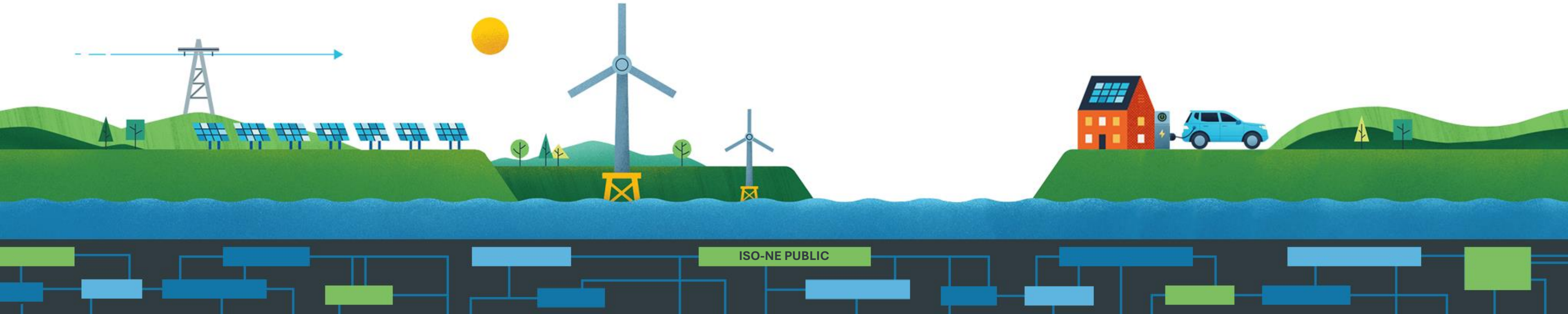
MAY 1, 2025

Final 2025 Electric Vehicle Forecast

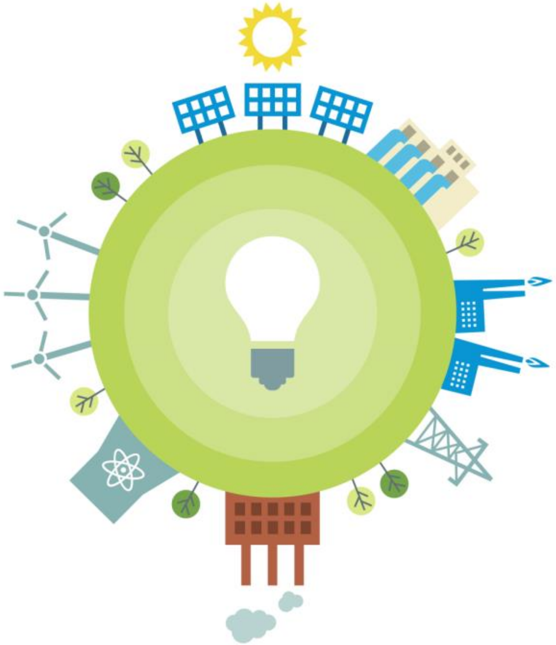


Acronyms

BTM PV	Behind-the-meter Photovoltaic	**LDV**	Light-Duty Vehicle
BEV	Battery Electric Vehicle	**LFC**	Load Forecast Committee
CELT	Capacity, Energy, Load, and Transmission	**MHD**	Medium/Heavy Duty
DER	Distributed energy resource	**PHEV**	Plugin Hybrid Electric Vehicle
EPRI	Electric Power Research Institute	**PLDV**	Personal Light-Duty Vehicle
EV	Electric Vehicle	**PV**	Photovoltaic
EVMC	Electric Vehicle Managed Charging	**VMT**	Vehicle Miles Traveled
FLDV	Fleet Light-Duty Vehicle		

Outline

- Introduction & Overview
- Electric Vehicle Adoption Forecast
- Hourly Demand Modeling Methodology
- Energy and Peak Demand Forecast



Introduction

- Transportation electrification is expected to play a pivotal role in the achievement of New England state greenhouse gas (GHG) reduction mandates and goals
- Forecasted impacts of transportation electrification on state and regional electric energy and demand are included as part of the 2025 Capacity, Energy, Loads, and Transmission (CELT) forecast

Methodology Updates for CELT 2025

- The methodology used to model and forecast electric vehicles (EVs) remains relatively unchanged from the prior forecast cycle
  - Prior to CELT 2025 the EV forecast produced hourly results at the state level
  - Full set of hourly results could not be used prior to CELT 2025 since the gross load forecast only modeled peaks
    - Peak modeling utilized an assumed window of summer and winter peak hours
    - See the CELT 2024 Electric Vehicle Forecast for further methodology details
- For CELT 2025 the EV forecast consists of hourly forecasts, with accounting at the county level, reflecting climate adjusted weather
  - The same climate scenario will be used to simulate the base load and each electrification forecast over the 70 year simulation period, as discussed on slide 11 of the Update to Forecast Data Sources presentation
  - Peak demand impacts are determined from the compilation of the gross and net load forecasts as illustrated on slide 30 of this presentation

Electric Vehicle Forecast Methodology

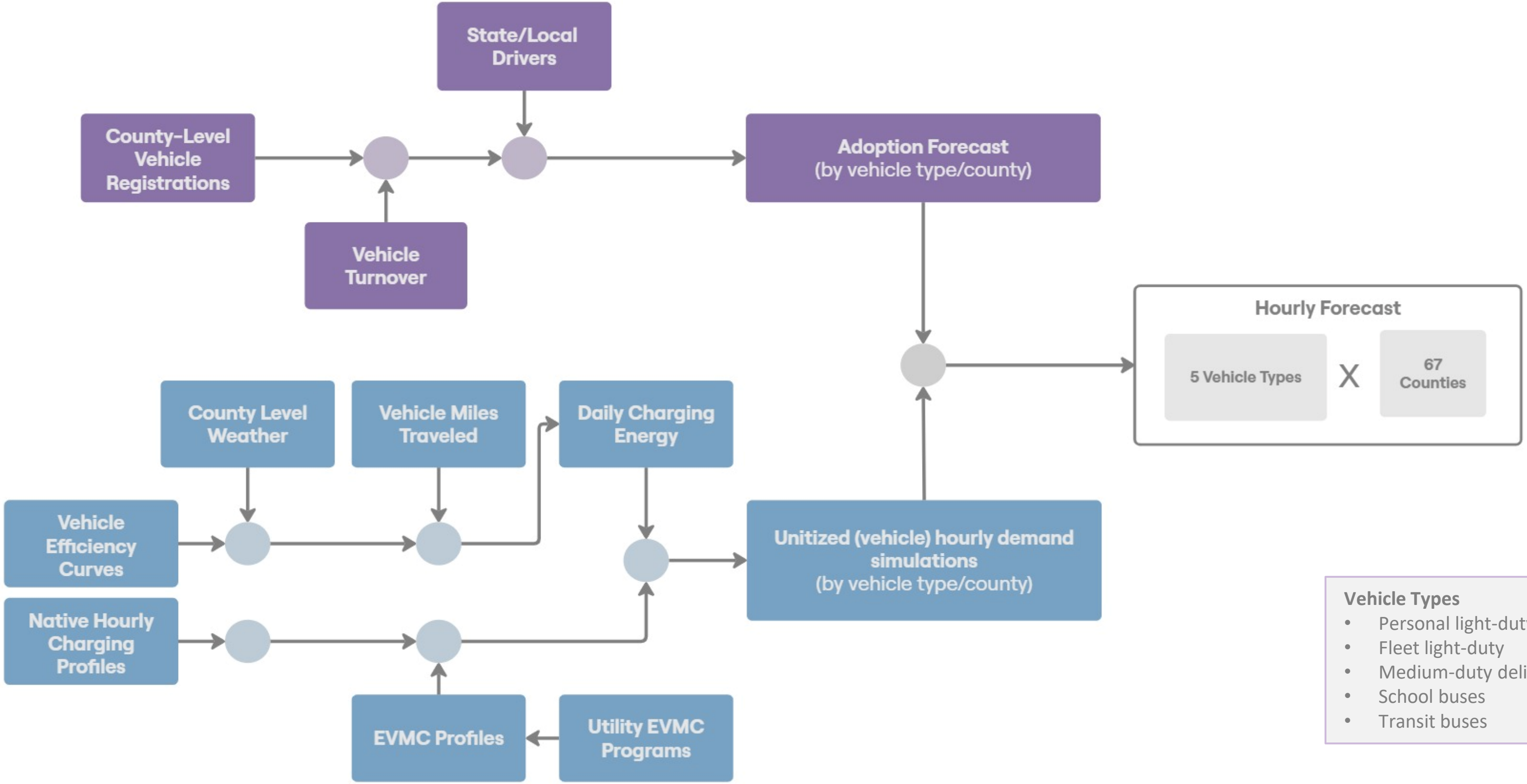
Forecast energy and demand impacts of EV adoption across five categories of vehicles in New England:

- light-duty personal
- light-duty fleet
- medium-duty delivery
- school buses
- transit buses

Forecast Methodology

1. Inventorying New England vehicle population and policy landscape
2. Adoption forecasting
   - Level of EV adoption for each vehicle class considering local, state, and federal initiatives
3. Hourly demand modeling
   - Captures the electric impacts of EV adoption in each vehicle class
   - Reflects increasing levels of managed charging for personal light-duty vehicles over the next decade
4. Calculating energy and peak demand
   - Energy stems from direct summation of simulated hourly demand
   - Peak demand is derived with a “waterfall” approach using peak magnitudes that arise considering all components of load

Electric Vehicle Forecast Process



Vehicle Types
- Personal light-duty
- Fleet light-duty
- Medium-duty delivery
- School buses
- Transit buses

ELECTRIC VEHICLE ADOPTION FORECAST

Updates to EV Adoption Modeling

- In the absence of comprehensive EV adoption data, previous EV adoption forecasts relied heavily on state and local policy objectives
  - Initial EV adoption data reviewed for CELT 2024 indicated our personal light-duty EV adoption forecast was too high
    - The CELT 2024 forecast incorporated reductions in personal light-duty EV adoption
  - Recently compiled EV adoption data for the last few years has shown that our EV adoption forecast across all vehicle types remains too high, and is out of sync with recent adoption trends

- EV adoption forecasts for CELT 2025
  - Revised adoption profiles have been calibrated to recent EV adoption rates in each state
    - Going forward, EV adoption trends will be recalibrated each year to observed EV adoption trends
  - Adoption forecasts across all vehicle categories have been reduced relative the previous CELT forecast to account for:
    - Consistent EV adoption rates that fall below CELT forecasts
    - Increased uncertainty in policy surrounding EV adoption and funding to support infrastructure buildout

EV Adoption Benchmarking for CELT 2024

*Incremental Growth in EVs from Q3 2023 to Q3 2024**

- EV adoption in the CELT 2024 forecast was mostly higher than actual values
  - Actual adoption figures listed below measure adoption from Q3 of 2023 to Q3 of 2024, likely resulting in slight undercounting of EV adoption across the calendar year. However, figures are assumed to be indicative of annual growth.
- EV adoption projections across all vehicle categories have been revised downward for the CELT 2025 forecast

State Growth in Personal Light-Duty EVs

	NE	CT	MA	ME	NH	RI	VT
Actual†	63,445	14,666	30,991	4,670	4,833	3,513	4,772
CELT 2024	109,338	23,074	61,269	9,218	4,801	6,090	4,886
Difference	**45,893**	**8,408**	**30,278**	**4,548**	**-32**	**2,577**	**114**

State Growth in Fleet Light-Duty EVs

	NE	CT	MA	ME	NH	RI	VT
Actual†	3,503	499	1,734	252	423	297	298
CELT 2024	9,698	782	7,175	1,002	345	228	228
Difference	**6,195**	**283**	**5,441**	**750**	**-78**	**-69**	**-70**

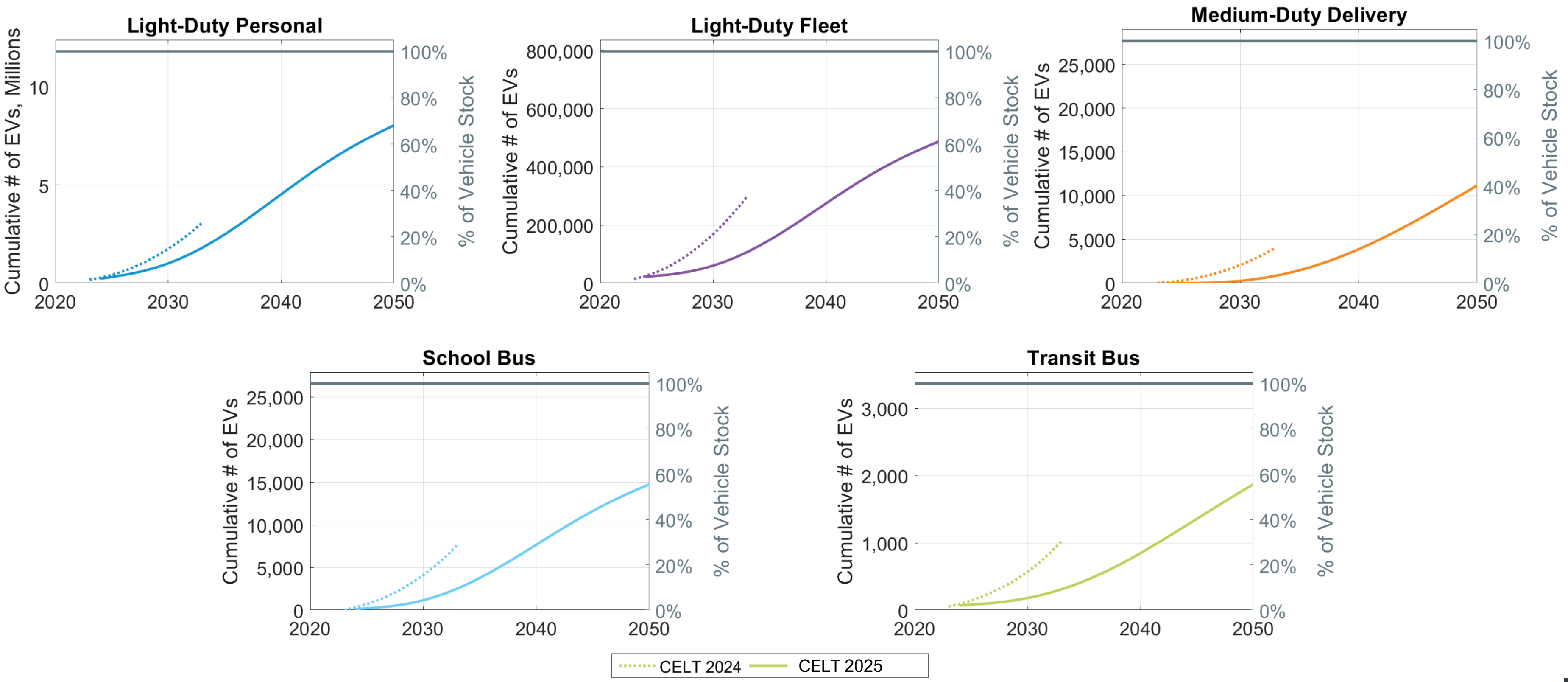
New England Growth in MHD EVs

	School Bus ‡	Transit Bus†	Medium Duty Delivery
Actual	91	16	0
CELT 2024	300	38	100
Difference	**209**	**22**	**100**

** All "actual" figures are preliminary and subject to change.*
† Source: Experian Information Solutions, Inc.
‡ Source: World Resources Institute

2025 EV Adoption Forecast

Cumulative EV Stock for New England



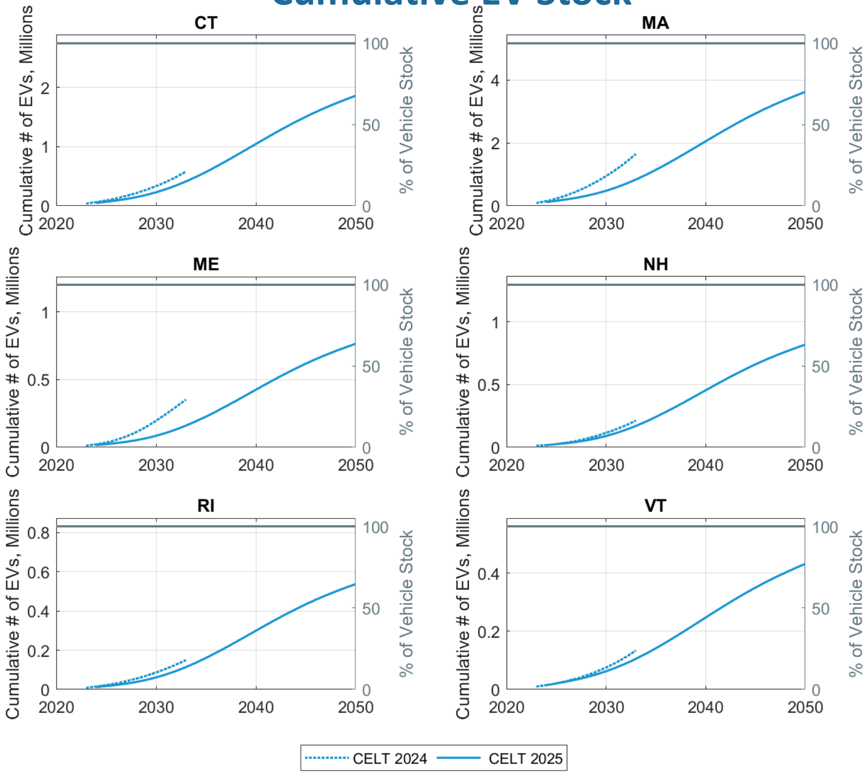
2025 EV Adoption Forecast

Annual Incremental Increase in EV Stock for New England

Year	Personal Light-Duty	Fleet Light-Duty	Medium Duty Delivery	School Bus	Transit Bus
2025	86,863	3,484	2	83	12
2026	92,872	3,890	9	95	12
2027	108,981	4,979	24	128	15
2028	132,813	6,589	44	178	19
2029	162,185	8,575	76	238	25
2030	195,115	10,800	110	307	29
2031	229,813	13,144	150	380	35
2032	264,683	15,501	195	455	43
2033	298,327	17,776	240	527	51
2034	329,543	19,884	289	597	57
10-year total (2025-2034)	**1,901,195**	**104,622**	**1,139**	**2,988**	**298**
EV % of Vehicle Stock 2024 (Actual)	**1.9%**	**2.7%**	**0.0%**	**0.6%**	**2.0%**
EV % of Vehicle Stock 2034 (Forecast)	**18.1%**	**15.8%**	**4.1%**	**11.7%**	**10.9%**

Personal Light-Duty EV Adoption

Cumulative EV Stock

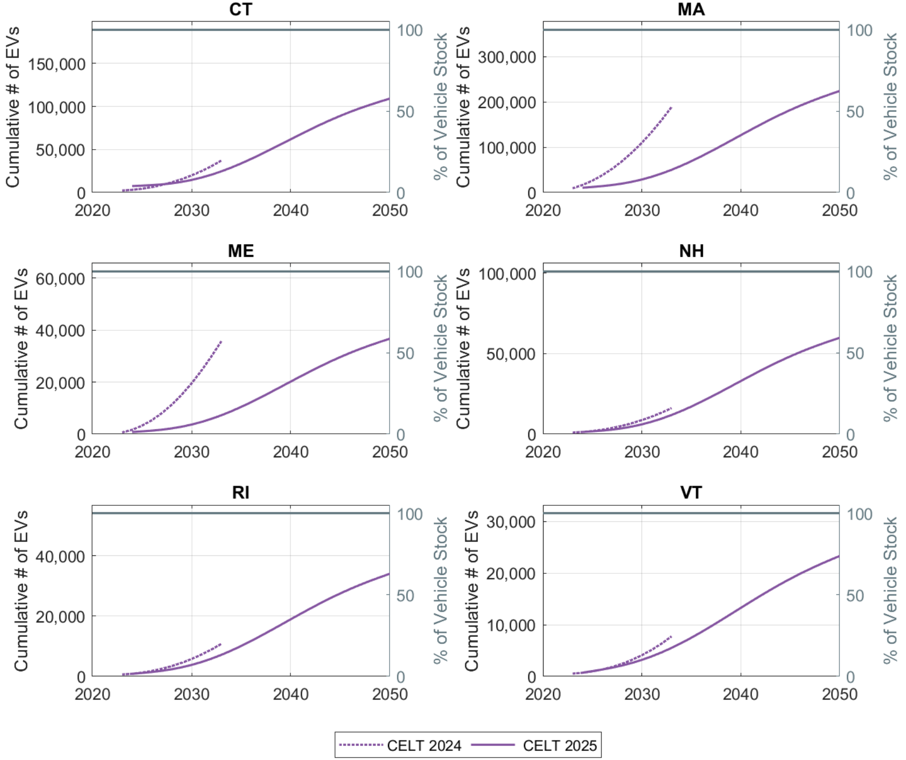


Annual Incremental Increase in EV Stock

Year	CT	MA	ME	NH	RI	VT	NE
2025	20,048	41,295	7,082	7,382	5,160	5,896	86,863
2026	21,447	43,925	7,693	8,042	5,583	6,182	92,872
2027	25,197	50,973	9,332	9,810	6,720	6,949	108,981
2028	30,745	61,400	11,757	12,426	8,401	8,084	132,813
2029	37,583	74,252	14,745	15,650	10,473	9,482	162,185
2030	45,249	88,661	18,095	19,265	12,796	11,049	195,115
2031	53,327	103,843	21,625	23,074	15,243	12,701	229,813
2032	61,444	119,100	25,173	26,902	17,703	14,361	264,683
2033	69,276	133,821	28,596	30,596	20,076	15,962	298,327
2034	76,543	147,480	31,772	34,022	22,278	17,448	329,543
10-year total (2025-2034)	**440,859**	**864,750**	**175,870**	**187,169**	**124,433**	**108,114**	**1,901,195**

Fleet Light-Duty EV Adoption

Cumulative EV Stock

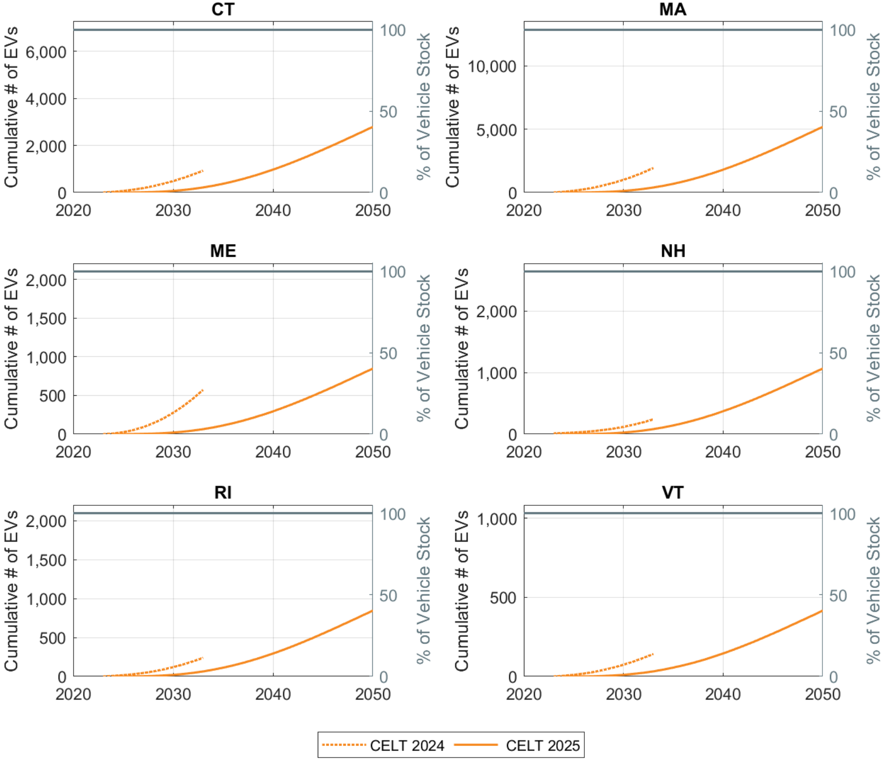


Annual Incremental Increase in EV Stock

Year	CT	MA	ME	NH	RI	VT	NE
2025	492	1,723	250	424	298	297	3,484
2026	588	1,906	282	476	325	313	3,890
2027	846	2,396	368	614	399	356	4,979
2028	1,228	3,121	494	818	508	420	6,589
2029	1,699	4,014	650	1,070	643	499	8,575
2030	2,227	5,016	824	1,352	794	587	10,800
2031	2,783	6,071	1,008	1,649	953	680	13,144
2032	3,342	7,132	1,193	1,947	1,113	774	15,501
2033	3,881	8,156	1,372	2,236	1,267	864	17,776
2034	4,381	9,105	1,537	2,503	1,410	948	19,884
10-year total (2025-2034)	**21,467**	**48,640**	**7,978**	**13,089**	**7,710**	**5,738**	**104,622**

Medium-Duty Delivery EV Adoption

Cumulative EV Stock

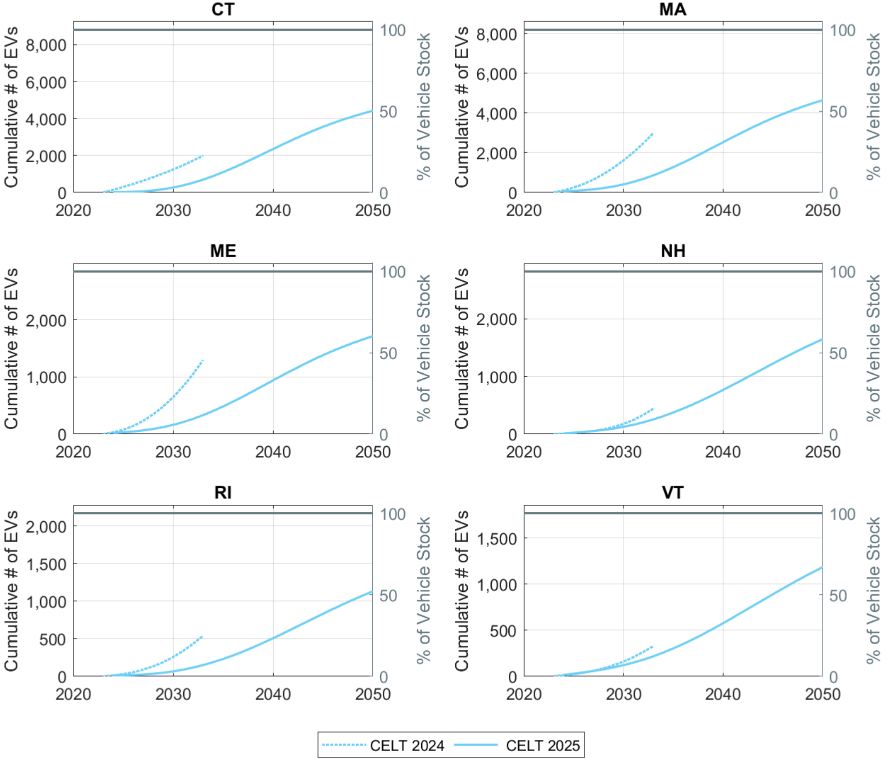


Annual Incremental Increase in EV Stock

Year	CT	MA	ME	NH	RI	VT	NE
2025	1	1	0	0	0	0	2
2026	2	4	1	1	1	0	9
2027	6	11	2	2	2	1	24
2028	11	21	3	4	3	2	44
2029	19	35	6	7	6	3	76
2030	28	51	8	11	8	4	110
2031	38	70	11	14	11	6	150
2032	49	90	15	19	15	7	195
2033	60	112	18	23	18	9	240
2034	72	134	22	28	22	11	289
10-year total (2025-2034)	**286**	**529**	**86**	**109**	**86**	**43**	**1,139**

School Bus EV Adoption

Cumulative EV Stock

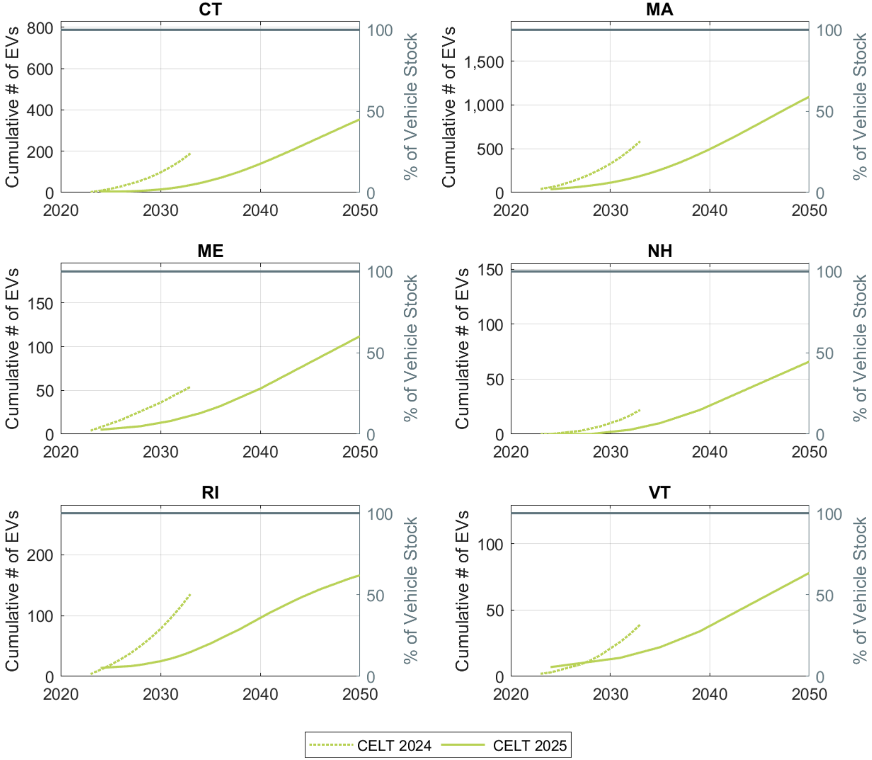


Annual Incremental Increase in EV Stock

Year	CT	MA	ME	NH	RI	VT	NE
2025	11	29	14	12	4	13	83
2026	15	33	15	13	5	14	95
2027	27	44	19	16	7	15	128
2028	45	61	25	19	10	18	178
2029	67	81	32	24	13	21	238
2030	91	104	40	30	18	24	307
2031	117	128	48	36	23	28	380
2032	143	152	57	43	28	32	455
2033	168	175	65	50	33	36	527
2034	192	197	73	56	38	41	597
10-year total (2025-2034)	**876**	**1,004**	**388**	**299**	**179**	**242**	**2,988**

Transit Bus EV Adoption

Cumulative EV Stock



Annual Incremental Increase in EV Stock

Year	CT	MA	ME	NH	RI	VT	NE
2025	0	9	1	0	1	1	12
2026	0	9	1	0	1	1	12
2027	1	11	1	0	1	1	15
2028	2	13	1	0	2	1	19
2029	3	15	2	1	3	1	25
2030	4	18	2	1	3	1	29
2031	5	22	2	1	4	1	35
2032	7	25	3	1	5	2	43
2033	9	29	3	2	6	2	51
2034	10	33	3	2	7	2	57
10-year total (2025-2034)	**41**	**184**	**19**	**8**	**33**	**13**	**298**

HOURLY MODELING METHODOLOGY

Hourly Modeling Overview

- Methodology for modeling hourly demand remains largely unchanged from the CELT 2024 forecast
  - See blue boxes on slide 7 for a graphical summary

Inputs

Specific to each vehicle type

- Annual vehicle miles traveled (VMT)
- Monthly allocation of VMT
  - Reflects seasonal driving patterns
  - Allocations for monthly VMT to weekdays/weekends
- Hourly allocation of daily charging, by month
  - Shapes for weekdays and weekends
- Relationship between weather (daily average dry-bulb) and EV efficiency (kWh/mile)

Process

Hourly demand is developed across all hours of the 70 year weather simulation period, for each vehicle type

- Develop VMT assumptions for weekends and weekdays within each month
- Apply temperature sensitive efficiency relationships to weather to calculate daily energy
- Apply daily charging shapes, and phased-in EV managed charging assumptions to allocate charging to hours
- Scale to adoption forecast

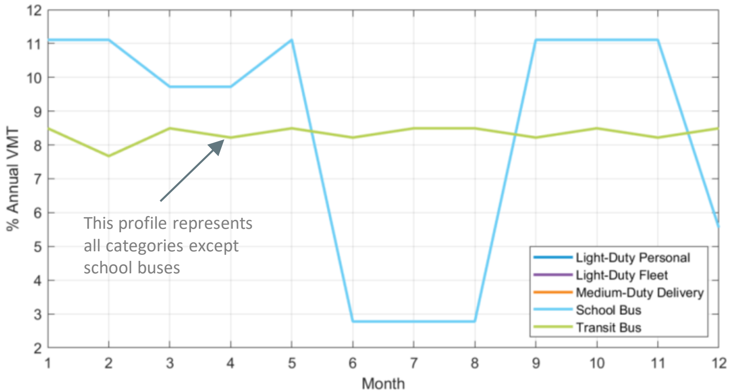
Modeling Inputs

Vehicle Miles Traveled (VMT)

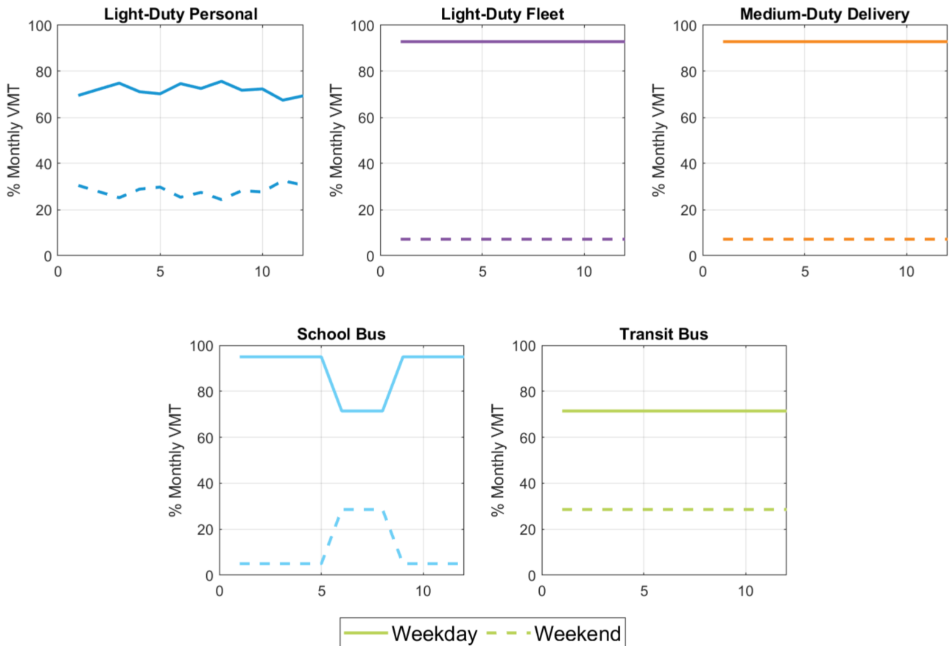
Annual VMT

Vehicle Category	Average Annual VMT
School bus	11,483
Transit bus	38,488
Medium-duty delivery	13,655
Light-duty fleet	21,258
Light-duty personal	11,505

Monthly VMT Allocation

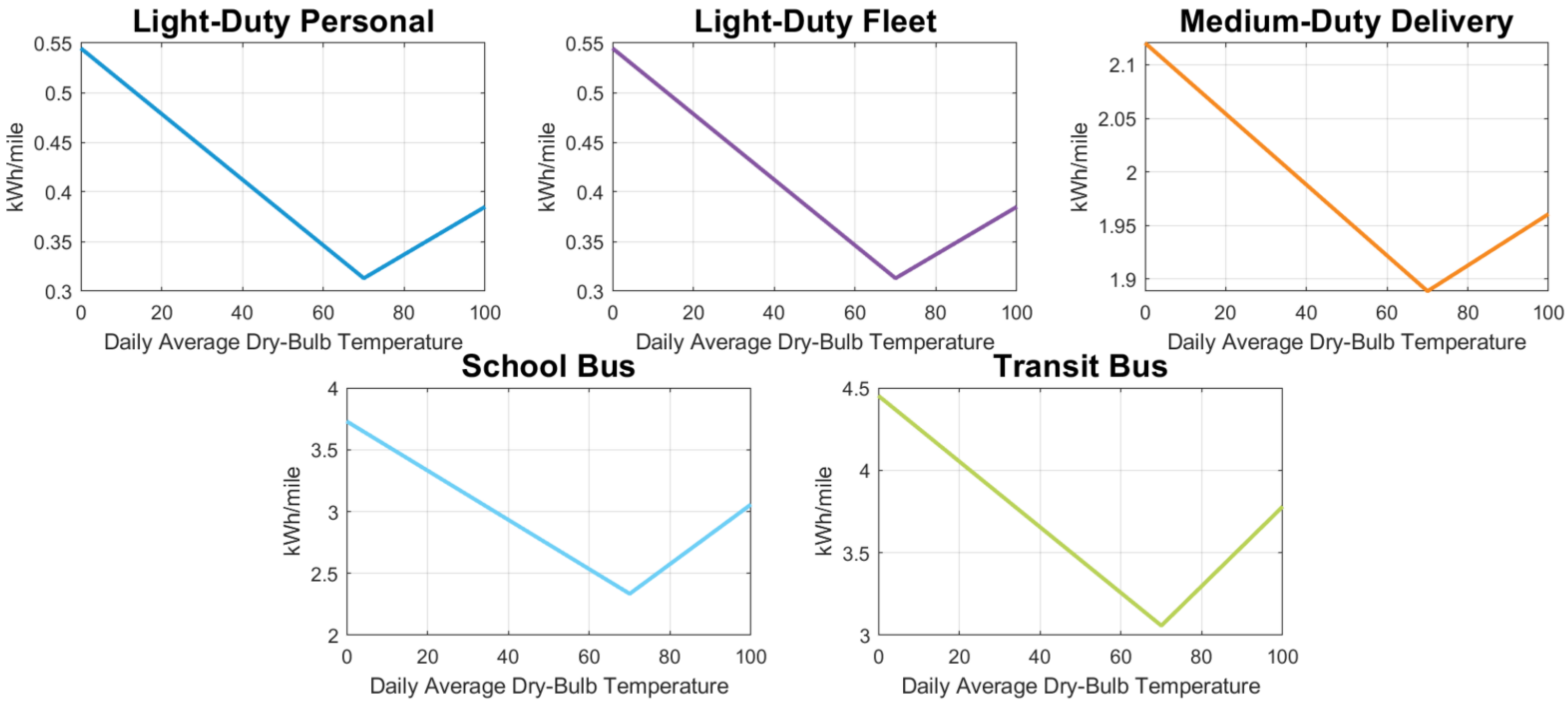


Day-type VMT Allocation



Modeling Inputs

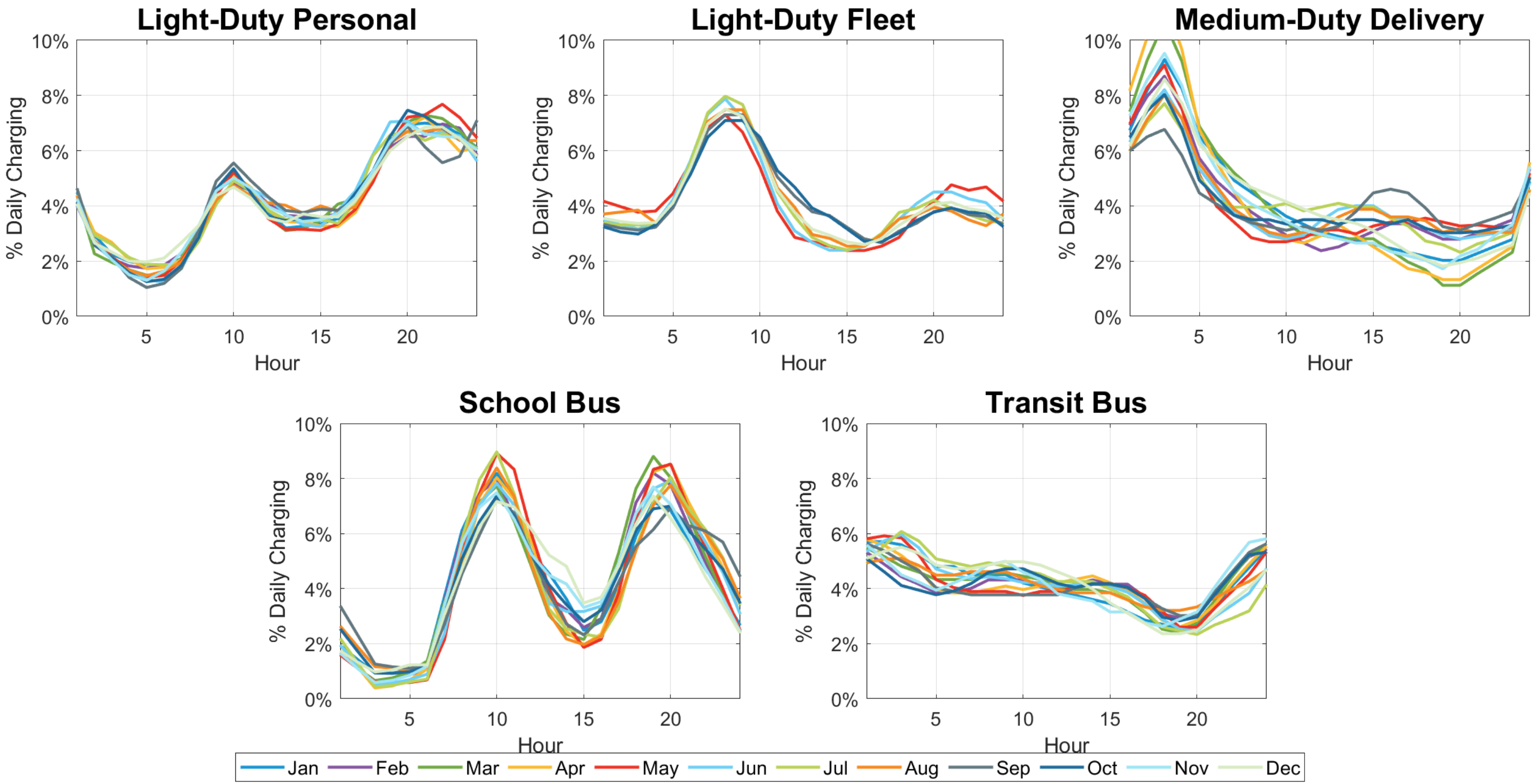
EV Efficiency: Energy Consumption as a Function of Daily Temperature



** School bus and transit bus efficiencies reflect an adjustment for the partial use of auxiliary cabin heating systems*

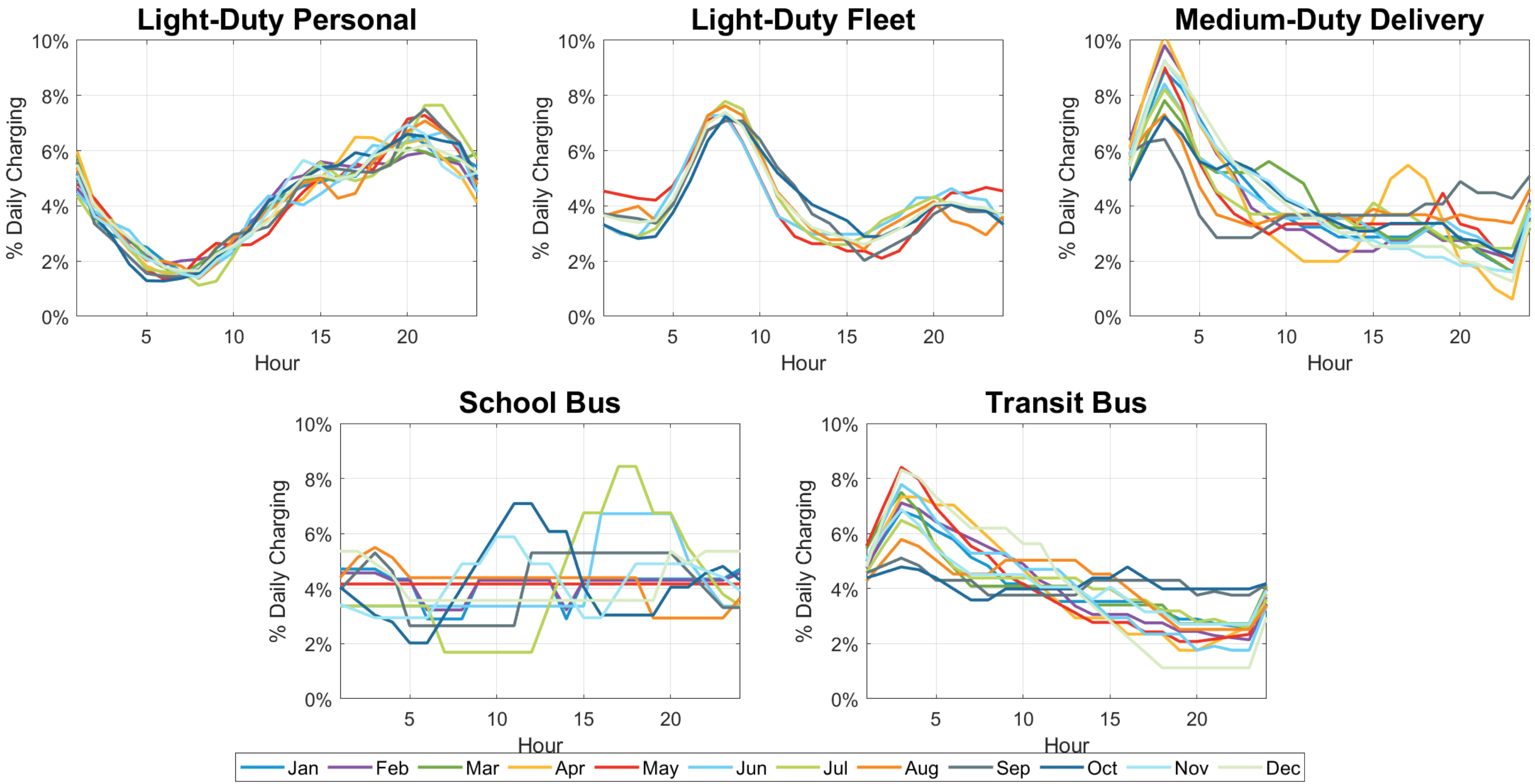
Modeling Inputs

Allocation of Hourly Charging by Month for Non-Holidays & Weekdays



Modeling Inputs

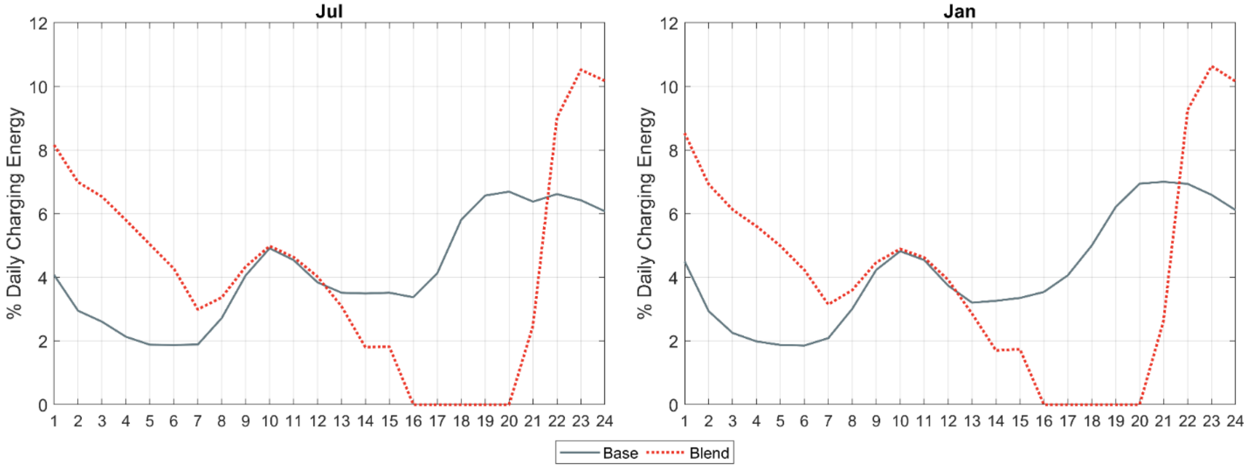
Allocation of Hourly Charging by Month for Holidays & Weekends



EV Managed Charging Participation Assumptions

Personal Light-Duty Vehicles

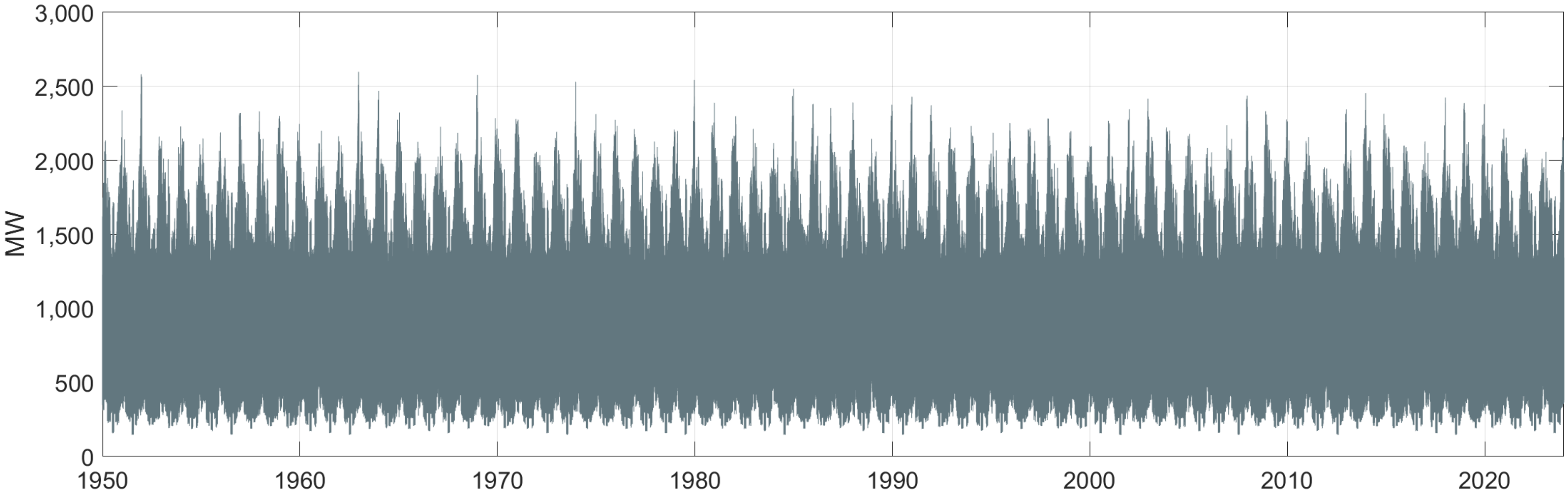
- The CELT 2025 forecast incorporates a gradual uptick in managed charging participation of personal light-duty EVs in New England over the next 10 years:
  - 2% participation in 2025
  - 11% participation in 2034
  - Incremental increase of 1% per year for years beyond 2034
- The regional blended EVMC profile shown in red below is phased into the personal light-duty EV population over the forecast horizon at the levels shown in the table to the right. (See the January 12, 2024 presentation on Electric Vehicle Managed Charging details on methodology)



Year	Participation Level (% of EV population)
2025	2%
2026	3%
2027	4%
2028	5%
2029	6%
2030	7%
2031	8%
2032	9%
2033	10%
2034	11%

Hourly Demand Across All Simulation Years

Example of Simulated Hourly EV Profiles for New England in 2034

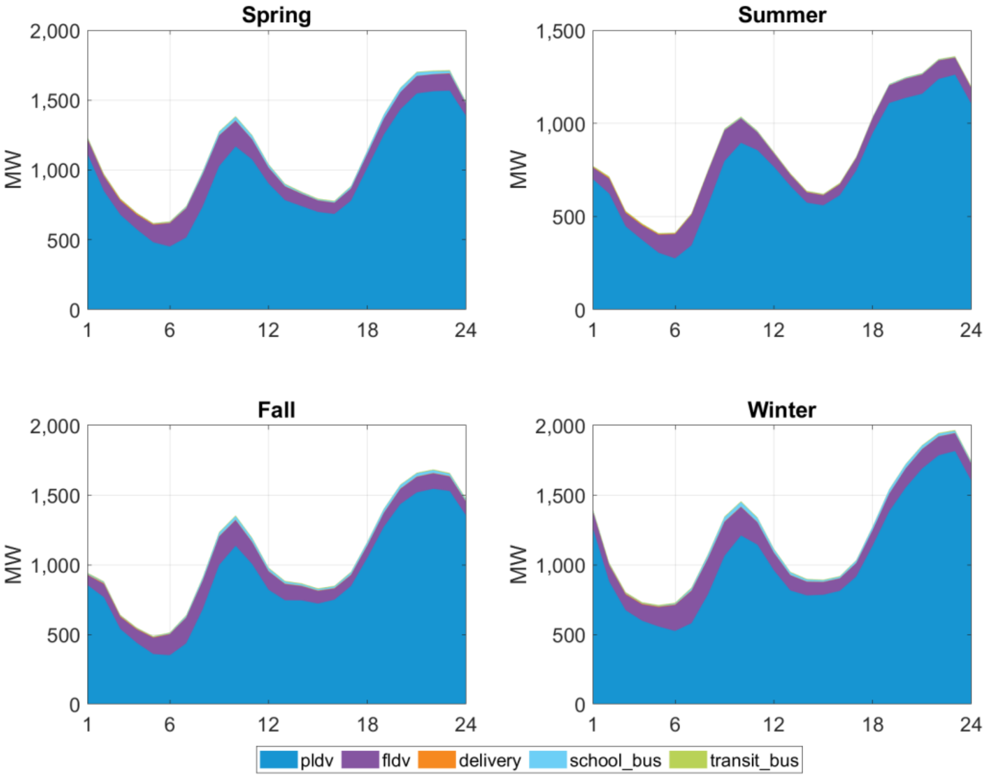


Typical Seasonal Load Shapes

New England 2034, by Vehicle Type

- Example seasonal profiles highlight how the hourly modeling captures the effects of EV charging across all hours of the day, during varied weather and calendar conditions

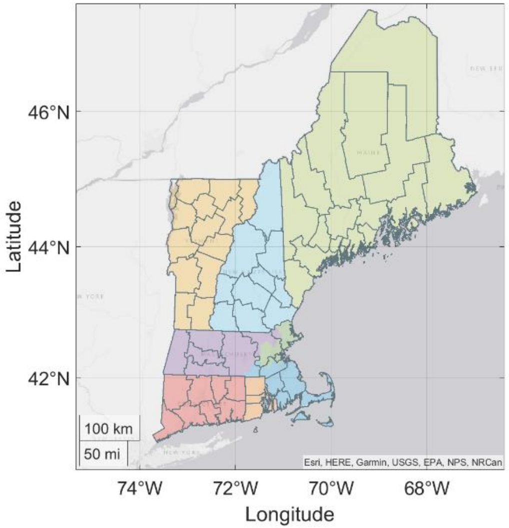
- Personal and fleet light-duty vehicles make up the largest share of EV charging demand throughout the forecast horizon

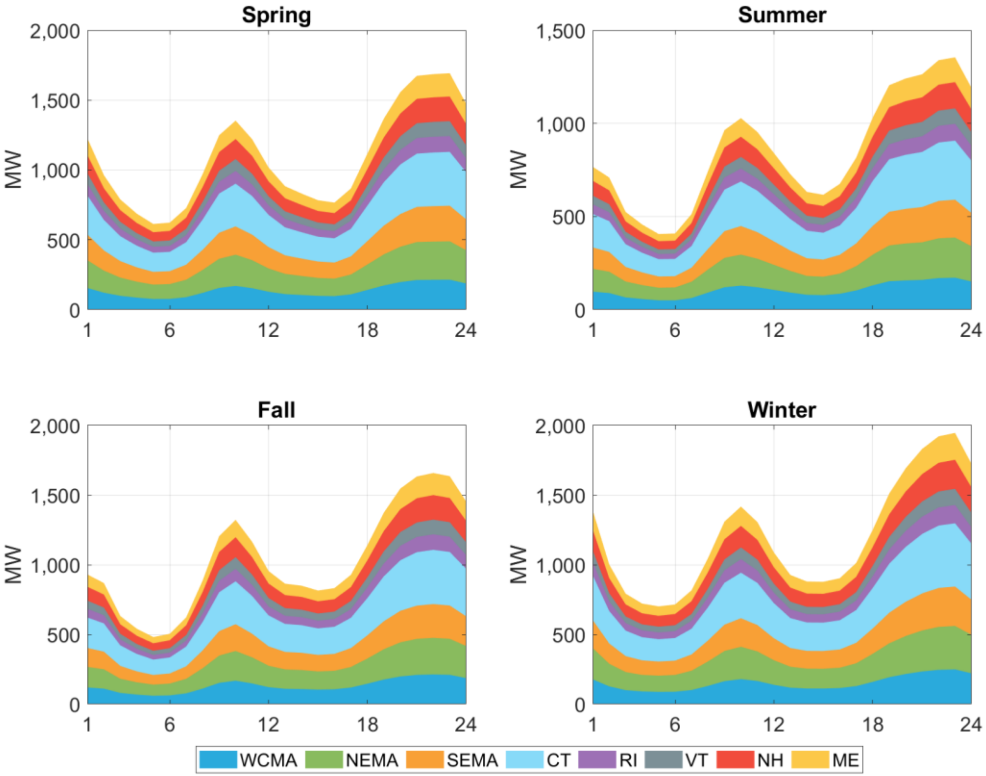


Typical Seasonal Load Shapes

New England 2034, by Load Zone

- Hourly county-level EV forecasts are aggregated to load zones based on recent EV adoption data





ENERGY AND PEAK DEMAND FORECAST

Methodology for Calculating EV Energy

- EV energy values stem directly from summing simulated hourly EV demand
- For a given forecast year, monthly energy is calculated as follows:
  1. Sum the hourly demand for all hours in each month, for each simulation year to get monthly simulated energy
  2. Average the simulated monthly energy for each month (e.g. average 70 monthly July energy values) to arrive at monthly energy values for a single forecast year

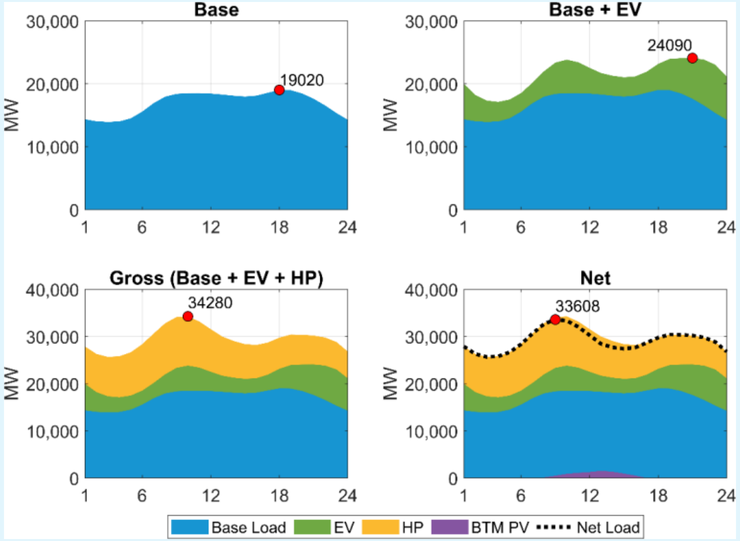
Methodology for Calculating EV Peak Demand

- EV peak demand stems from consideration of the over-arching load shape
- A “waterfall” approach is deployed using all components of forecast load to arrive at EV peak demand attribution

❖ 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

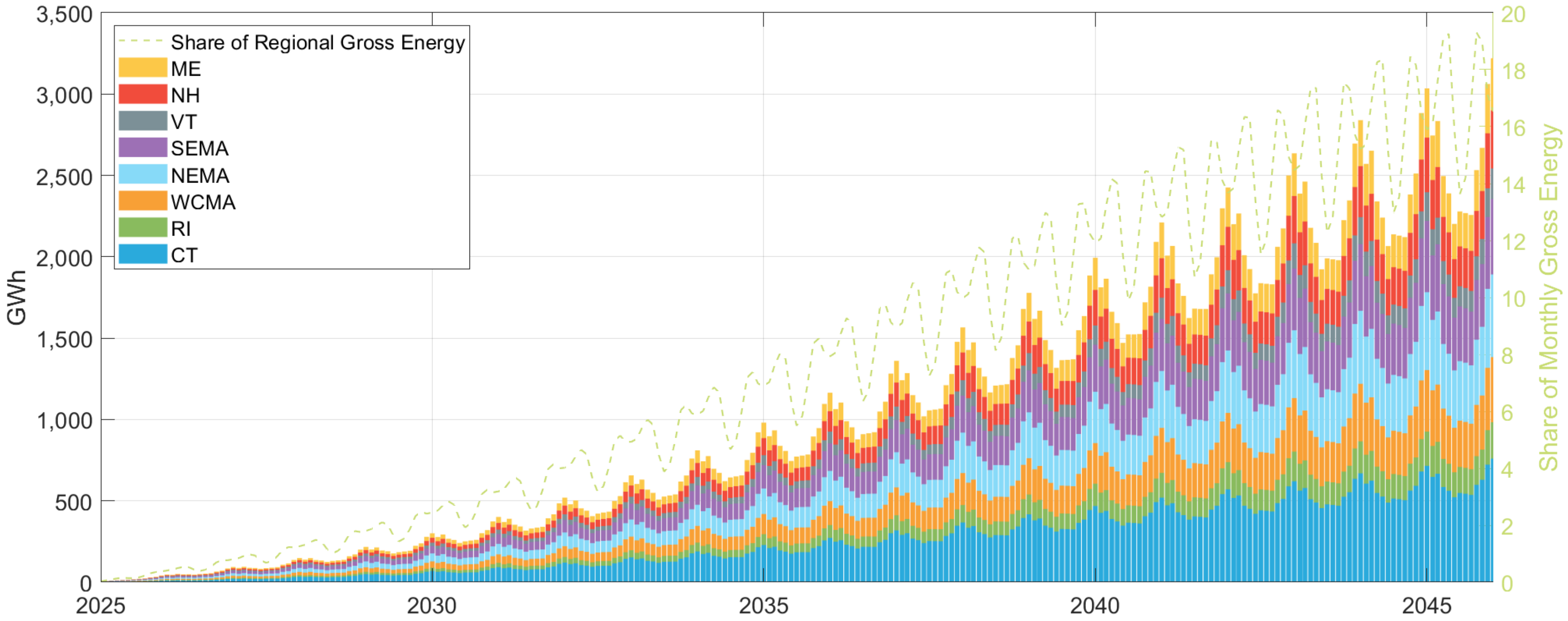
❖ A waterfall approach to the attribution of peak load contributions is used to standardize this forecast accounting

❖ Waterfall method steps (refer to plot):
1. Base = Base peak load value
   19,020 MW
2. EV = (Base+EV) – Base
   24,090 – 19,020 = 5,070 MW
3. HP = Gross – (Base+EV)
   34,280 – 24,090 = 10,190 MW
4. BTMPV = Gross – Net
   34,280 – 33,608 = 672 MW



2025 EV Energy Forecast

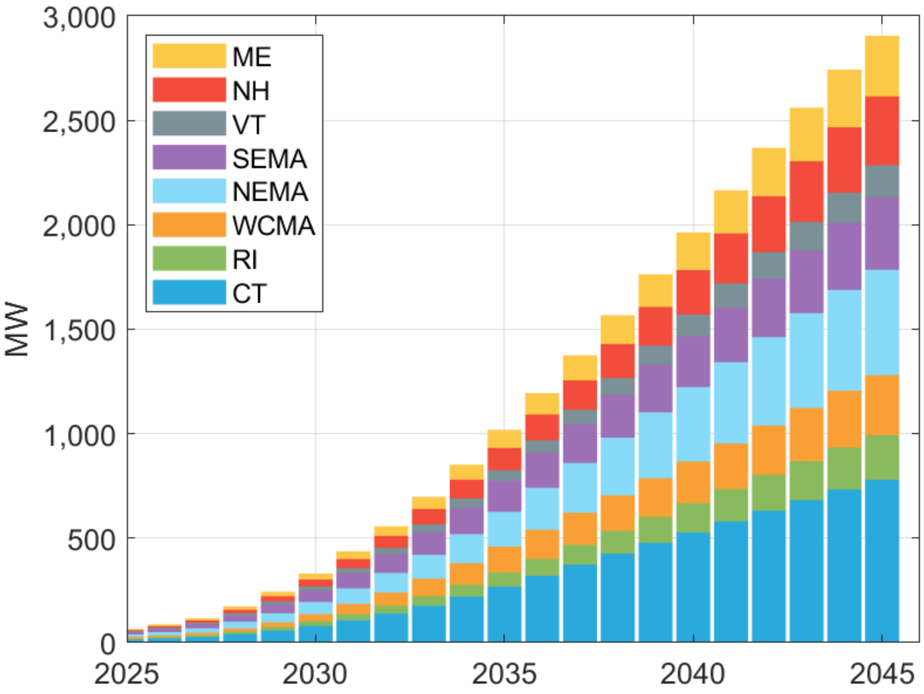
Monthly Energy by Load Zone



2025 EV Summer Peak Demand Forecast

Summer 50/50 Peak Demand, by Load Zone

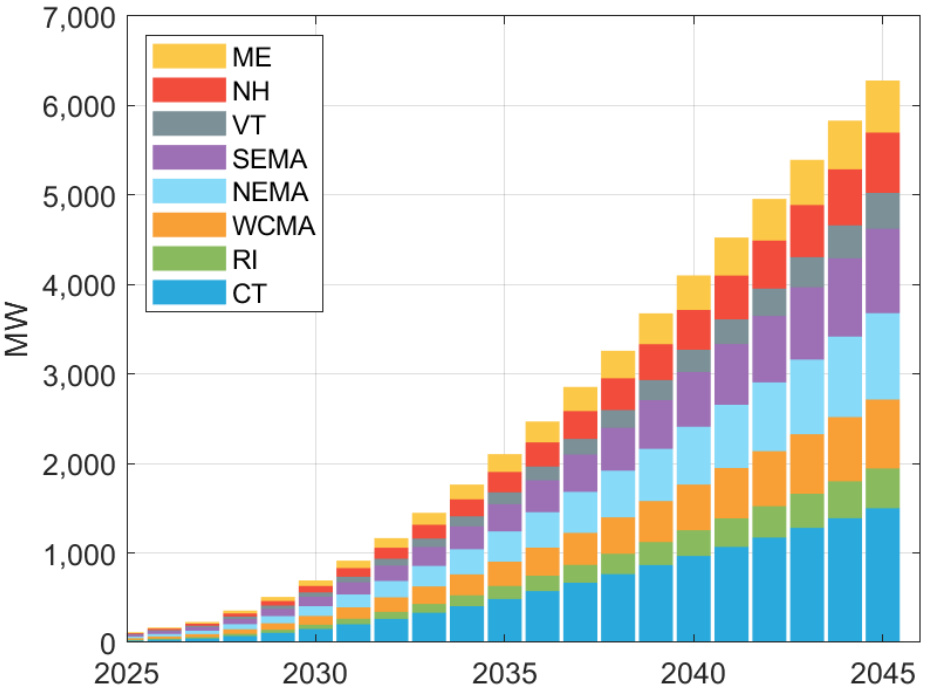
Summer Peak Demand (MW)									
Year	CT	ME	NEMA	NH	RI	SEMA	VT	WCMA	ISONE
2025	15	6	11	6	4	11	4	9	66
2026	20	8	16	8	6	14	6	8	87
2027	27	11	21	11	8	19	8	13	117
2028	41	16	32	17	12	29	11	16	174
2029	58	22	44	24	17	41	16	22	244
2030	81	29	58	33	23	54	20	33	331
2031	107	37	75	44	30	71	25	49	437
2032	139	47	94	57	38	89	31	63	558
2033	176	58	114	73	47	108	38	83	698
2034	220	72	138	90	57	126	45	104	852



2025 EV 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
2025	21	10	19	9	8	21	9	17	114
2026	31	14	28	15	11	30	13	25	168
2027	44	20	38	22	15	39	18	34	229
2028	72	32	57	35	24	58	27	51	356
2029	108	46	80	52	34	80	37	72	509
2030	151	63	110	72	46	105	49	98	694
2031	203	84	144	95	62	136	63	128	914
2032	263	107	183	123	79	171	78	162	1,166
2033	331	134	230	154	99	211	94	196	1,449
2034	405	165	282	190	121	255	112	235	1,764



Seasonal Peak Demand and Annual Energy

New England Comparison Between CELT 2024 and CELT 2025