

Draft 2023 Transportation Electrification Adoption Forecast

Load Forecast Committee



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Introduction

- The ISO's transportation electrification forecast seeks to forecast the energy and demand impacts associated with the uptake of electric vehicles (EVs) within selected categories of vehicles:
 - Light-duty personal vehicles
 - Light-duty fleet vehicles
 - Medium-duty delivery vehicles
 - School buses
 - Transit buses
- The purpose of today's meeting is to share draft EV adoption figures for the CELT 2023 forecast

EV Adoption Forecast Overview

- For the CELT 2023 forecast, ISO is working to develop a consistent approach for generating state-level EV adoption forecasts
- ISO has developed 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)***
 - **“Draft CELT 2023” 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 will be used to generate the energy and demand impacts for the CELT 2023 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 through 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 made clear their intent to apply for funding
 - Award selection expected to take place in late 2022
- [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
 - Signed in 2013 (MA, CT, RI, VT) - goal of 5 million light-duty ZEVs on road by 2025 across the 9 signatory states
 - Signed in 2020 (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 seeking feedback
 - Reasonableness of the “Full Electrification” scenario
 - Considerations for developing the “Draft CELT 2023” scenario
 - The adoption figures shared in this presentation reflect the most recent state-level feedback but may continue to evolve as discussions continue

Current Vehicle Stock in New England

*As of March 31, 2021**

	Light-Duty Personal Vehicles		Light-Duty Fleet Vehicles		Medium-Duty Delivery Vehicles		School Buses		Transit Buses	
	All	Electric	All	Electric	All	Electric	All	Electric	All	Electric
CT	2,856,427	15,533	142,921	623	4,581	0	5,265	2	771	2
MA	5,082,420	36,533	337,296	1,915	9,476	8	9,668	7	1,763	25
ME	1,247,151	4,822	66,180	210	1,869	0	3,777	1	194	0
NH	1,222,363	5,014	98,716	379	2,047	0	3,571	0	143	0
RI	782,764	3,046	48,552	199	1,389	0	2,404	0	252	3
VT	518,562	4,332	30,020	219	833	0	1,780	6	118	2
Total	11,709,687	69,280	723,685	3,545	20,195	8	26,465	16	3,241	32

Source: DNV Energy Insights USA Inc.

* Updated figures reflecting totals as of Q3 2022 will be shared at the February 24, 2023 LFC meeting

MASSACHUSETTS

EV Adoption Forecast Drivers

- In Massachusetts, 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
- [MA Decarbonization Roadmap](#)
 - Reducing emissions 45% 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

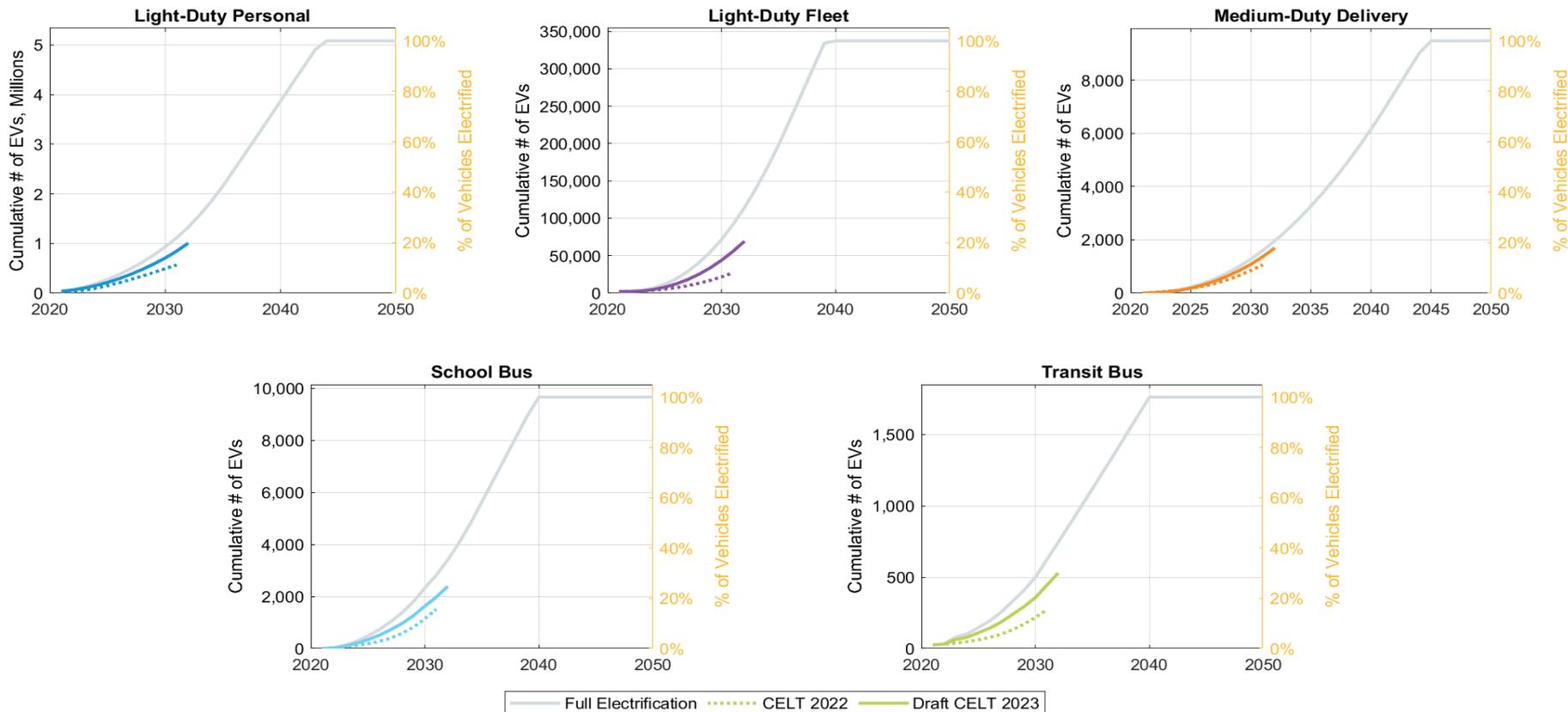
EV Adoption Forecast Drivers

- [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
- [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."*

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
- “Draft CELT 2023” 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
 - 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

Massachusetts Draft EV Adoption Forecast



CONNECTICUT

EV Adoption Forecast Drivers

- In Connecticut, 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
- [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)

EV Adoption Forecast Drivers

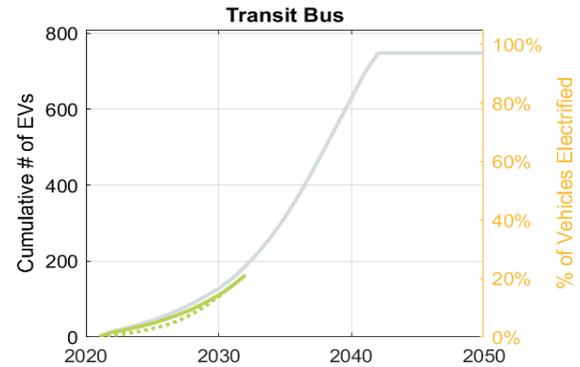
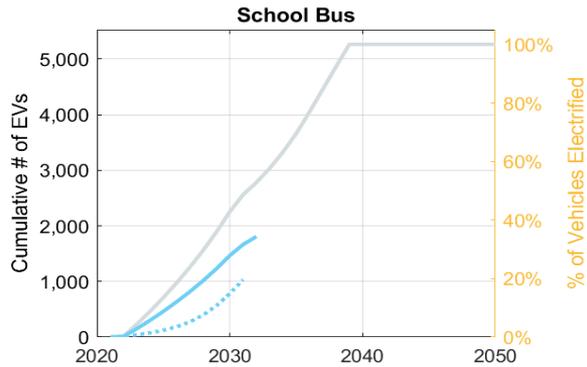
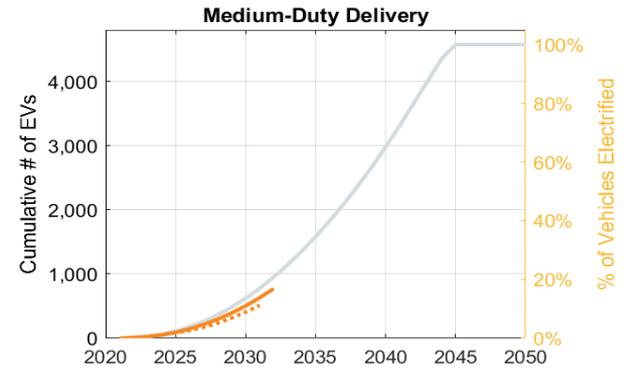
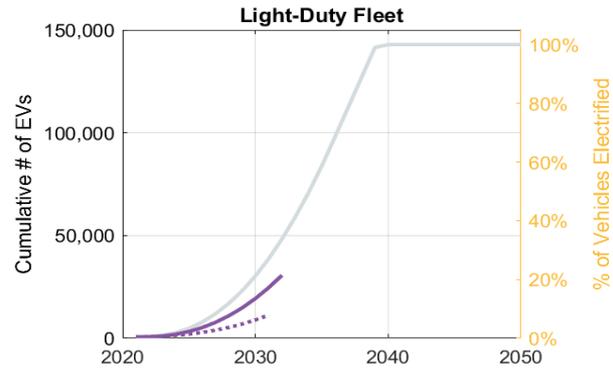
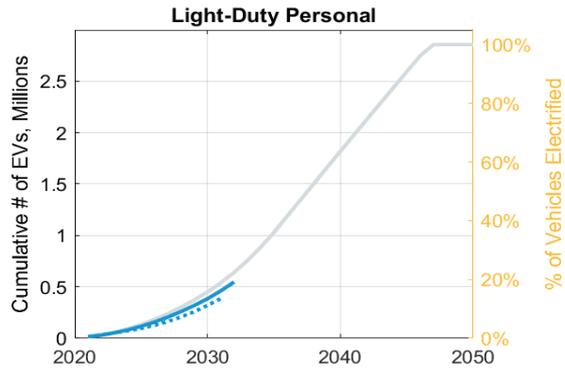
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- [Public Act No. 22-25](#)
 - Mandates targets for the procurement of state owned or leased light-duty vehicles
 - State fleet is roughly 3,500 out of almost 3 million light-duty vehicles state-wide
 - Transit Buses
 - After January 1, 2030, at least 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](#) aiming for “...*electric vehicles to make up 50% of all vehicles sold in the United States by 2030.*”

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
- “Draft CELT 2023” 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

Connecticut



— Full Electrification CELT 2022 — Draft CELT 2023

VERMONT

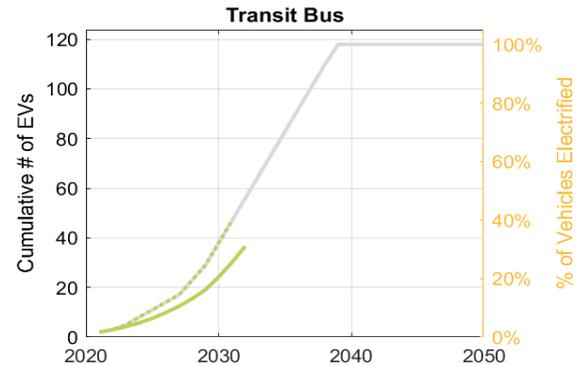
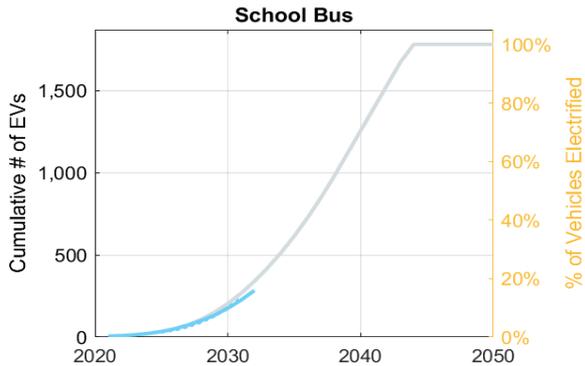
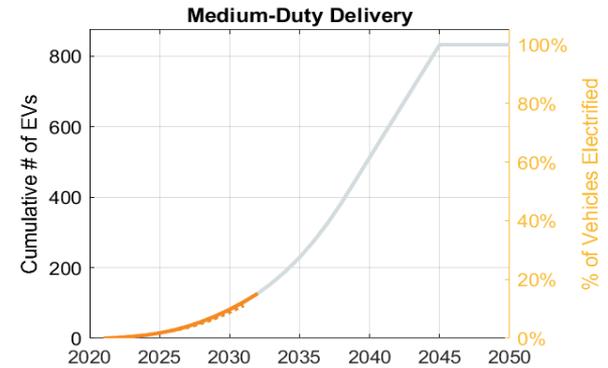
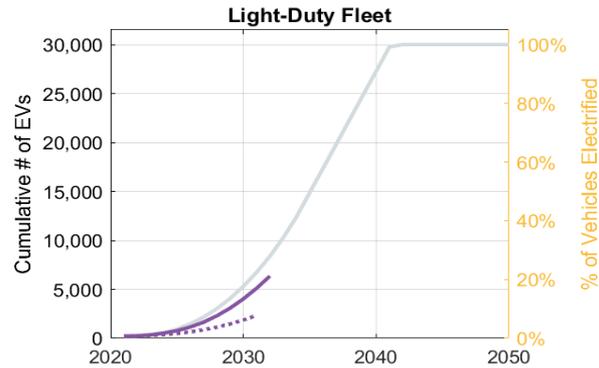
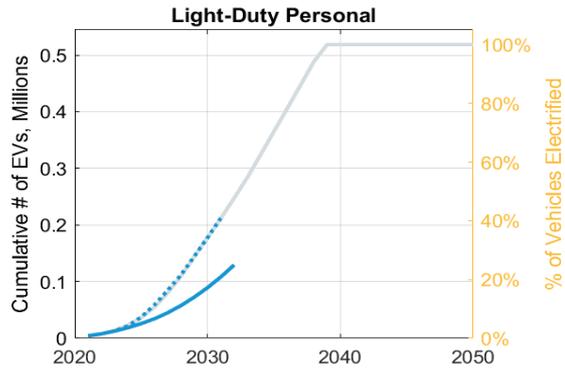
EV Adoption Forecast Drivers

- In Vermont, 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
- [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.”*

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
- “Draft CELT 2023” scenario
 - Personal and Fleet light-duty vehicles
 - Reflects anticipated adoption of the Advanced Clean Cars II (ACCI) 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

Vermont Draft EV Adoption Forecast



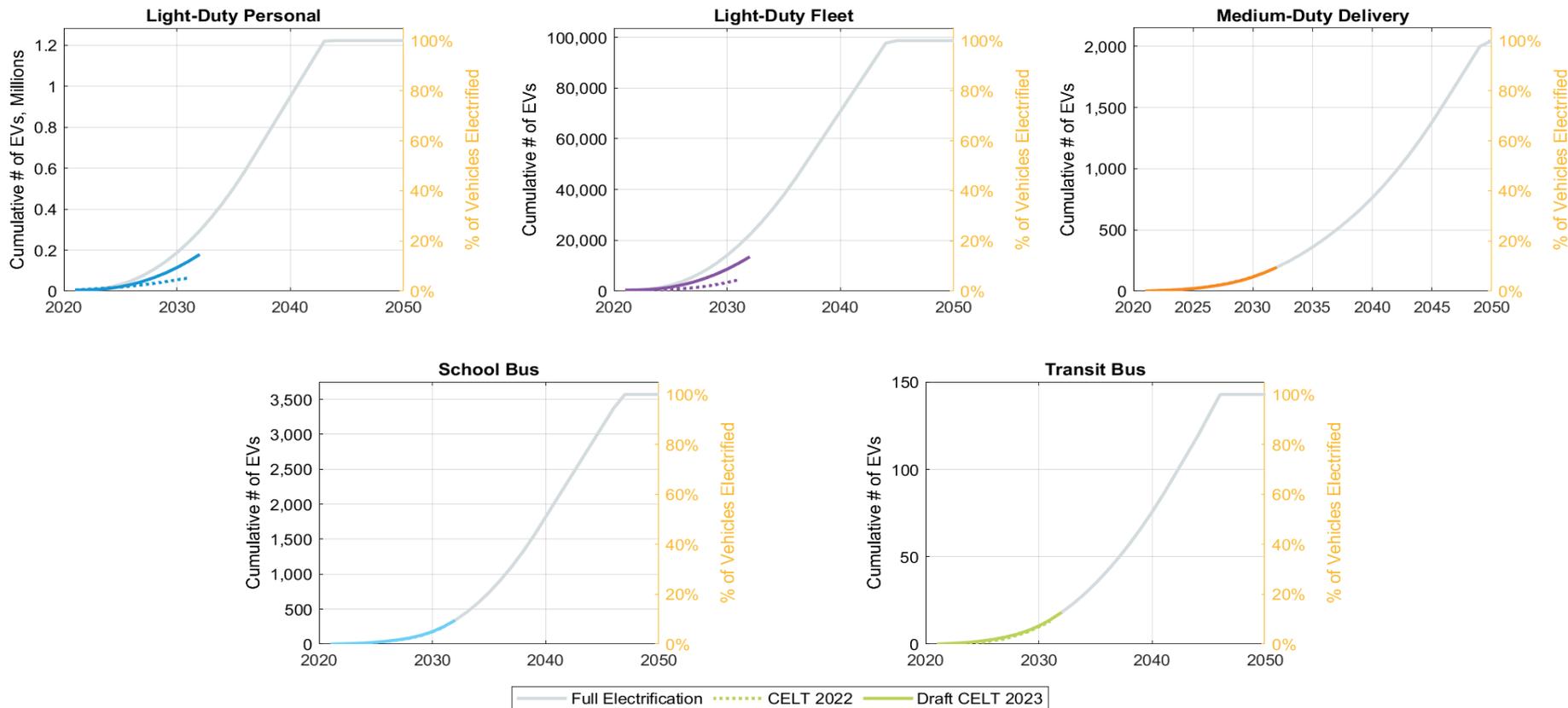
— Full Electrification
 ⋯ CELT 2022
 — Draft CELT 2023

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
- “Draft CELT 2023” 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

New Hampshire Draft EV Adoption Forecast



MAINE

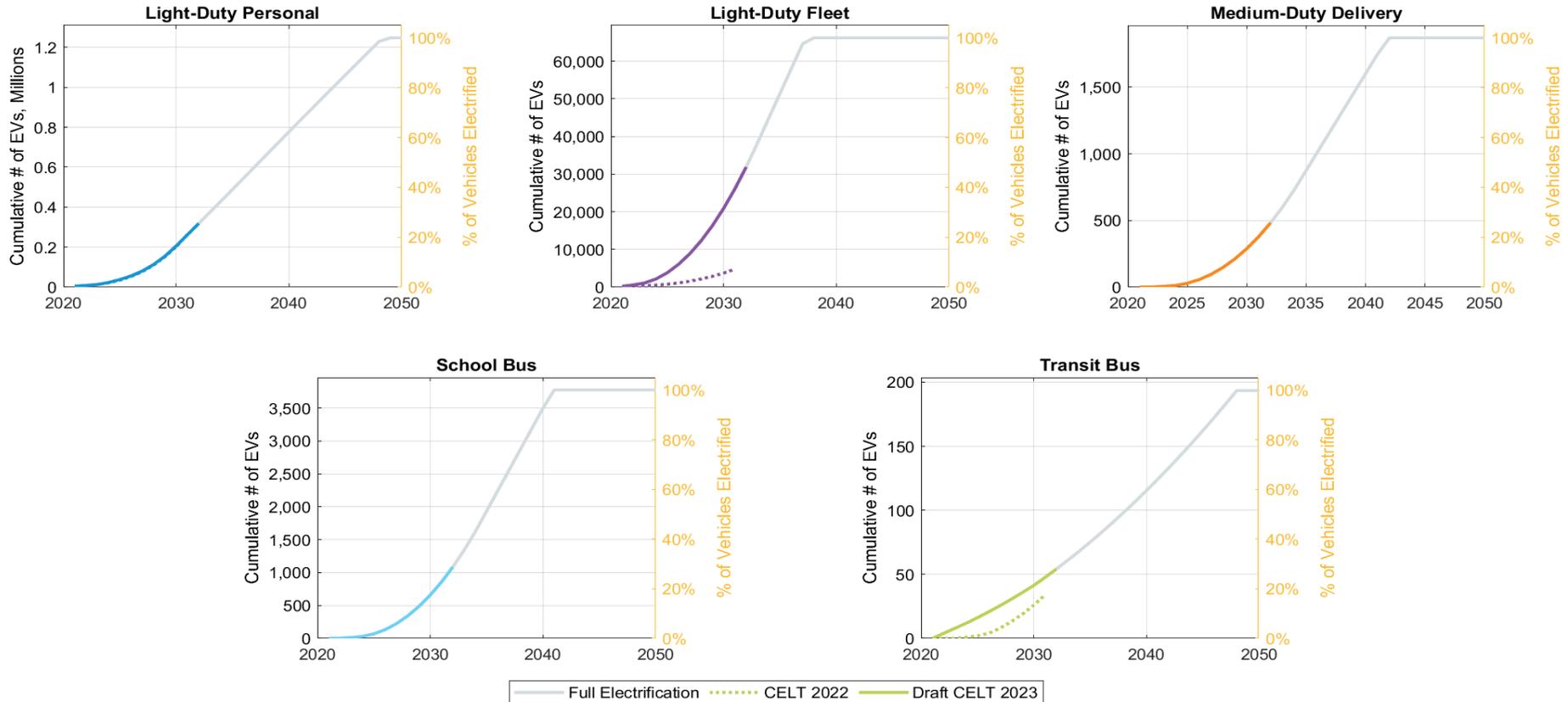
EV Adoption Forecast Drivers

- 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

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
- “Draft CELT 2023” scenario
 - Aligns with the “Full Electrification” scenario and state confidence that the goals it reflects will be achieved

Maine Draft EV Adoption Forecast



RHODE ISLAND

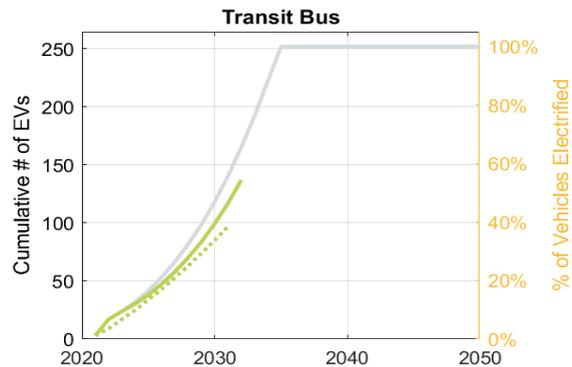
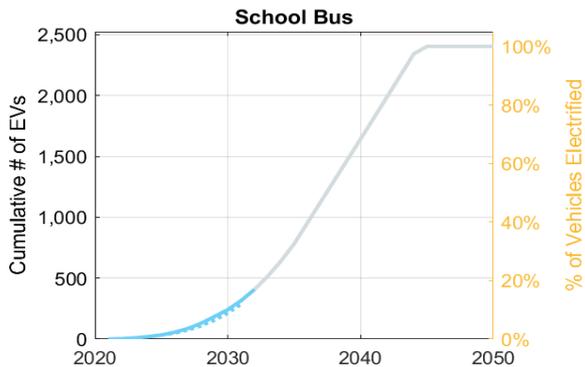
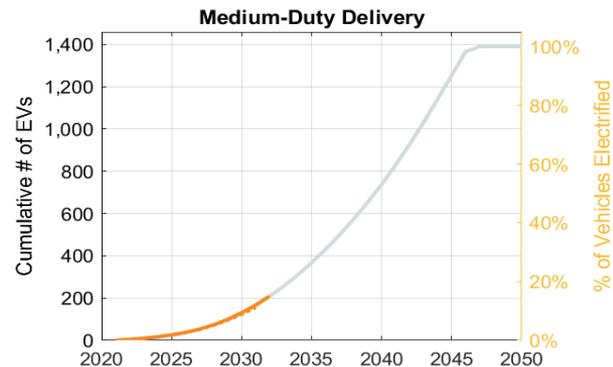
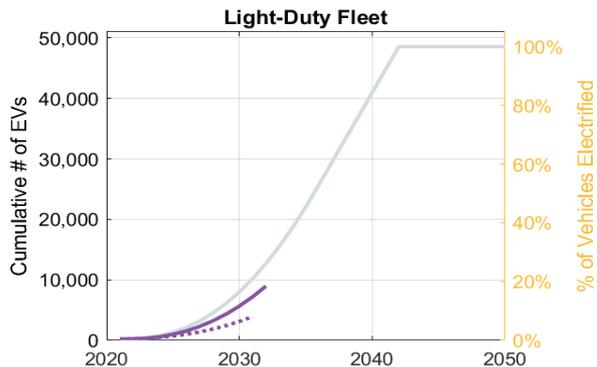
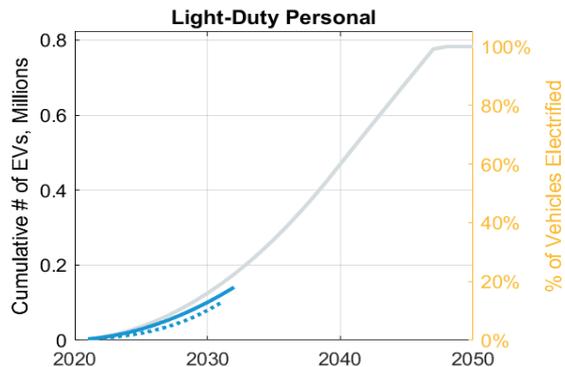
EV Adoption Forecast Drivers

- In Rhode Island, 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
- [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
- [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.”

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
- “Draft CELT 2023” 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

Rhode Island Draft EV Adoption Forecast



— Full Electrification CELT 2022 — Draft CELT 2023

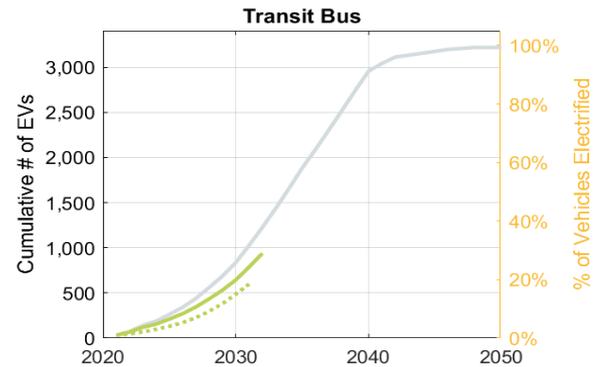
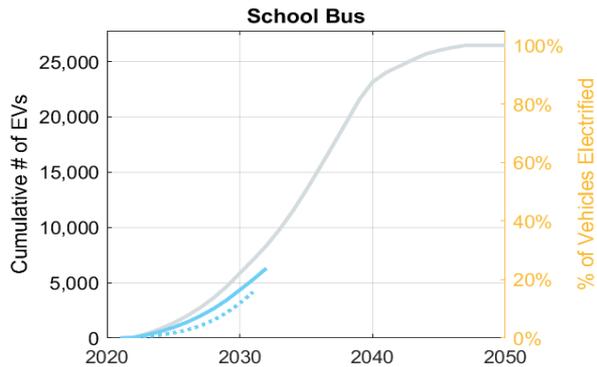
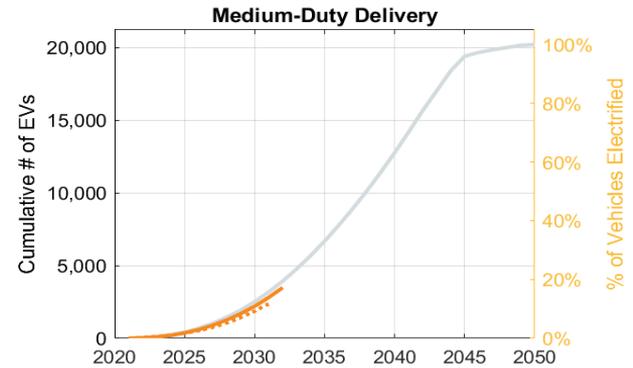
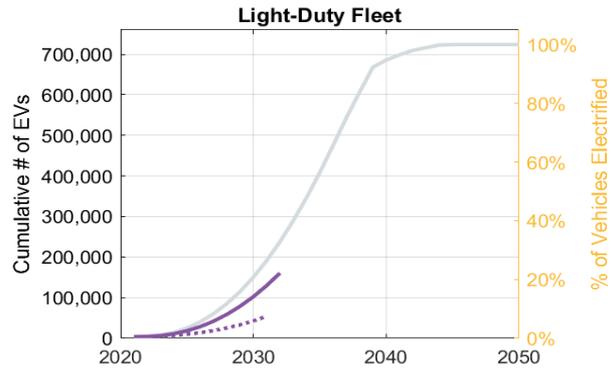
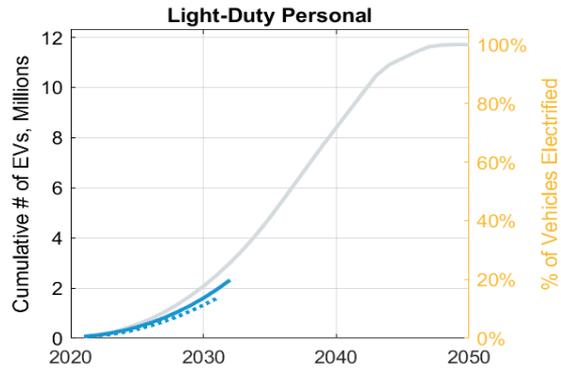
NEW ENGLAND

Draft CELT 2023 Incremental Annual EV Adoption

New England

Year	Transit Bus	School Bus	Medium-Duty Delivery	Light-Duty Fleet	Light-Duty Personal
2023	53	237	58	2,070	78,341
2024	35	301	106	4,494	108,268
2025	56	376	167	7,339	136,821
2026	60	461	230	10,233	165,220
2027	75	560	295	13,491	197,348
2028	89	655	364	16,774	230,603
2029	96	786	435	20,056	263,953
2030	113	925	510	23,702	299,225
2031	143	941	602	27,307	341,954
2032	152	1,017	681	30,912	377,581
Total (2023-2032)	871	6,260	3,447	156,378	2,199,314

New England



— Full Electrification CELT 2022 — Draft CELT 2023

NEXT STEPS

Next Steps

- ISO will continue to work with stakeholders to update adoption figures
- Draft energy and demand impacts will be shared at the February 24, 2023 LFC meeting

Questions

