Final 2024 Transportation Electrification Forecast

Outline

Acronyms

- **BEV** – Battery Electric Vehicle

- **BTM PV** – Behind-the-meter Photovoltaic

- **CELT** – Capacity, Energy, Loads and Transmission

- **EIA** – Energy Information Agency

- **EV** – Electric Vehicle

- **FCM** – Forward Capacity Market

- **GHG** – Greenhouse Gas

- **HE** – Hour Ending

- **ICR** – Installed Capacity Requirement

- **LDV** – Light-Duty Vehicle

- **LFC-** Load Forecast Committee

- **PHEV** – Plug-in Hybrid Electric Vehicle

- **RSP** – Regional System Plan

- **TCI** – Transportation Climate Initiative

- **VMT** – Vehicle Miles Traveled

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 2024 Capacity, Energy, Loads, and Transmission (CELT) forecast

Transportation Electrification Forecast

Overview

- For CELT 2020 and 2021, the forecast focused solely on the adoption of light-duty electric vehicles (EVs)
  - Includes battery electric vehicles (BEV) and plug-in hybrid electric vehicles (PHEV)

- For the CELT 2022 forecast the scope of vehicles was expanded to include select categories of fleet vehicles
  - Light-duty fleet vehicles, medium-duty delivery trucks, school buses, and transit buses

- For the CELT 2023 forecast ISO developed a more consistent approach to generate state-level EV adoption forecasts
  - This effort includes canvasing of all federal, state, and local goals, initiatives, and policies regarding EV adoption
  - Details on the CELT 2023 forecast methodology can be found in the 2023 Transportation Electrification Forecast

- The CELT 2024 forecast incorporates existing EV managed charging programs for personal light-duty vehicles
  - Assumptions and methodology are summarized in the January 12, 2024 presentation on Electric Vehicle Managed Charging

Transportation Electrification 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

Methodology includes:

1. Inventorying New England vehicle population and policy landscape
   - Understand New England vehicle population and canvas policies driving EV uptake
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
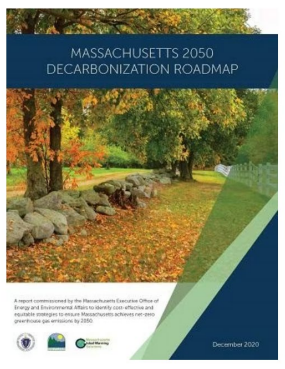
Transportation Electrification Forecast
Example: Personal Light-Duty Vehicles
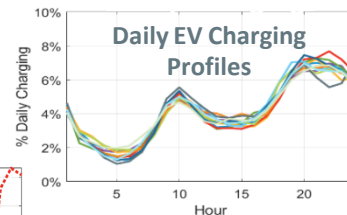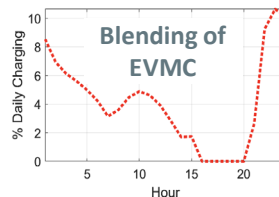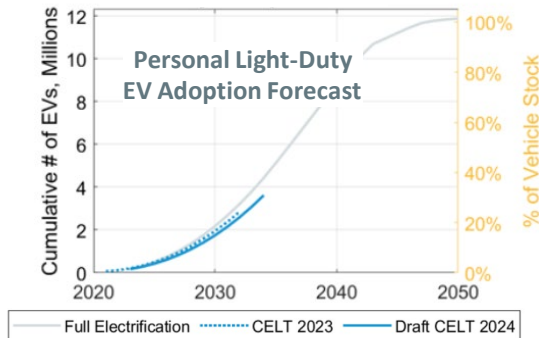
EV ADOPTION FORECAST

EV Adoption Forecast Overview

- ISO develops two adoption scenarios that reflect different assumptions about the pace and extent of transportation electrification within each state

  - **"Full Electrification" adoption scenario**
    - Intended to represent an upper bound on the pace and extent of EV adoption
    - Reflects comprehensive EV adoption estimates reflective of state emissions goals and associated EV adoption targets will be developed
    - Assumes state ZEV (Zero Emissions Vehicle) goals are met entirely by electric vehicles
    - Assumes all vehicles in each vehicle class are electrified by 2050
    - *This scenario is informational only (not directly used in the forecast)*

  - **"CELT 2024" adoption scenario**
    - Intended to reflect the likely pace and level of EV adoption over the next 10 years given the current understanding of individual state goals, policies, and programs
    - Reflects uncertainty in the timing of goal achievement and extent to which electric vehicles will be utilized to accomplish goals
    - *This scenario was used to generate the energy and demand impacts for the CELT 2024 forecast*

Federal EV Adoption Considerations

- Inflation Reduction Act
  - Enacts a tiered incentive for the purchase of new personal light-duty EVs meeting increasingly strict vehicle assembly and material sourcing requirements through 2032
  - Includes incentives for the purchase of used EVs through 2032
  - Includes incentives for the purchase of commercial light, medium, and heavy-duty EVs though 2032
  - Impact on regional EV adoption remains uncertain

- Environmental Protection Agency's (EPA) Clean School Bus Program
  - Funding from the Bipartisan Infrastructure Law provides $5 billion over the next five years (FY 2022-2026) to replace existing school buses with zero-emission and low-emission models
  - A number of New England cities have already been awarded funding during the 2022 selection process and have made clear their intent to apply for future funding

- [2021 White House announcement regarding 2030 goal for light-duty vehicle sales](#) which was applied to the adoption of both personal and fleet light-duty vehicles and aims for:

  "…electric vehicles to make up 50% of all vehicles sold in the United States by 2030."

State-Specific EV Adoption Considerations

- Multi-State Zero-Emission Vehicle MOUs
  - 2013 Multi-State Zero-Emission Vehicle MOU (MA, CT, RI, VT) - goal of 5 million light-duty ZEVs on road by 2025 across the 9 signatory states
  - 2020 Multi-State Medium- and Heavy-Duty Zero Emission Vehicle MOU (MA, CT, RI, VT, ME) - commitment to phase out fossil fuel-burning medium- to heavy-duty truck and bus sales by one hundred percent by 2050, with a target for 30 percent of new truck and bus sales to be zero-emission by 2030 in all 15 signatory states

- Various individual state and local considerations including
  - State transportation electrification "Road Maps"
  - Local (usually individual cities) announcements/goals/programs for transitioning public transit and school bus fleets to ZEV
  - State transportation electrification "Action Plans"

- Existing or anticipated adoption of California rules for ZEVs
  - Advanced Clean Cars II (ACCII) requires by 2035 that 100% of light-duty vehicles sold will be ZEVs
  - Advanced Clean Trucks (ACT) requires by 2035 that:
    - 55% of Class 2b – 3 truck sales are zero emissions.
    - 75% of Class 4 – 8 straight truck sales are zero emissions.
    - 40% of truck tractor sales are zero-emissions

- State feedback
  - The ISO has shared all assumptions and references, along with preliminary adoption figures with each of the six New England states. Guidance was provided on:
    - Reasonableness of the "Full Electrification" scenario
    - Considerations for developing the "Draft CELT 2024" scenario

- See Appendix I for more details on state-level considerations

ISO-NE PUBLIC

Historical Electric Vehicle Adoption

2023 Adoption of Personal LDVs

- Recent personal light-duty EV adoption data suggests that the CELT 2023 forecast may reflect an overly optimistic EV adoption outlook, especially in the near-term

| Growth in Personal Light-Duty Vehicles							
	NE	**CT**	**MA**	**ME**	**NH**	**RI**	**VT**
Actual*	51,173	11,762	27,187	3,378	3,487	2,818	2,541
CELT 2023	85,901	20,844	48,107	4,634	2,251	5,461	4,604
Difference	**+34,728**	**+9,082**	**+20,920**	**+1,256**	**-1,236**	**+2,643**	**+2,063**
Difference (%)	+68%	+77%	+77%	+37%	-35%	+94%	+81%

- For the CELT 2024 the ISO is discounting personal light-duty EV adoption figures for CT, MA, RI, and VT by the following amounts:

Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Discount (%)	15	14	13	12	10	9	8	7	6	5

*Source: S&P Global

Final 2024 EV Adoption Forecast

Cumulative EV Stock for New England
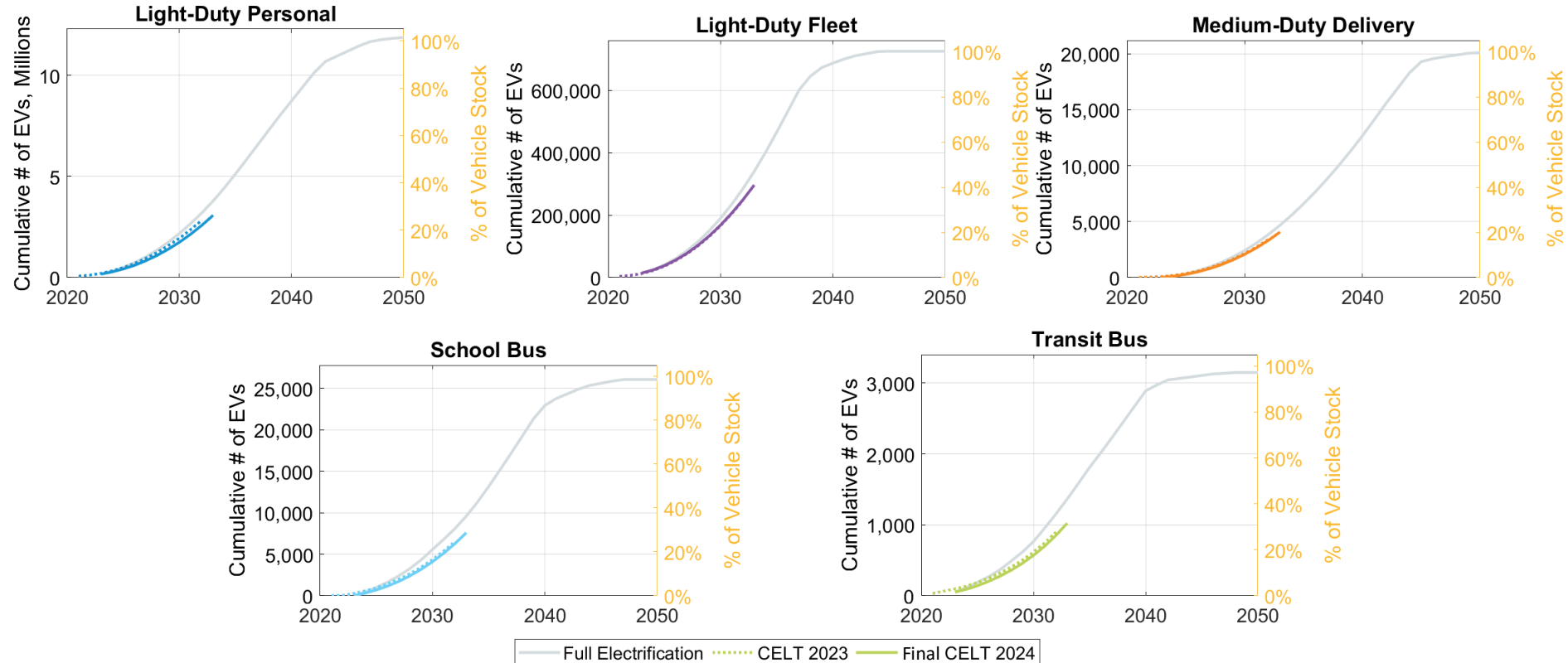
Legend: Full Electrification — CELT 2023 ······ — Final CELT 2024 —

Personal Light-Duty EV Adoption

Cumulative EV Stock
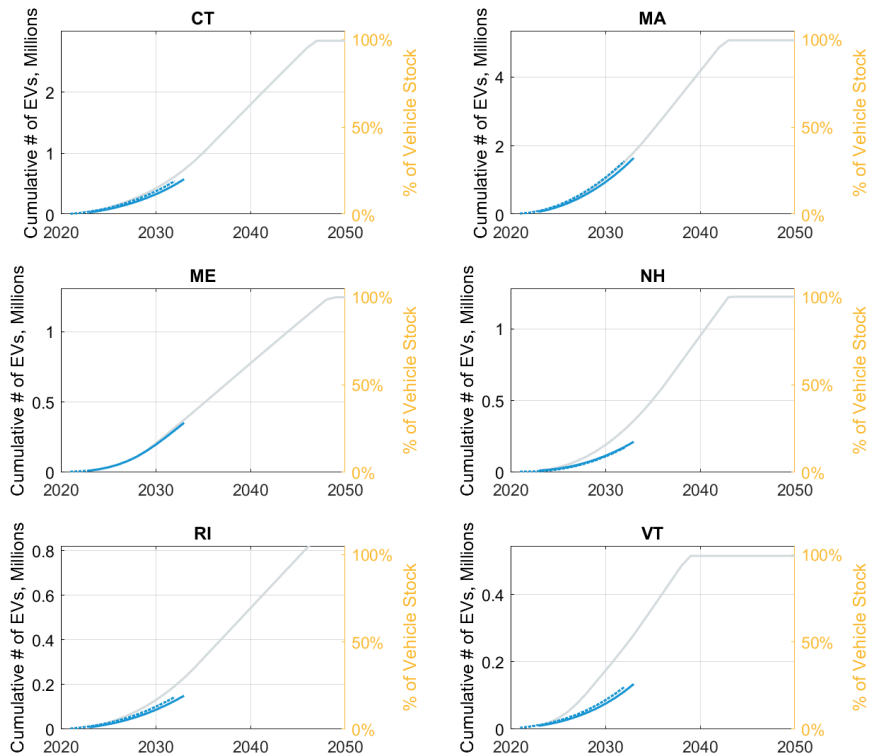
Annual Incremental Increase in EV Stock

Year	CT	MA	ME	NH	RI	VT	NE
2024	23,074	61,269	9,218	4,801	6,090	4,886	109,338
2025	29,033	80,540	13,758	8,006	7,545	6,102	144,983
2026	35,207	100,983	19,036	11,115	9,060	7,483	182,884
2027	41,457	121,832	25,066	14,385	10,915	9,035	222,690
2028	47,854	142,930	32,035	17,830	12,832	10,766	264,246
2029	55,132	163,976	39,262	21,371	14,823	12,674	307,238
2030	62,697	185,553	45,314	24,946	16,905	14,641	350,056
2031	71,543	209,039	49,894	28,655	19,096	16,897	395,123
2032	81,765	234,114	52,854	32,593	21,058	19,470	441,854
2033	93,409	260,247	53,957	36,672	23,112	22,380	489,777
10-year total (2024-2033)	541,170	1,560,483	340,394	200,374	141,435	124,332	2,908,189
Previous 10-year total (2023-2032)	518,934	1,494,004	291,071	165,953	137,080	117,884	2,724,923
Change	**+22,236**	**+66,479**	**+49,323**	**+34,421**	**+4,355**	**+6,448**	**+183,266**

Full Electrification .... CELT 2023 —— Final CELT 2024

Fleet Light-Duty EV Adoption

Cumulative EV Stock

Legend: Full Electrification — CELT 2023 ······· Final CELT 2024 ——
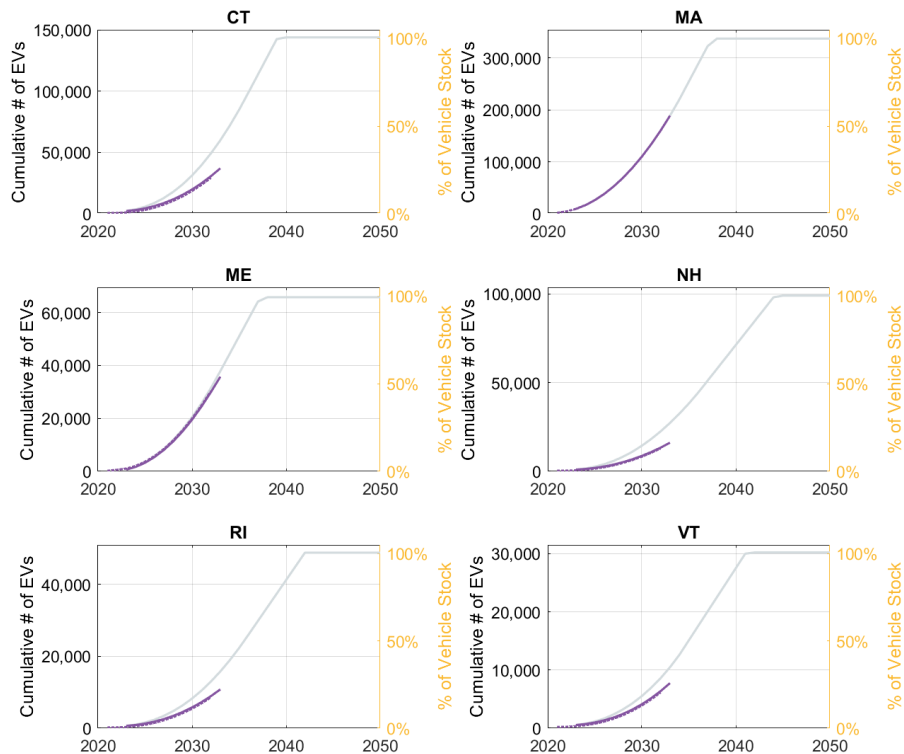
Annual Incremental Increase in EV Stock

Year	CT	MA	ME	NH	RI	VT	NE
2024	782	7,175	1,002	345	228	166	9,698
2025	1,338	9,567	1,577	590	390	265	13,727
2026	1,877	11,959	2,130	828	547	369	17,710
2027	2,450	14,351	2,693	1,081	714	487	21,776
2028	3,059	16,743	3,257	1,349	891	620	25,919
2029	3,702	19,135	3,821	1,625	1,079	757	30,119
2030	4,362	21,526	4,385	1,900	1,271	899	34,343
2031	5,040	23,918	4,948	2,181	1,469	1,050	38,606
2032	5,735	26,310	5,437	2,473	1,671	1,211	42,837
2033	6,430	28,702	5,813	2,767	1,874	1,382	46,968
10-year total (2024-2033)	**34,775**	**179,386**	**35,063**	**15,139**	**10,134**	**7,206**	**281,703**
Previous 10-year total (2023-2032)	28,693	155,468	29,744	12,525	8,361	5,919	240,713
Change	**+6,082**	**+23,918**	**+5,319**	**+2,614**	**+1,773**	**+1,287**	**+40,990**

Medium-Duty Delivery EV Adoption

Cumulative EV Stock
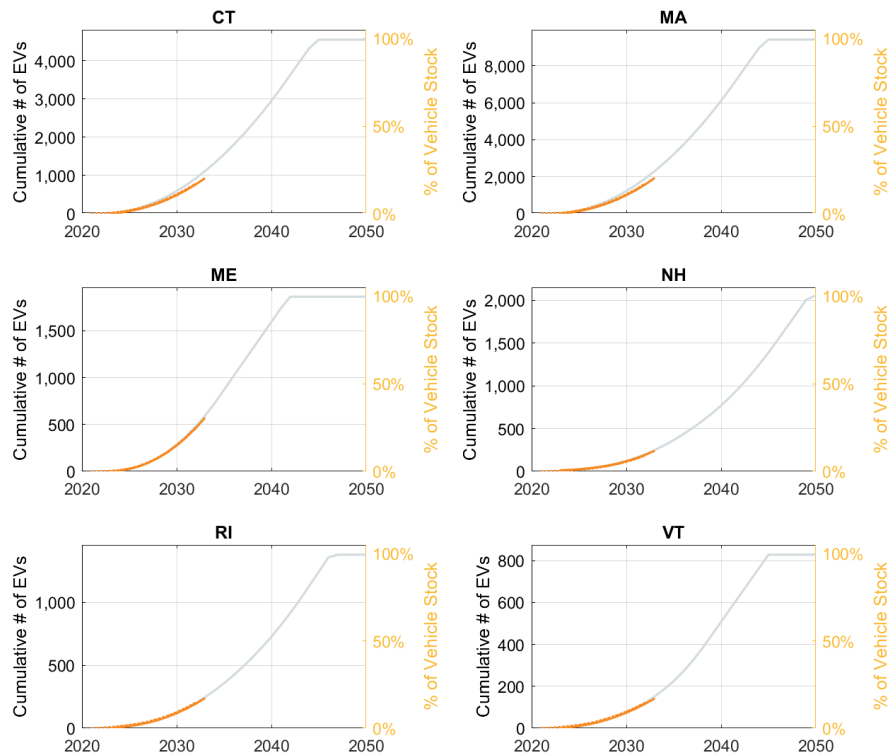
Annual Incremental Increase in EV Stock

Year	CT	MA	ME	NH	RI	VT	NE
2024	26	52	7	5	7	4	101
2025	40	83	18	8	9	6	164
2026	54	112	27	10	12	8	223
2027	68	141	38	14	16	10	287
2028	83	171	50	18	20	13	355
2029	99	204	61	23	25	15	427
2030	115	238	74	28	30	18	503
2031	132	272	86	34	35	20	579
2032	148	311	99	41	40	23	662
2033	165	353	112	47	45	25	747
10-year total (2024-2033)	**930**	**1,937**	**572**	**228**	**239**	**142**	**4,048**
Previous 10-year total (2023-2032)	778	1,611	464	184	199	120	3,352
Change	+152	+326	+108	+44	+40	+22	+696

Full Electrification · · · · · CELT 2023 —— Final CELT 2024

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School Bus EV Adoption

Cumulative EV Stock

Full Electrification · · · · CELT 2023 —— Final CELT 2024
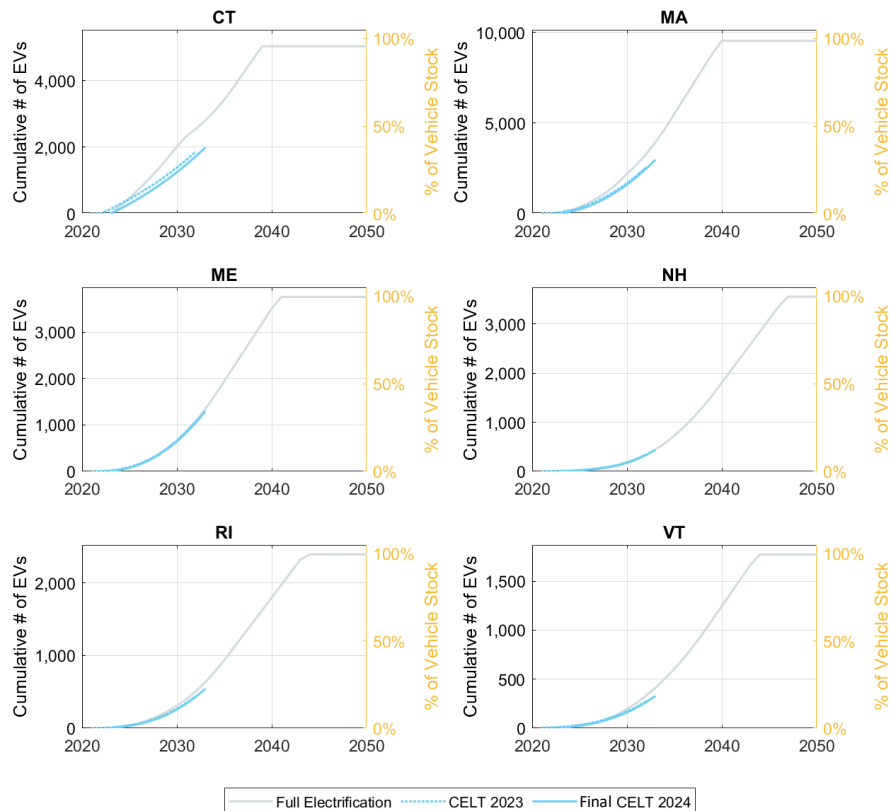
Annual Incremental Increase in EV Stock

Year	CT	MA	ME	NH	RI	VT	NE
2024	144	103	27	7	11	8	300
2025	154	140	47	11	18	12	382
2026	165	179	66	15	25	16	466
2027	176	224	89	21	34	21	565
2028	188	277	112	29	44	27	677
2029	202	320	138	40	56	33	789
2030	217	362	164	53	68	40	904
2031	230	410	190	70	81	48	1,029
2032	248	459	217	88	94	56	1,162
2033	268	505	243	107	108	64	1,295
10-year total (2024-2033)	**1,992**	**2,979**	**1,293**	**441**	**539**	**325**	**7,569**
Previous 10-year total (2023-2032)	1,857	2,542	1,064	338	439	266	6,505
Change	**+135**	**+437**	**+229**	**+103**	**+100**	**+59**	**+1,064**

Transit Bus EV Adoption

Cumulative EV Stock
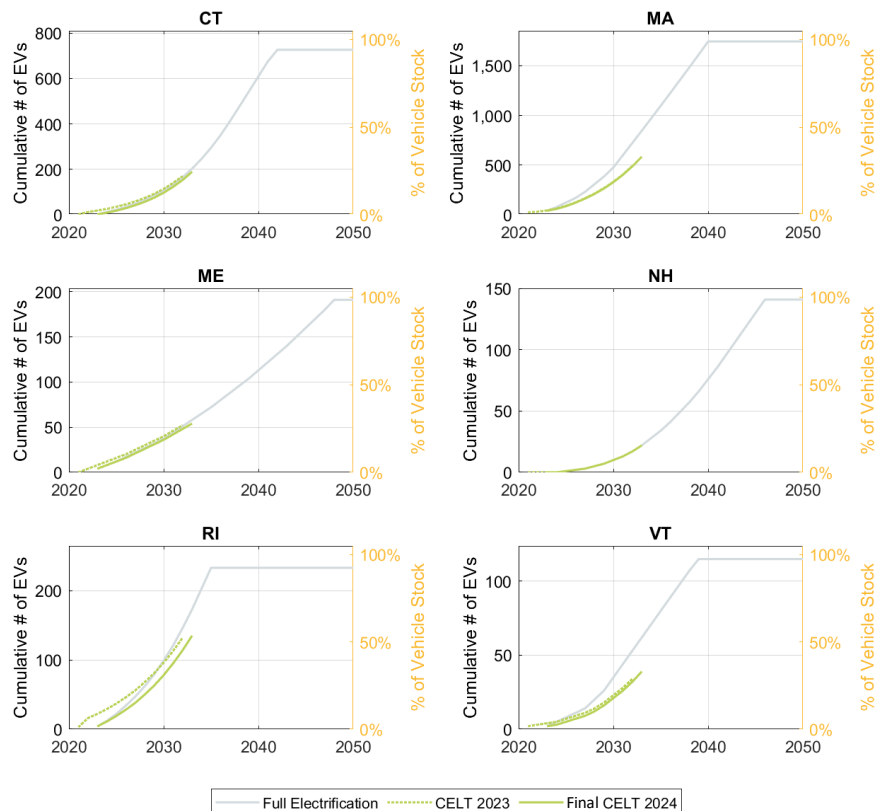
Annual Incremental Increase in EV Stock

Year	CT	MA	ME	NH	RI	VT	NE
2024	7	19	4	0	7	1	38
2025	9	27	4	1	8	2	51
2026	11	35	4	1	9	2	62
2027	13	41	5	1	10	2	72
2028	15	47	5	2	12	3	84
2029	18	55	5	2	13	4	97
2030	22	64	5	3	15	5	114
2031	26	73	6	3	17	5	130
2032	30	86	6	4	19	6	151
2033	36	97	6	5	21	7	172
10-year total (2024-2033)	**187**	**544**	**50**	**22**	**131**	**37**	**971**
Previous 10-year total (2023-2032)	158	461	48	17	116	31	833
Change	+29	+83	+2	+5	+15	+6	+138

ENERGY AND DEMAND MODELING METHODOLOGY

Methodology Overview

- Energy and demand impacts are based on analysis of vehicle driving patterns and a sample of vehicle charging data

- Inputs developed specific to each vehicle category
  - 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)

- Monthly energy and demand impacts are developed for each vehicle category
  - Develop VMT assumptions for all days within a month
  - Apply temperature sensitive efficiency relationships to get daily energy
  - Apply daily charging shapes, and phased-in EV managed charging assumptions to allocate charging to hours
  - Monthly energy impacts stem from the same 30 year normal period used in the load forecast
  - Monthly demand impacts result from applying the weather distribution used in the load forecast
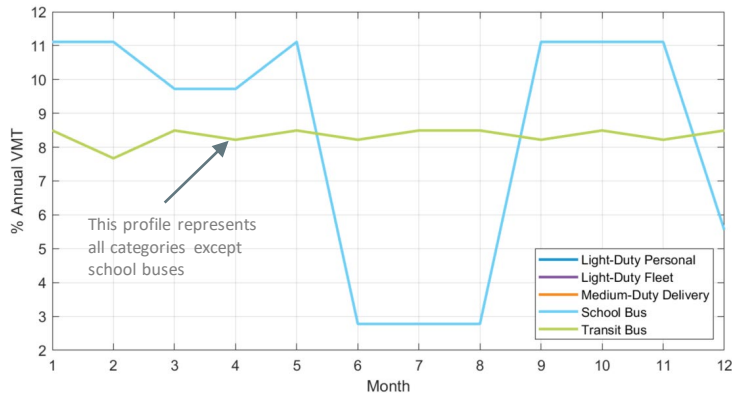 - Scale to adoption forecast
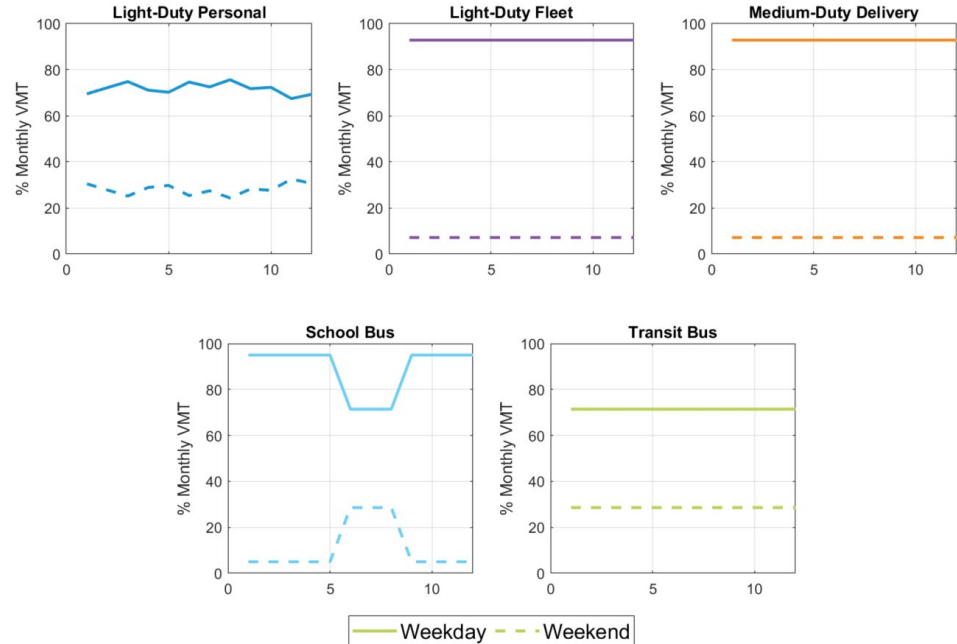
Vehicle Miles Traveled (VMT)

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

Day-type VMT Allocation

Monthly VMT Allocation

This profile represents all categories except school buses
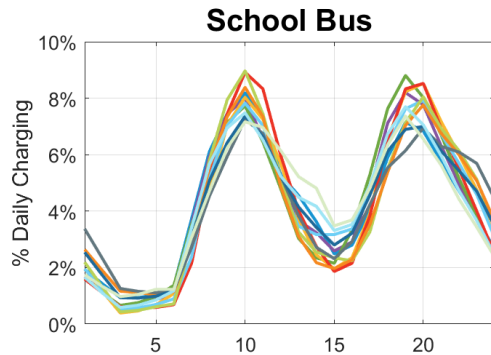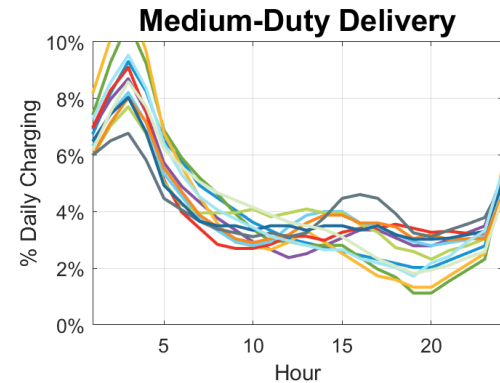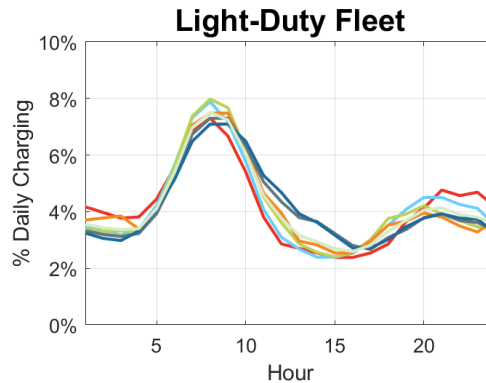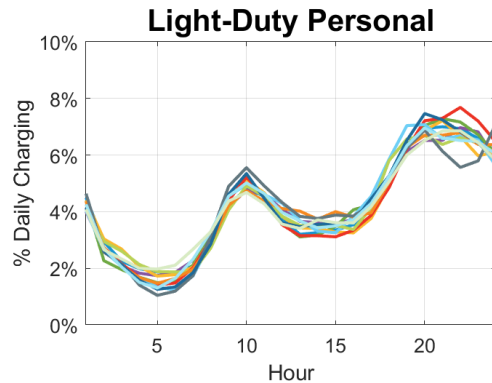
Electric Vehicle Efficiency

Energy Consumption as a Function of Daily Temperature
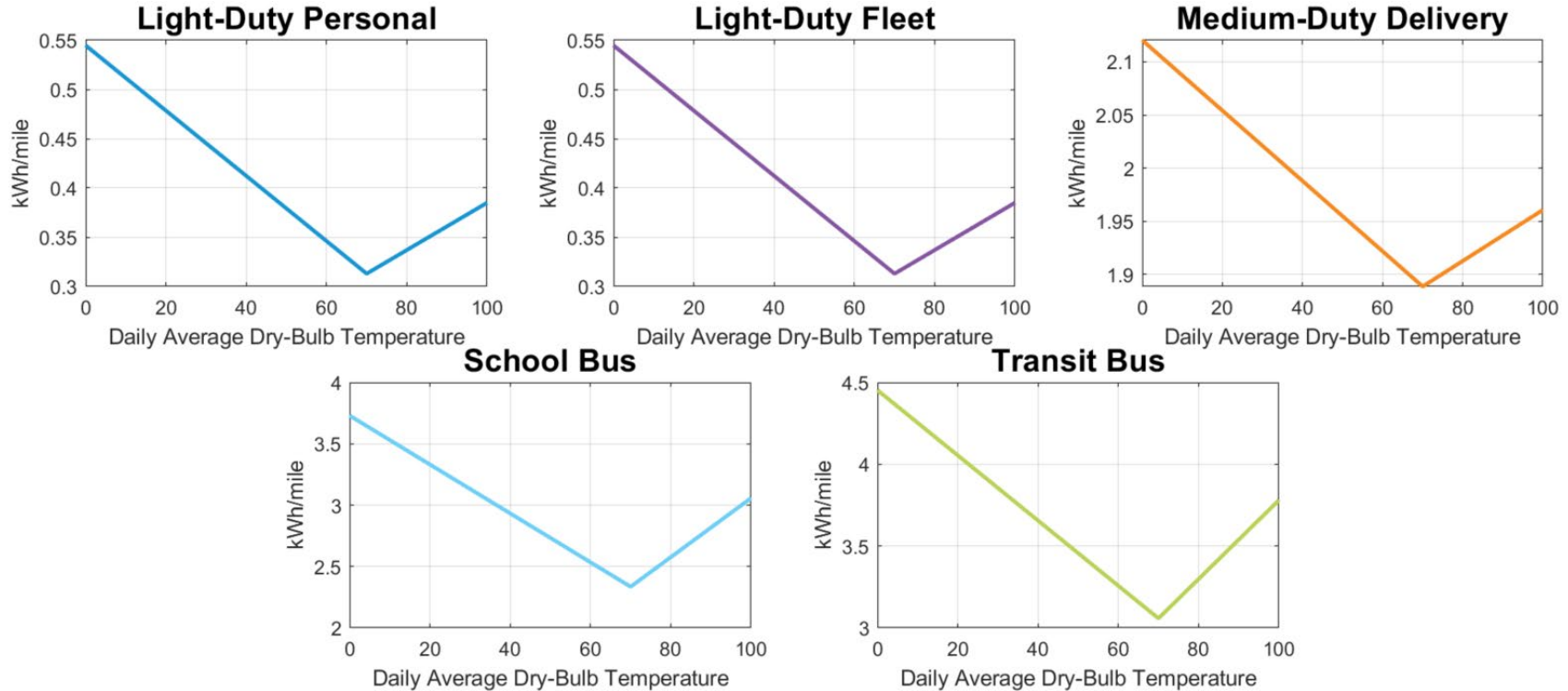
* School bus and transit bus efficiencies reflect an adjustment for the partial use of auxiliary cabin heating systems

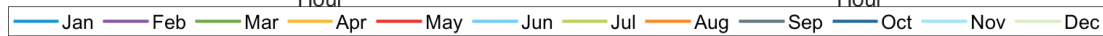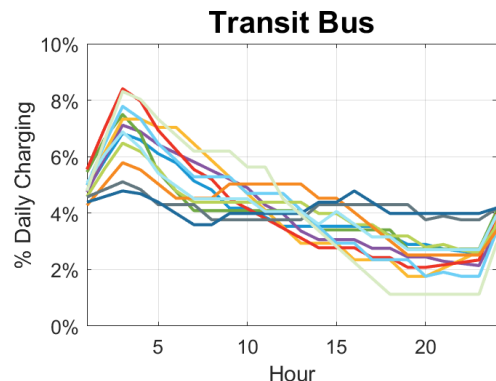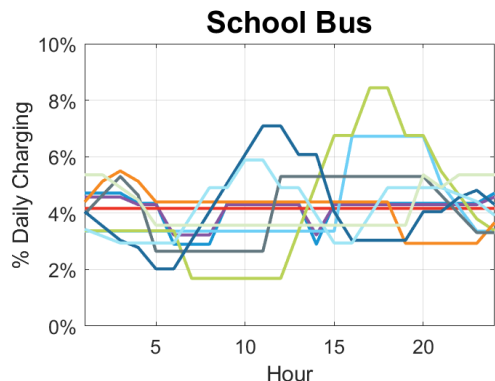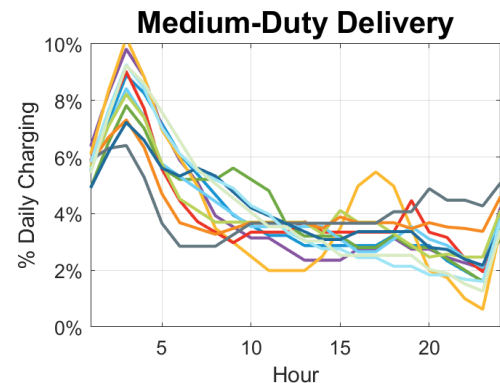# Allocation of Hourly Charging by Month

Non-Holidays & Weekdays
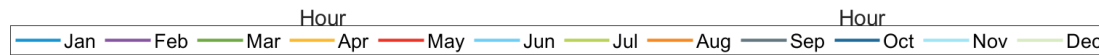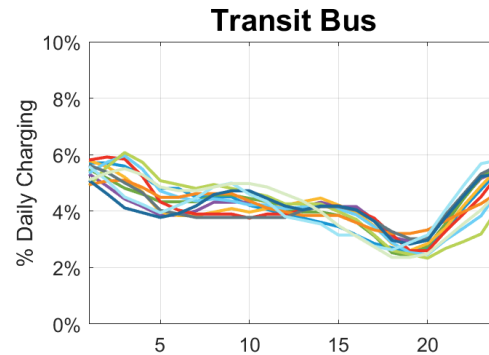
Allocation of Hourly Charging by Month

Holidays & Weekends
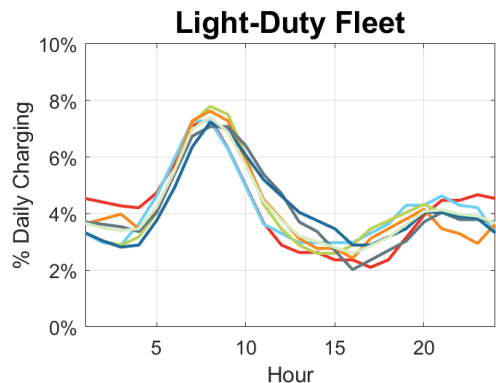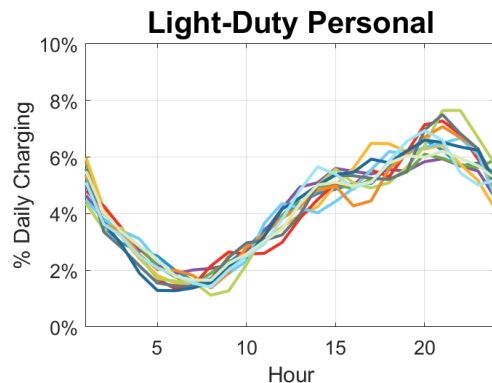
Estimating Demand Impacts of EV Adoption

- For applications that include hourly analysis, EV demand will be modeled hourly
  - E.g., probabilistic ICR analysis

- Other forecast applications and reporting require a deterministic peak value (e.g., CELT report), and for which:
  - Winter peak demand:
    - Use the monthly average EV demand from HE 18-19
    - January-April, October-December
  - Summer demand impacts should reflect expectations of peak shifting due to increasing BTM PV penetrations
  - Weather-sensitive demand impacts
  - Hourly weekday allocation of daily energy is used to estimate demand impacts
  - Daily energy is derived using VMT and temperature responsiveness of electric vehicle efficiency

Interaction of EV Summer Demand and BTM PV

- For forecast applications and reporting that require a deterministic peak value, EV demand during the summer months is estimated as the average monthly EV demand during the summer peak hours tabulated to the right
  - May through September
  - Hours reflect effect of shifting peak demand due to BTM PV based on the CELT 2023 PV Forecast

- Used for forecasts of fleet vehicles and personal light-duty vehicles

Year	PV Nameplate Bin (GW)*	Summer Peak Hours
2024	6	[17,18,19]
2025	7	[17,18,19]
2026	8	[18,19,20]
2027	8	[18,19,20]
2028	9	[18,19,20]
2029	10	[18,19,20]
2030	10	[18,19,20]
2031	11	[18,19,20]
2032	11	[18,19,20]
2033	11	[18,19,20]

Based on 2023 PV forecast values

Forecast of Participation in EV Managed Charging

Personal Light-Duty Vehicles

- The CELT 2024 forecast incorporates a gradual uptick in managed charging participation of personal light-duty EVs in New England over the next 10 years:
  - 1% participation in 2024
  - 10% participation in 2033

- 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)
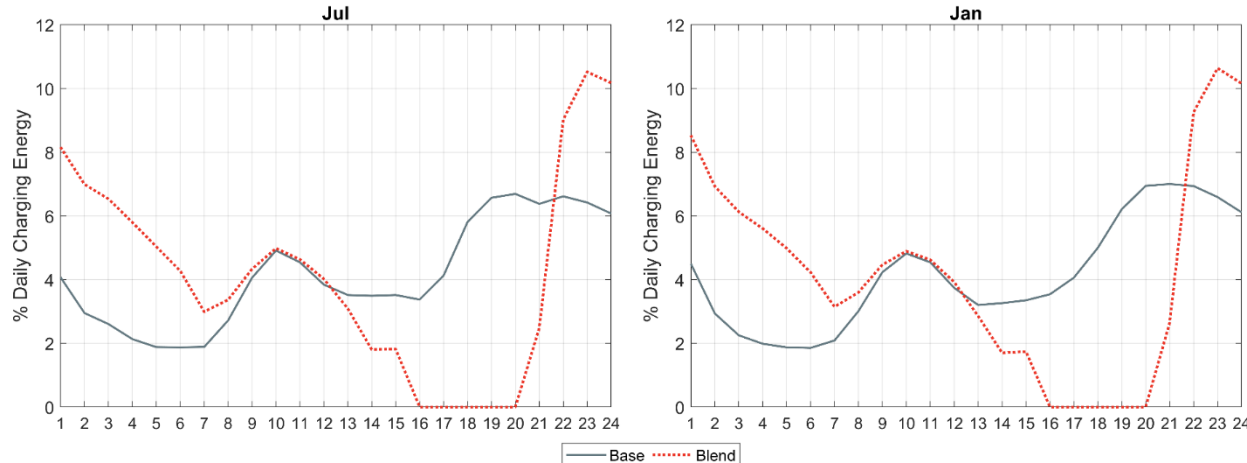
Year	Participation Level (% of EV population)
2024	1%
2025	2%
2026	3%
2027	4%
2028	5%
2029	6%
2030	7%
2031	8%
2032	9%
2033	10%

ENERGY FORECAST

Estimating Energy Impacts of EV Adoption

Average Daily Charging Energy – New England
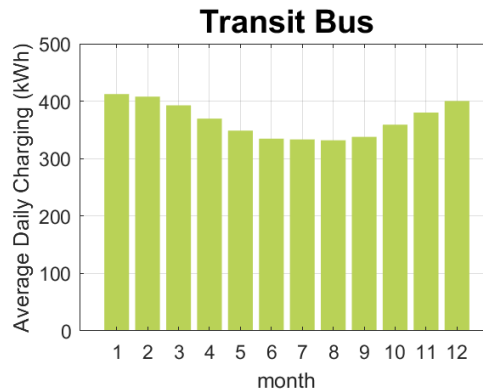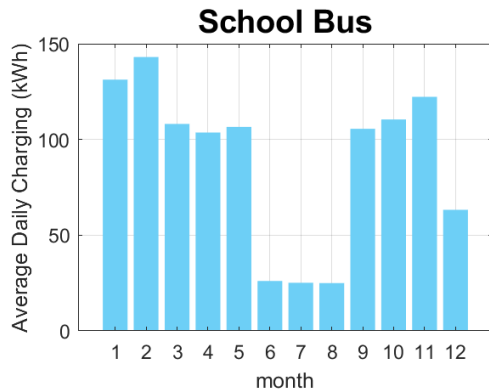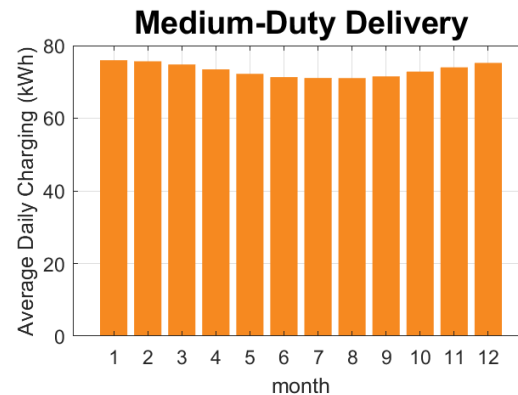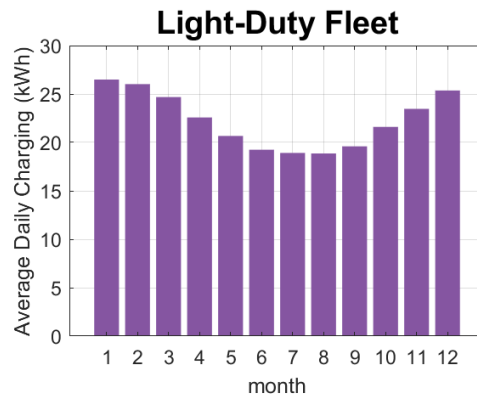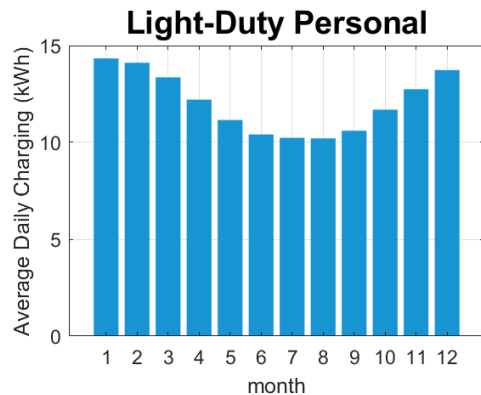
2024 Transportation Electrification Forecast

Monthly Energy
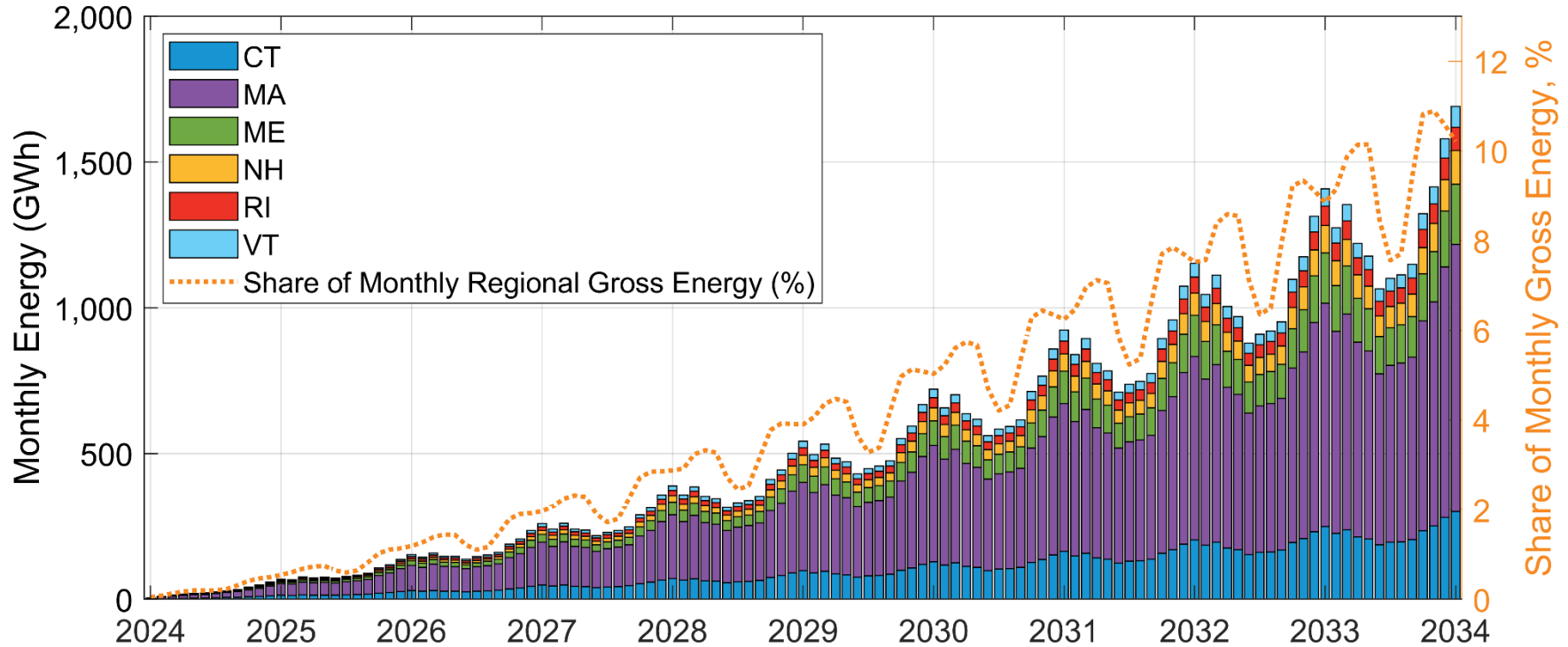
Transportation Electrification Energy Forecast

New England Comparison Between CELT 2023* and CELT 2024
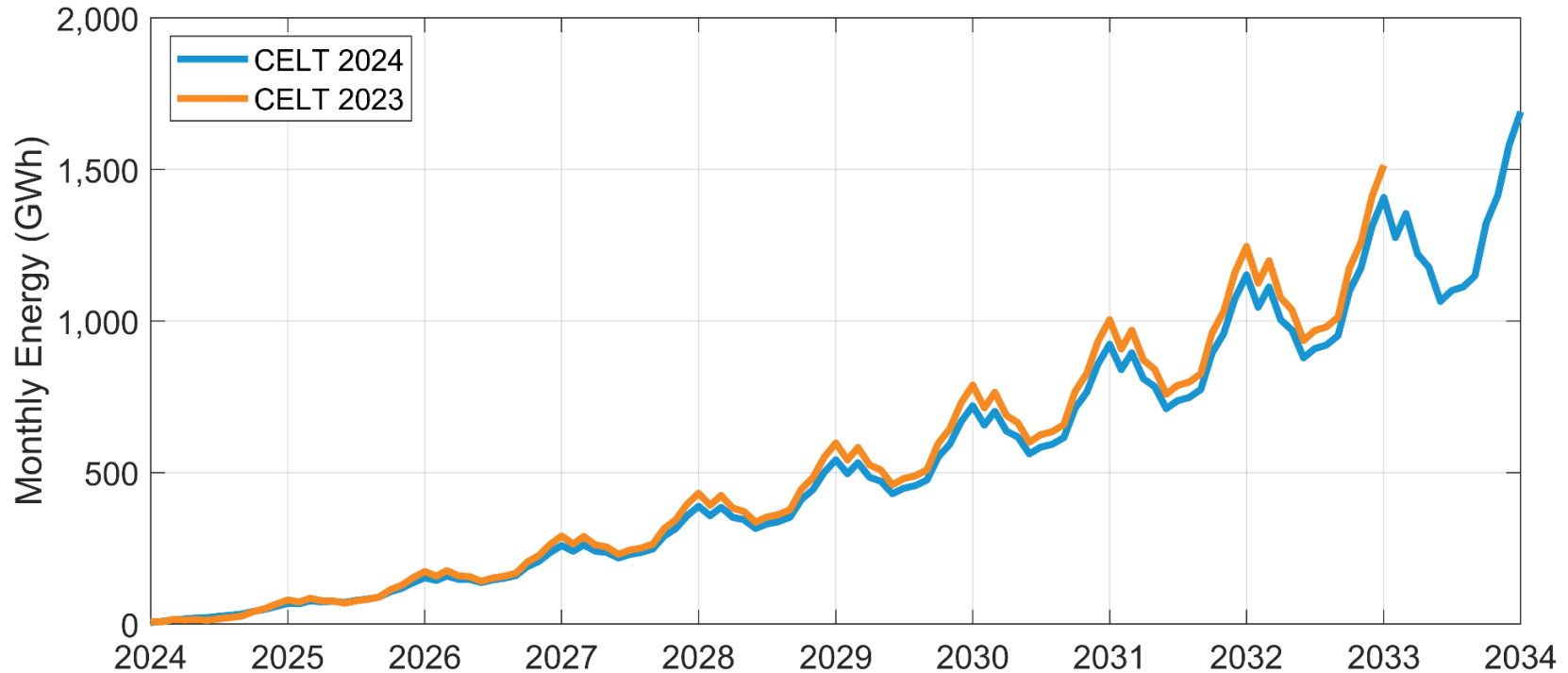
* CELT 2023 values have been adjusted to begin accumulating 2024

2024 Transportation Electrification Forecast

Annual Energy

Annual Energy (GWh)							
Year	CT	MA	ME	NH	RI	VT	NE
2024	64	188	29	14	17	13	325
2025	202	600	98	50	53	43	1,045
2026	374	1,129	196	103	98	79	1,978
2027	580	1,776	328	174	152	124	3,134
2028	822	2,545	496	264	217	178	4,522
2029	1,102	3,435	705	373	294	242	6,151
2030	1,424	4,448	951	502	382	318	8,024
2031	1,791	5,590	1,229	652	483	405	10,148
2032	2,209	6,869	1,530	823	595	505	12,532
2033	2,687	8,291	1,845	1,018	720	621	15,182

New England
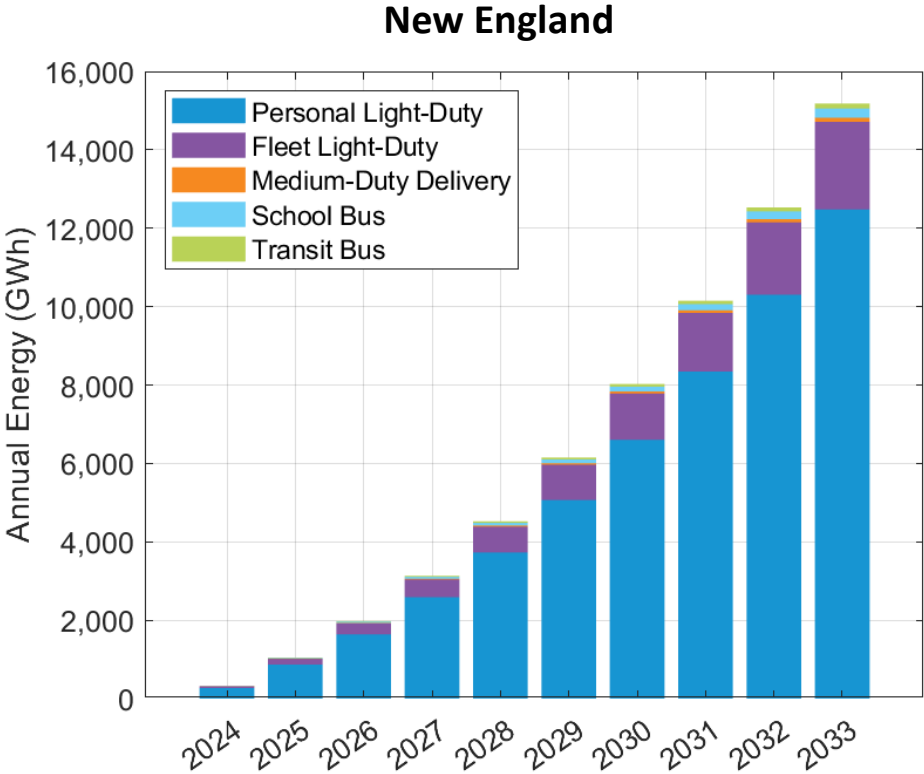
DEMAND FORECAST

2024 Transportation Electrification Forecast

Monthly 50/50 Peak Demand by State
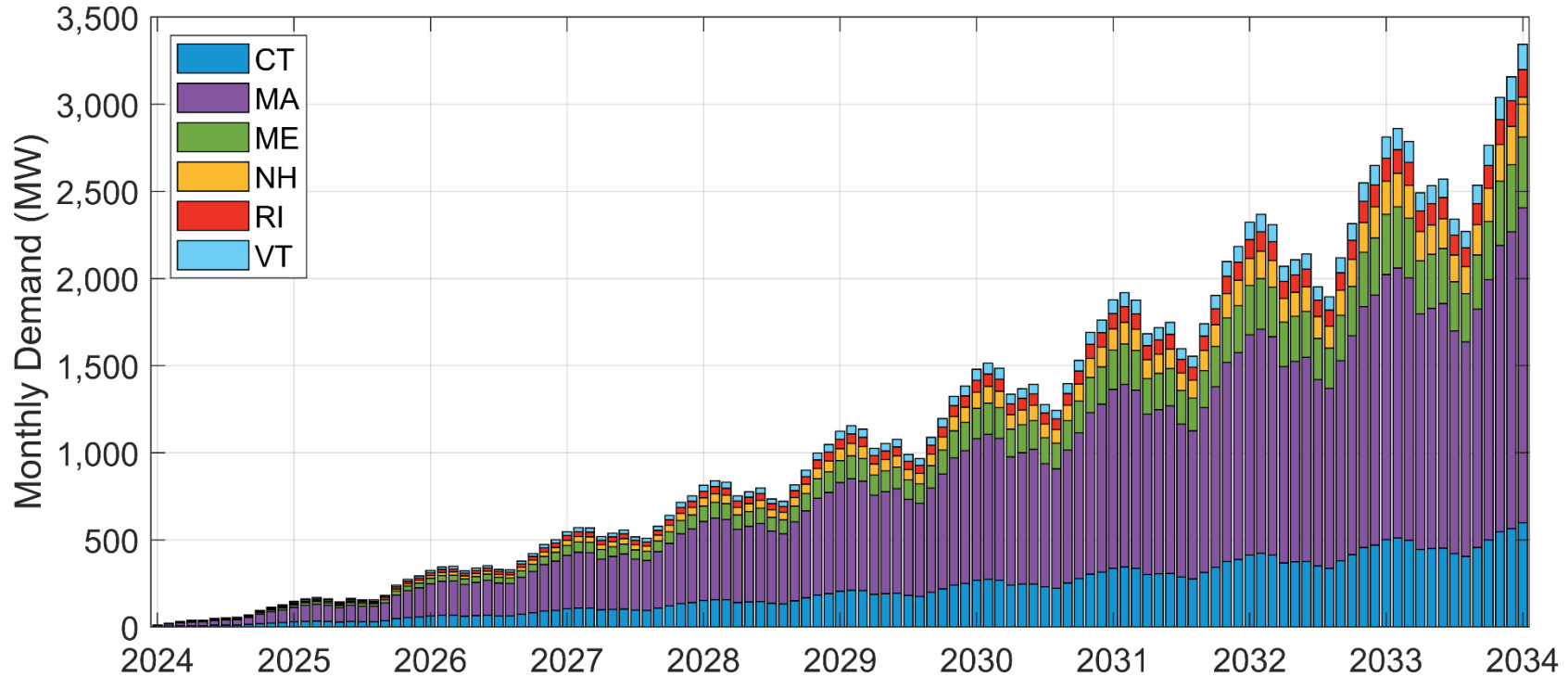
2024 Transportation Electrification Forecast

50/50 Summer Peak Demand

Summer Peak Demand (MW)							
Year	CT	MA	ME	NH	RI	VT	NE
2024	10	30	4	2	3	2	51
2025	31	89	14	7	8	6	155
2026	64	188	32	17	16	13	331
2027	98	292	53	28	25	20	517
2028	137	413	80	42	36	28	736
2029	181	551	112	59	48	38	990
2030	231	706	150	79	61	50	1,277
2031	287	879	192	101	77	62	1,598
2032	350	1,069	236	126	94	77	1,953
2033	421	1,278	282	154	112	94	2,342

New England (July)
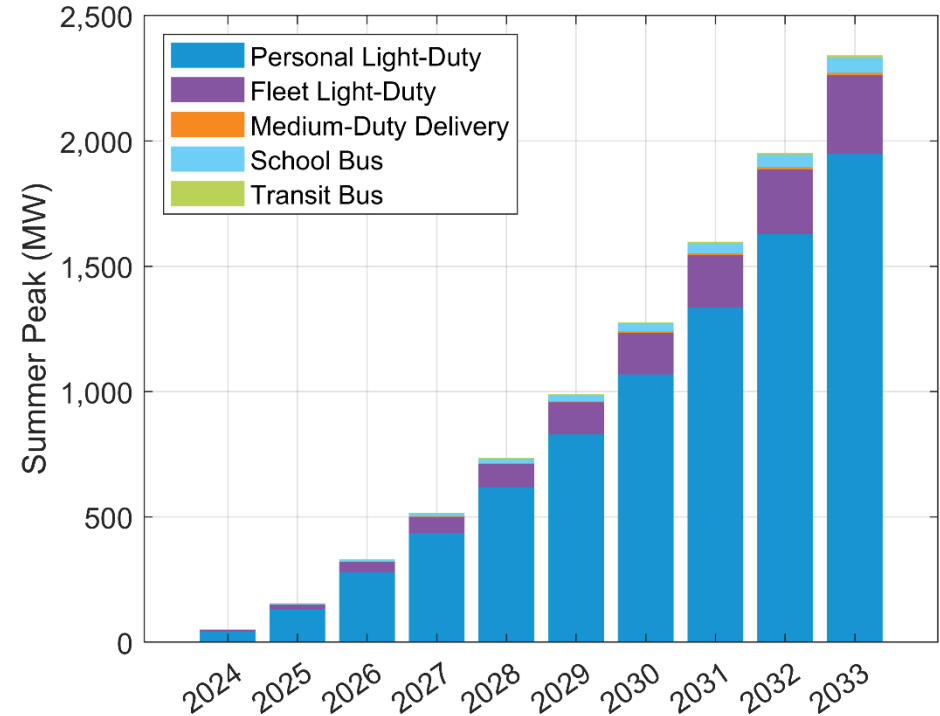
2024 Transportation Electrification Forecast

50/50 Winter Peak Demand

Winter Peak (MW)							
Year	CT	MA	ME	NH	RI	VT	NE
2024	30	84	13	7	8	6	147
2025	64	184	31	17	16	14	326
2026	104	308	56	30	26	23	547
2027	152	454	87	47	39	34	813
2028	206	623	126	68	53	47	1,123
2029	267	814	173	93	70	62	1,479
2030	336	1,027	226	121	89	79	1,878
2031	414	1,263	284	154	109	98	2,322
2032	501	1,523	345	190	132	121	2,811
2033	599	1,807	406	230	157	146	3,345

New England (January)
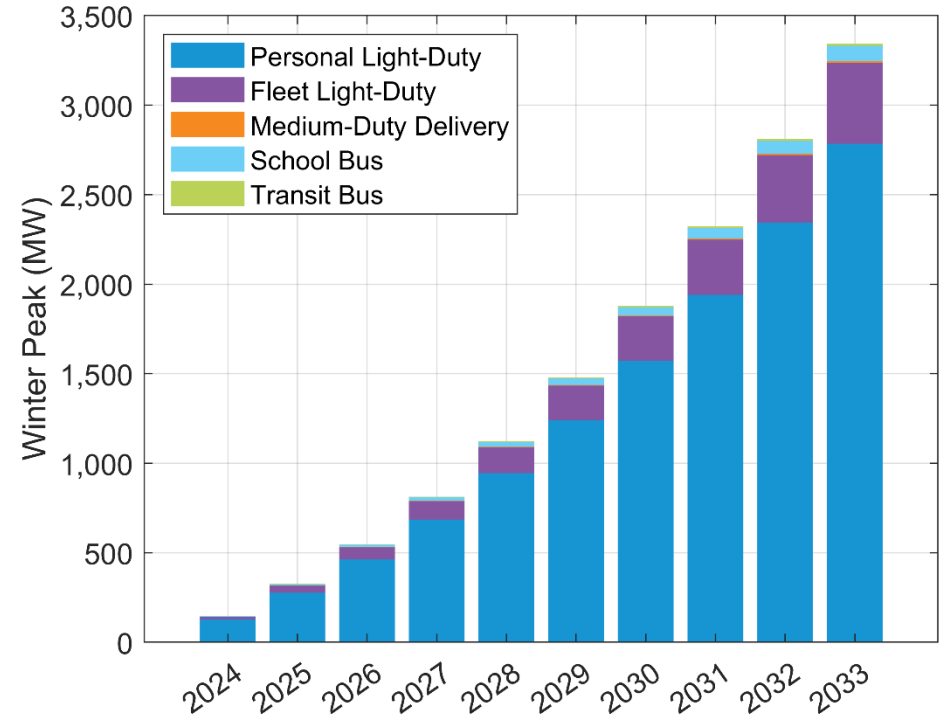
Transportation Electrification Demand Forecast

50/50 New England Comparison Between CELT 2023* and CELT 2024

Summer (July) Demand
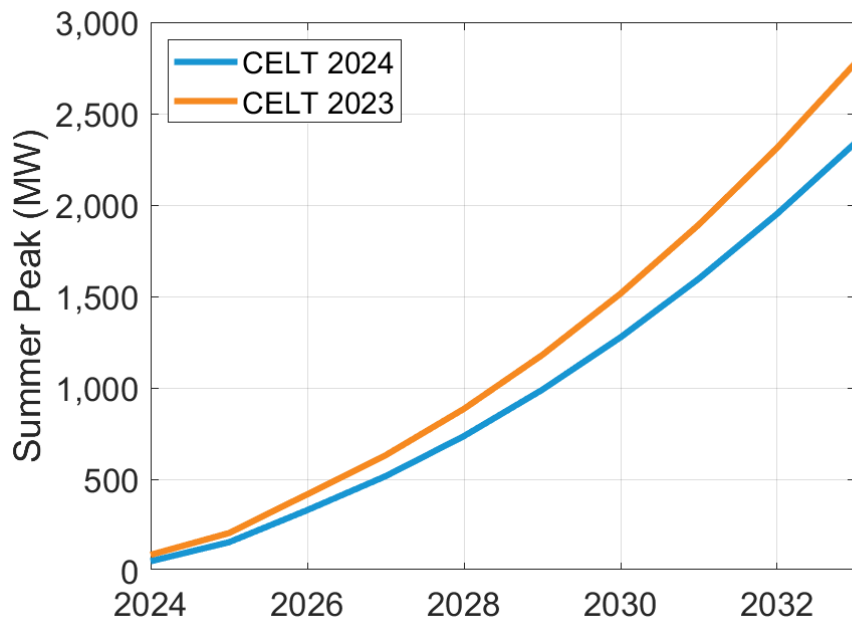
Winter (January) Demand
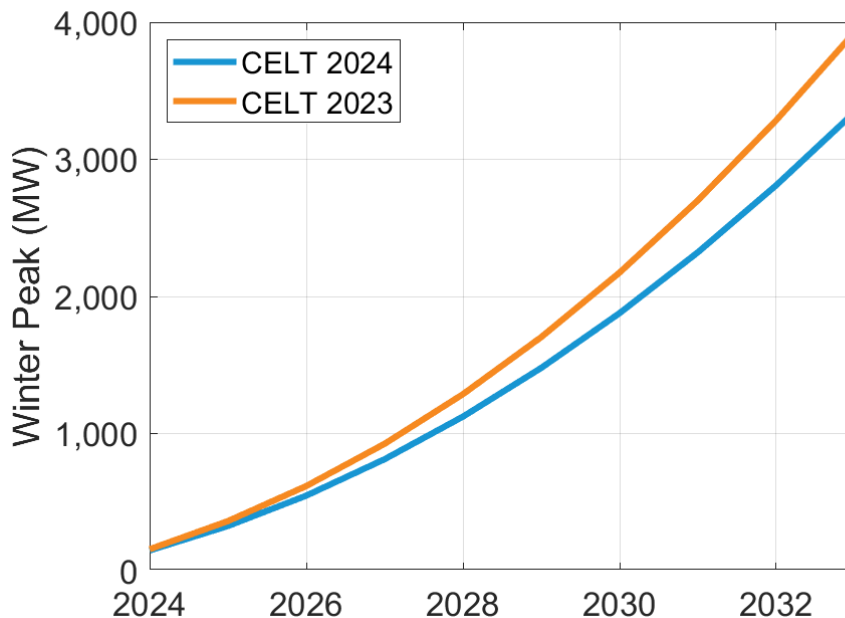
* CELT 2023 values have been adjusted to begin accumulating 2024

APPENDIX I

State-Specific EV Adoption Forecast Considerations

Massachusetts

EV Adoption Forecast Drivers

- **2013 Multi-State Zero-Emission Vehicle MOU**
  - Collective target among initial signatory states to achieve a goal of 3.3 million EVs on the road by 2025

- **2020 Multi-State Medium- and Heavy-Duty Zero Emission Vehicle MOU**
  - Goal that all new medium- and heavy-duty vehicle sales in each of 15 state jurisdictions be zero-emission vehicles by 2050, with an interim goal of 30% of new vehicle sales by 2030

- **Massachusetts Clean Energy and Climate Plan for 2025 and 2030**
  - Reducing transportation sector emissions 34% below 1990 levels by 2030 would require that about 1 million of the 5.5 million LDVs projected to be registered in the Commonwealth in 2030 be ZEVs

- **City of Boston - Mayor's Office Announcement (2022)**
  - Electric school bus pilot program, deploying 20 buses during the 2022-2023 school year
  - Goal to electrify all 700 of the city's school buses by 2030

- **MBTA Procurement of 40-Foot, Low Floor, Battery Electric Buses (issued April 2022)**
  - MBTA is soliciting bids from manufacturers to obtain up to 460 new battery-electric buses starting in 2023

- **MBTA Bus Electrification Plan (May 2022)**
  - The MBTA is working to convert it's entire bus fleet of 1,150 buses to battery electric buses by 2040

- **Adoption of California's Clean Trucks Act** requires by 2035 that:
  - 55% of Class 2b – 3 truck sales are zero emissions
  - 75% of Class 4 – 8 straight truck sales are zero emissions
  - 40% of truck tractor sales are zero-emissions

- **Advanced Clean Cars II (ACCII)** requires by 2035 that:
  - 100% of light-duty vehicles sold will be zero emissions

- **2021 White House announcement regarding 2030 goal for light-duty vehicle sales**
  - Aims for *"…electric vehicles to make up 50% of all vehicles sold in the United States by 2030."*

Massachusetts

EV Adoption Forecast Assumptions

- "Full Electrification" scenario
  - Assumes all state and local policy, programs, goals and announcement targets are achieved in the listed timeframe solely through the adoption of electric vehicles

- "CELT 2024" scenario
  - School buses, transit buses, and medium-duty delivery
    - Maintains that the 2030 MDHD ZEV goal (30% of new truck and bus sales) is met by EVs
  - Personal and fleet light-duty vehicles
    - Assumes ACCII rule is met (100% of new vehicle sales by 2035) by EVs, but delayed slightly due to recently observed adoption trends

Connecticut

EV Adoption Forecast Drivers

- **2013 Multi-State Zero-Emission Vehicle MOU**
  - Collective target among initial signatory states to achieve a goal of 3.3 million EVs on the road by 2025

- **2020 Multi-State Medium- and Heavy-Duty Zero Emission Vehicle MOU**
  - Goal that all new medium- and heavy-duty vehicle sales in each of 15 state jurisdictions be zero-emission vehicles by 2050, with an interim goal of 30% of new vehicle sales by 2030

- **Electric Vehicle Roadmap for Connecticut**
  - Goal of putting 125,000 to 150,000 EVs on the road in CT by 2025 per the 2013 ZEV MOU (annual LDV sales are roughly 150,000-180,000 vehicles)

- **Public Act No. 22-25**
  - Mandates targets for the procurement of state owned or leased light-duty vehicles
    - State fleet is roughly 3,500 out of almost 3 million light-duty vehicles state-wide
  - Transit Buses
    - After January 1, 2030, at least 30% of all buses purchased or leased by the state shall be zero-emission buses
    - Public transit bus fleet is roughly 400 of all 770 total state-wide
  - School buses
    - 100% of all school buses in environmental justice communities must be ZEV by 1/1/2030
    - All school buses must be ZEV (all electric or alternative fuel) by 1/1/2040
    - Roughly 1800 school buses are considered to be with in environmental justice communities out of 5,300 state-wide

- **2021 White House announcement regarding 2030 goal for light-duty vehicle sales**
  - Aims for *"...electric vehicles to make up 50% of all vehicles sold in the United States by 2030."*

Connecticut

EV Adoption Forecast Assumptions

- "Full Electrification" scenario
  - Assumes all state and local policy, programs, goals and announcement targets are achieved in the listed timeframe solely through the adoption of electric vehicles

- "CELT 2024" scenario
  - Medium-duty delivery
    - Maintains that the MDHD MOU ZEV goal (30% of new truck and bus sales by 2030) is met by EVs
  - School buses and transit buses
    - Reflects EV adoption beyond the MDHD ZEV MOU, shadowing the trajectory of EV adoption for these vehicles outlined in Public Act No. 22-25
  - Personal and fleet light-duty vehicles
    - Split between the CELT 2022 forecast and the "Full Electrification" scenario, recognizing the EV goals currently in place, but reflecting the fact that there is significant uncertainty in the timing of progress toward these goals over the next decade

Vermont

EV Adoption Forecast Drivers

- 2013 Multi-State Zero-Emission Vehicle MOU
  - Collective target among initial signatory states to achieve a goal of 3.3 million EVs on the road by 2025

- 2020 Multi-State Medium- and Heavy-Duty Zero Emission Vehicle MOU
  - Goal that all new medium- and heavy-duty vehicle sales in each of 15 state jurisdictions be zero-emission vehicles by 2050, with an interim goal of 30% of new vehicle sales by 2030

- Initial Vermont Climate Action Plan (2021)
  - Modeling indicates that in order to achieve the state's emissions reduction requirements
    - Approximately 170,000 light-duty EVs will need to be deployed by 2030
    - Approximately 50,000 medium and heavy-duty EVs will need to be deployed by 2030

- Advanced Clean Cars II (ACCII) and Advanced Clean Trucks (ACT) rules
  - State of VT is considering adopting these by the end of 2022

- 2021 White House announcement regarding 2030 goal for light-duty vehicle sales aiming for *"…electric vehicles to make up 50% of all vehicles sold in the United States by 2030."*

Vermont

EV Adoption Forecast Assumptions

- "Full Electrification" scenario
  – Assumes all state and local policy, programs, goals and announcement targets are achieved in the listed timeframe solely through the adoption of electric vehicles

- "CELT 2024" scenario
  – Personal and Fleet light-duty vehicles
    - Reflects anticipated adoption of the Advanced Clean Cars II (ACCII) and Advanced Clean Trucks (ACT) rules, but at a lagged pace 3-5 years behind the targets listed in the rules
  – School buses, transit buses, and medium-duty delivery
    - Maintains that the 2030 MDHD ZEV goal (30% of new truck and bus sales) is met by EVs

New Hampshire
EV Adoption Forecast Drivers and Assumptions

- In New Hampshire, although there are a number of utility incentive programs offering rebates for charger installations, documentation pointing to specific expectations about EV adoption is scarce
  - There does not appear to be any guidance about EV targets needed to meet decarbonization goals

- "Full Electrification" scenario
  - The only explicit driver incorporated into the "Full Electrification" scenario is the 2021 White House announcement regarding 2030 goal for light-duty vehicle sales aiming for *"…electric vehicles to make up 50% of all vehicles sold in the United States by 2030."*
  - In the remaining 3 vehicle categories (medium-duty delivery, school buses, and transit buses) the "Full Electrification" scenario traces very closely to the CELT 2022 forecast through 2031, and is extrapolated out until all vehicles in each category are electrified

- "CELT 2024" scenario
  - Personal and Fleet light-duty vehicles
    - Split between the CELT 2022 forecast and the "Full Electrification" scenario
  - School buses, transit buses, and medium-duty delivery
    - Aligns with the CELT 2022 forecast and the "Full Electrification" scenario

Maine

EV Adoption Forecast Drivers

- In Maine, in addition to incentive programs offering rebates for EV purchases and charger installations, the state also has a number of references that mandate or suggest specific expectations about EV adoption

- 2013 Multi-State Zero-Emission Vehicle MOU
  – Collective target among initial signatory states to achieve a goal of 3.3 million EVs on the road by 2025

- 2020 Multi-State Medium- and Heavy-Duty Zero Emission Vehicle MOU
  – Goal that all new medium- and heavy-duty vehicle sales in each of 15 state jurisdictions be zero-emission vehicles by 2050, with an interim goal of 30% of new vehicle sales by 2030

- Maine Won't Wait
  – State climate action plan setting a goal of 41,000 light-duty EVs on the road in Maine by 2025 and 219,000 by 2030

- Greater Portland Transit District (Metro) ZEV Goal
  – Metro's Board of Directors passed a resolution committing to be zero emissions by 2040
  – Metro oversees approximately 29 out of the state's 194 transit buses

Maine

EV Adoption Forecast Assumptions

- "Full Electrification" scenario
  - Assumes all state and local policy, programs, goals and announcement targets are achieved in the listed timeframe solely through the adoption of electric vehicles

- "CELT 2024" scenario
  - Aligns closely with the "Full Electrification" scenario and state confidence that the goals it reflects will be achieved

Rhode Island

EV Adoption Forecast Drivers

- 2013 Multi-State Zero-Emission Vehicle MOU
  - Collective target among initial signatory states to achieve a goal of 3.3 million EVs on the road by 2025

- 2020 Multi-State Medium- and Heavy-Duty Zero Emission Vehicle MOU
  - Goal that all new medium- and heavy-duty vehicle sales in each of 15 state jurisdictions be zero-emission vehicles by 2050, with an interim goal of 30% of new vehicle sales by 2030

- RIPTA Sustainable Fleet Transition (2020)
  - Considers nine technology deployment scenarios for converting RIPTA's bus fleet to ZEV
    - Include a baseline diesel case and four scenarios that are based on combinations of technologies
  - "100% Depot Charging Scenario" is utilized to develop the "Full Electrification" scenario listed in this presentation
    - RIPTA's current diesel fleet is transitioned to depot-charged battery-electric buses by 2032

- Electrifying Transportation (2021)
  - Strategic policy guide for improving public access to EV charging infrastructure in Rhode Island
  - RIPTA has plans to purchase and deploy 16-20 electric buses as permanent additions to its fleet by 2023

- Advanced Clean Cars II (ACCII)
  - Requires by 2035 that 100% of light-duty vehicles sold will be zero emissions

- Adoption of California's Clean Trucks Act requires by 2035 that:
  - 55% of Class 2b – 3 truck sales are zero emissions
  - 75% of Class 4 – 8 straight truck sales are zero emissions
  - 40% of truck tractor sales are zero-emissions

- 2021 White House announcement regarding 2030 goal for light-duty vehicle sales aiming for *"…electric vehicles to make up 50% of all vehicles sold in the United States by 2030."*

Rhode Island

EV Adoption Forecast Assumptions

- "Full Electrification" scenario
  - Assumes all state and local policy, programs, goals and announcement targets are achieved in the listed timeframe solely through the adoption of electric vehicles

- "CELT 2024" scenario
  - Medium-duty delivery and school buses
    - Maintains that the MDHD MOU ZEV goal (30% of new truck and bus sales by 2030) is met by EVs
  - Transit buses
    - Reflects EV adoption beyond the MDHD ZEV MOU, assuming near-term RIPTA goals are met (deployment of 16-20 EV buses by 2023)
  - Personal and fleet light-duty vehicles
    - Split between the CELT 2022 forecast and the "Full Electrification" scenario, recognizing the EV goals currently in place, but reflecting the fact that there is significant uncertainty in the timing of progress toward these goals over the next decade