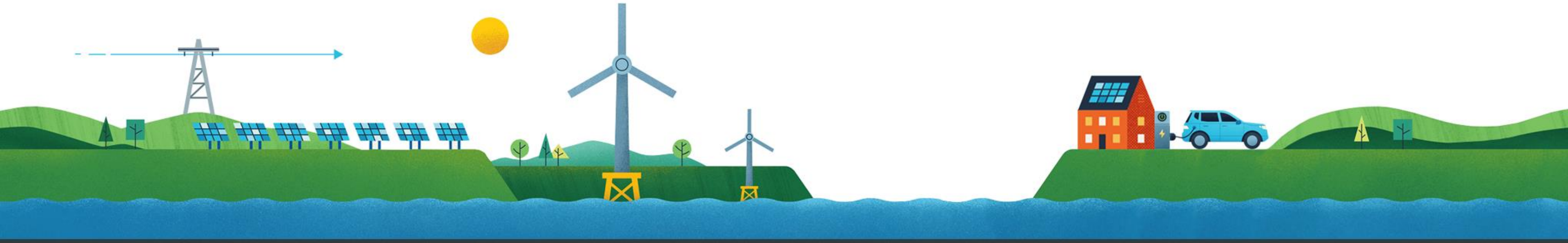
MAY 1, 2026

Final 2026 Heat Pump Forecast

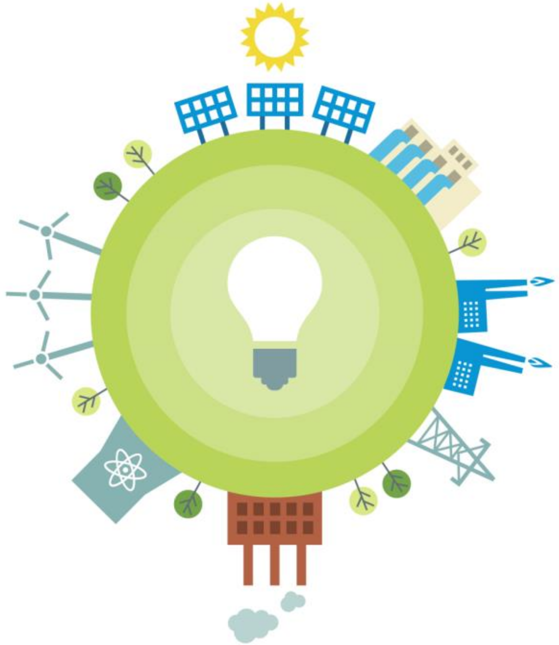


Acronyms

BTMPV	Behind-the-meter Photovoltaics	**CELT**	Capacity, Energy, Loads, and Transmission
COP	Coefficient of Performance	**EV**	Electric Vehicle
GHG	Greenhouse Gas	**GSHP**	Ground Source Heat Pump
GWh	Gigawatt Hour	**HP**	Heat Pump
MW	Megawatt	**NREL**	National Renewable Energy Laboratory
PTHP	Packaged Terminal Heat Pump	**RUT**	Rooftop Unit
SF	Square Feet	**VRF**	Variable Refrigerant Flow

Outline

- Introduction
- Heat Pump Adoption Forecast
- Hourly Demand Modeling Methodology
- Energy and Peak Demand Forecast



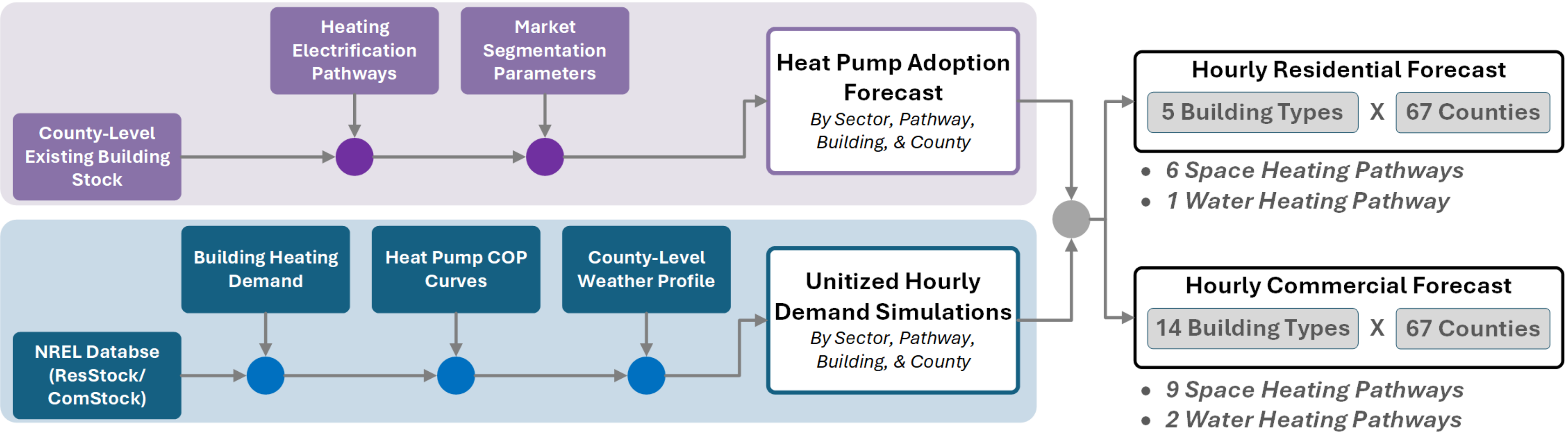
Introduction

- The heat pump (HP) forecast reflects the anticipated energy and demand impacts of electrifying space heating and water heating across residential and commercial buildings in New England
  – These impacts are included as part of the 2026 Capacity, Energy, Loads, and Transmission (CELT) forecast
- The methodology used to model and forecast heating electrification impacts remains relatively unchanged from the CELT 2025 forecast cycle (slides 29-71):
  1. Adoption forecasting
     - Forecasts adoption of residential and commercial space and water heating electrification technologies at the county level considering building stock characteristics, state policy, and economic factors
     - Adoption pathways consist of unique combinations of building type, legacy fuel, and displacement level
  2. Hourly demand modeling
     - Captures the electricity demand impacts of HP adoption
  3. Energy and peak demand calculation
     - Energy stems from a direct summation of simulated hourly demand
     - Peak demand is derived from a "waterfall" approach, considering all load forecast components
     - Peak demand and monthly energy incorporate gross-ups to account for transmission and distribution losses

Updates to the HP Forecast for CELT 2026

- For CELT 2026, the HP adoption forecast was reduced by 5% across all sectors and heating types
  - Detailed on slide 5 of the November 7, 2025 Update on Heat Pump Forecast Enhancements presentation
- Building space heating demand parameters were reduced by 15% for residential and 5% for commercial applications to reflect the impact of weatherization
  - Discussed on slide 6 of the November 7, 2025 Update on Heat Pump Forecast Enhancements presentation
- Maximum heating demand parameters were reduced by 10% in full displacement modeling to reflect less resistance backup heat
  - Discussed on slide 7 of the November 7, 2025 Update on Heat Pump Forecast Enhancements presentation

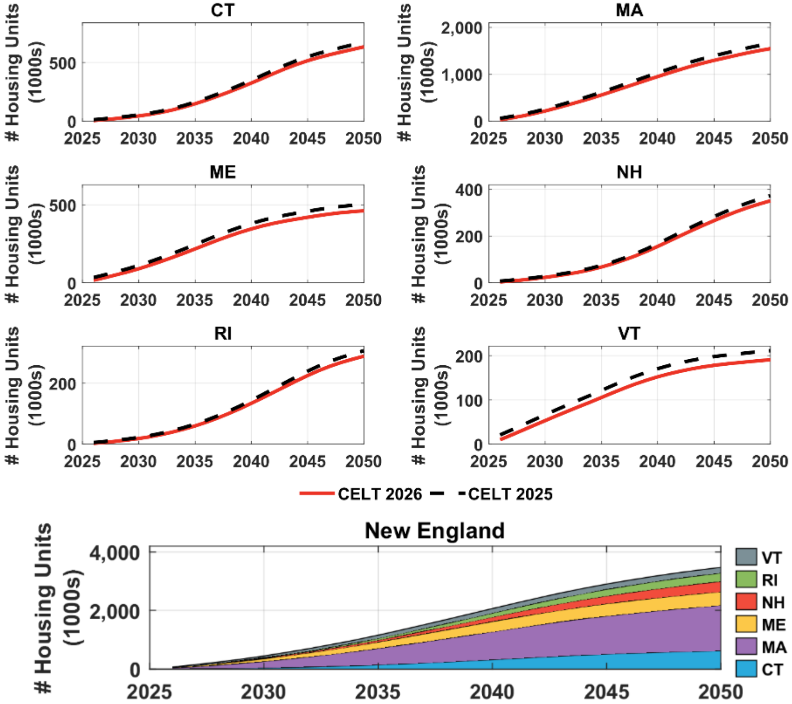
Heating Electrification Forecast Process



HEAT PUMP ADOPTION FORECAST

Residential Space Heating Adoption

Cumulative HP Stock (1,000 Housing Units)

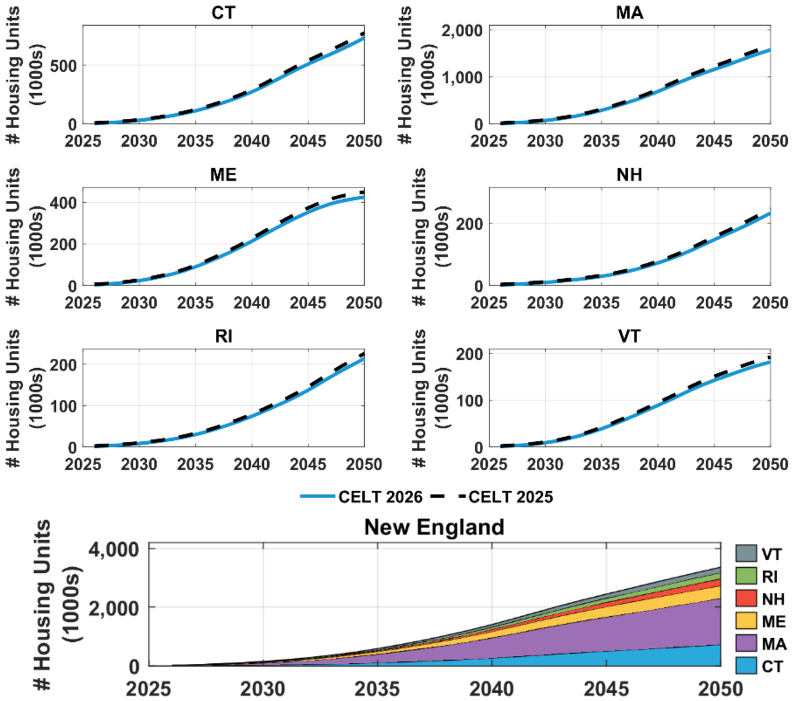


Annual Incremental Increase in HP Stock (1,000 Housing Units)

Year	CT	MA	ME	NH	RI	VT	NE
2026	7	33	16	4	3	10	73
2027	8	38	17	4	3	11	81
2028	9	44	18	5	4	11	89
2029	10	49	19	5	4	11	98
2030	12	56	20	6	5	11	109
2031	14	63	23	7	6	11	123
2032	17	66	25	7	7	10	132
2033	21	68	26	9	8	10	141
2034	25	69	26	10	10	10	145
2035	28	75	28	12	11	11	164
Cumulative Adoption (2026-2035)	**150**	**561**	**217**	**67**	**60**	**106**	**1,161**

Residential Water Heating Adoption

Cumulative HP Stock (1000 Housing Units)

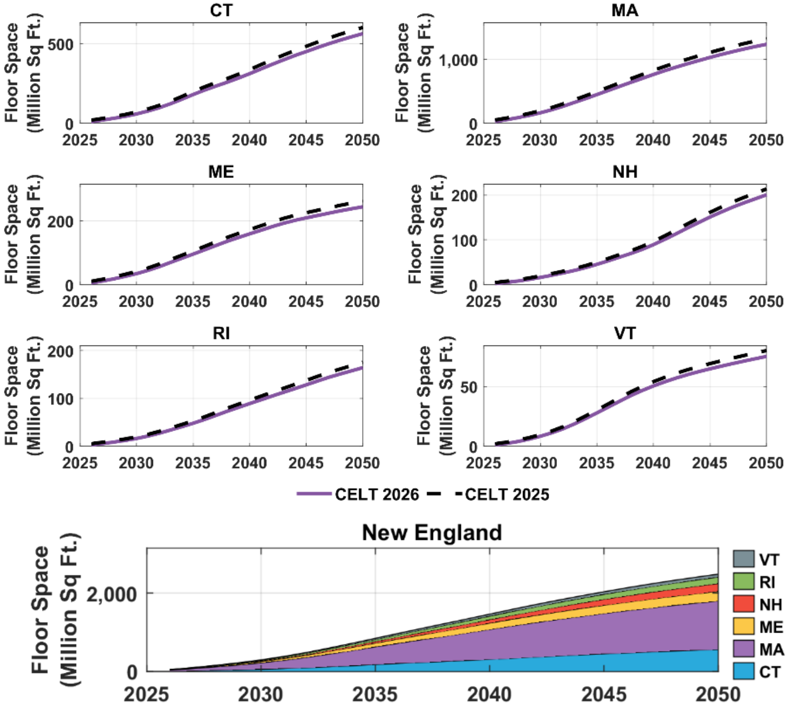


Annual Incremental Increase in HP Stock (1,000 Housing Units)

Year	CT	MA	ME	NH	RI	VT	NE
2026	4	9	3	2	1	1	19
2027	5	11	3	2	1	1	24
2028	6	14	4	2	2	2	29
2029	7	18	6	2	2	2	37
2030	9	23	7	3	2	3	47
2031	11	29	9	3	3	4	58
2032	14	35	12	3	4	5	71
2033	16	42	13	4	4	6	85
2034	18	51	16	4	5	7	102
2035	22	60	19	5	6	8	119
Cumulative Adoption (2026-2035)	**112**	**291**	**90**	**29**	**30**	**39**	**592**

Commercial Space Heating Adoption

Cumulative Electrified Floor Space (Million Sq Ft.)

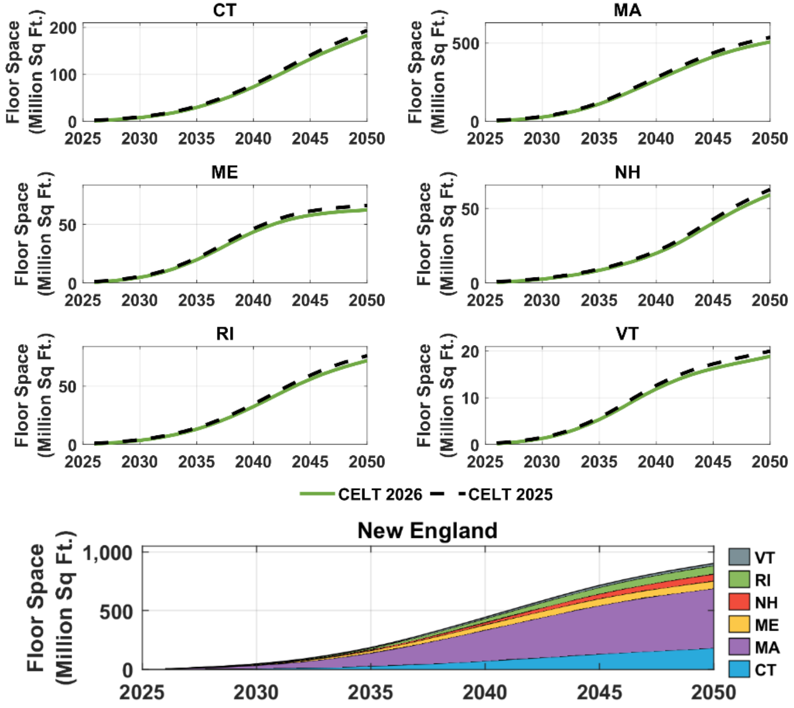


Annual Incremental Increase in Floor Space (Million Sq Ft.)

Year	CT	MA	ME	NH	RI	VT	NE
2026	10	26	6	3	3	1	47
2027	10	29	6	3	3	1	52
2028	11	32	7	3	3	2	58
2029	12	36	8	4	3	2	65
2030	15	40	8	4	4	2	75
2031	18	48	10	5	5	3	89
2032	21	54	12	5	6	3	101
2033	25	60	13	6	7	4	115
2034	28	61	13	6	7	5	120
2035	30	63	13	7	7	5	125
Cumulative Adoption (2026-2035)	181	449	96	46	48	28	847

Commercial Water Heating Adoption

Cumulative Electrified Floor Space (Million Sq Ft.)



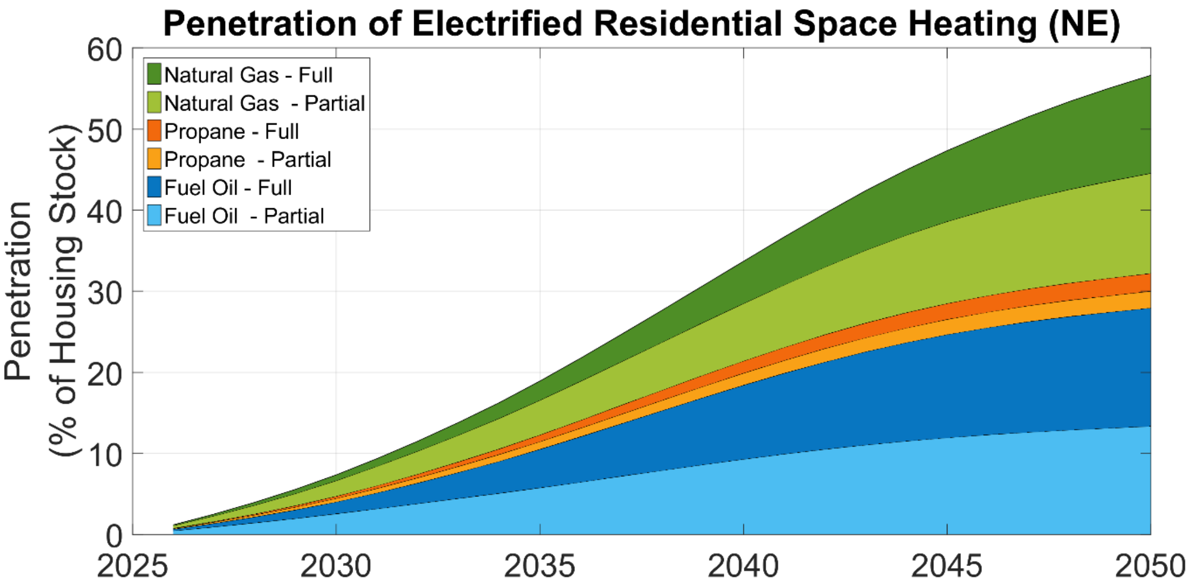
Annual Incremental Increase in Floor Space (Million Sq Ft.)

Year	CT	MA	ME	NH	RI	VT	NE
2026	1	3	1	<1	1	<1	6
2027	1	4	1	<1	1	<1	7
2028	2	5	1	1	1	<1	9
2029	2	7	1	1	1	<1	11
2030	2	8	1	1	1	<1	14
2031	3	11	2	1	1	1	18
2032	3	14	3	1	2	1	23
2033	4	17	3	1	2	1	28
2034	5	20	4	1	2	1	33
2035	6	23	4	2	3	1	38
Cumulative Adoption (2026-2035)	**30**	**111**	**20**	**9**	**13**	**5**	**188**

Fossil Fuel Displacement

New England – Residential Space Heating

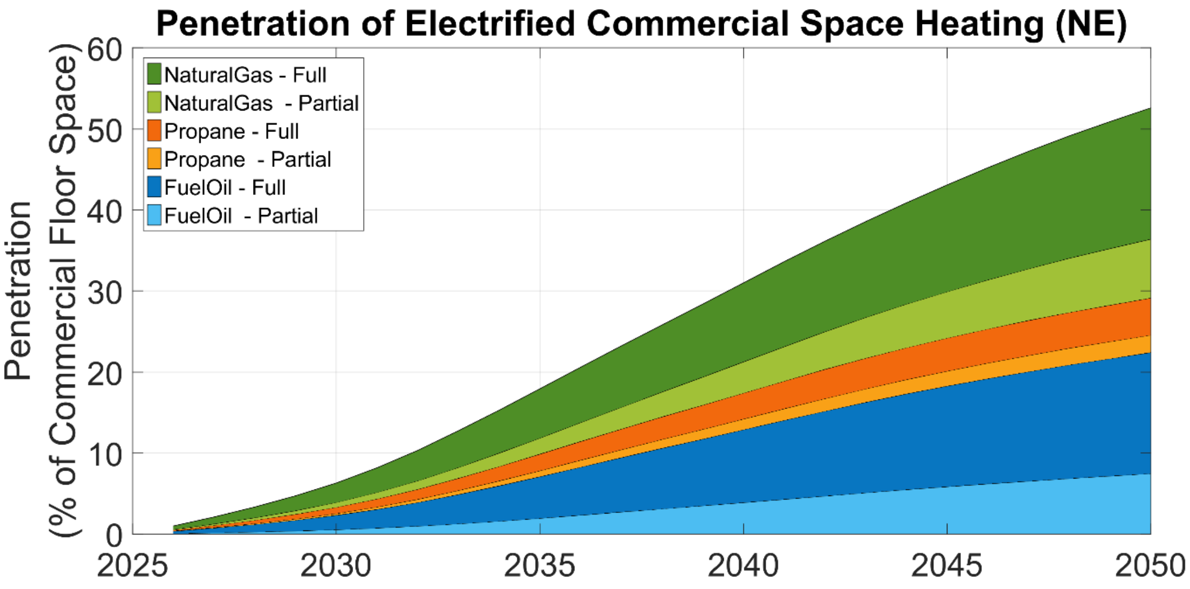
- Each band represents adoption for combinations of heating fuel and displacement type relative to the total New England Housing stock
- Forecast projects fossil fuels displaced by heat pumps will account for about 58% of total residential housing stock (c. 2022) by 2050
- Heat pump adoption primarily displaces fuel oil and natural gas



Fossil Fuel Displacement

New England – Commercial Space Heating

- Each band represents adoption for combinations of heating fuel and displacement type relative to the total New England commercial building stock
- Forecast projects fossil fuels displaced by heat pumps will account for about 52% of total commercial building space (c. 2022) by 2050
- Heat pump adoption primarily displaces fuel oil and natural gas



HOURLY MODELING METHODOLOGY

Hourly Demand Forecast Overview

- The methodology to model hourly HP demand aligns with the CELT 2025 forecast
  - See slides 29-37 and 64-71 of the CELT 2025 Heat Pump Forecast for further details
- Hourly electricity demand is developed across all hours of the 70-year weather simulation period, for each combination of sector, heating type, and pathway

1 Develop relationships between hourly heating usage and outdoor temperature for all building types

Inputs:

- NREL's ResStock and ComStock databases

2 Convert heating usage to electricity demand using reference HPs' coefficients of performance (COP)

Inputs:

- Relationship between temperature and HP efficiency ($COP = \frac{Heat\ Output}{Input\ Power}$)

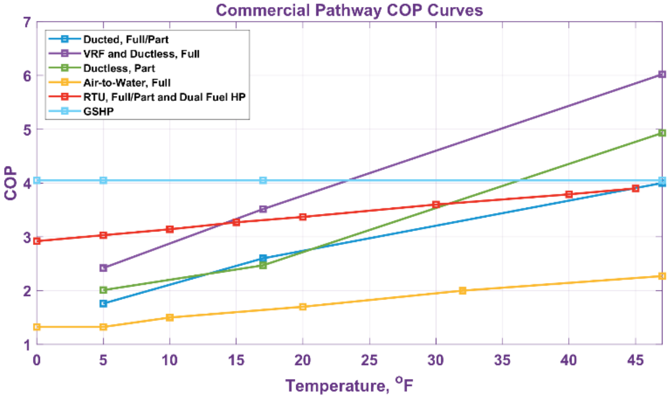
3 Develop HP electrical demand models

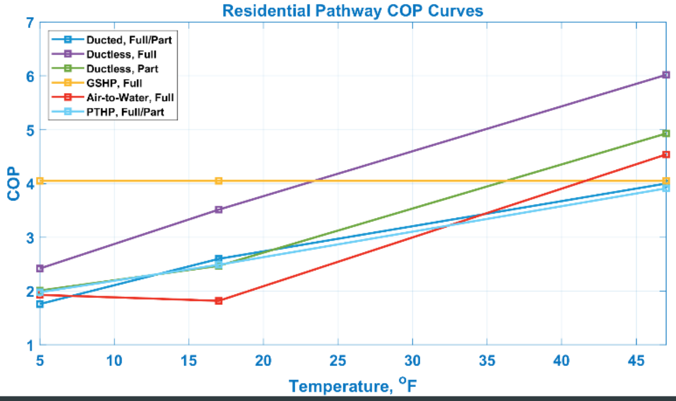
Assumptions:

- Space heating occurs at temperatures below 62°F
- Each combination of building type and heating pathway modeled separately

Modeling Inputs

Reference HPs



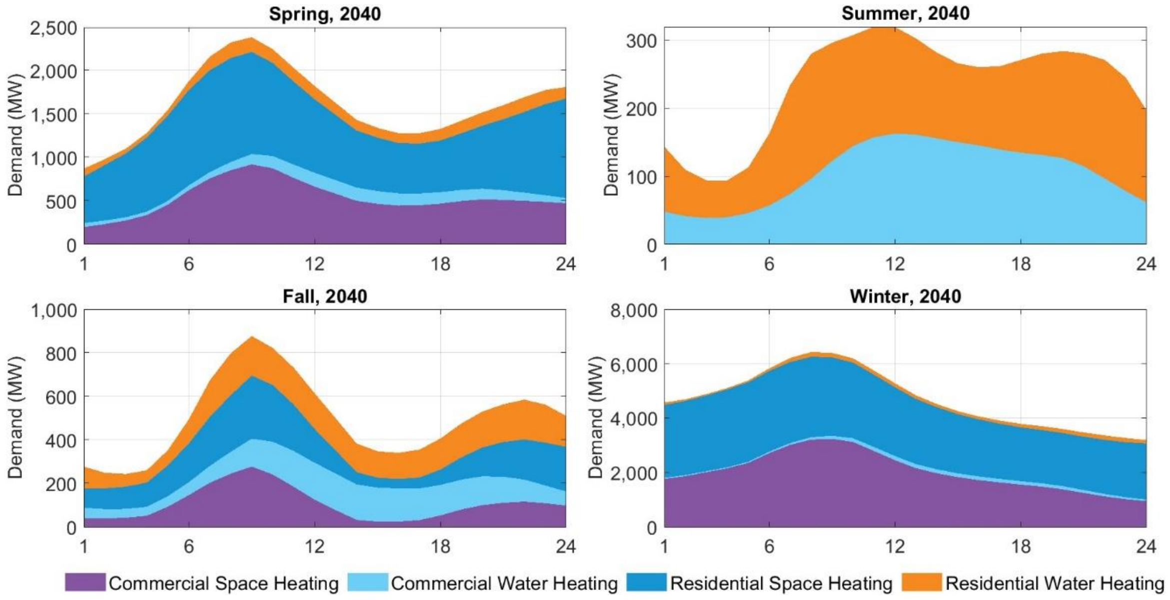


Sector	Pathway	Min. Temp.	Heating Supplied (%)
Commercial	Trane ACX (Air-to-Water)	0	100
Commercial	Rheem Renaissance Packaged HP (RTU)	0	81
Commercial	Lennox Central HP (Ducted Full)	5	100
Commercial	Lennox Central HP (Ducted Partial)	5	61-74
Commercial	Mitsubishi M-Series (Ductless Full)	-13	100
Commercial	Daikin DZ6VS (Ductless Partial)	5	63-76
Commercial	Energy Star rated models (GSHP)	-20	100
Commercial	Rheem Renaissance Packaged HP (RTU – Full)	0	100
Commercial	Rheem Renaissance Packaged HP (RTU – Partial)	0	81
Commercial	Mitsubishi M-Series (VRF)	-13	100
Residential	Taco Comfort System M (Air-to-Water)	-5	100
Residential	Lennox Central Heat Pump (Ducted Full)	5	100
Residential	Lennox Central Heat Pump (Ducted Partial)	5	63-74
Residential	Mitsubishi M-Series (Ductless Full)	-13	100
Residential	Aikin DZ6VS (Ductless Partial)	-13	65-76
Residential	Energy Star rated models (GSHP)	-20	100
Residential	ICE-AIR HP (PTHP)	5	81

Typical Seasonal Load Shapes

New England in Forecast Year 2040 by Sector and Heating Type

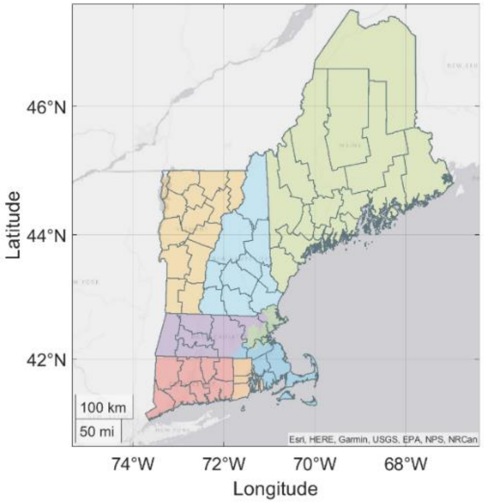
- Seasonal profiles highlight the effects of HP operation across the day and in varied weather conditions
- Space heating applications typically peak in the morning and may experience a second, smaller peak in the evening
- HP demand in the summer results solely from water heating applications

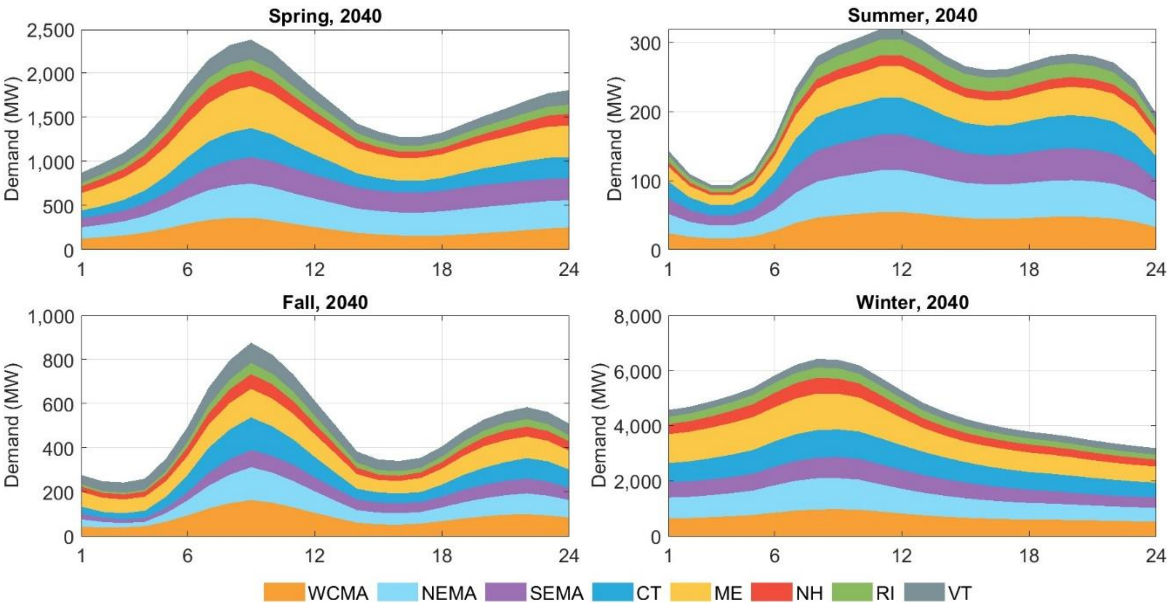


Typical Seasonal Load Shapes

New England in Forecast Year 2040 by Load Zone

- Hourly county-level HP forecasts are aggregated to load zones



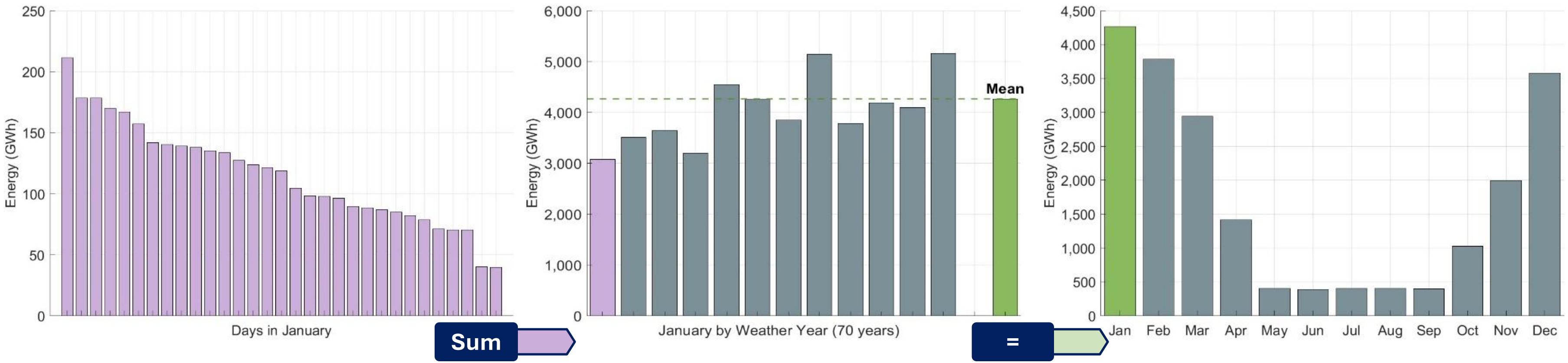


ENERGY AND PEAK DEMAND FORECAST

Methodology for Calculating HP Energy

Example: January, Forecast Year 2040

- HP energy values derive from hourly demand as follows:



1. Sum the hourly demand of each day in each month of a weather year
2. Sum the daily energy in each month of each weather year
3. Average the simulated energy across weather years to derive the monthly energy in a forecast year

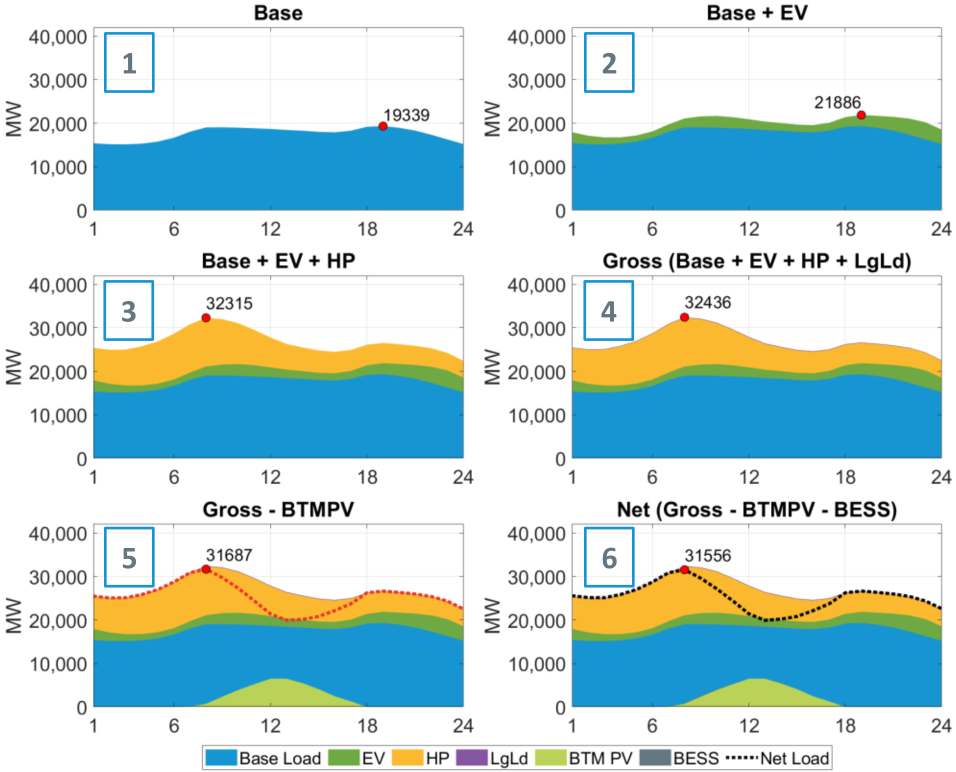
Calculating HP Demand Impacts on System Peak

- The hourly forecast results in a dynamic interplay of modeled load components
  - Peak hour shifts due to the growth of one component affect the peak attribution of other components
  - Attribution of peak load values to components is path dependent

- A waterfall approach to the attribution of peak load contributions is used to standardize this forecast accounting

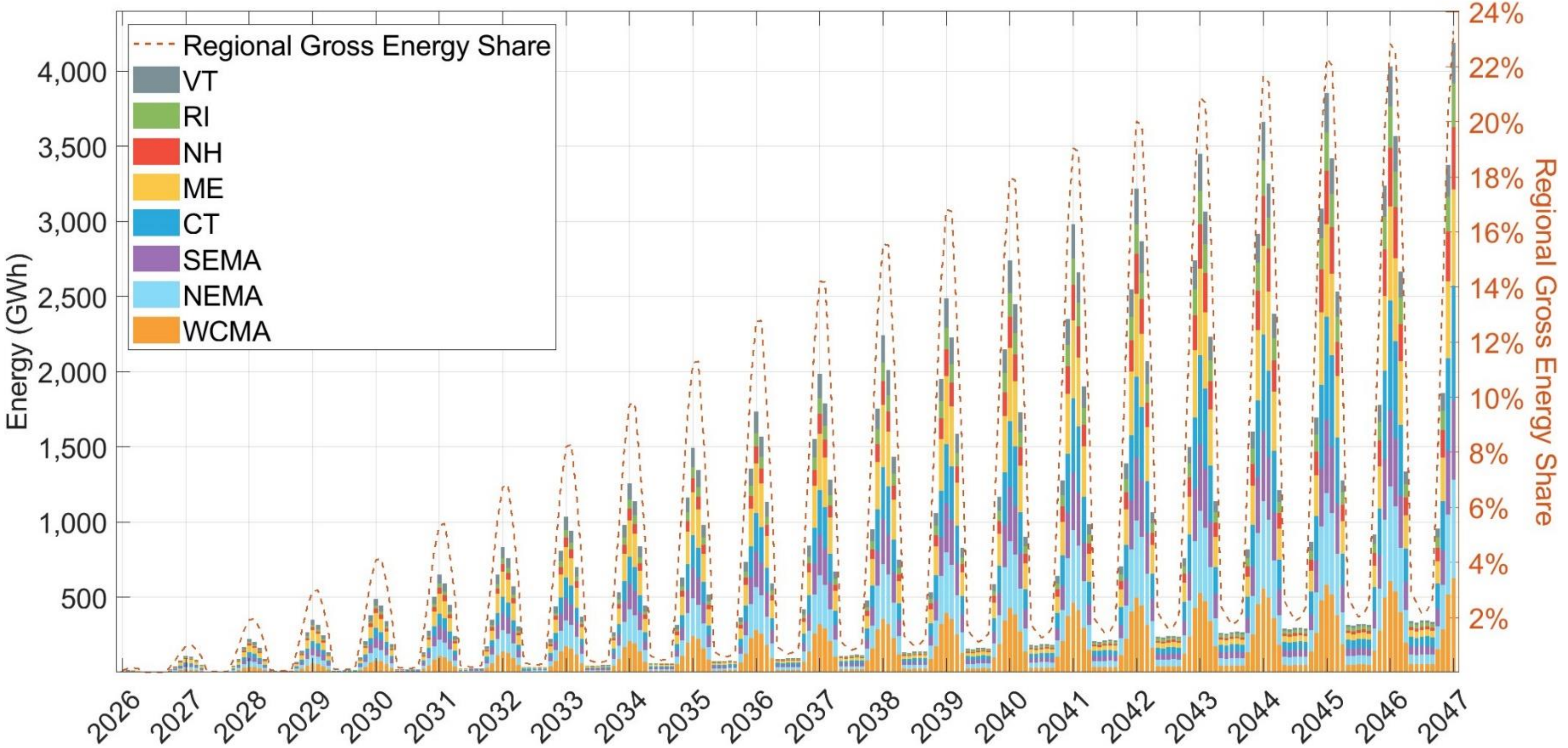
- Waterfall method steps (refer to plot):
  1. Base = Base peak load value
     19,339 MW
  2. EV = (Base+EV) – Base
     21,886 – 19,339 = 2,547 MW
  3. **HP = (Base+EV+HP) – (Base+EV)**
     32,315 – 21,886 = 10,429 MW
  4. LargeLd = (Base+EV+HP+LargeLd) – (Base+EV+HP)
     32,436 – 32,315 = 121 MW
  5. BTM PV = Gross – (Gross-BTM PV)
     32,436 – 31,687 = 749 MW
  6. BTM BESS = (Gross-BTM PV) – Net
     31,687 – 31,556 = 121 MW

Example Winter Peak Day, 2038



2026 HP Energy Forecast

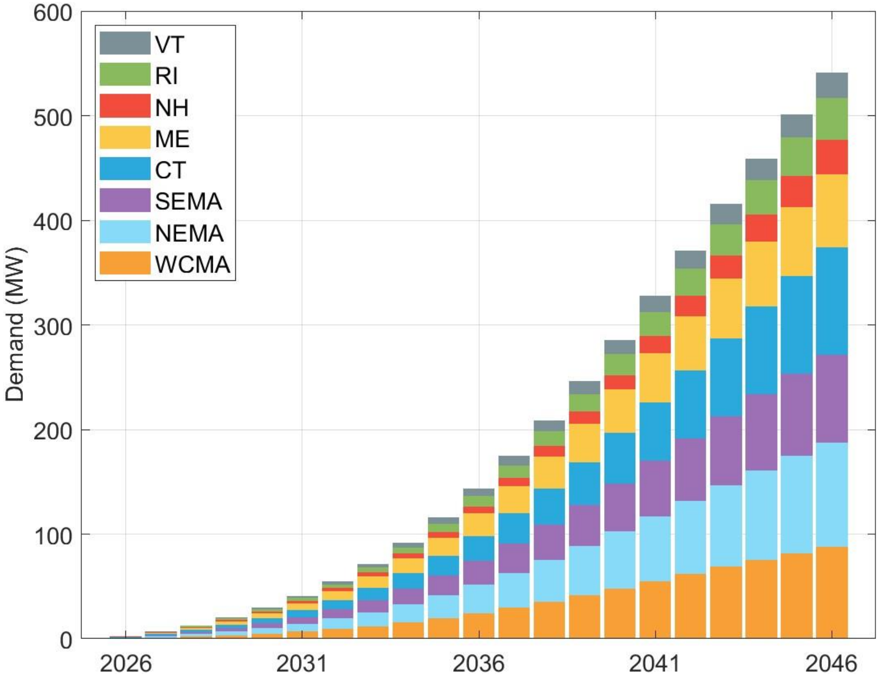
Monthly Energy by Load Zone



2026 HP Summer Peak Demand Forecast

Summer 50/50 Peak Demand by Load Zone

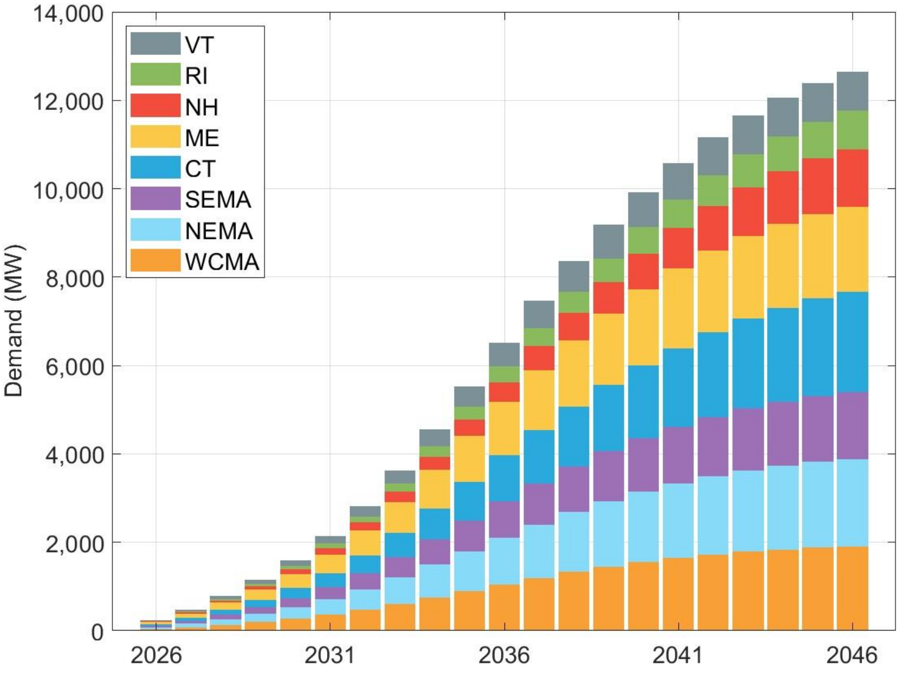
Summer Peak Demand (MW)									
Year	**CT**	**ME**	**NEMA**	**NH**	**RI**	**SEMA**	**VT**	**WCMA**	**ISONE**
2026	0	0	0	0	0	0	0	0	2
2027	1	1	1	0	1	1	0	1	7
2028	2	2	2	1	1	2	1	2	13
2029	4	3	4	1	1	3	1	3	20
2030	5	4	5	2	2	5	1	5	29
2031	7	6	8	2	3	6	2	7	41
2032	9	8	10	3	4	9	3	9	55
2033	12	11	13	4	5	11	4	12	72
2034	15	14	17	5	6	15	5	15	92
2035	19	17	22	6	8	19	6	20	116



2026 HP Winter Peak Demand Forecast

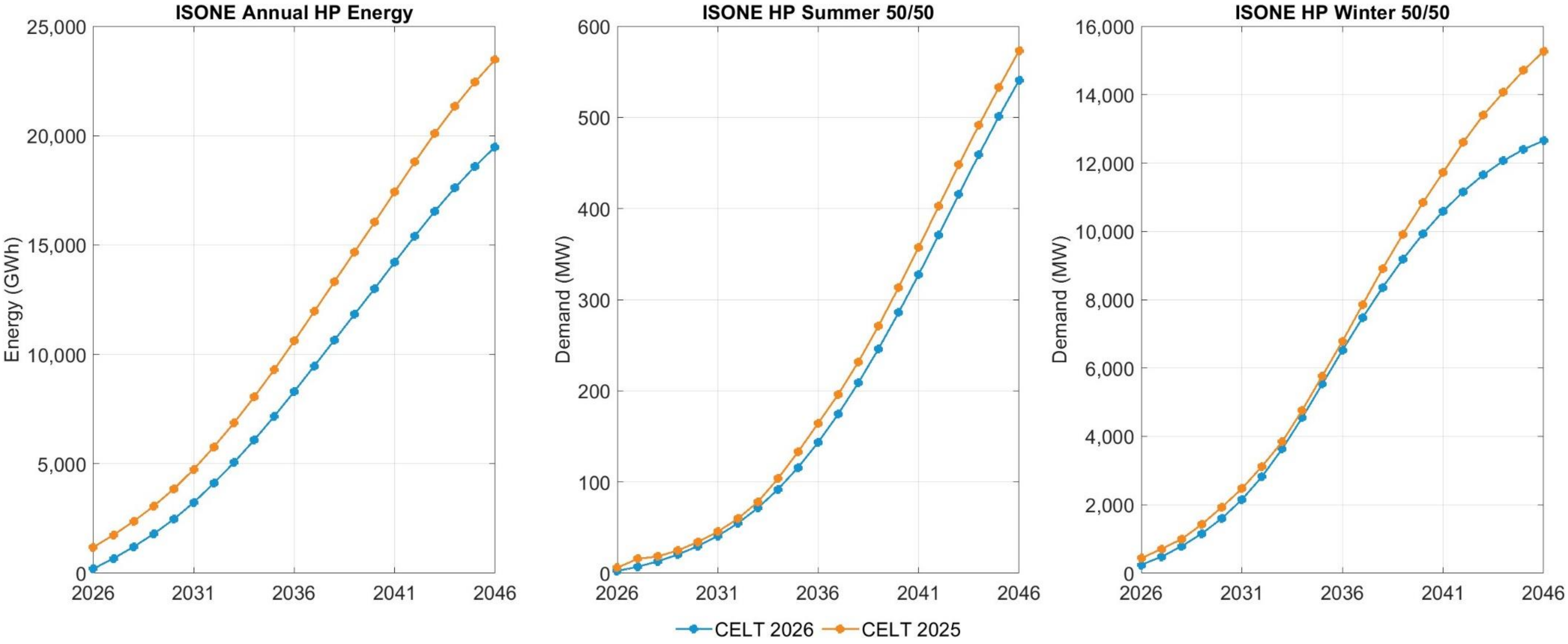
Winter 50/50 Peak Demand by Load Zone

Winter Peak Demand (MW)									
Year	CT	ME	NEMA	NH	RI	SEMA	VT	WCMA	ISONE
2026	35	49	40	15	11	31	18	41	241
2027	68	99	80	30	23	62	38	81	480
2028	110	159	131	50	37	101	63	132	783
2029	161	233	191	75	54	149	96	194	1,152
2030	224	322	264	106	75	206	134	268	1,600
2031	308	425	355	141	103	276	180	360	2,149
2032	411	555	465	184	139	362	237	471	2,823
2033	540	701	600	235	185	465	303	603	3,631
2034	699	864	747	298	235	576	382	748	4,550
2035	874	1,037	902	373	290	695	463	899	5,533



Seasonal Peak Demand and Annual Energy

New England CELT 2025 and CELT 2026 Comparison



Seasonal Peak Demand

New England 50/50 and 90/10 Comparison