

# California Low Carbon Fuel Standard – Modeling Updates

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AUGUST 16, 2023



# Agenda

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- LCFS Rulemaking Overview
- Summary of the LCFS Model (CATS)
- Updates to Example Scenario
- Public Comments

# Today's Webinar Objectives

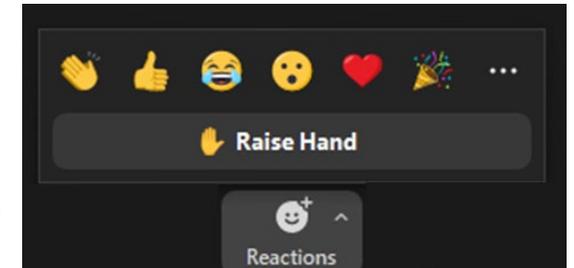
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- Provide an overview of the CATS model
- Highlight significant changes to example scenario inputs since the February 2023 workshop (example scenario released in March)
- Post an updated example scenario

# Public Comment Logistics

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- Workshop materials and public comment page available on the LCFS Meetings and Workshops page:  
<https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard/lcfs-meetings-and-workshops>
- Q&A during the workshop
  - 1) Use the “**Raise Hand**” function in the “reactions” box at the bottom Zoom toolbar
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# Objectives for LCFS Rulemaking

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- Update LCFS to support increased low-carbon fuel supply identified in 2022 Scoping Plan Update
- Provide long-term price signals and increase regulatory clarity for the market to support deeper transportation sector decarbonization needed through mid-century
- Leverage new federal programs/funding via complimentary LCFS policies
- Modify existing crediting opportunities to align with the Scoping Plan, while also reducing risk of backsliding on GHG benefits
- Streamline program implementation

# CATS Model Background

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# The California Transportation Supply (CATS) Model

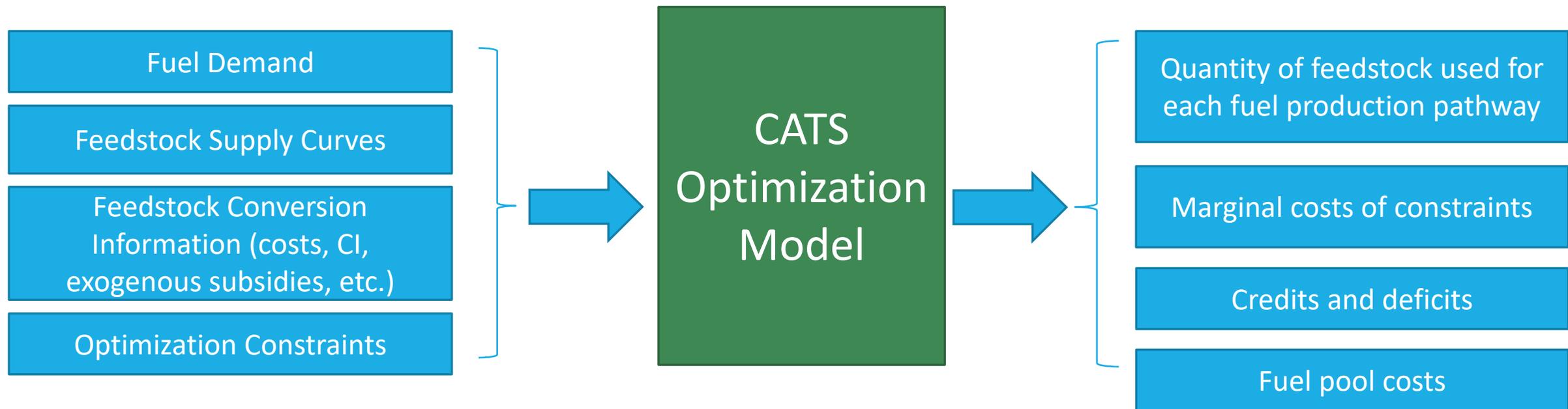
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- Developed by CARB staff to evaluate potential fuel market and policy assumptions and outcomes
- CATS is a transportation fuel supply optimization model
- CATS minimizes the cost of supplying fuel to meet the specified annual fuel demand
- CATS scenarios do not capture the California fuel markets perfectly; does not necessarily capture all factors that could impact costs and supply in the actual California fuel market

# The California Transportation Supply (CATS) Model

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- CATS is a transportation fuel supply optimization model
- Minimizes the cost of supplying fuel to meet fuel demand in each year



# CATS Model and LCFS Benchmarks

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- Each fuel pathway has a defined carbon intensity (CI) and conversion cost
- California fuel demand is met using Feedstock-to-Fuel conversion pathways (e.g., Crude Oil to Gasoline, Biomethane to CNG)
- Annual LCFS compliance must be met:
  - Credits  $\geq$  Deficits for every year
  - A user-defined LCFS benchmark trajectory determines the number of credits/deficits generated for each feedstock-to-fuel conversion pathway
- Output: the model estimates the annual transportation fuel pool and LCFS credit price

# CATS Versions and Feedback Received

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## November 2022:

- CATS Model v0.1 released
- [Example Scenario](#)

## March 2023:

(after February workshop)

- CATS Model v0.2 released
  - Updates to model to resolve bugs/enhance features
- [Example scenario](#) updates responsive to feedback
  - Feedstock and fuel pricing
  - Federal incentives (e.g., IRA)
  - Waste oil definitions/supply

# CATS Versions and Feedback Received (cont.)

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## August 2023:

- CATS Model v0.2 (no update)
- Example Scenario updates responsive to feedback:
  - Update to diesel fuel pool demand and vehicle electrification (accounting for ACF)
  - Added out-of-state supply availability for biomethane resources
  - Updates to model to calibrate with 2022 data (not fully available during past releases)

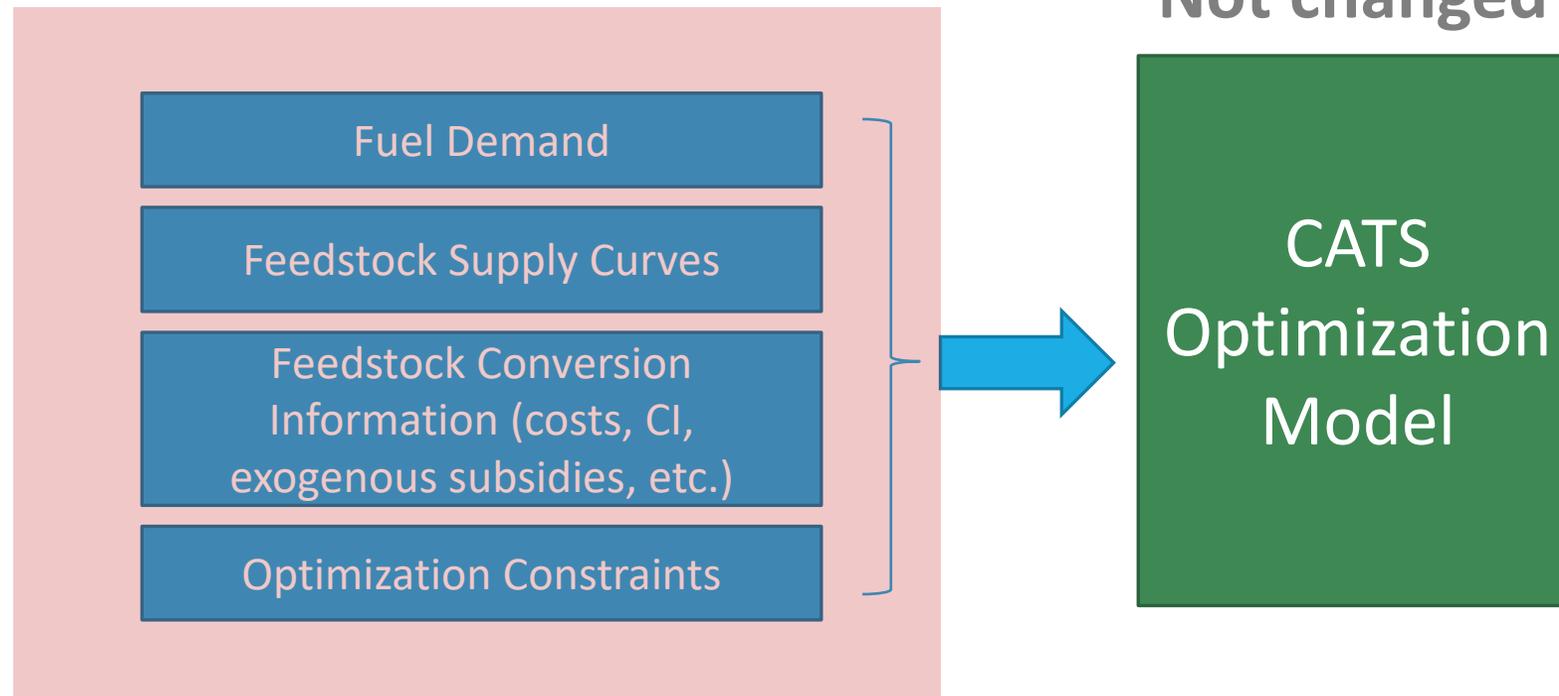
# Modeling Updates

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# The CATS Example Scenario has been updated

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## Example Scenario Updates



# Summary of Scenario Changes

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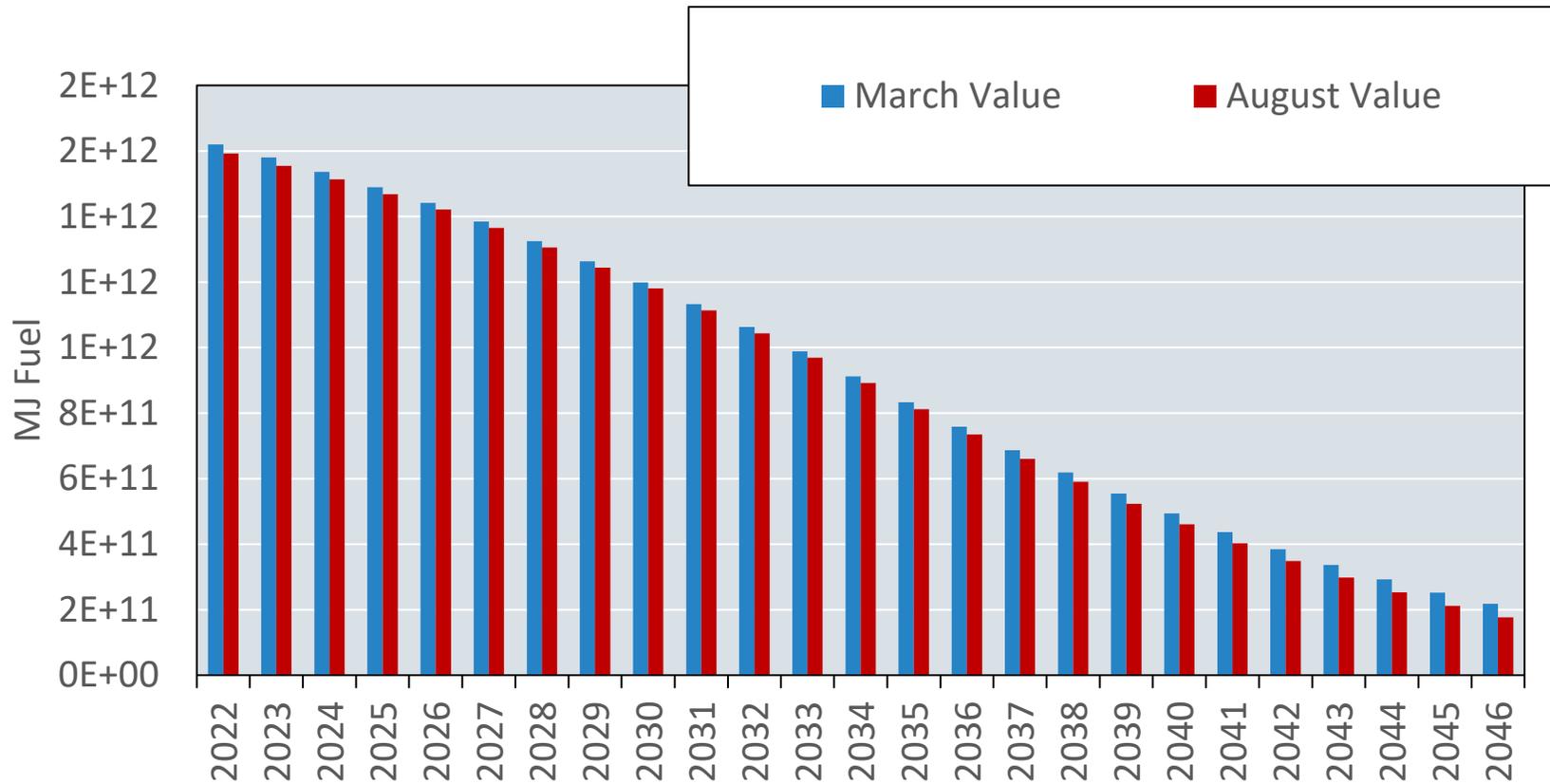
- Energy demand from HDV and MDV stocks adjusted to reflect vehicle electrification trends anticipated to occur due to adoption of Advanced Clean Fleets
- Out-of-state biomethane supply added based on stakeholder feedback on biomethane volumes available
- Alternative jet fuel cost estimates updated

# Summary of Scenario Changes (cont.)

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- 2022 energy demand calibrated with 2022 LRT data
- Credit estimates for various off-road electrification pathways updated
- Credit Bank draw down pathway has been endogenized into the model
- Pathway Carbon Intensities updated to reflect use of CCS for ethanol blended to make E85

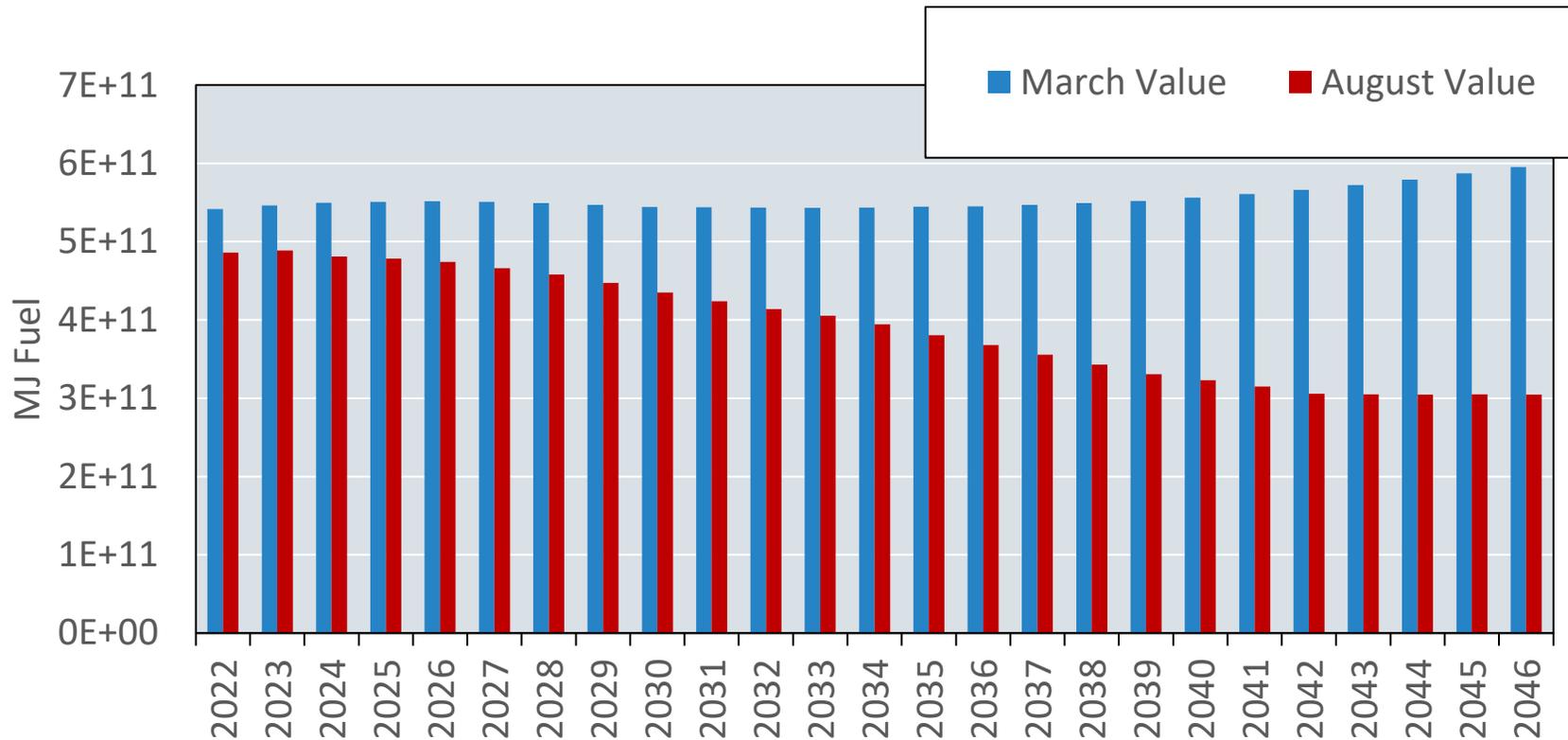
# Comparison of Gasoline Fuel Pool Demand



Adjustments made to starting year energy demand to align gasoline fuel pool with 2022 LRT data

2022 calibrated by adjusting VMT for gasoline-using MDVs and HDVs

# Comparison of Diesel Fuel Pool Demand



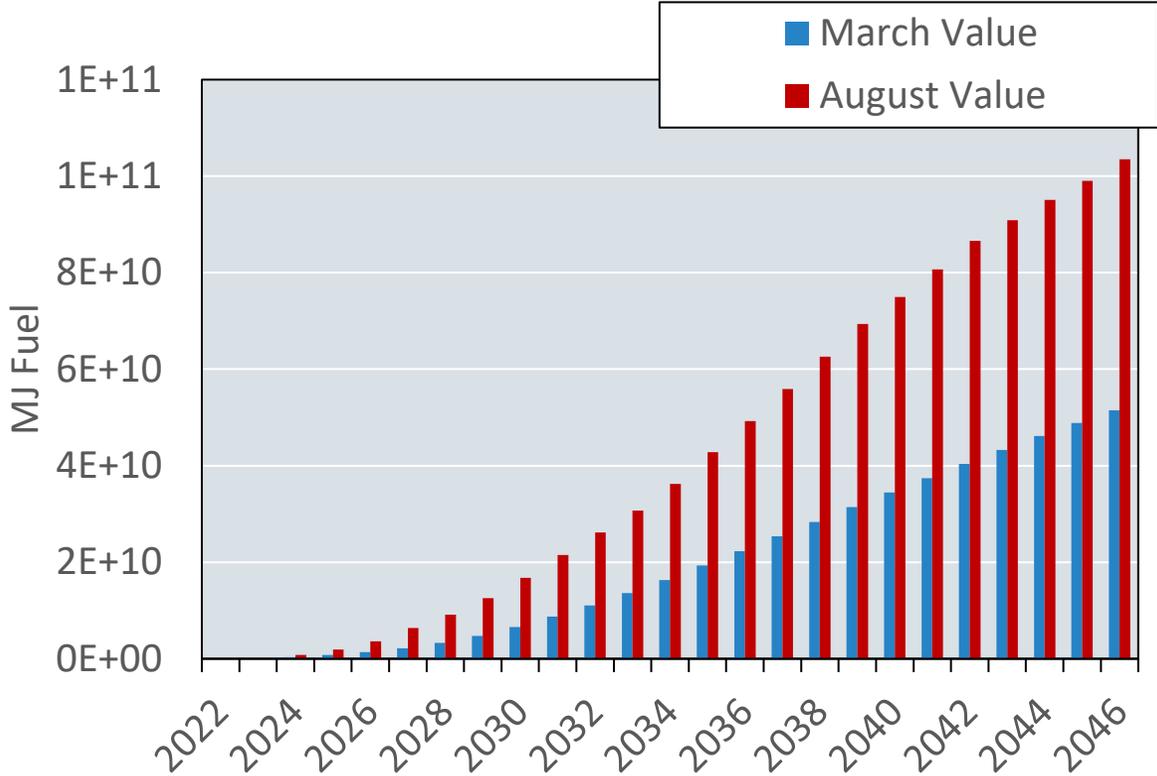
Assumptions about vehicle electrification due to ACF adoption were added

Adjustments made to starting year energy demand to align diesel fuel pool with 2022 LRT data

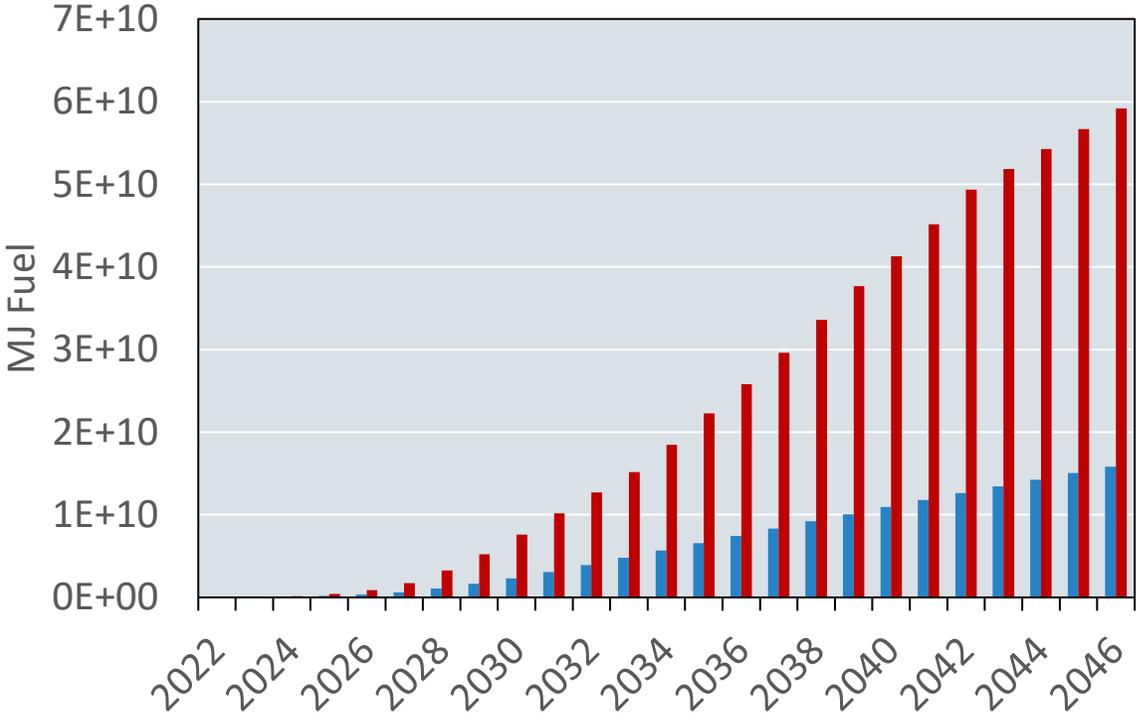
2022 calibrated by adjusting VMT for MDVs and HDVs

# Comparison of HDV ZEV Energy Demand

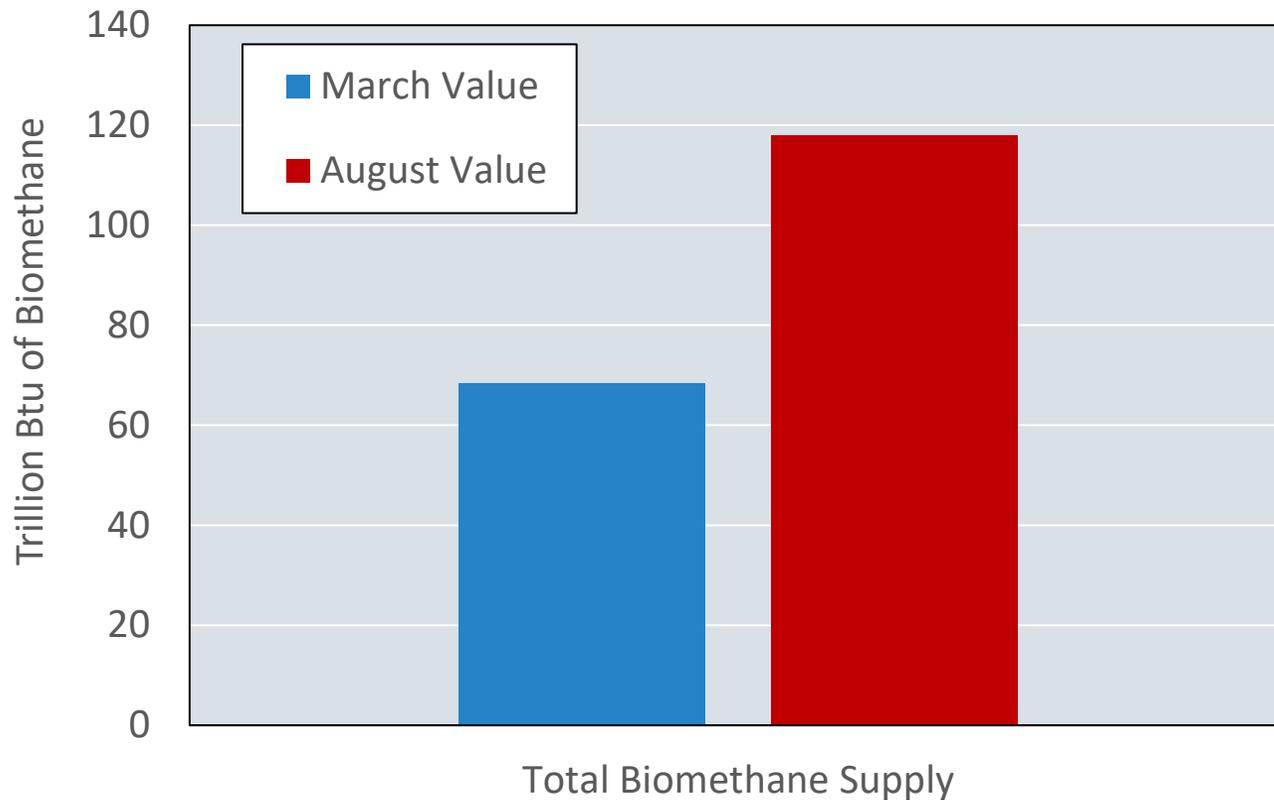
### Heavy-Duty Battery Electric Vehicle Demand



### Heavy-Duty Hydrogen Vehicle Demand



# Comparison of Biomethane Supplies



Example scenario now includes assumptions about out-of-state biomethane supply. This additional supply is only used by the model if price support is sufficient.

**Landfill gas supply** was updated based on North American projects that are pipeline injecting fuel

From stakeholder feedback, Out-of-state **dairy gas supply** modifies manure estimates from the [American Gas Foundation, 2019](#) report

# CATS Inputs and Documentation

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- CATS scenarios are simplified representations of California's total fuel system
- LCFS price outputs and results can be used to gain intuition for how policy scenarios may impact credit prices and fuel supply in the market. Real market values will be different.
- Model documentation posted: [Download](#)
- Core model inputs posted: [Download](#)
- CATS Model v0.2 posted: [Download](#)

# Rulemaking Timeline

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- Release SRIA
- September Board meeting (non-voting)
- Release 45-day
- Early 2024 Board meeting (voting)
- Regulation in effect in 2024

# Public Comments

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# Public Comment Logistics

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