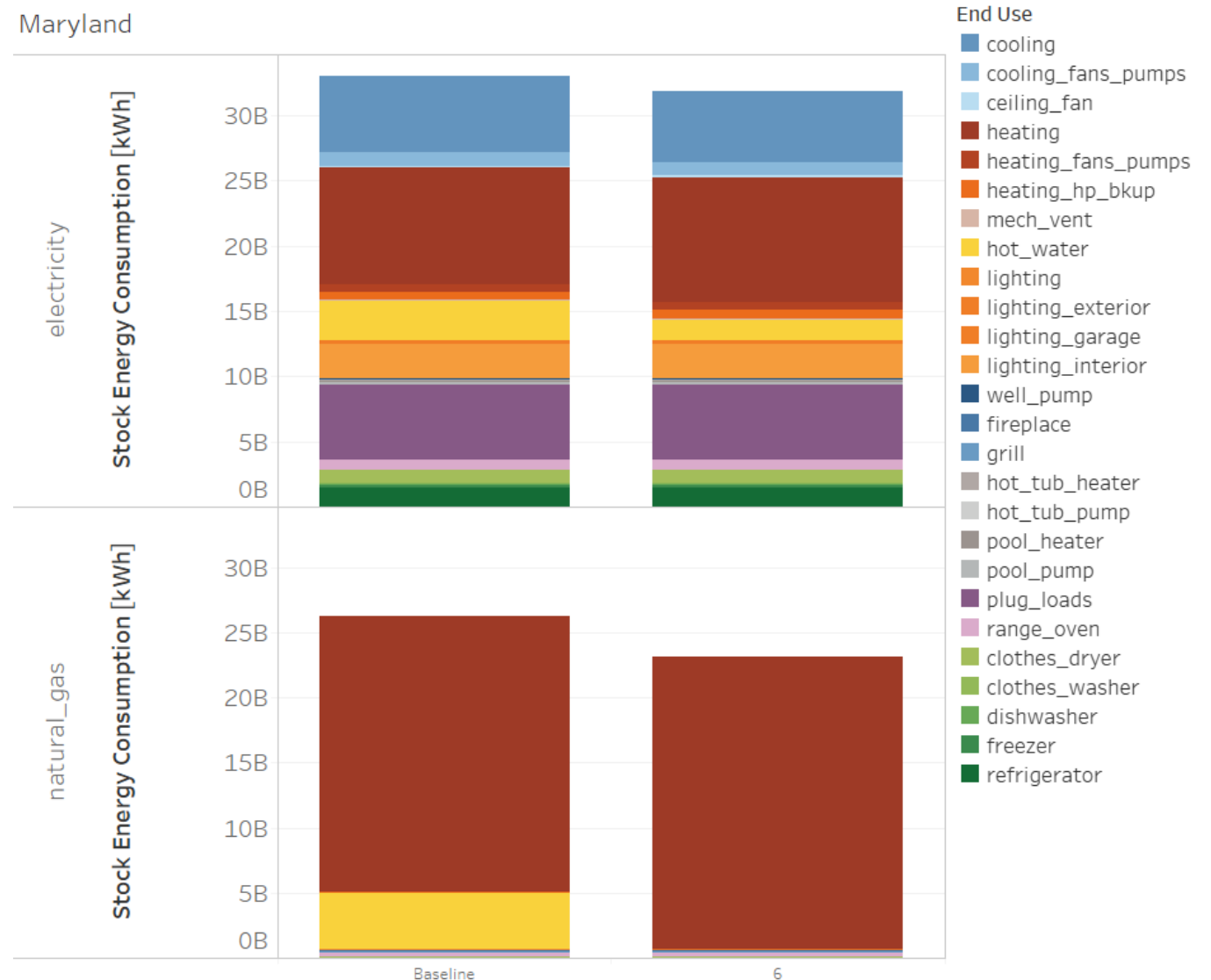
80-Gallon, 3.45 UEF HPWH

- For >4 bedroom homes

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Maryland



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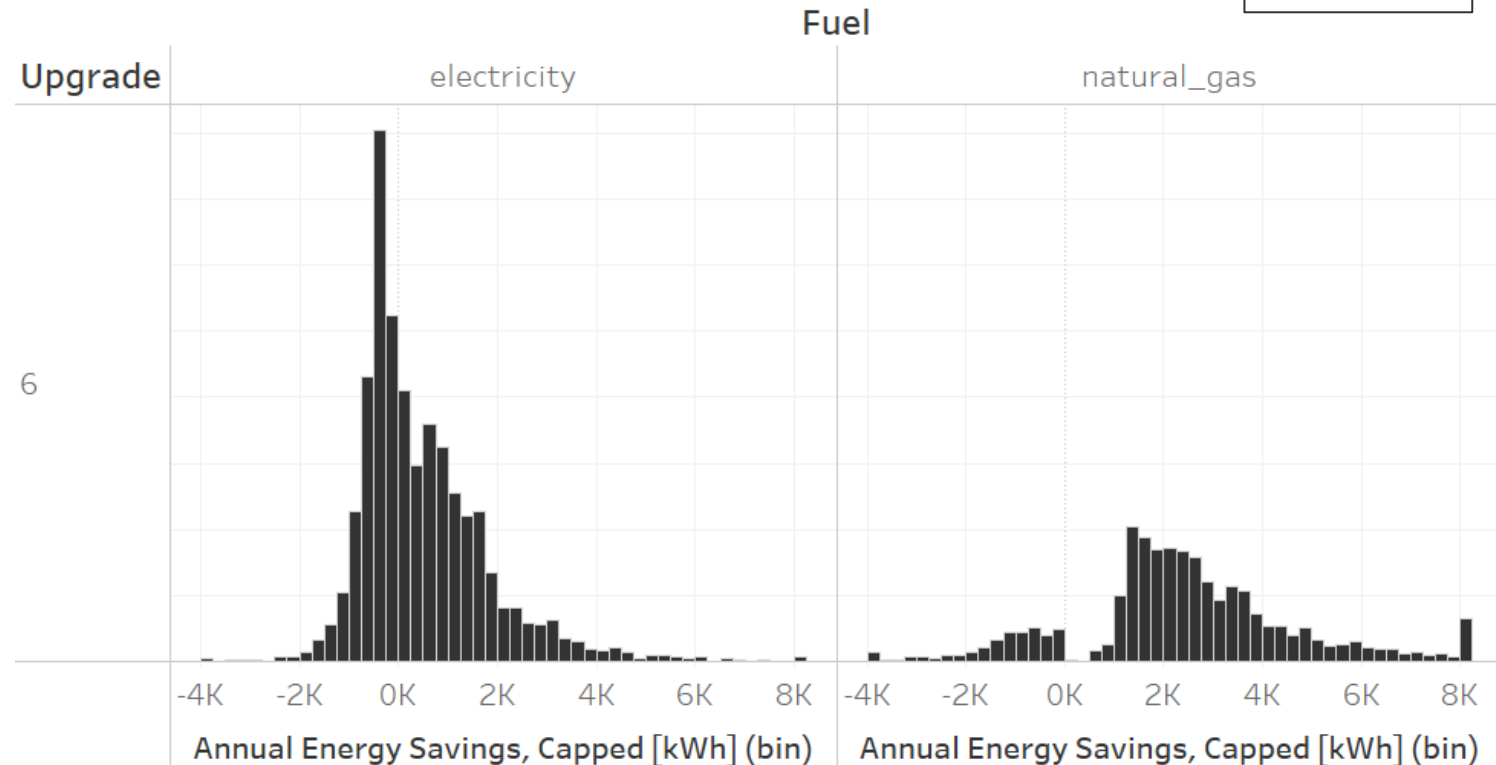
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Energy Savings Distribution (Non-Zero)

Maryland





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Homes with non-electric...	Receive
Heating	Min-efficiency heat pump and electric resistance backup from Measure Package 3
Water heating	Heat pump water heater from Measure Package 6
Dryer	Electric resistance dryer
Cooking	Electric range & oven

- No enclosure measures
- No change to existing electric loads

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## Homes with less-efficient or non-electric... Receive

Heating	High-efficiency heat pump and electric resistance backup from Measure Package 4
Water heating	Heat pump water heater from Measure Package 6
Dryer	Ventless heat pump dryer
Cooking	Induction range & electric oven

- No enclosure measures

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## Measure Package 1

- Attic floor insulation
- Air sealing
- Duct sealing
- Drill-and-fill wall insulation



## Measure Package 8

- High-efficiency heat pump
- Heat pump water heater
- Ventless heat pump dryer
- Induction range & electric oven

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## Measure Package 2

- Attic floor insulation
- Air sealing
- Duct sealing
- Drill-and-fill wall insulation
- Foundation wall and rim joist insulation
- Finished attic and cathedral ceiling insulation

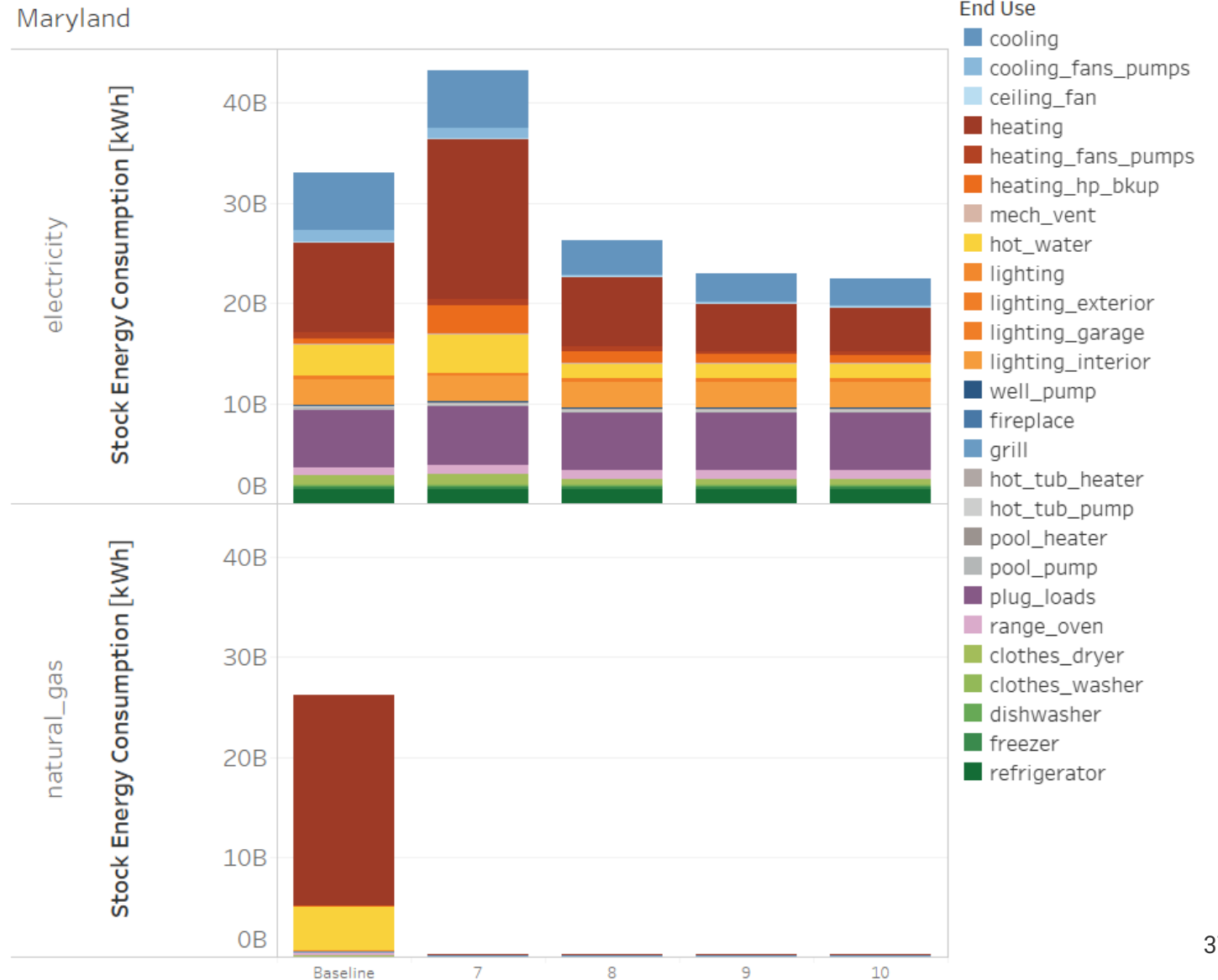


## Measure Package 8

- High-efficiency heat pump
- Heat pump water heater
- Ventless heat pump dryer
- Induction range & electric oven

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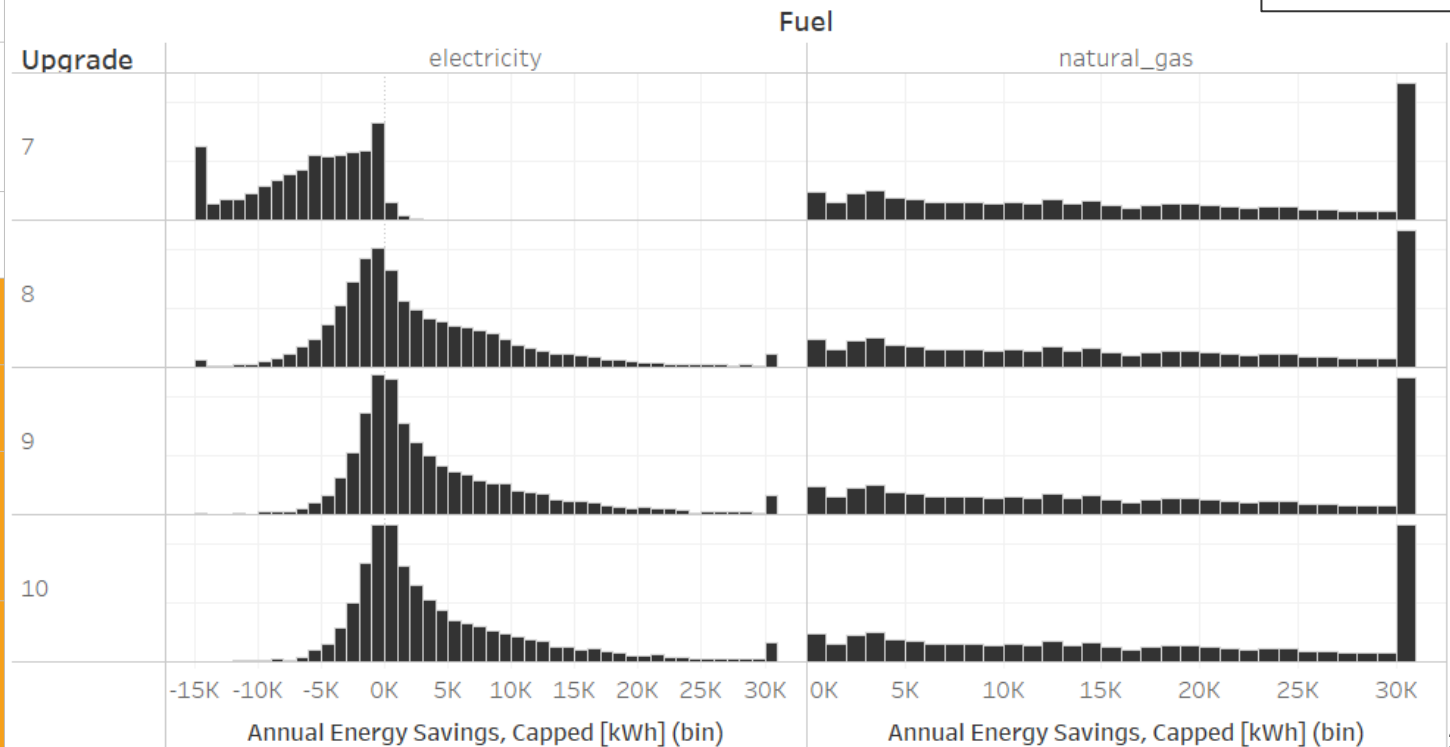
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7	Whole-home electrification, min-efficiency
8	Whole-home electrification, high efficiency
9	Whole-home electrification, high efficiency + basic enclosure package
10	Whole-home electrification, high efficiency + enhanced enclosure package

Count of Models

	electricity		natural_gas		fuel_oil		propane	
	Energy Change	No Energy Change	Energy Change	No Energy Change	Energy Change	No Energy Change	Energy Change	No Energy Change
7	6,611	3,362	5,332	4,641	847	9,126	650	9,323
8	9,973		5,332	4,641	847	9,126	650	9,323
9	9,973		5,332	4,641	847	9,126	650	9,323
10	9,973		5,332	4,641	847	9,126	650	9,323

Energy Savings Distribution (Non-Zero)

Maryland



# Measure Packages in EUSS Res Round 1

## 1 Basic enclosure

Higher-efficiency electrification (8), or electrification + envelope measures (9 & 10), have very different electric impacts than the basic electrification approach in (7)

## 5 Heat pumps, min-efficiency, existing heating as backup

## 6 Heat pump water heaters

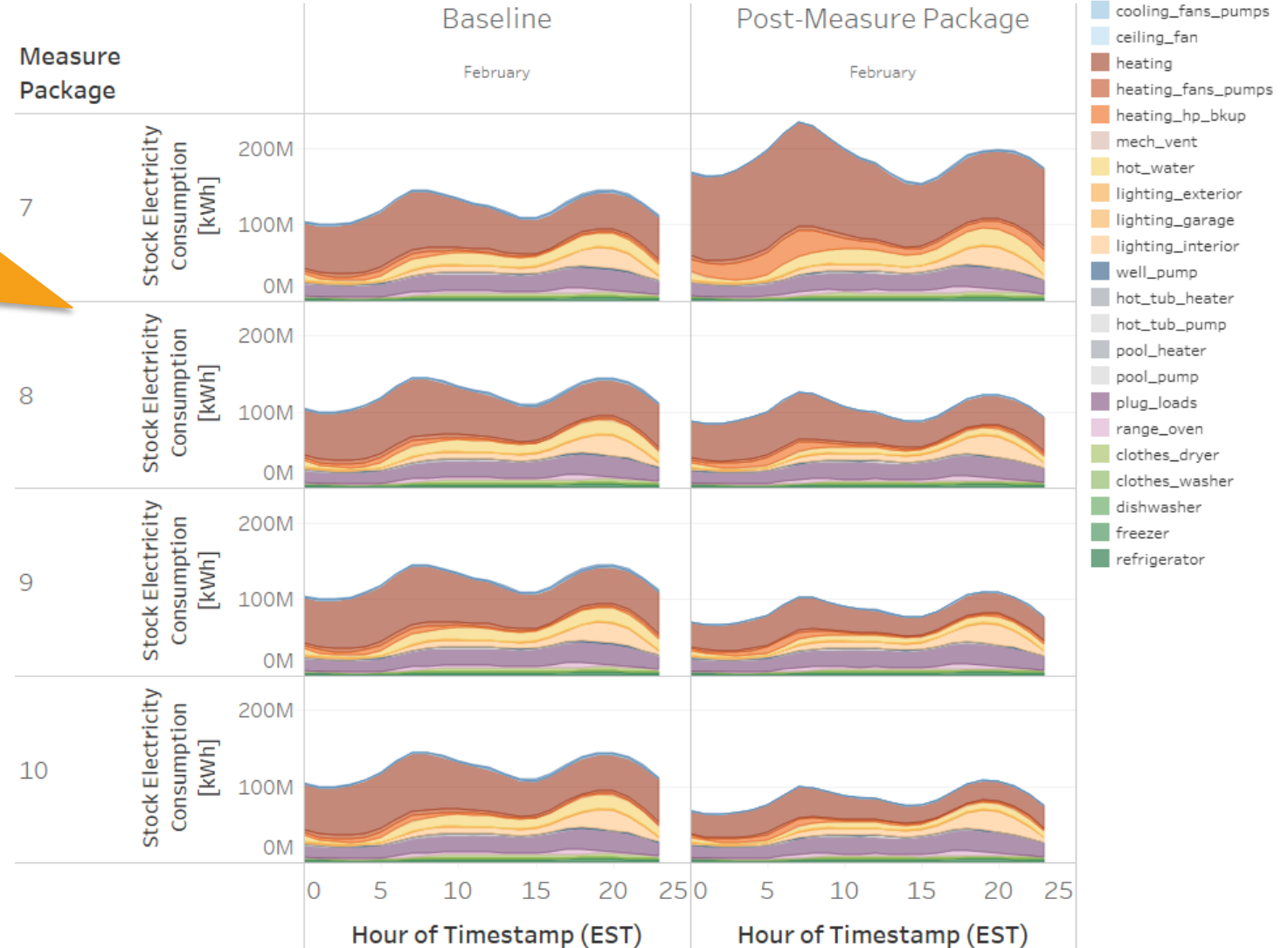
## 7 Whole-home electrification, min-efficiency

## 8 Whole-home electrification, high efficiency

## 9 Whole-home electrification, high efficiency + basic enclosure package

## 10 Whole-home electrification, high efficiency + enhanced enclosure package

Maryland - Total Electric Consumption - Average February Day



# Carbon Emissions Avoided

## Types of CO<sub>2</sub> Emission Factors for Electricity

### Average emissions rate

Total emissions divided by total load.

All 3 types can be

- Hourly or annual
- Single-year or lifetime
- Historical or future years

### Short-run marginal emission rate

Emission rate of the generation that would serve a change in electrical load  
**keeping the capital assets of the grid fixed.**  
(aka operating margin)

### Long-run marginal emission rate

Emission rate of the generation that would serve a change in electrical load  
**considering the structural changes to the grid** that would be induced by a  
persistent change in load.  
(aka build margin)



# Carbon Emissions Avoided

## Electricity

- Selected four datasets of Long Run Marginal Emissions from NREL Cambium Database

<u>NREL Standard Scenario</u>	<u>Start Year</u>	<u>Levelization Period</u> (3% discount rate)
MidCase	2025	15 years
LowRECost	2025	15 years
95% Decarbonization by 2035	2025	15 years
LowRECost	2025	25 years

month-hour time aggregations

## On-Site Fossil Fuel Consumption

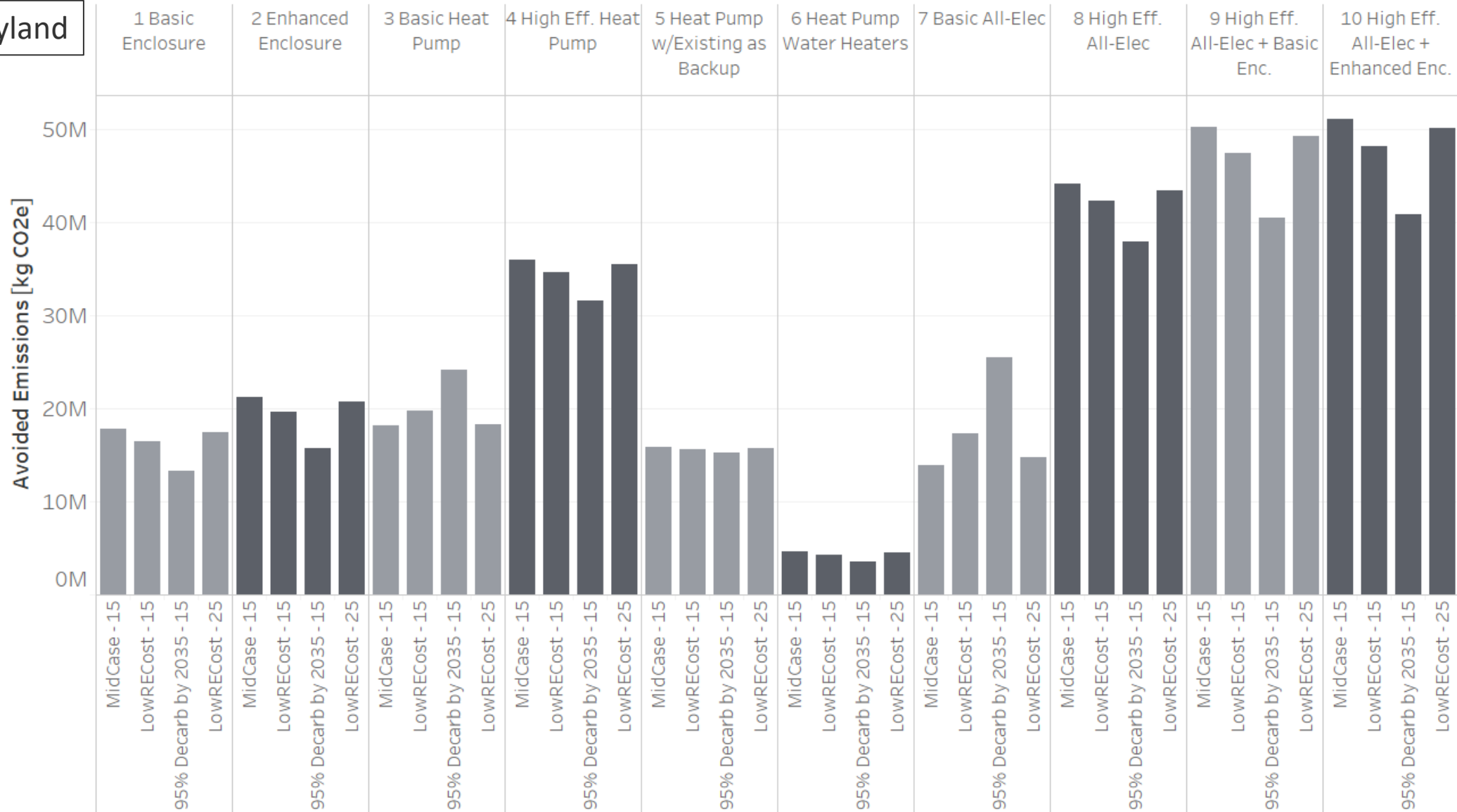
- Used values from Table 7.1.2(1) of draft ANSI/RESNET/ICCC 301

Natural gas	147.3 lb/mmbtu (228.0 kg/MWh)
Propane	177.8 lb/mmbtu (182.3 kg/MWh)
Fuel oil	195.9 lb/mmbtu (303.2 kg/MWh)

# Carbon Emissions Avoided

Upgrade / Emissions Dataset

Maryland



# How to Access the Dataset

---



# Accessing the Data



Annual & Aggregate files



Web Viewer



Full database

# Metadata & Annual Files



Annual & Aggregate files



Web Viewer



Full database

## Included information, by model bldg\_id

- Dwelling unit characteristics
  - In the baseline model  
*in.foo*
  - In the measure package, if different from baseline  
*upgrade.foo*
- Annual outputs
  - Energy consumption for each end use, for each fuel  
*out.[fuel].[end\_use].energy\_consumption.kwh*
  - LRMER carbon emissions for each fuel and emissions dataset  
*out.emissions.[fuel].[emissions\_dataset].co2e\_kg*
  - Energy savings for each end use, for each fuel  
*out.[fuel].[end\_use].energy\_consumption.kwh.savings*
  - Avoided emissions for each fuel and emissions dataset  
*out.emissions\_reduction.[fuel].[emissions\_dataset].co2e\_kg*

## Formats available

State-level metadata & annual by upgrade

- .csv < 200 MB
- .parquet < 25 MB

Full national metadata & annual by upgrade

- .csv < 2 GB
- .parquet < 200 MB

Full national metadata only by upgrade

- .csv < 1.3 GB
- .parquet < 30 MB

# Metadata & Annual Files

 Annual & Aggregate files

 Web Viewer

 Full database

Example: MA\_upgrade01\_metadata\_and\_annual\_results.csv

4 simulation info  
columns

bldg_id	upg_rate	weight	applicability
21	1	242.13	TRUE
117	1	242.13	TRUE
182	1	242.13	TRUE
281	1	242.13	TRUE
352	1	242.13	TRUE
367	1	242.13	FALSE
393	1	242.13	TRUE

1 row = 1 modeled dwelling unit (even though it says "bldg")

Package 1 didn't apply to this unit

154 baseline  
characteristic  
columns

in.bedrooms	in.building_america_climate_zone
4	Cold
3	Cold
1	Cold
3	Cold
3	Cold
4	Cold
1	Cold

49 energy  
consumption  
output columns

out.site_energy_total.energy_consumption.kwh
20764.965
35444.308
25008.047
41230.41
14618.385
24803.484
12976.015

Post-upgrade values are the same as baseline when the package does not apply

20  
emissions  
columns

out.emissions.all_fuels.latter_mid_case_15_2025_start.co2e
5329.1234
8967.2726
6128.1708
9080.4334
3785.5077
5706.5014
3325.3814

49 energy  
savings  
columns

out.site_energy_total.energy_consumption.kwh.savings
3621.7723
487.37719
8188.1126
9775.0925
358.13285
0
3796.7357

20 emissions  
reduction  
columns

out.emissions_reduction.all_fuels.latter_mid_case_15_2025
844.73868
112.90867
1895.9921
2297.9978
83.752656
0
876.03202

Upgrade  
characteristics  
columns

upgrade.insulation_ceiling
R-60
R-60
R-60
R-60

Characteristics that differ from baseline are listed here



# Pre-Aggregated Timeseries Files



Annual & Aggregate files



Web Viewer



Full database

Example pre-aggregated file for Maryland, Package 1, Single-Family Detached

## Housing Stock Totals

- Energy Consumption, Pre and Post Measure
- Energy Savings
- Carbon Emissions & Avoided Carbon Emissions

## Geographic Levels Available

- AHRAE/IECC Climate Zone
- Building America Climate Zone
- ISO or RTO Region
- State

## Each File

- One geography (e.g. Maryland)
- One building type (e.g. single-family detached)
- One measure package
- Approximately 50 MB

15-min time resolution [EST]

End-use load data in kWh

Results based on  
5106 energy models

Results represent  
1.2 million dwelling units

	A	B	C	D	E	F	G	H	I
	upgrade	in.state	in.geometry_building_type_recs	timestamp	models_used	units_represented	out.electricity.ceiling_fan.energy_consumption.kwh	out.electricity.clot_hes_dryer.energy_consumption.kwh	out.electricity.clot_hes_washer.energy_consumption.kwh
1									
2		1 MD	Single-Far	1/1/2018 0:15	5106	1236321	1236.07882	11849.65	274.5766
3		1 MD	Single-Far	1/1/2018 0:30	5106	1236321	1221.0667	6398.796	976.7565
4		1 MD	Single-Far	1/1/2018 0:45	5106	1236321	1182.56787	8670.712	1015.255
5		1 MD	Single-Far	1/1/2018 1:00	5106	1236321	1169.25066	12163.69	836.8048
6		1 MD	Single-Far	1/1/2018 1:15	5106	1236321	1131.23609	15074.83	471.6712
7		1 MD	Single-Far	1/1/2018 1:30	5106	1236321	1118.16102	14012.12	194.4312
8		1 MD	Single-Far	1/1/2018 1:45	5106	1236321	1103.14889	12038.75	121.5498
9		1 MD	Single-Far	1/1/2018 2:00	5106	1236321	1099.51693	10312.6	66.3439
10		1 MD	Single-Far	1/1/2018 2:15	5106	1236321	1088.62103	8042.139	49.87899

# Web Data Viewer



Annual & Aggregate files



Web Viewer



Full database

EUSS ResStock National 2018 Release 2022.1 > Maryland > Timeseries Data

Print This Report

Export CSV

**Fuel Type:** all

**Upgrade:** Heat pumps, min-efficiency, existing heating as backup

**Output:** energy\_consumption

**Aggregation Type:** average

**Timeseries Range:** day

**Month Constraints:** Start: End:

**Chosen Search Parameters:**

Location: Maryland

Fuel Type: all

Upgrade: Heat pumps, min-efficiency, existing heating as backup

Output: energy\_consumption

Aggregation Type: average

Timeseries Range: day

Month Constraints: Jan to Mar

**Filters**

✓ Vintage: 1940s ✓ Vintage: 1950s ✓ Vintage: 1960s ✓ Vintage: 1970s ✓ Vintage: <1940

Edit Filters

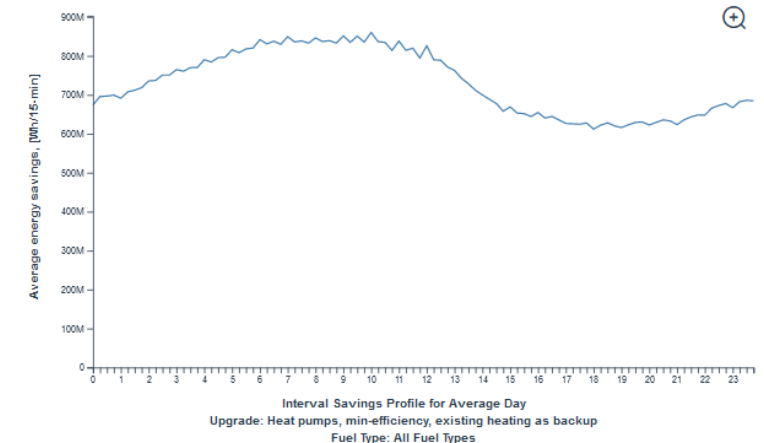
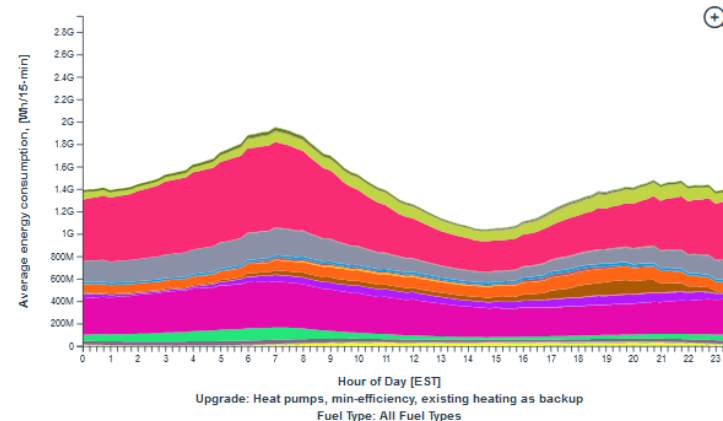
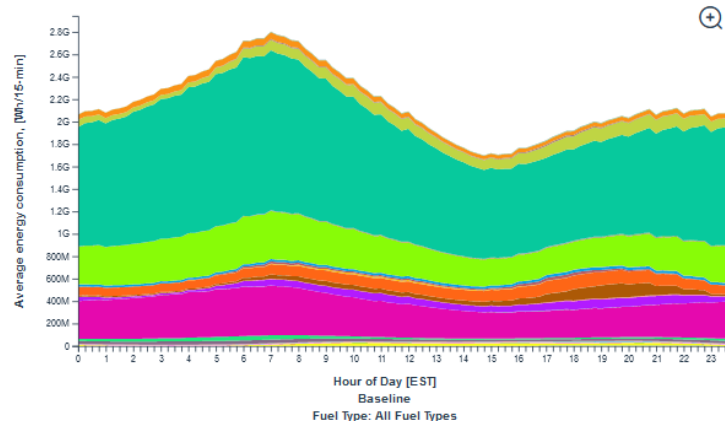
Currently Viewing:

Maryland

+ More Locations

Legend:

- Electricity: Ceiling Fan
- Electricity: Clothes Dryer
- Electricity: Clothes Washer
- Electricity: Cooling Fans Pumps
- Electricity: Cooling
- Electricity: Dishwasher
- Electricity: Freezer
- Electricity: Heating Fans Pumps
- Electricity: Heating Hp Bkup
- Electricity: Heating
- Electricity: Hot Tub Heater
- Electricity: Hot Tub Pump
- Electricity: Hot Water
- Electricity: Lighting Exterior
- Electricity: Lighting Garage
- Electricity: Lighting Interior
- Electricity: Mech Vent
- Electricity: Plug Loads
- Electricity: Pool Heater
- Electricity: Pool Pump
- Electricity: Range Oven
- Electricity: Refrigerator
- Electricity: Well Pump
- Fuel Oil: Heating Hp Bkup
- Fuel Oil: Heating
- Fuel Oil: Hot Water
- Natural Gas: Clothes Dryer
- Natural Gas: Fireplace
- Natural Gas: Fireplaces
- Natural Gas: Grill
- Natural Gas: Heating Hp Bkup
- Natural Gas: Heating
- Natural Gas: Hot Tub Heater
- Natural Gas: Hot Water
- Natural Gas: Lighting
- Natural Gas: Pool Heater
- Natural Gas: Range Oven
- Propane: Clothes Dryer
- Propane: Heating Hp Bkup
- Propane: Heating
- Propane: Hot Water
- Propane: Range Oven





# Custom Aggregations



Annual & Aggregate files



Web Viewer



Full database

EUSS ResStock National 2018 Release 2022.1 > Maryland > Timeseries Data

Print This Report

Export CSV

Carbon emissions, PV, and net load totals are not available in the web data viewer or custom aggregations. They are available in annual results, individual results, and pre-aggregated results. Custom annual aggregations can be made in Excel.

Fuel Type:

Upgrade:

Aggregation Type:

Timeseries Range:

Filters

☒ Vintage: 1940s ☒ Vintage: 1950s ☒ Vintage: 1960s ☒ Vintage: 1970s ☒ Vintage: <1940

Currently Viewing:

Maryland

[+ More Locations](#)

Electricity: Ceiling Fan Electricity: Heating Hp Bkup Electricity: Mech Vent Fuel Oil: Hot Water Natural Gas: Pool Heater

Chosen Search Parameters:

Location:

Upgrade: Heat pumps, min-efficiency, existing heating as backup

Aggregation Type: average

Timeseries Range: day

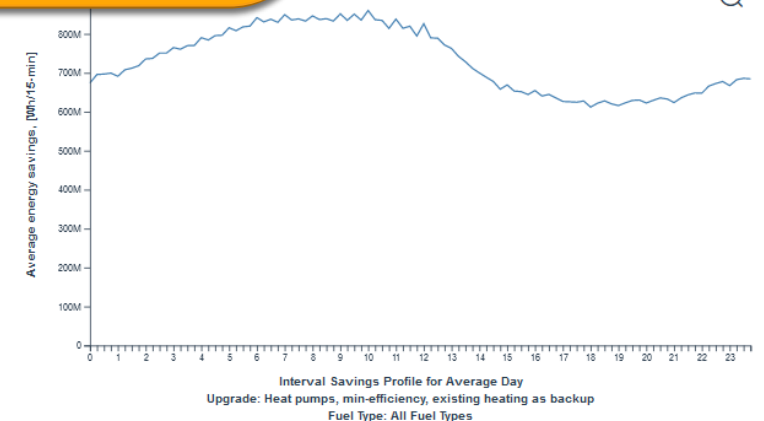
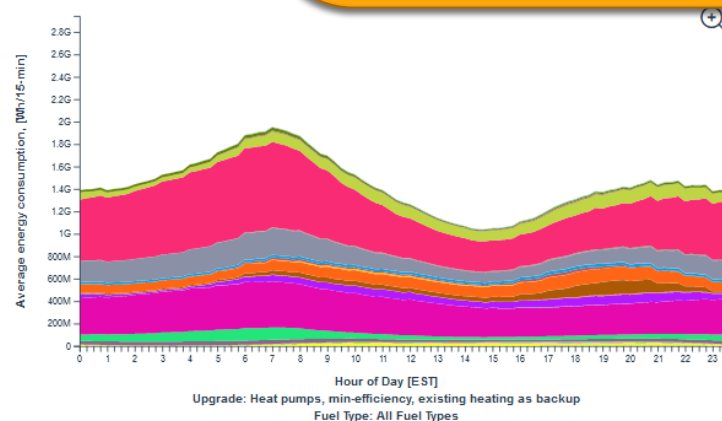
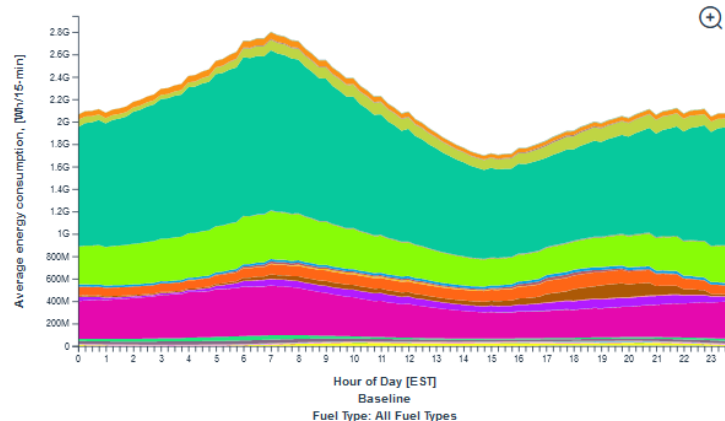
Month: Consumption

Print This Report

Export CSV

Current Data Display

15 Minute Resolution



# Individual Model Files



Annual & Aggregate files



Web Viewer



Full database

## Individual dwelling unit end-use load profiles

- For each individual dwelling unit modeled
- For baseline and each of 10 measure packages
- For each of 3 weather years
- Approximately 12 TB of data per weather year

## Format

- Amazon S3 bucket
- Folders with Apache parquet files

## Additional data

- HPXML input file for each model
- Weather data
- Schedule files

# Where to find it...

## Project Website

<https://www.nrel.gov/buildings/end-use-load-profiles.html>

Links to everything else • Mailing list signup • Video tutorials • General FAQs

Documentation of the end-use load profiles baseline stock modeling improvement project

## AWS OEDI Repository

<https://data.openei.org/submissions/4520>

Metadata & annual results files • Pre-aggregated results • Individual model results & input files including weather

Technical documentation • Data dictionary and enumeration dictionary • Geospatial information

## Web Data Viewer

<https://resstock.nrel.gov/datasets>

Graphical in-browser data visualizations • Custom aggregation tool • Data-specific FAQs

*Requires free account*

# A Few Reminders

- All time stamps time-period-ending and are in EST
- All energy units are kWh
- All results are per dwelling unit, not per building
- Aggregating across weather stations with timeseries results from TMY3 weather is not advised
- Check your sample sizes on custom aggregations

# Next Steps

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# Our Next Steps

- Commercial EUSS Rounds
  - Round 1: Expected Winter/Spring 2023
  - Round 2: Expected Summer/Fall 2023
- Residential EUSS Rounds
  - Round 1 (this one): Finish uploading the TMY3 & AMY2012 results
  - Round 2: Expected Winter/Spring 2023

# Your Next Steps



Use the data!



Let us know what cool things you are doing with it!  
[Load.profiles@nrel.gov](mailto:Load.profiles@nrel.gov)



Let us know if you have questions that the documentation, FAQs, webinar recording, webinar slides, and other supporting materials do not address: [load.profiles@nrel.gov](mailto:load.profiles@nrel.gov)



Sign up to receive updates about the project at  
[nrel.gov/buildings/end-use-load-profiles.html](https://nrel.gov/buildings/end-use-load-profiles.html)

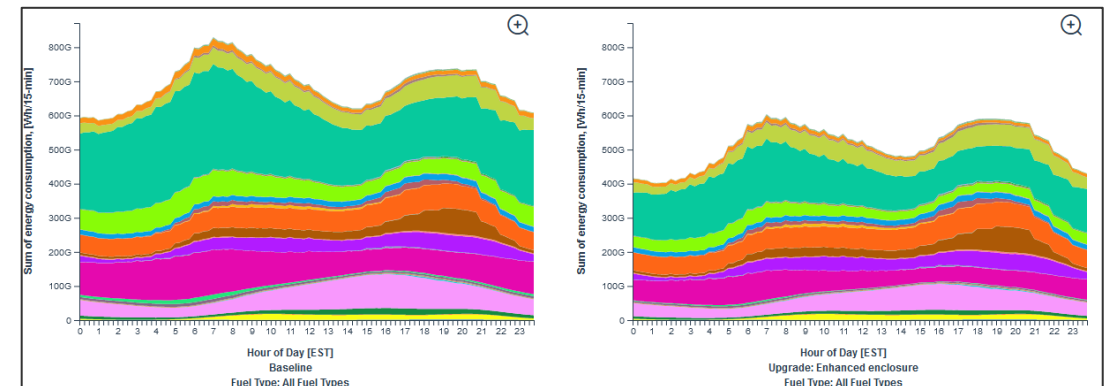
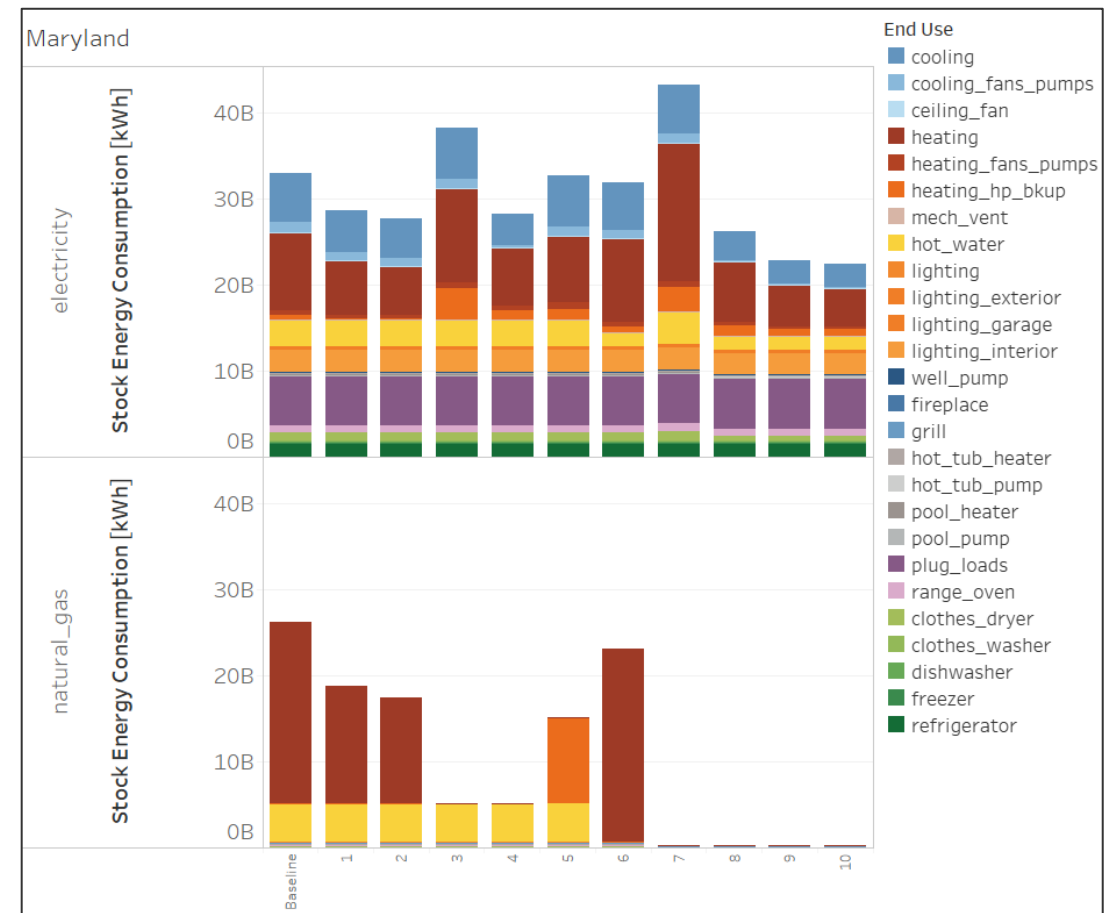


Let us know what you'd like to see included in residential round 2, and why: <https://forms.office.com/g/wrGeAEwZh7>

# Residential Round 2

*What do you want to see?*

- Less aggressive enclosure measure
- More aggressive enclosure measure
- Packages that include appliance upgrades (e.g. lighting, refrigerator, dishwasher)
- Dual-fuel heat pumps with different logic
- Heat pumps with different sizing methodology
- Other





# Q & A

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Load.Profiles@nrel.gov

[nrel.gov/buildings/end-use-load-profiles.html](https://nrel.gov/buildings/end-use-load-profiles.html)

NREL/PR-5500-84931

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