Santee Cooper IRP Stakeholder Process 2024-2026

Market Potential Study Technical Meeting – Meeting Summary

Date: 9/10/2025
Time: 1:30 PM – 3:30 PM EDT
Location: Virtual Meeting via Zoom, Vanry Associates hosting

Topics and Presenters

Santee Cooper Demand Side Management Market Potential Studies: Reviewing Assumptions with Stakeholders

Steven Roys, Manager Program Development, Santee Cooper

Jim Herndon, Vice President - Advisory Services, Resource Innovations

Wenjia Zhu, Lead - Advisory Services, Resource Innovations

Greg Sidorov, Senior Manager - Advisory Services, Resource Innovations

Steven Roys opened the meeting by thanking the group for their feedback and updates that were made following meeting #1 on May 1st of this year. Jim Herndon briefly described the Demand Side Management (DSM) programs offered by Santee Cooper. He then provided a high-level overview of the assumptions and methodology proposed for the 2026 Market Potential Study (MPS). Wenjia then went into a deep dive on the MPS assumptions, analytics and baseline data including energy efficiency for both residential and commercial customer type. Greg Sidorov continued the discussion of MPS Inputs by going over the demand response assumptions for both customer types. Finally, Steven covered the schedule for the MPS, going over milestone dates, including stakeholder engagement. The slide deck presented at the meeting is attached for reference.

Meeting Action Items

The following is a summary of action items, with status updates if applicable, agreed to at the close of the meeting.

ACTION ITEMS	RESPONSIBLE PARTY
Santee Cooper committed to sharing a more detailed breakdown of the miscellaneous commercial category with stakeholders for review and feedback.	Santee Cooper Program Management
Santee Cooper committed to sharing residential end-use cooling and heating data, when available.	Santee Cooper Program Management
Santee Cooper committed to reviewing whether additional adoption rate data could be shared and would continue discussing with members.	Santee Cooper Program Management
Prior to the meeting, the Energy Futures Group (on behalf of the Coastal Conservation League, Southern Alliance for Clean	Santee Cooper Program Management

Energy, and Southern Environmental Law Center) submitted comments to Santee Cooper regarding the MPS. Santee Cooper reviewed the comments, responded on 9/5/2025 and reviewed during the meeting. [On 9/19/2025, EFG on behalf of the Joint Commentators provided comments on the forecast disaggregation, customer segmentation, and measure parameter materials that were provided on 9/5/2025. Santee Cooper will review and respond to these comments.]	
Santee Cooper committed to reviewing the commercial rates goal and will provide a response.	Santee Cooper Program Management
Santee Cooper requested feedback from stakeholders on the information presented and the proposed schedule by 9/19/2025.	All Stakeholders
Santee Cooper committed to the proposed schedule, as outlined in the slide deck.	Santee Cooper Program Management

Santee Cooper DSM MPS

Stakeholder Meeting - Review of Study Inputs

September 10, 2025

Steven Roys - Manager Program Development
Jim Herndon - Resource Innovations
Wenjia Zhu - Resource Innovations
Greg Sidorov – Resource Innovations

Meeting Agenda

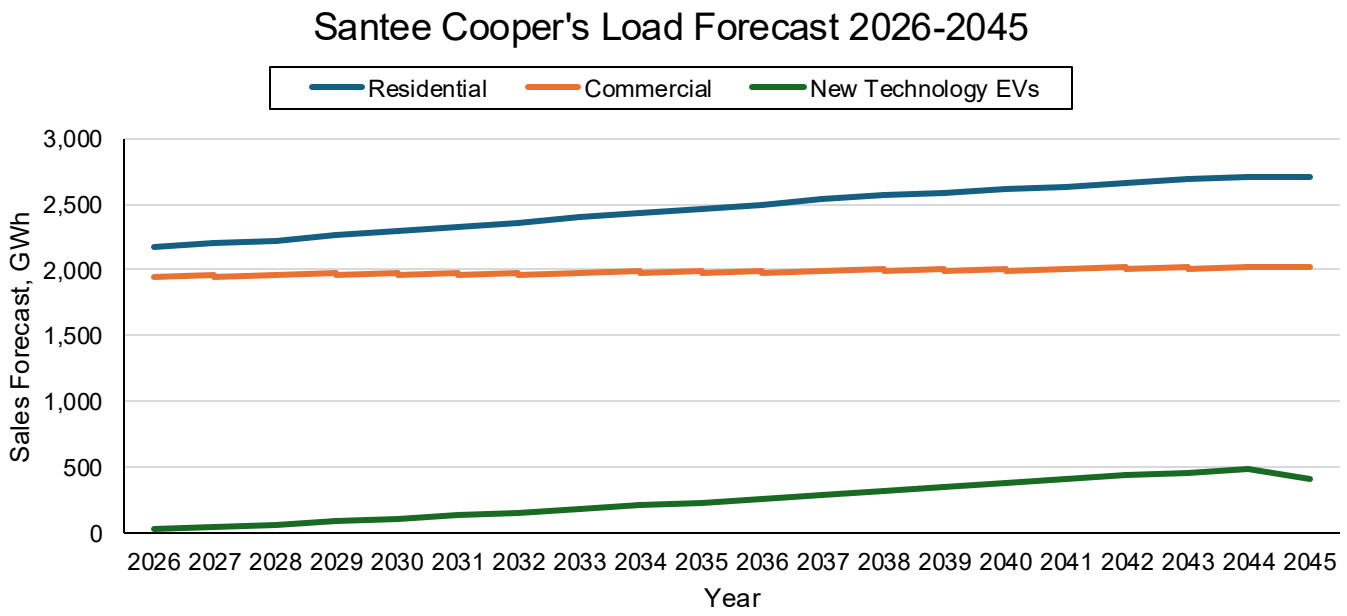
- Introductions
- Discussion of Study Inputs
  - Energy Efficiency
  - Demand Response
- Updated Study Schedule
- Appendix: Primary Data Collection (customer survey, occupancy analysis)

Feedback from Meeting 1

- Thanks for the great feedback
- A few changes were made based on this feedback:
  - 6 EE measures added
  - 3 EE measures removed
  - 1 DR measure added
  - Segmentation of residential customers
- Additional feedback was addressed directly with stakeholders who submitted comments

Forecast Disaggregation

- Eligible Customers
  - Residential Direct Serve - 186,000+ customers
  - Commercial Direct Serve - 30,000+ customers



Need to identify major drivers of electricity use, including which:

- Customer types
- End uses
- Equipment categories

contribute most to consumption.

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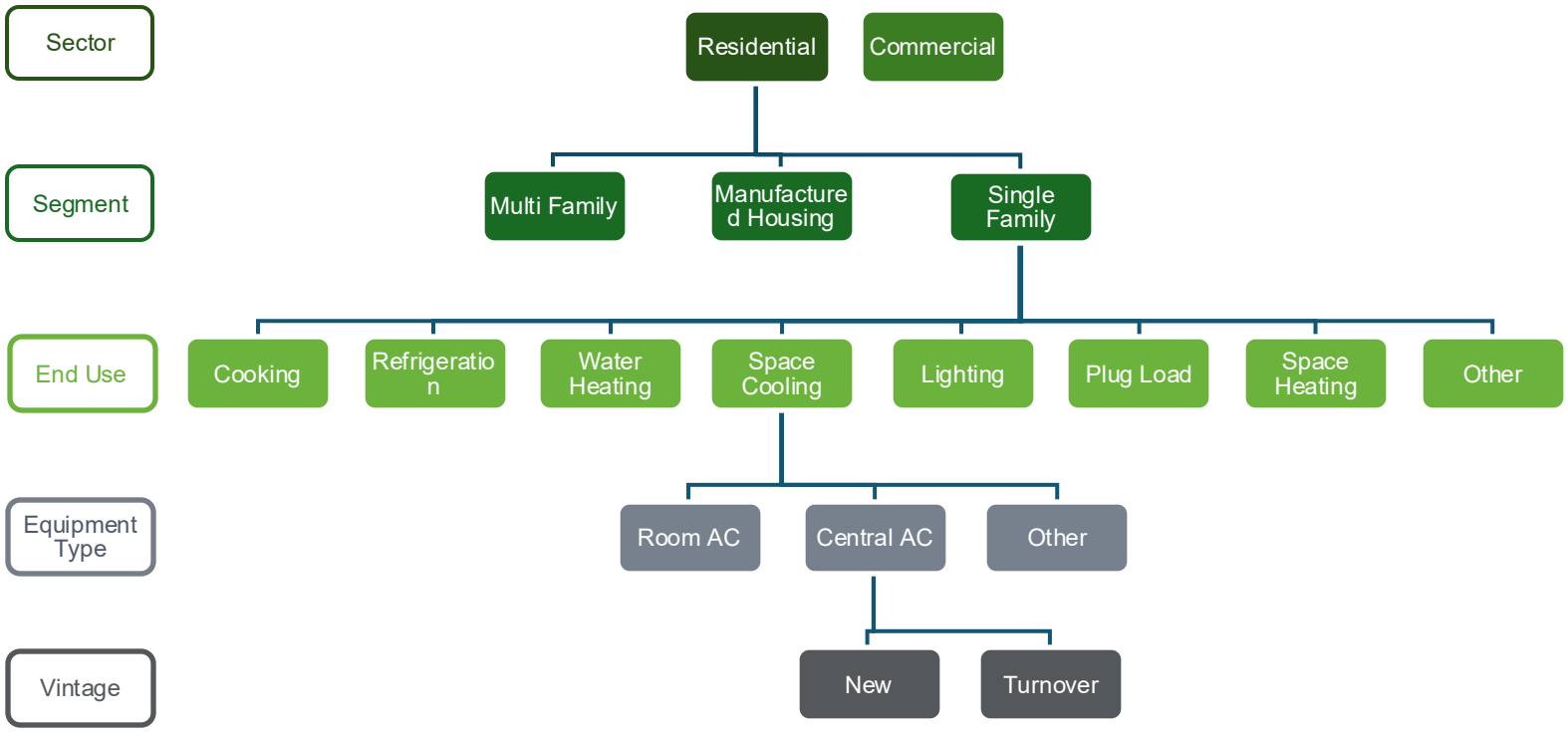
Forecast Disaggregation

Illustrative Forecast Disaggregation for Residential Sector



Breaking the sector-level forecast down to customer segments, end uses, equipment types and building vintages.

- Reflects regional consumption patterns
- Links savings directly to equipment

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Baseline Characterization

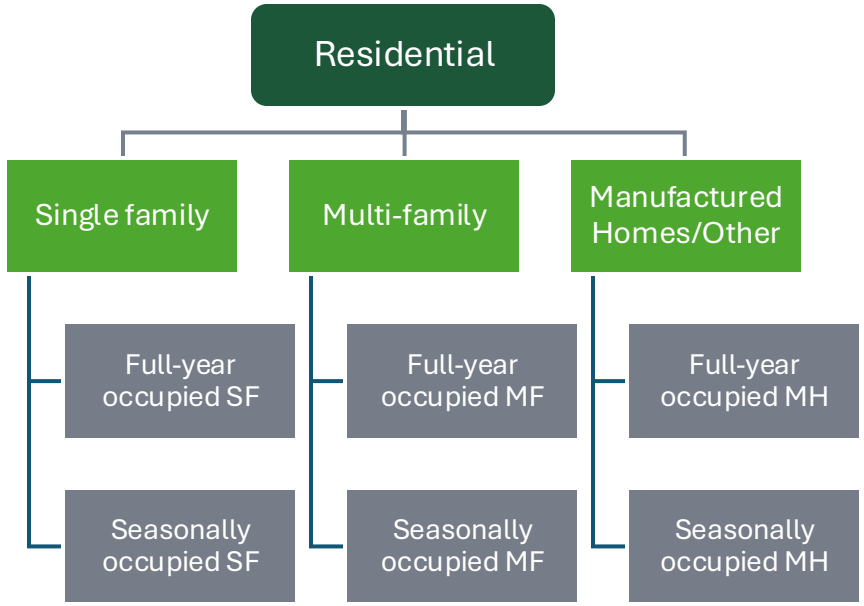
Approach

- Top-down: allocate observed load ► end uses using benchmark shares.
- Bottom-up: Sum equipment stock × energy use intensity ► end uses, then reconcile with observed load.

Inputs include:

- Customer segmentation
- Segment end-use consumption share
- Customer stock
- End-use saturation
- End-use fuel share
- Equipment saturation
- Equipment energy use intensity

Residential Taxonomy



Residential End Uses	
Space heating	Space cooling
Ventilation and circulation	Domestic hot water
Refrigerators	Freezers
Clothes Dryers	Clothes Washers
Dishwashers	Lighting
Plug load	Cooking
Electric Vehicles	Res Miscellaneous

Data Sources for Residential

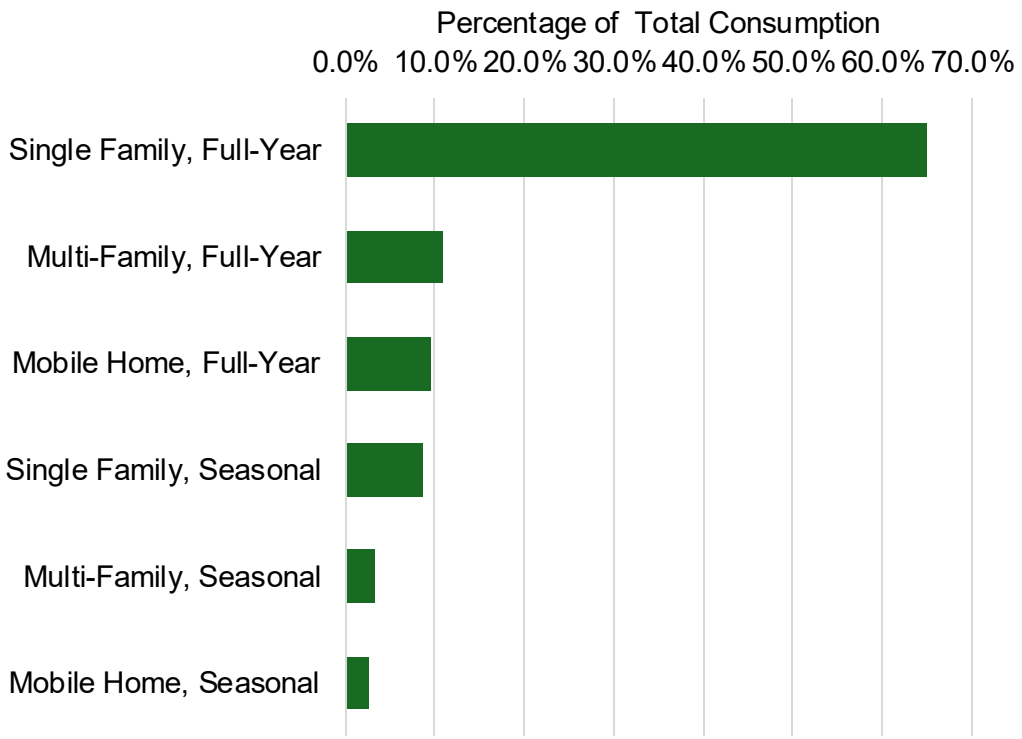
- Survey & Secondary Data
  - Primarily use recently completed customer survey data to establish distributions of household type, end uses, and appliance saturation.
  - Supplement with 2020 Residential Energy Consumption Survey (RECS) data where survey responses are limited.

- Benchmarking & Weighting
  - Benchmark against 2023 American Community Survey (ACS) 5-year estimates for Horry, Berkeley, and Georgetown counties.
  - Apply weighting to align survey respondents with household type and ownership distributions.

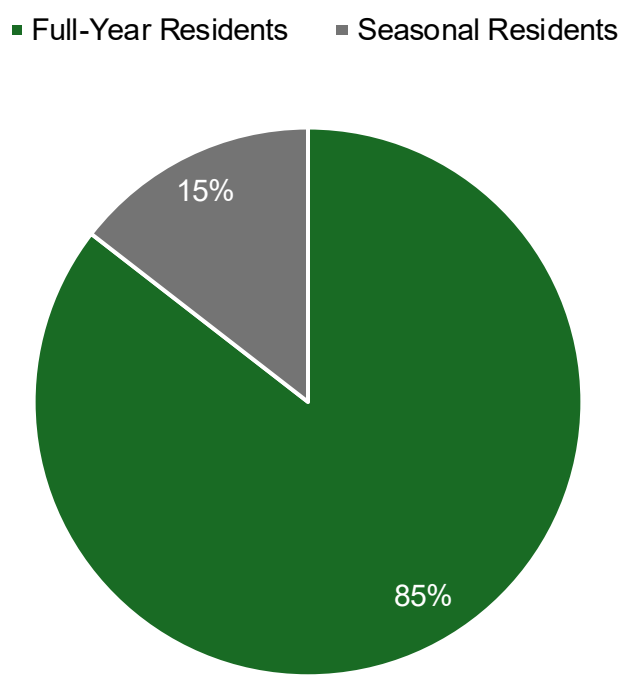
- Occupancy Adjustment
  - Use sampled residential AMI data to distinguish full-year vs. seasonally occupied customers within each household type.

Residential Sales by Segment

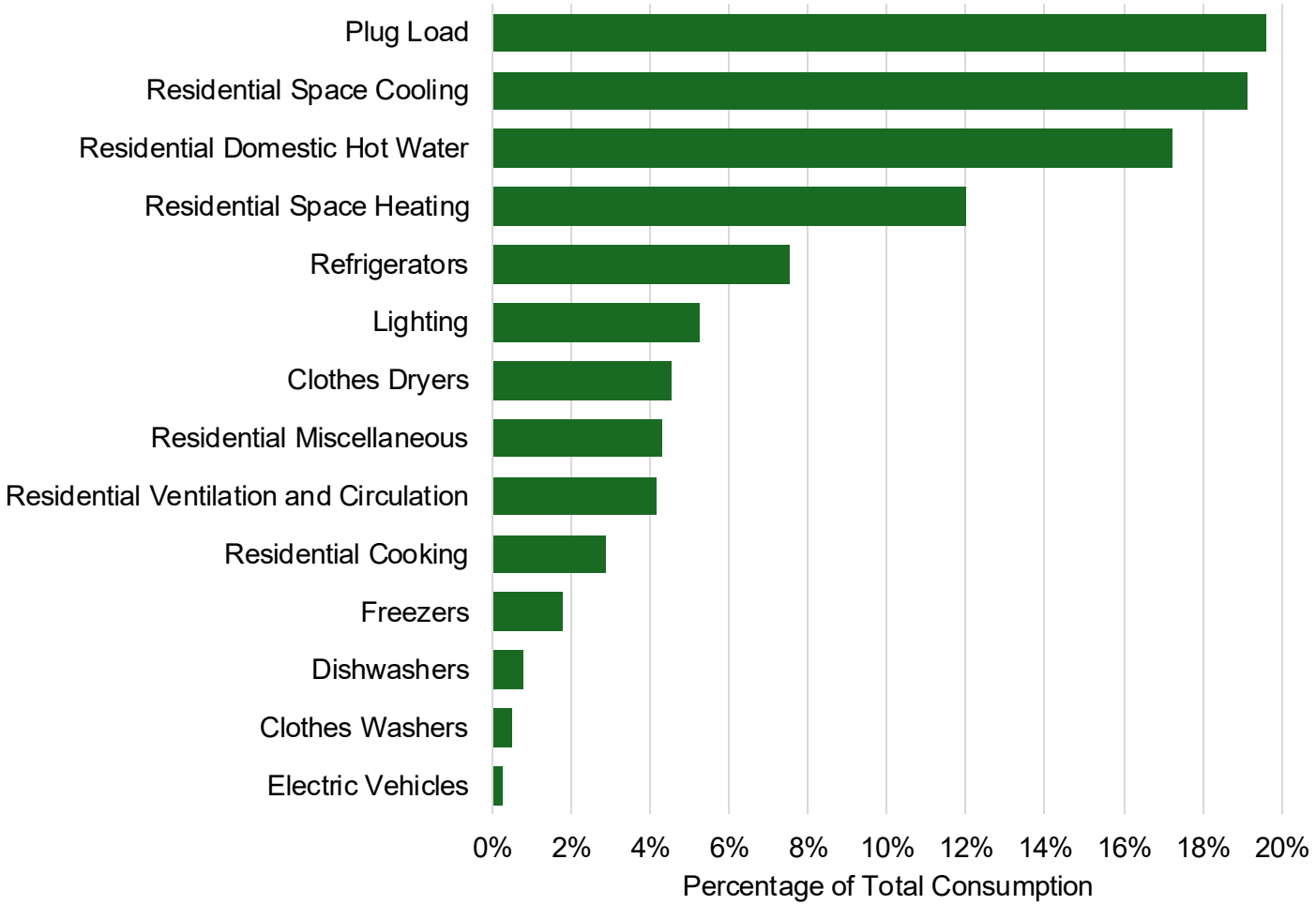
Start-Year Sales by Customer Segment



Start-Year Sales by Occupancy Status



Residential Sales by End Use



- The top five end uses account for 75% of total residential electricity consumption.
  - Plug Load (TVs, PCs, etc)
  - Space Cooling
  - Domestic Hot Water
  - Space Heating
  - Refrigerators

Cooling by Occupancy Status

Customer Segment	Space Heating	Space Cooling	Other
SF, Full-Year	12%	18%	70%
SF, Seasonal	12%	**25%**	63%
MF, Full-Year	9%	18%	73%
MF, Seasonal	9%	**25%**	66%
MH, Full-Year	15%	20%	65%
MH, Seasonal	12%	**31%**	57%

Seasonally or partially occupied households

- Tend to have a comparatively higher share of consumption from cooling end uses, with energy use concentrated in summer months.
- This pattern suggests these households are primarily occupied during hotter seasons and much less in other months.

Implications

- Measure applicability: Most relevant measures are those targeting cooling loads.
- Program participation: Willingness to install measures may be lower; these households are harder to reach.

Commercial Taxonomy

Commercial End Uses	
Space heating	Space cooling
Ventilation and circulation	Interior lighting
Exterior lighting	Office equipment
Domestic hot water	Cooking
Refrigeration	EV charging
Miscellaneous	Compressed air*
Motors fans blowers*	Motors pumps*
Process cooling*	Process heating*
Process specific*	

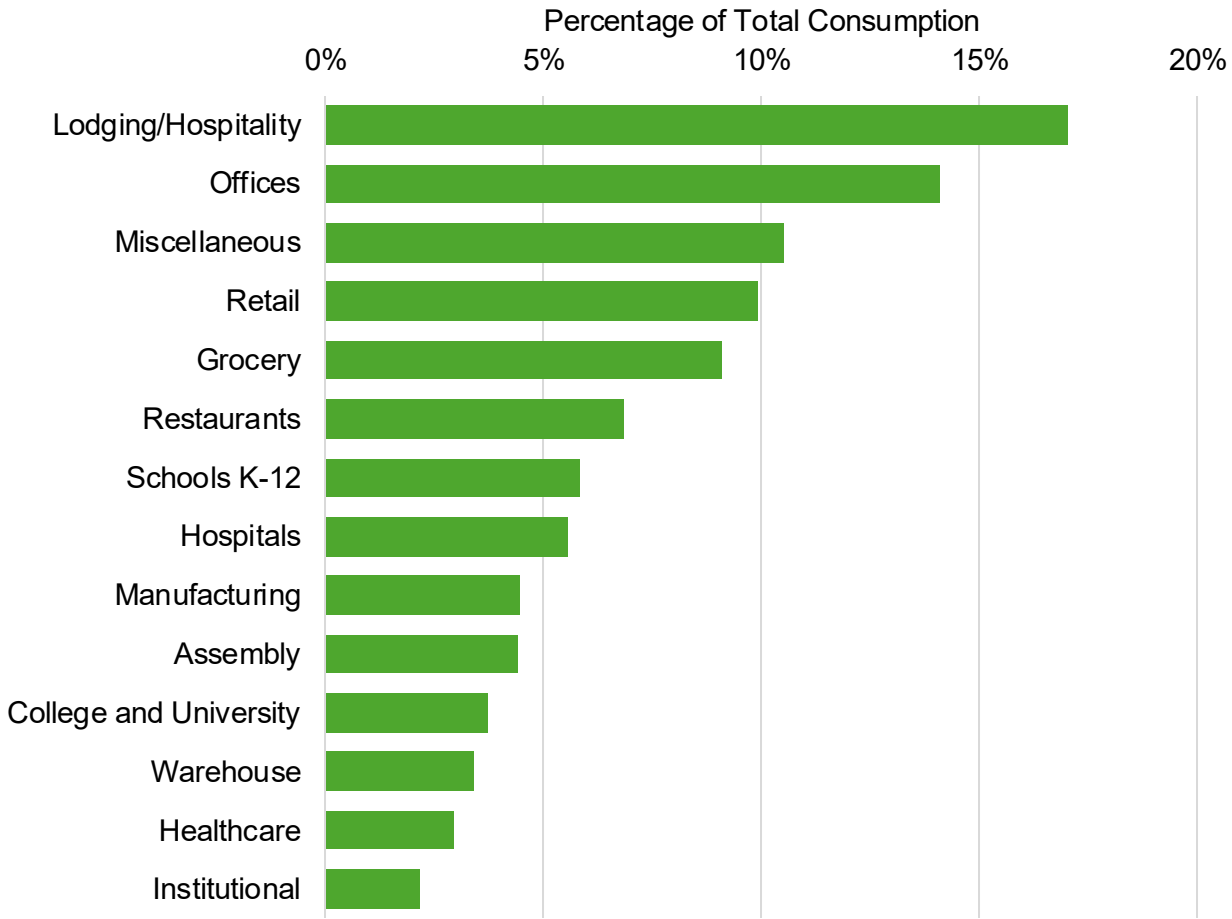
*End uses are only applied to manufacturing customers

Data Sources for Commercial

- Commercial Customer Data
  - Primarily rely on commercial customer data to classify high-use customers into the appropriate segments.
  - Identify the minimal set of customers whose cumulative consumption reaches 70% of the sector's load.

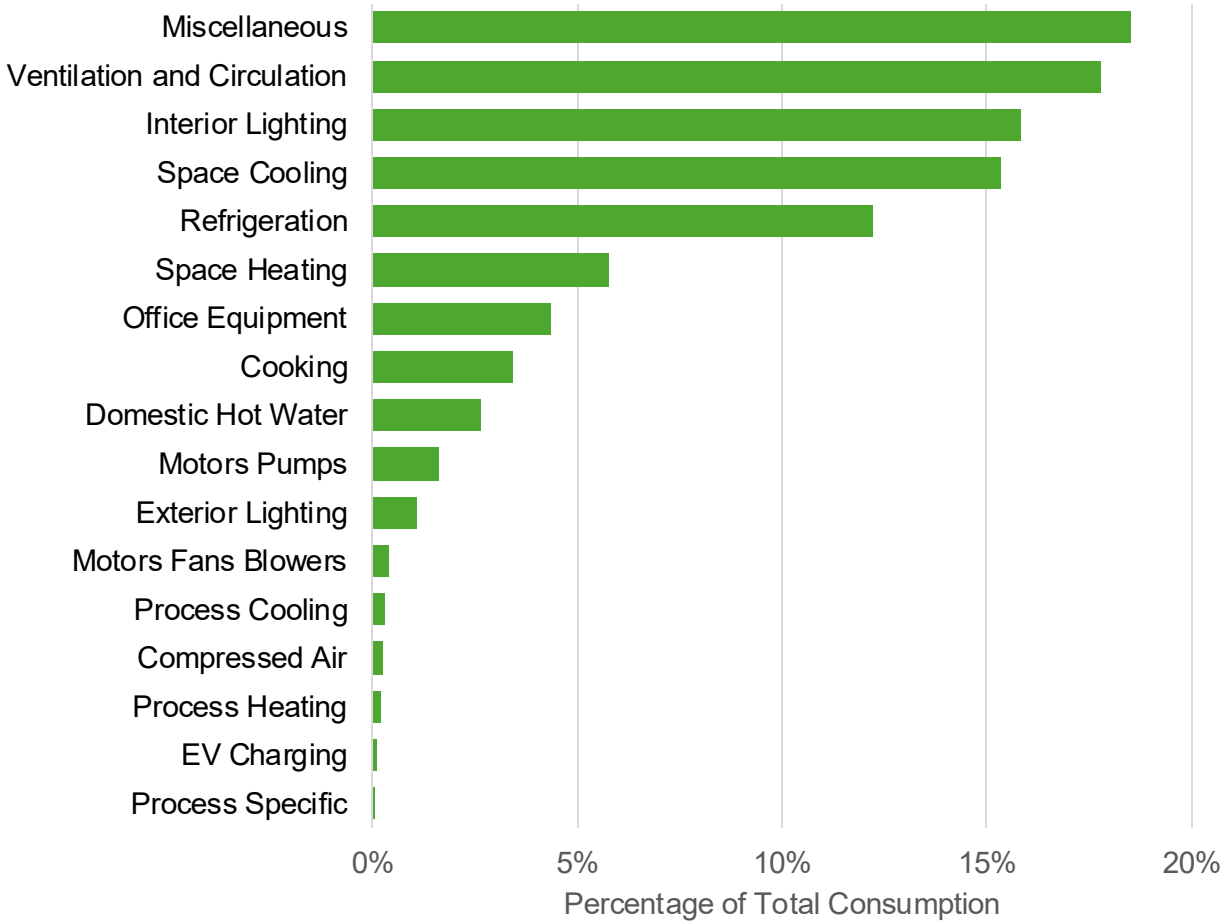
- 2018 Commercial Buildings Energy Consumption Survey (CBECS)
  - Distribute the remaining 30% across customer segments using CBECS South Atlantic building-type shares.
  - Use CBECS for end-use fuel shares, end-use saturation and equipment type saturation by building type.

Commercial Sales by Segment



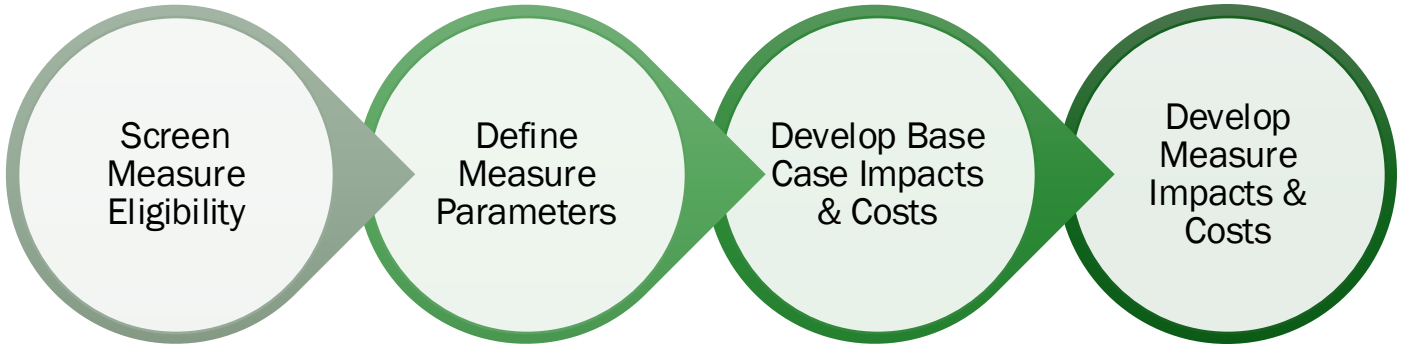
- The top five customer segments account for 61% of total commercial electricity consumption.
  - Lodging/Hospitality
  - Offices
  - Miscellaneous
  - Retail
  - Grocery

Commercial Sales by End Use



- The top five end uses account for 80% of total commercial electricity consumption.
  - Miscellaneous
  - Ventilation and Circulation
  - Interior Lighting
  - Space Cooling
  - Refrigeration

EE Measure Characterization



Measure list:

- The measure list incorporates feedback provided by stakeholders on 5/16/25.

Measure data required:

- Efficient and baseline technology characteristics
- Equipment and labor costs
- Equipment useful life
- Energy and demand savings
- Applicability and current saturation

Measure sources:

- Technical Reference Manual(s)
- RI measure library platform
- Santee Cooper customer characteristic data
- Input from stakeholders
- Market research - custom measures and new technologies

EE Measure Workbooks

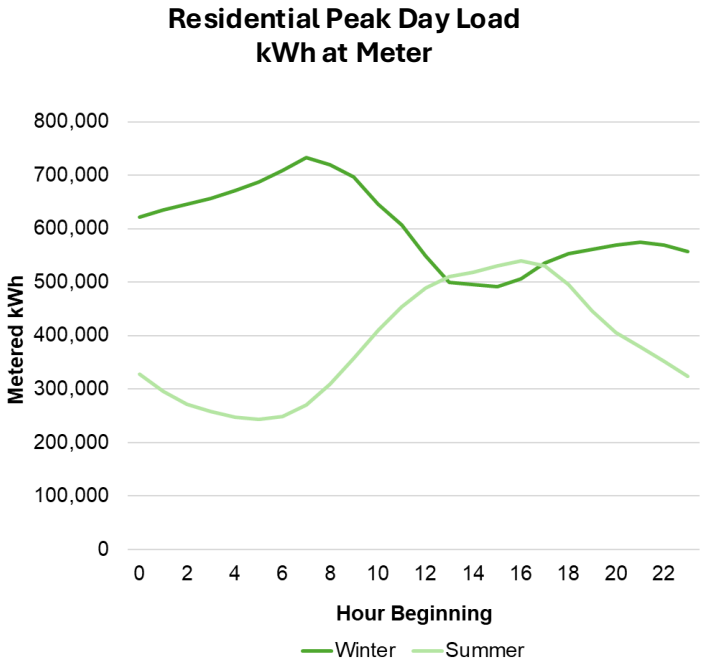
Algorithm_Paramater

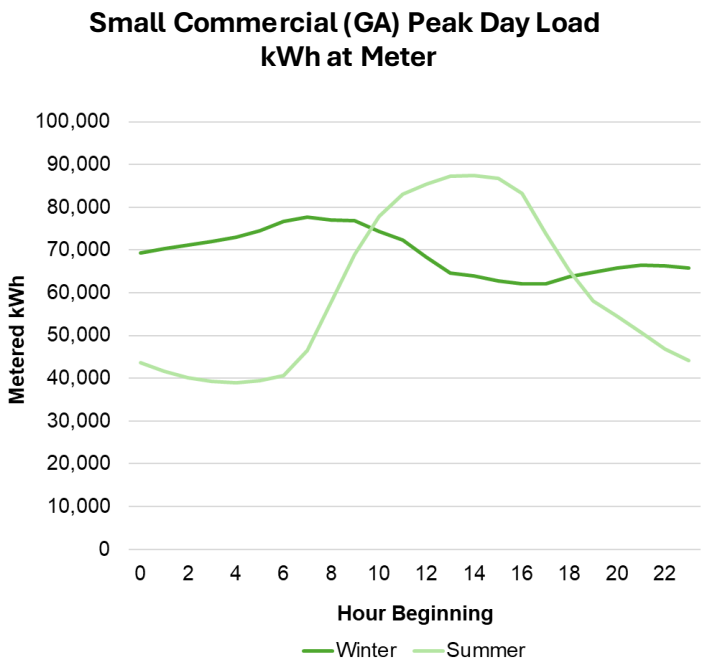
- This sheet contains the parameters and algorithms used to calculate measure savings, along with measure life, incremental cost, and their references.

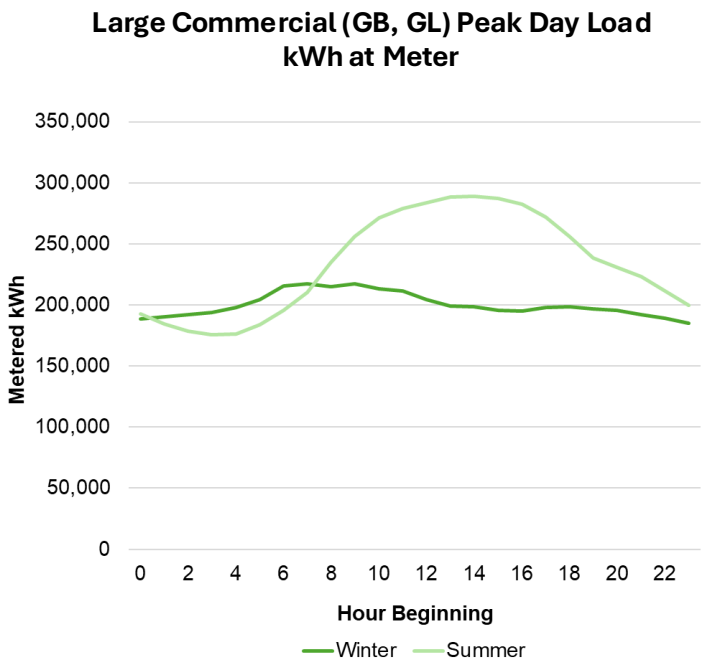
Measure Impacts

- This sheet summarizes the calculated savings impacts of measures at the equipment level, organized by customer segment and building vintage.

DR Market Characterization







Charts above show hourly load profiles by sector on recent system peak days

- **Winter: Wednesday, 2025-01-23**, 1,036 MW @ peak hour 07:00 Eastern
- **Summer: Monday, 2024-07-15**, 919 MW @ peak hour 16:00 Eastern

Plan to adjust load profiles above to account for impact of Santee Cooper three-part rate structure (in effect 2025-04-01) on system peak, as impacts are available

- Res: 15:00 to 18:00 in summer months, 06:00 to 09:00 in winter months
- Commercial: 15:00 to 19:00 in summer months, 05:00 to 09:00 in winter months

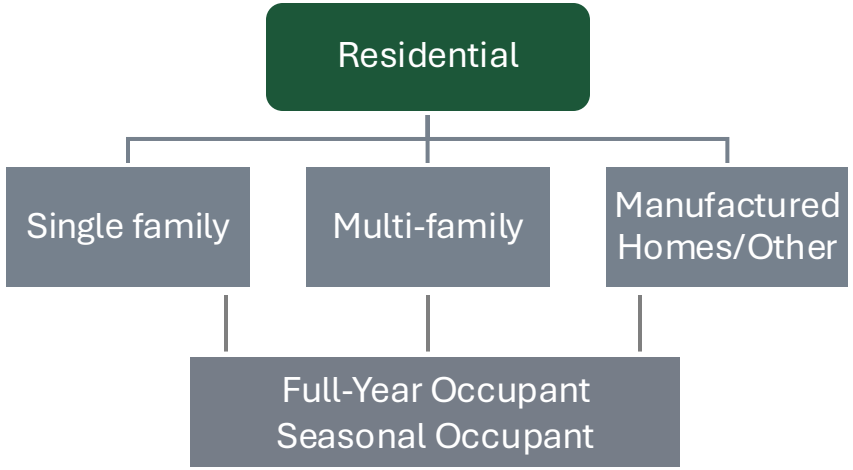
Source: Analysis of Santee Cooper AMI data

DR Segmentation

Within **sector** we further group into **segments** based on account characteristics

Estimate potential independently within each sector, segment

Residential
Building type, Occupancy



Commercial
Small Commercial (GA) – Energy Consumption
Large Commercial (GB and GL) – Peak Demand

	Small Commercial	Large Commercial
Segment 1	< 5,000 kWh	< 200 kW
Segment 2	5,000-10,000 kWh	200-500 kW
Segment 3	10,000-25,000 kWh	500-1,000 kW
Segment 4	> 25,000 kWh	> 1,000 kW

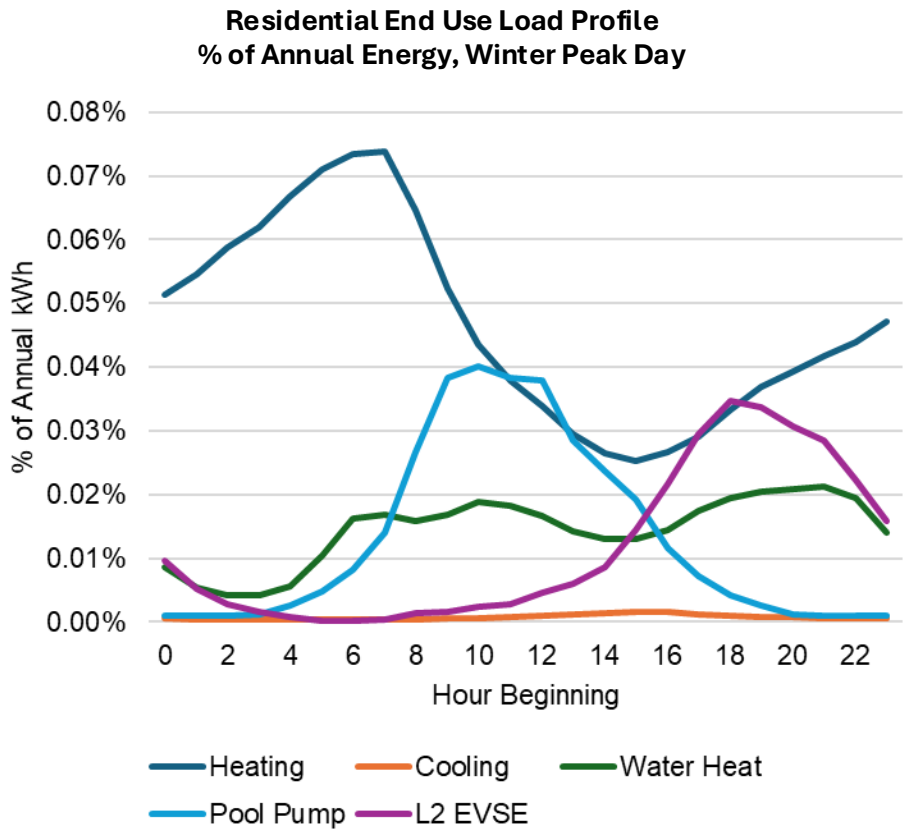
DR Measures

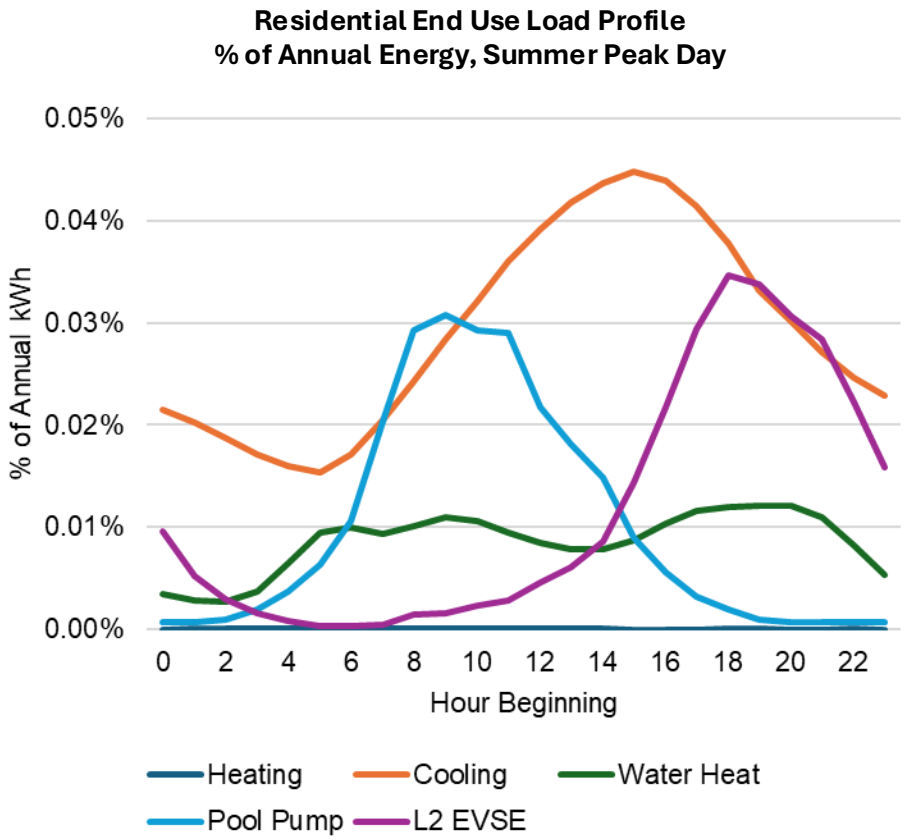
DR Measure List

Measure Category	Measure Name	Applicable End Use	Occupancy
Large Commercial	Contractual DR	N/A	N/A
	Automated DR	N/A	N/A
	Emergency Load Reduction	N/A	N/A
DLC (Residential + Small Commercial)	Battery Storage	N/A	Full, Seasonal
	EV Charging (Telematics)	EV	Full
	EV Charging (Switch)	EV	Full
	HVAC - Cooling (Switch)	Cooling	Full, Seasonal
	HVAC - Heating (Switch)	Heating	Full, Seasonal
	Room AC Control	Cooling	Full
	Pool Pump (Switch)	Pool Pump	Full, Seasonal
	Smart Thermostat - BYOT	Cooling, Heating	Full, Seasonal
	Smart Thermostat - Utility Install	Cooling, Heating	Full, Seasonal
	Water Heat (Switch)	Water Heat	Full, Seasonal
	Water Heat (Grid-Enabled)	Water Heat	Full, Seasonal
Pricing (Residential + Small Commercial)	Critical Peak Pricing	N/A	Full
	Peak Time Rebates	N/A	Full
	Real Time Pricing	N/A	Full
	Behavioral Demand Response (BDR)	N/A	Full

- DR measure list
  - Santee Cooper shared with stakeholders in May 2025
  - We are incorporating suggestions and feedback
- Some DR measures
  - require end-use load shapes to derive amount of controllable load
  - not applicable to seasonal occupants

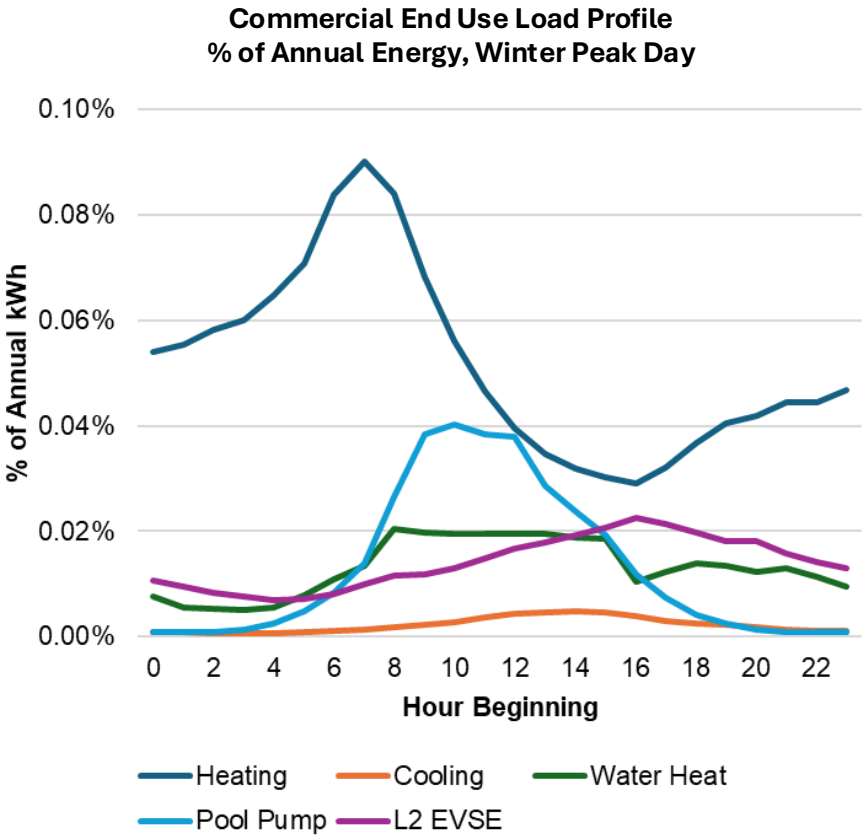
Residential End Use Load Shapes

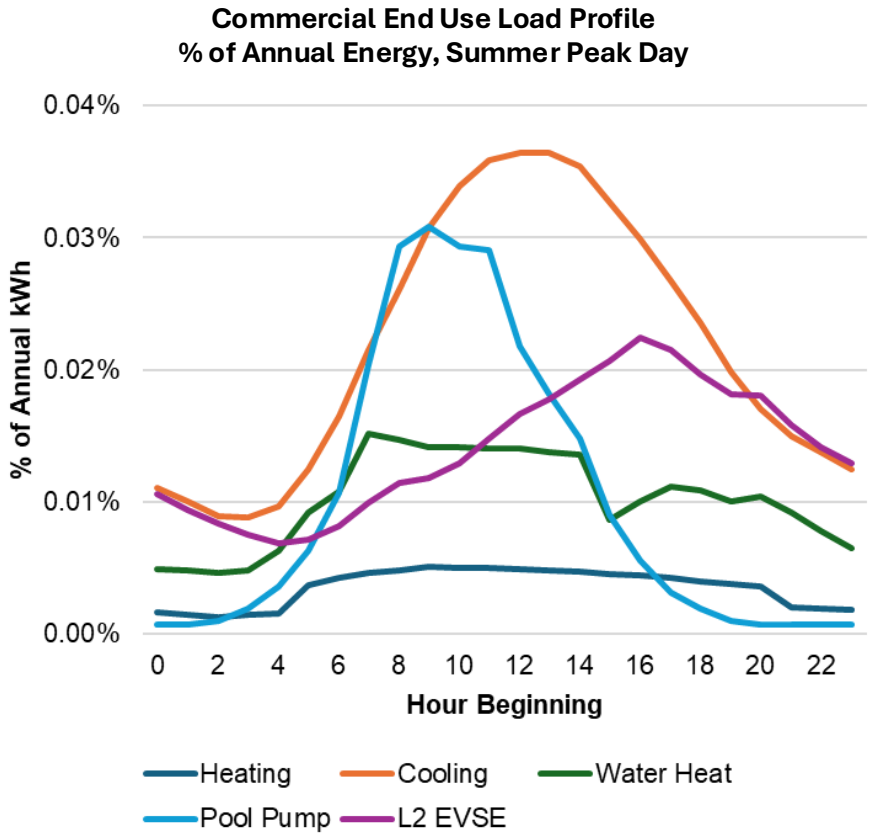




Source: Analysis of NREL ResStock (Heating, Cooling, Water Heat, and Pool Pump) and EVI-Pro Lite (L2 EVSE)

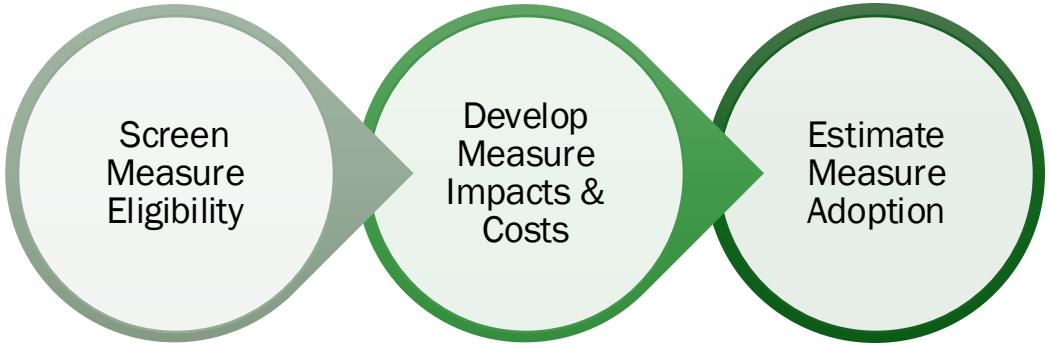
Commercial End Use Load Shapes





Source: Analysis of NREL ComStock (Heating, Cooling, Water Heat) and EVWatts Dashboard (L2 EVSE). Pool pump assumption same as residential.

DR Measure Characterization



Measure list:

- The measure list incorporates feedback provided by stakeholders on 5/16/25.

Measure data required:

- Applicable “baseline” load (summer and winter)
- Avoided capacity cost
- Equipment, installation, acquisition, and admin costs
- Initial and ongoing incentives
- Expected participation period (years)
- Demand savings
- Applicability and current saturation

Measure data sources:

- Customer AMI
- Energy Efficiency MPS
- Secondary research (literature review and benchmarking)
- Analysis and expert judgement

Updated Schedule

Task	Milestone Date (Original)	Stakeholder Comments Date (Original)	Milestone Date (UPDATED)	Stakeholder Comments Date (UPDATED)
Technical Stakeholder Work Session	5/1/2025			
Study Plan & Draft Measure List (provided via email)	5/1/2025	5/16/2025		
Primary Data Collection (Customer surveys, AMI occupancy analysis)	-	-	8/19/25	
Forecast Disaggregation/Customer Segmentation/Measure Parameters (provided via email)	8/1/2025	8/15/2025	9/5/25	9/19/25
Technical Stakeholder Work Session: review baseline data	8/4 – 8/8/2025		9/10/25	
Technical Potential (provided via email)	9/12/2025	9/26/2025	10/10/25	10/24/25
Economic Potential (provided via email)	10/3/2025	10/17/2025	10/31/25	11/14/25
Achievable Potential (provided via email)	10/31/2025	11/14/2025	12/5/25	12/19/25
Technical Stakeholder Work Session: review draft results	11/3 – 11/7/2025		12/10/25	
MPS Report	December 2025 or Q1 2026		Q1 2026	
Present findings to IRP Stakeholders	Q4 2025 or Q1 2026		Q1 2026	

Questions?

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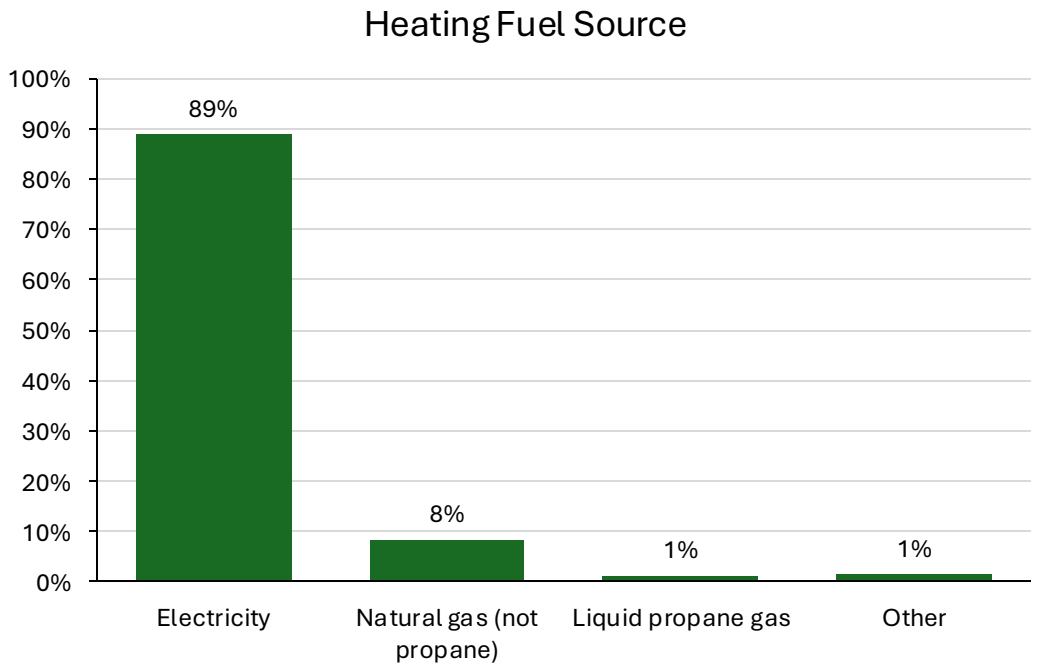
Customer Survey

- Survey period: Mid July – Early August
- Number of responses: 1,106

Home Type	
	Total (n=1,106)
Single-family detached	61%
House attached to one or more other houses	6%
Apartment buildings or condo with 2-4 units	4%
Apartment building or condo with 5 or more units	16%
Mobile or manufactured home	13%

Ownership Status	
	Total (n=1,081)
Own	85%
Rent	11%
Own home, but rent or lease to long-term tenants	2%
Own home, but rent or lease as a vacation property	3%

Exemplary Results

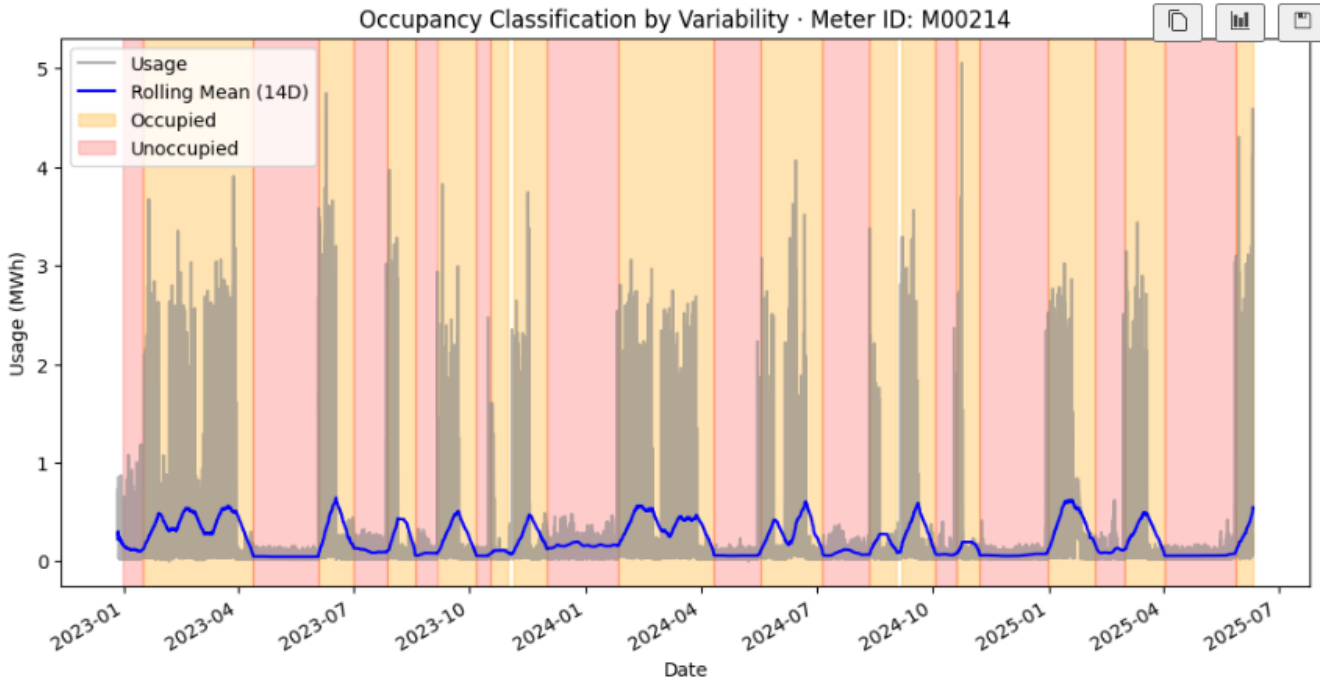


Heating System	
	Total (n=938)
Air-source heat pump	72%
Natural gas furnace	8%
Geothermal heat pump	5%
Electric space heaters	4%
Electric baseboard heating	3%
Fireplace or wood stoves	3%
Wall heaters	2%
Gas-fired space heaters	1%
Other	11%

AMI Occupancy Analysis

We want to understand when a site is occupied or not, but we don't have labels for occupancy status to train on.

The key insight here is that unoccupied homes tend to have both **low overall usage** and **low variability** in their energy profiles.



Approach:
We used a rolling standard deviation to track variability in usage and compared it to a tuned threshold value to detect flat (low-activity) periods.

Details:
- Data is analyzed in rolling windows to detect changes over time
- Segments must be at least one week long to reduce noise
- Because rolling metrics are used, this method is a lagging indicator
  → But it still captures the correct stretch of time in or out of occupancy

AMI Weather Fitting

We used a **5 Change Point Energy Model**, otherwise known as an **Energy Signature Model**. This is a piece wise regression model that defines the energy profile of a meter by fitting 5 variables:

- Heating Slope
- Cooling Slope
- Heating Cut-off
- Cooling Cut-off
- Baseline Energy

We can get an inferred heating/cooling energy usage by taking the difference between the usage value and the baseline energy usage.