NOVEMBER 7, 2025 | VIRTUAL

Updates to the EV Adoption Forecast Methodology

Load Forecast Committee

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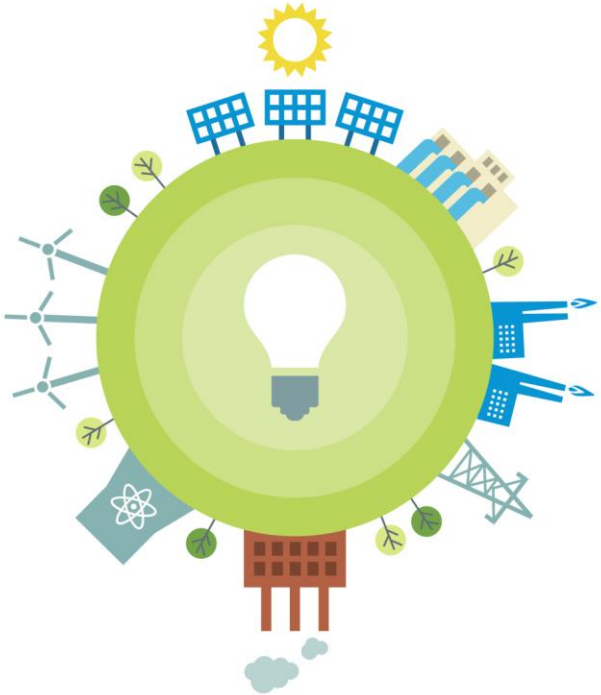
Acronyms

BEV	Battery Electric Vehicle
CELT	Capacity, Energy, Load, and Transmission
EV	Electric Vehicle
FLDV	Fleet Light-Duty Vehicle
ICE	Internal Combustion Engine
MDV	Medium-Duty Delivery Vehicle
PLDV	Personal Light-Duty Vehicle
RIPTA	Rhode Island Public Transit Authority

Outline

- Overview & Background
- Updated EV Adoption Forecast Process
- Preliminary Forecast Comparison
- Summary & Next Steps



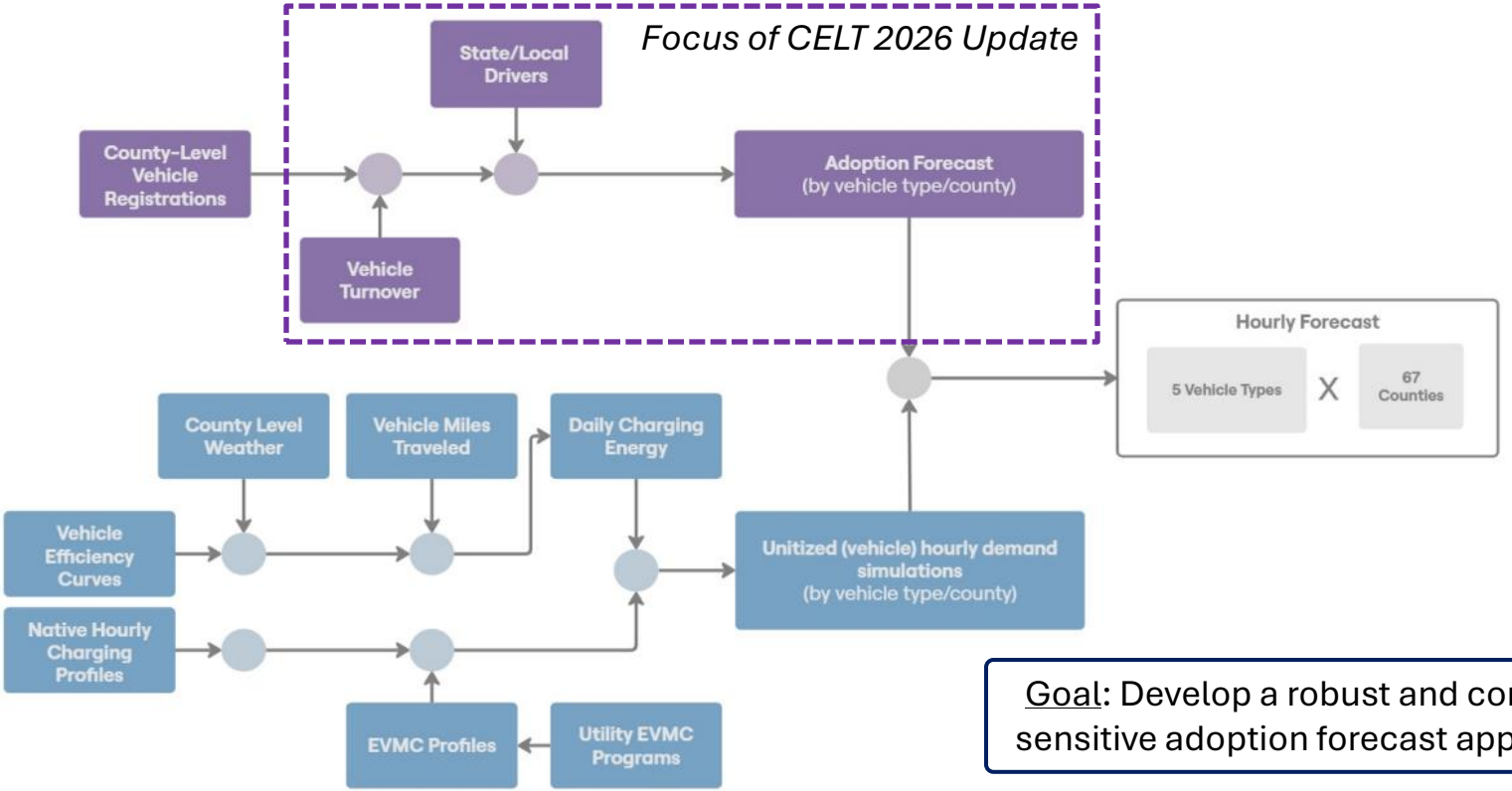
Electric Vehicle (EV) Forecast Methodology

- The EV forecast is intended to forecast the energy and demand impacts of EV adoption across five vehicle classes in New England:
  - Personal light-duty vehicles (PLDV)
  - Fleet light-duty vehicles (FLDV)
  - Medium-duty delivery vehicles (MDV)
  - School buses
  - Transit buses
- Forecast Methodology:
  1. Adoption forecasting
     - Forecasts the adoption of each vehicle class
     - Inventories the New England vehicle population and policy landscape
  2. Hourly demand modeling
     - Captures the electricity demand impacts of EV adoption in each vehicle class
     - Reflects increased levels of PLDV managed charging
  3. Energy and peak demand calculation
     - Energy stems from a direct summation of the simulated hourly demand
     - Peak demand is derived from a “waterfall” approach, considering all load components

Updates to EV Adoption Modeling

- Prior to CELT 2025, EV adoption forecasts relied heavily on state and local policy objectives due to an absence of comprehensive adoption data
  - Initial adoption data reviewed for CELT 2024 indicated that the PLDV adoption forecast was too high
    - The CELT 2024 forecast incorporated reductions in PLDV EV adoption
- For CELT 2025, the EV adoption forecast methodology was revised to reflect recent EV adoption trends in each state
  - Updated EV adoption data indicated that our adoption forecast across all vehicle classes was too high, and out of sync with recent trends
  - Forecasts across all classes were reduced relative to the CELT 2024 forecast to account for:
    - EV adoption rates that consistently fell below the CELT forecast rates
    - Heightened uncertainty surrounding EV adoption policy and funding for infrastructure buildout
- For CELT 2026, the EV adoption forecast methodology has been further advanced to incorporate a more robust, algorithmic approach to adoption modeling
  - Incorporates observed state-specific EV adoption, economic data, and policy drivers
  - **Resulting adoption forecasts reflect similar trends as the CELT 2025 EV adoption forecast**

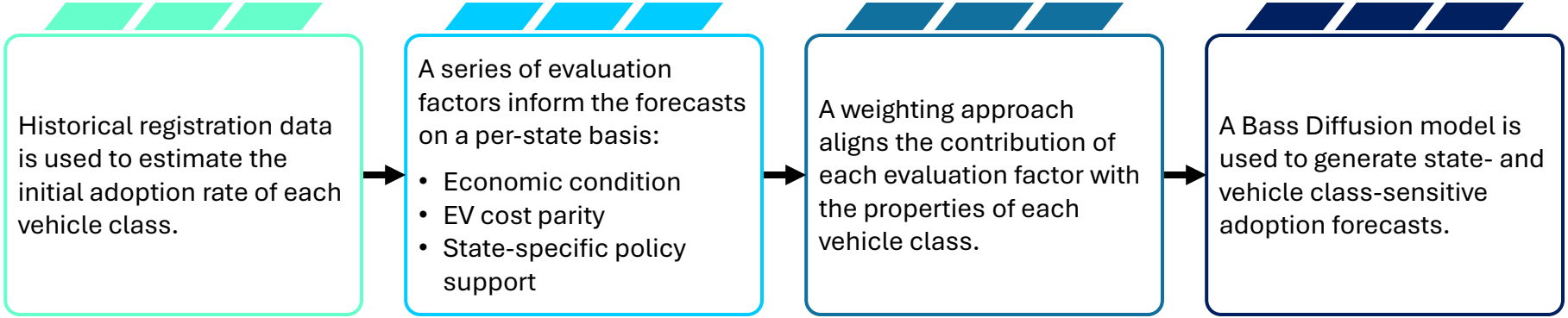
EV Forecast Process



Goal: Develop a robust and context-sensitive adoption forecast approach

UPDATED ADOPTION FORECAST PROCESS

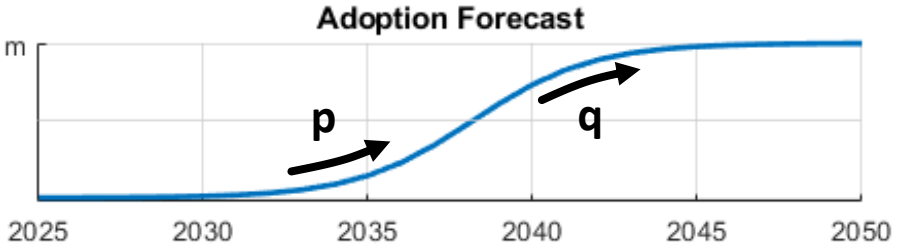
Process Description

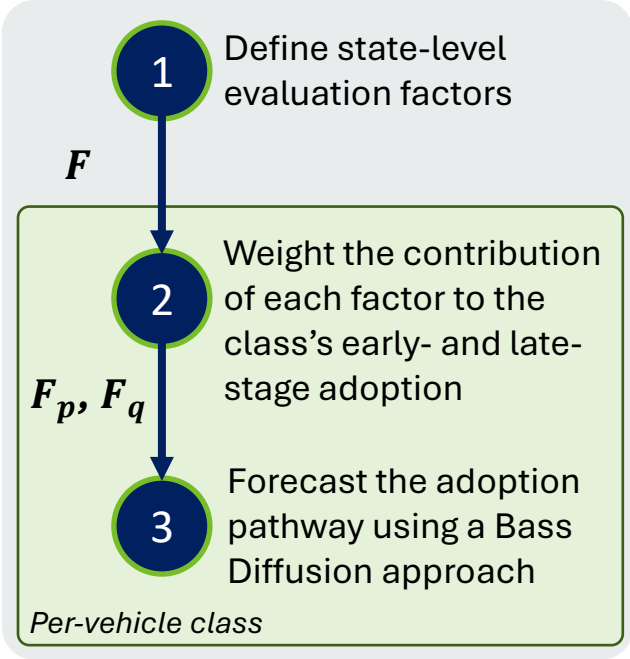


- Preliminary forecasts have been generated for each state using the updated process.
  - A sample selection is provided at the end of the presentation.

Process Description

- **Bass Diffusion:** Forecast approach to predict the diffusion of emerging technologies
  - Models the interactions of early innovators (p) and late-stage imitators (q)
- Based on the total market capacity (m) and the rate of saturation (p, q)
  - Market capacity based on NREL's EV Future Scenarios





State-Level Evaluation Factors

Cost of Ownership

Total lifetime expense of owning and operating a BEV, including acquisition, maintenance, and disposal, compared to its ICE counterpart.

Source: NREL Annual Technology Baseline

F1

Policy Support

Regulatory incentives, subsidies, and government initiatives that influence attractiveness from a policy support perspective.

Source: Internal & State Partnerships

F2

Socioeconomic Index

Location-specific socioeconomic conditions that govern adoption, including population, employment, and urbanization demographics.

Source: Moody's & US Census Data

F3

Historical Registration

State-level adoption figures that define the existing EV stock and current rate of adoption across the vehicle classes.

Source: Experian Information Solutions Inc. & World Resources Institute

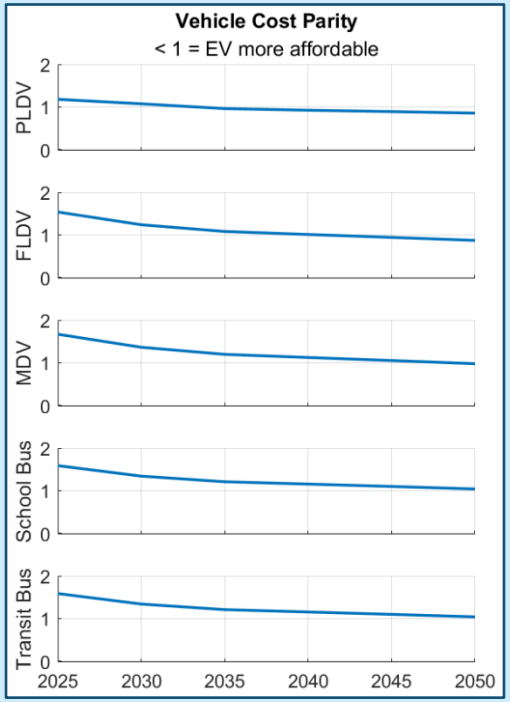
F4

Evaluation factors (F) quantify adoption potential from financial, policy, social, and historical perspectives

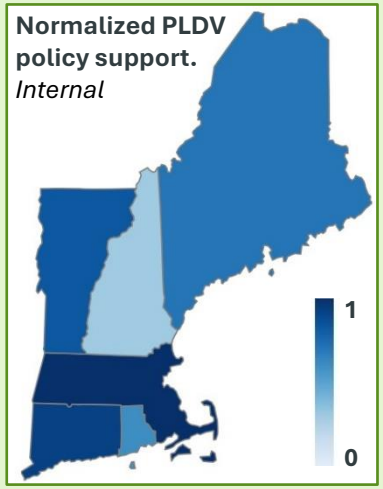
State-Level Evaluation Factors

Values subject to change.

Comparison of relative vehicle purchase prices.
NREL 2024 Annual Technology Baseline.

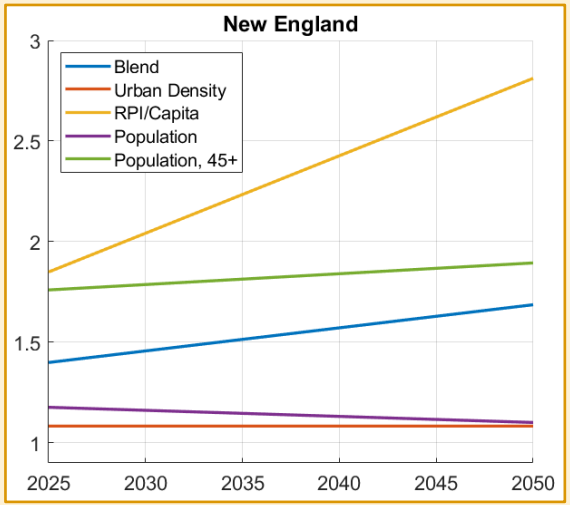


Normalized PLDV policy support.
Internal



Example Policy	Support	Result
RIPTA Sustainable Fleet Transition	Strong	
EV Bus Pilot Program	Moderate	
EV Owner Fee	Adverse	

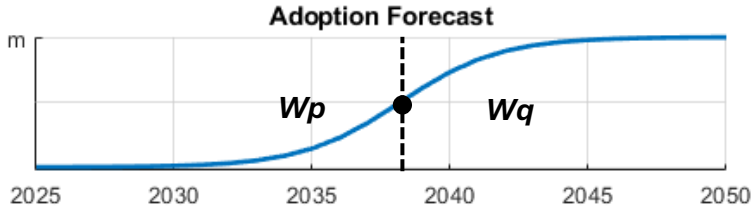
Normalized PLDV socioeconomic index.
Moody's & US Census Data

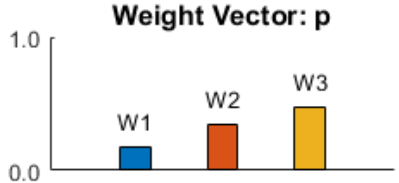


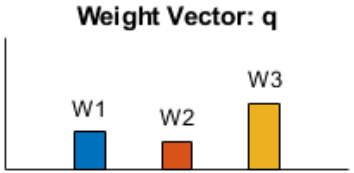
Index definition and blending processes follow the method presented on slides 10-13 of the February 23, 2024 LFC presentation. The blend is specified per-vehicle class.

Adapted Adoption Forecast

- Coefficients (p, q) are located through a weighted sum approach:
  - Evaluation factors (F) are defined per-state as outlined in slides 10 & 11
  - Weights (w) balance the contribution of each factor to the expected class adoption behavior
  - Coefficient bounds (min, max) are identified from existing studies and forecasts







Not representative of actual weights.

$$S_p = \sum_i w_{p,i} \cdot F_i \qquad \boldsymbol{p} = f_p(S_p)\Big|_{min}^{max}$$

$$S_q = \sum_i w_{q,i} \cdot F_i \qquad \boldsymbol{q} = f_q(S_q)\Big|_{min}^{max}$$

Scores (S) are specific to each vehicle class and state

Adapted Adoption Forecast

$$F(t) = \frac{1 - e^{-(p+q)t}}{1 + \frac{q}{p}e^{-(p+q)t}}$$

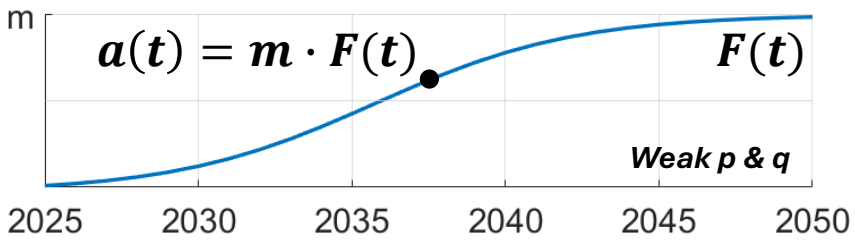
F: Adoption fraction

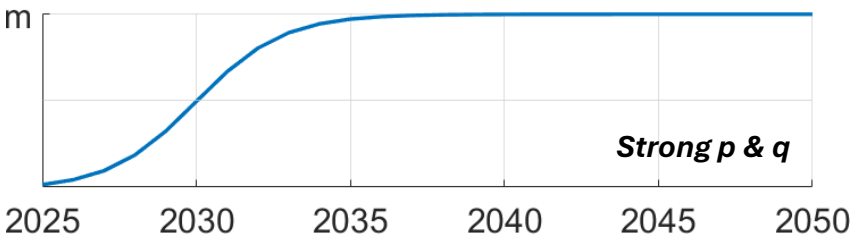
a: Cumulative adoption (vehicles)

m: State-level market capacity

p: Coefficient of innovation (early-stage)

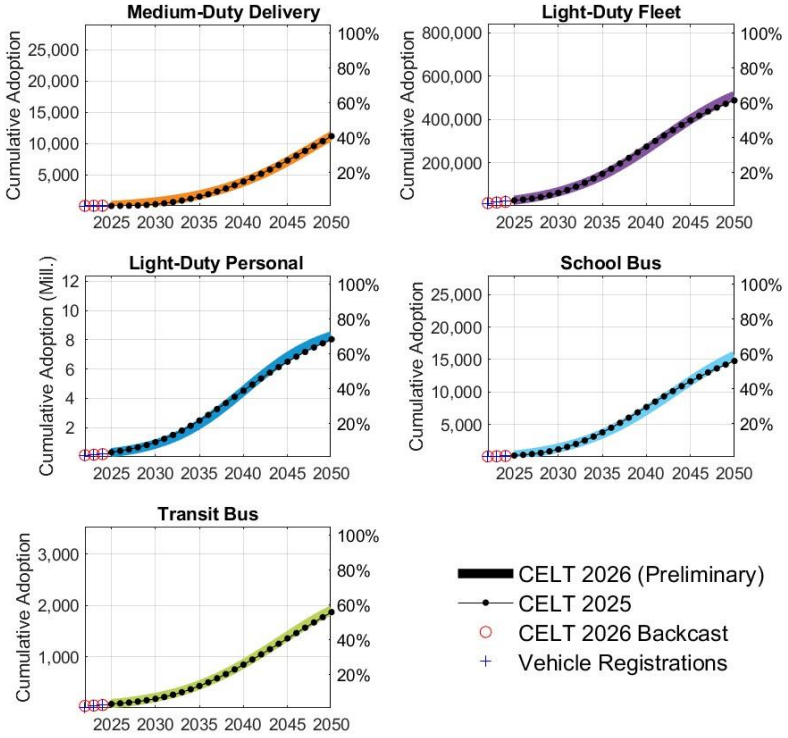
q: Coefficient of imitation (late-stage)





PRELIMINARY FORECAST PERFORMANCE

Cumulative Adoption Forecast: New England



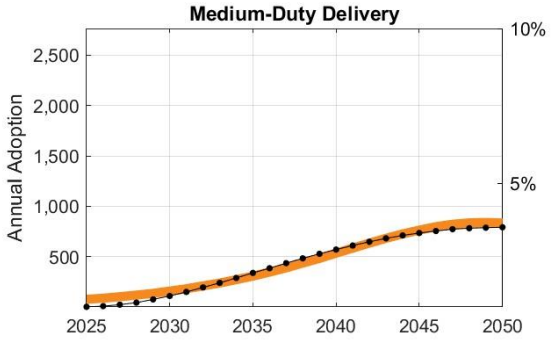
Average Annual Difference (%)

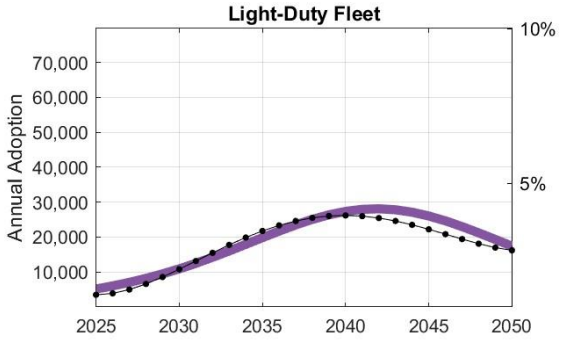
Medium-Duty Delivery	**0.6**
Light-Duty Fleet	**0.9**
Light-Duty Personal	**1.4**
School Bus	**1.0**
Transit Bus	**0.7**

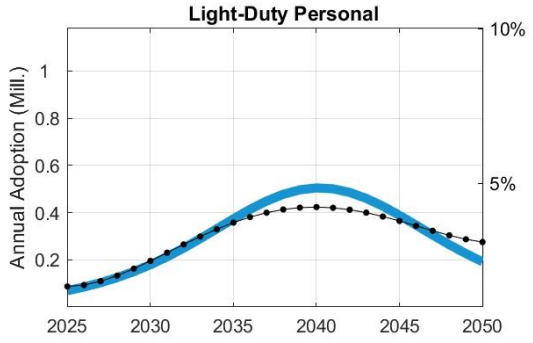
Early results capture New England's adoption forecast trends

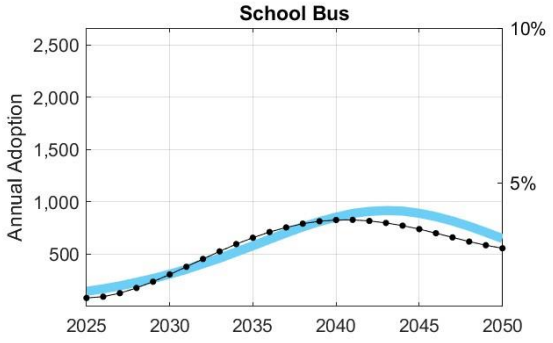
+ *Vehicle registrations sourced from Experian Information Solutions Inc. & World Resources Institute, Figures subject to change*

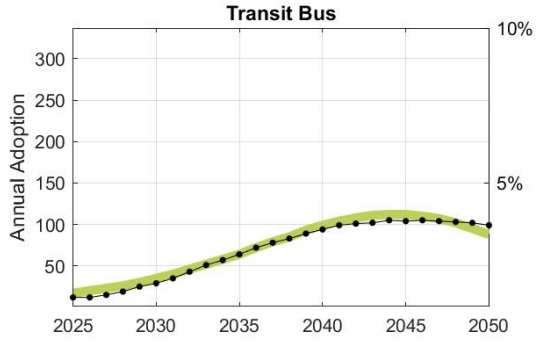
Incremental Adoption Forecast: New England





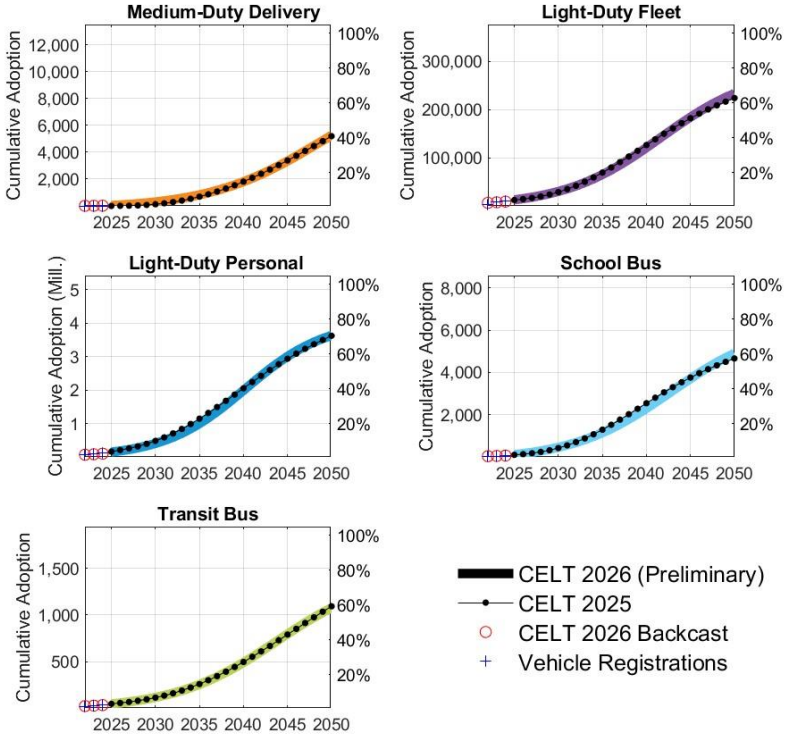






CELT 2026 (Preliminary)
CELT 2025

Cumulative Adoption Forecast: Massachusetts



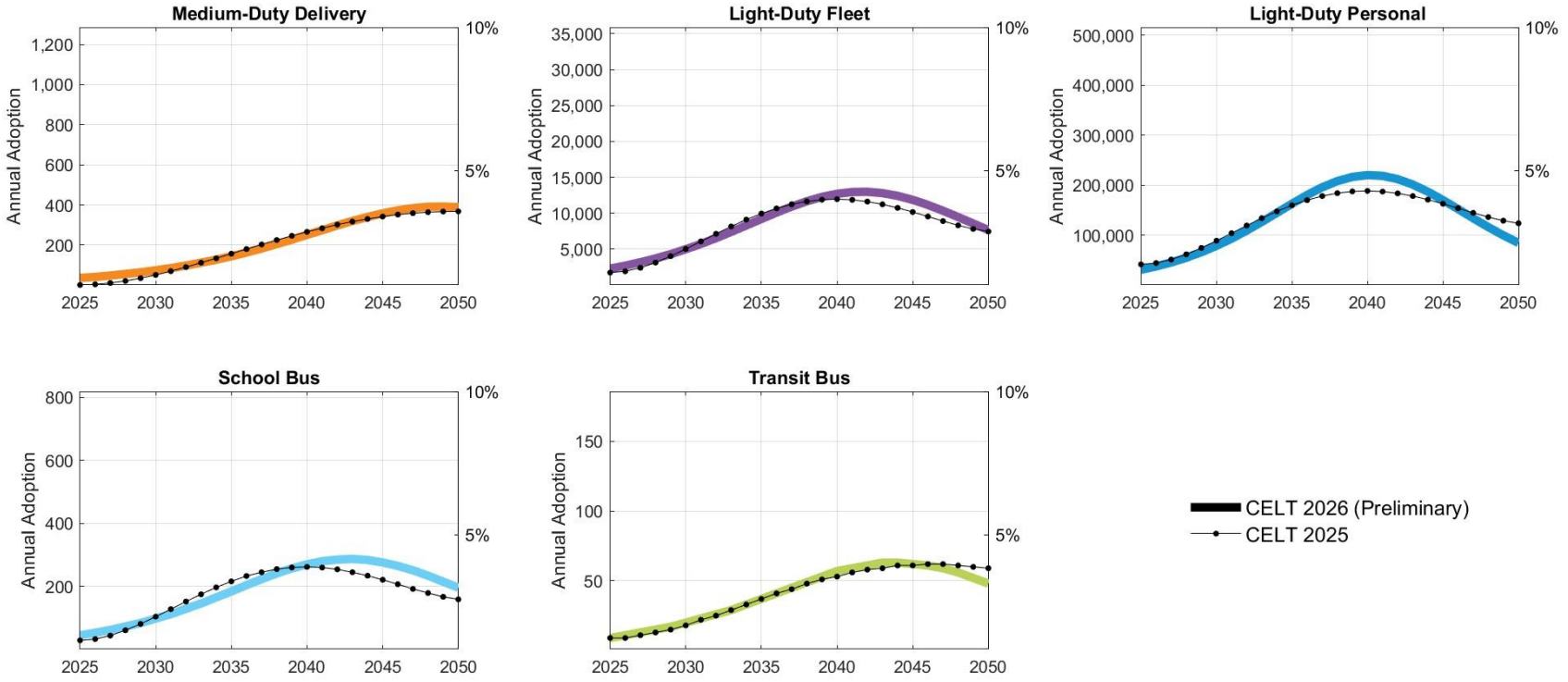
Average Annual Difference (%)

Medium-Duty Delivery	**0.7**
Light-Duty Fleet	**1.2**
Light-Duty Personal	**1.7**
School Bus	**1.7**
Transit Bus	**0.3**

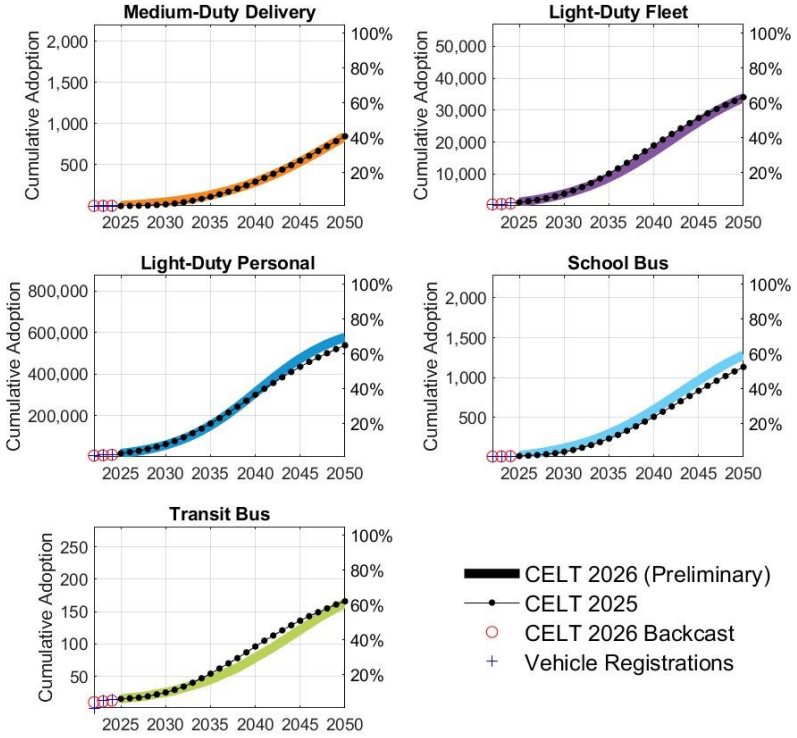
Results are also able to represent state-level adoption dynamics

+ *Vehicle registrations sourced from Experian Information Solutions Inc. & World Resources Institute, Figures subject to change*

Incremental Adoption Forecast: Massachusetts



Cumulative Adoption Forecast: Rhode Island



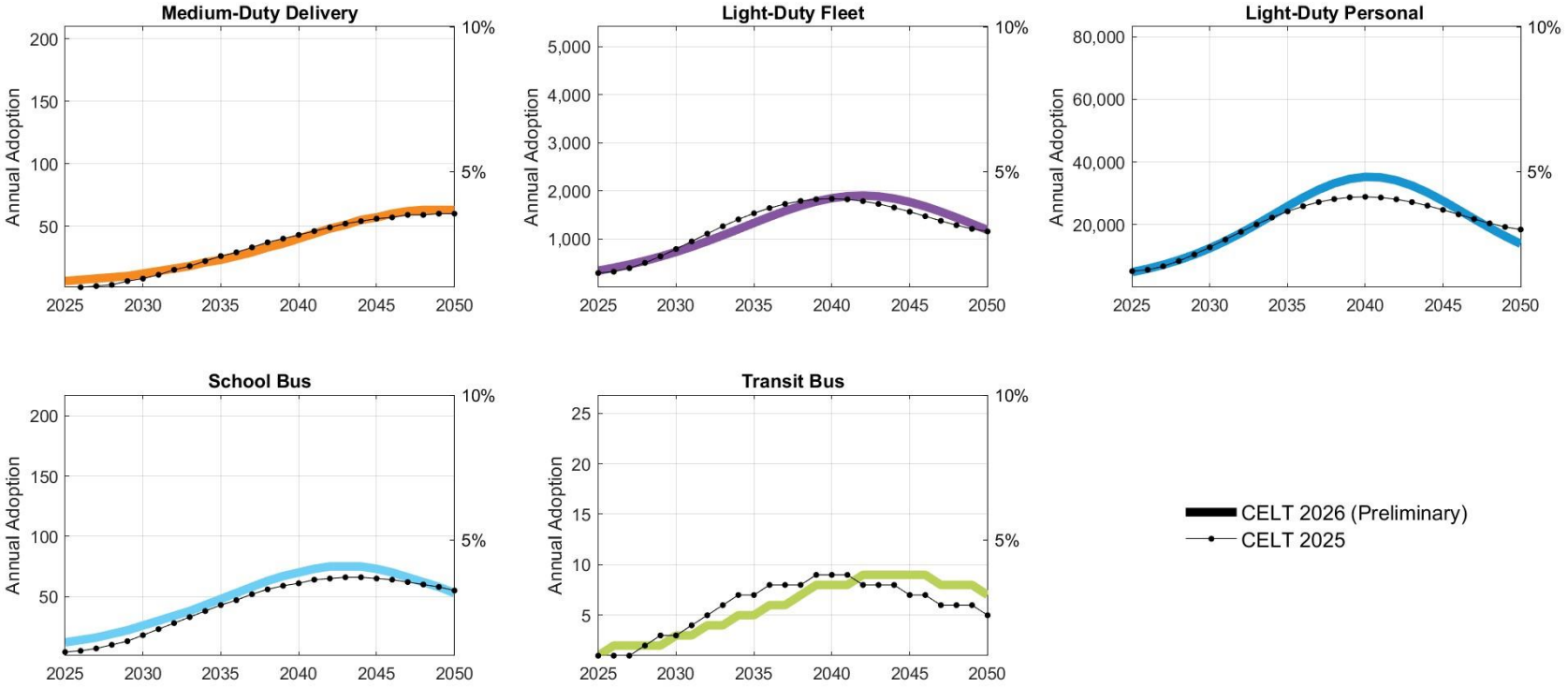
Average Annual Difference (%)

Medium-Duty Delivery	**0.8**
Light-Duty Fleet	**1.9**
Light-Duty Personal	**2.3**
School Bus	**4.3***
Transit Bus	**3.9***

Policy identification is challenging, and certain cases* require further review

+ *Vehicle registrations sourced from Experian Information Solutions Inc. & World Resources Institute, Figures subject to change*

Incremental Adoption Forecast: Rhode Island



Summary & Next Steps

- Preliminary forecasts reflect similar trends as the CELT 2025 EV adoption forecast
- The updated CELT 2026 EV adoption forecast leverages an algorithmic Bass Diffusion process to estimate adoption:
  - Sensitive to observed adoption figures, technical maturity, and state economic and policy drivers
  - Systematically integrates time-sensitive drivers into the EV adoption forecasts
    - Enables the forecast to capture changes in the baseline factors over time
- Next Steps:
  - Coordinate further with the states on the expected updates to their EV-focused policies
  - Translate updated policy information into model inputs and benchmark the resulting forecasts, incorporating Q3 2025 EV adoption data
  - Integrate the updated forecasts into the CELT 2026 hourly EV energy demand model

Questions