# Additional Achievable Transportation Electrification

Framework and Scenario Descriptions for the Demand Analysis Working Group

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# Additional Achievable Transportation Electrification (AATE): Synopsis

AATE enables the expansion of the original IEPR forecasting approach used for transportation.

Advanced Clean Cars II (ACC2), Advanced Clean Trucks (ACT), and Advanced Clean Fleets (ACF) are either completely or partly supply-based regulations. This fact poses unique challenges to the existing transportation energy demand forecasting models.

Using policy-guided vehicle populations coupled with the remaining transportation forecasting tools, the AATE will be more useful for planning purposes by using **managed forecasts**.

# Managed Forecasts

A **managed forecast** is an energy demand scenario that adjusts a baseline forecast to reflect either or all the following:

a) The impacts of policies and programs that cannot be included within the basic architecture of the forecasting model.
b) Significant uncertainties about existing programs, funding, or implementation features.
c) Uncertainties regarding new policies and programs motivated by state or federal goals.

The underlying rationale of managed forecasts is that these policies and programs are reasonably expected to occur, but that the energy outcomes are sufficiently uncertain that special consideration is required before making commitments to the generating, transmission, or other resources needed to match energy supply with demand. As a result, multiple managed forecasts may be developed and used for various energy infrastructure planning purposes.

# Baseline Forecast

AATE starts with a baseline forecast, with scenarios generally adding annual electricity demand.

The baseline forecast is the previously mid-case IEPR forecast. It uses annually updated vehicle attributes, existing ZEV incentives, and economic and demographic forecast data.

Some vehicle populations remain consistent with the baseline. For example, the Innovative Clean Transit regulation and the ZEV Airport Shuttle Bus Regulation have been in place for several years, and staff do not anticipate modifications to the requirements. Additionally, light-duty government vehicles grow to 100 percent ZEV sales by 2028 in the baseline, so no modifications to them are necessary.

Scenarios beyond the baseline will only add to the ZEV baseline population. Thus, if a scenario's initial output population shows a lower ZEV population in a year, then the baseline year's population will be assigned to that year.

# Scenario 1

Scenario 1 modifies vehicle attributes and ZEV incentives to match attributes and other conditions that result in higher ZEV adoption, similar to previous IEPR cycles' "high case" inputs. For example, high case conditions include the following:

- Longer ZEV ranges
- Greater ZEV availability
- Lower ZEV prices
- Higher ICE prices
- Additional ZEV incentives
- Stronger preferences for ZEVs

Such attributes draw more consumer choices in the model more toward ZEVs over combustion vehicles.

The economic and demographic forecast data, however, remains consistent with the baseline.

This is expected to produce a slightly higher ZEV population and therefore greater electricity demand for LD and MDHD vehicles.

# Scenario 2

Scenario 2 increases the ZEV population further.

For light-duty vehicles, the scenario introduces a post-process modification to the vehicle populations. Starting in 2026, light-duty ZEVs as a proportion of total sales will increase linearly from 35 percent ZEV to 100 percent in **2040**. The number of new vehicle sales and the vehicle class distribution (e.g., 65,789 mid-size premium sedans sold in 2023) will remain the same, but the fuel types of the vehicles sold (e.g., gasoline vs. electric) will be assigned to align with each year's sales requirement.

For medium- and heavy-duty vehicles, Scenario 2 builds on Scenario 1 with increased incentives to approach Advanced Clean Fleets (ACF) requirements and exemptions for renewable natural gas vehicles outside of non-attainment areas and other edge use cases (e.g., icy climates, emergency vehicles).

# Scenario 3

Scenario 3 will be a post-process modification to vehicle sales to align with regulatory requirements of both ACC2 and ACF, a further increase above scenario 2.

For light-duty vehicles, ACC2 ramps sales requirements from 35 percent ZEV in 2026 to 100 percent in **2035**. As with Scenario 2, the post process will assign fuel types of vehicles to align with these requirements.

For MDHD, Scenario 3 will also be a post-process modification to vehicle sales to align with ACF as in the May 2022 draft proposal. The number of new vehicle sales and vehicle class distribution will remain unchanged, but the fuel types of vehicles sold will be modified to align with ACF requirements.

Prior to 2026, Scenario 1 vehicle populations will be used.

# Post-Process: Simplified Example

| Scenario 1 | |
|---|---|
| Total LD Vehicle Population | 34,000,000 |
| New LD Vehicle Sales | 2,400,000 |
| ZEV Sales Requirement | 59% |
| Standard Mid Size Sales | 400,000 |
| Gasoline* | 265,328 |
| Electric* | 134,672 |

| Scenario 3 | |
|---|---|
| Total LD Vehicle Population | 34,000,000 |
| New LD Vehicle Sales | 2,400,000 |
| ZEV Sales Requirement | 59% |
| Standard Mid Size Sales | 400,000 |
| Gasoline* | 164,000 |
| Electric* | 236,000 |

In the post-process approach, the distribution of ZEVs will change, but the vehicle population, new vehicle sales, and classes of new vehicles will remain constant. ZEV populations within a class may not align precisely to the sales, but the total ZEV sales will align.

*there are four major ZEV fuel types, and many combustion fuel types. This example is simplified for illustration.

# Plug-in Hybrids (PHEVs)

- PHEVs are a difficult case. For light-duty, ACC2 allows PHEVs to count as a ZEV value if they satisfy certain conditions.
- Limitation: PHEVs cannot be used to satisfy more than 20 percent of a manufacturer's ZEV requirement.
- Assumption for Scenario 2: ramping down of Scenario 1's PHEV populations to 15 percent PHEVs in 2040.
- Assumption for Scenario 3: ramping down of Scenario 1's PHEV populations to 15 percent PHEVs in 2035.

# Scenario Comparisons: Light-Duty Approach

| | Baseline | Scenario 1 | Scenario 2 | Scenario 3 |
|---|---|---|---|---|
| **Econ/Demo** | Baseline | Baseline | Identical to 1 | Identical to 1 |
| **Vehicle Attributes** | Mid | Higher | Identical to 1 | Identical to 1 |
| **Incentives** | Mid | Higher | Identical to 1 | Identical to 1 |
| **Total LD Population** | Mid | Higher* | Identical to 1 | Identical to 1 |
| **CARB Regulations** | **Modeled** under standard mid forecast framework | **Modeled** with higher conditions | New Vehicle Sales **assigned** to ramp to 100 percent ZEV in 2040 | New Vehicle Sales **assigned** to match ACC2 ZEV sales requirements |

*Using baseline economic and demographic factors, the vehicle population may differ from the baseline if prices are lower or incentives are greater

# Scenario Comparisons: Medium- and Heavy-Duty Approach

| | Baseline | Scenario 1 | Scenario 2 | Scenario 3 |
|---|---|---|---|---|
| **Econ/Demo** | Baseline | Baseline | Baseline | Identical to 2 |
| **Vehicle Attributes** | Mid | Higher | Higher | Identical to 2 |
| **Incentives** | Mid | Higher | Increased to align with some targets | Identical to 2 |
| **Total MDHD Population** | Mid | Higher* | Higher* | Identical to 2 |
| **CARB Regulations** | **Modeled** under standard mid forecast framework | **Modeled** with higher conditions | **Modeled** to approximate some ACF factors with some exemptions | New Vehicle Sales **assigned** to match ACF/ACT ZEV requirements |

*Using baseline economic and demographic factors, the vehicle population may differ from the baseline if prices are lower or incentives are greater

# Thank You!

Questions?

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