DOCKETED	
Docket Number:	23-IEPR-03
Project Title:	Electricity and Gas Demand Forecast
TN #:	260155
Document Title:	Presentation - 2023 Demand Scenarios Project Introduction
Description:	N/A
Filer:	Bryan Hsieh
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	11/19/2024 10:01:00 AM
Docketed Date:	11/19/2024

CEC Demand Scenarios Project

Anitha R. Rednam, P.E.
Project Manager
November 20, 2024

Acronyms & Initialisms

AAEE – Additional Achievable Energy Efficiency
AAFS – Additional Achievable Fuel Substitution
Ag + WP – Agriculture and Water Pumping
BTM – Behind-the-meter
CAISO – California Independent System Operator
CARB – California Air Resources Board
CEC – California Energy Commission
Comm - Commercial
DER – Distributed Energy Resource
dGen – Distributed Generation Model
DSM- Demand Scenarios Model
FSSAT – Fuel Substitution Scenario Analysis Tool
GHG – Greenhouse Gas
H2 – Hydrogen
IEPR – Integrated Energy Policy Report
Ind – Industrial
IOU – Investor-Owned Utilities
LADWP – Los Angeles Department of Water and Power
OGV – Ocean-Going Vessel
PGE – Pacific Gas & Electric
PV – Photovoltaics (usually rooftop)
POU – Publicly-Owned Utilities
Res - Residential
SCE – Southern California Edison
SDGE – San Diego Gas and Electric
TE – Transportation Electrification
TCU – Transportation, Communications, and Utilities

Purpose of Demand Scenarios Project

- Expand CEC demand assessments using forecasting techniques
- Assess GHG associated with energy demand
- Increase collaboration and data sharing among CEC, CPUC, and CARB to reduce unnecessary uncertainty caused by data limitations.
- Gain insight for potential legislative, regulatory, or programmatic initiatives

Role of Demand Scenarios

CEC Demand Forecasting	CEC Demand Scenarios	CARB Scoping Plan
▪ Electric energy and hourly loads, 15 years forward, used by CPUC and CAISO for system planning ▪ Natural gas forecast usage by CPUC is evolving ▪ Transportation fuel demand forecasts evolving to address electrification and the annual energy and hourly load implications	▪ Modeling addresses all fuel types and end use sectors ▪ CEC forecasting and load modifier tools supplemented by other models ▪ Explore combinations of existing, expanded, and new policies to gain insights in advance of commitments	▪ A set of GHG emission control measures that collectively achieve statutory GHG reduction goals ▪ Most individual control measures are aspirational targets ▪ Scope includes emissions from energy consumption and state's natural and working lands domains

Demand Scenarios Project Overview

Project Aspect	Description
Purpose	Longer-term project using forecasting tools to explore potential policy and planning impacts on energy demand
Time Horizon	To 2050
Scope	All fuel types annually and electricity demand hourly
Number of Scenarios	Three primary scenario types with various sensitivities
Methods	Use CEC demand forecast and load modifier projection tools, augmented by a modeling tool to provide complete coverage of all fuels and all sectors
Outputs	Sectoral demand projections by fuel & utility planning area with corresponding GHG emissions

Scope of Work

- Demand Scenarios Model Development
- Design Framework for Scenarios and Sensitivities
- Develop Scenario Projections
  - Project annual energy demand for all fuel types, and annual GHG emissions, from 2023-2050 for each scenario, sector, and planning area combinations
  - Project hourly electric load from 2023-2050 for each scenario, sector, and planning area combinations

Primary Scenario Types of the Demand Scenarios Project

Reference Scenario (Not Part of SB 100)

- CEC-adopted 2023 IEPR planning demand forecast, extended to 2050

Policy Scenario

- New policies in development or with a development pathway
- Impacts of federal subsidies for industrial electrification and hydrogen use
- Three sets of projections used in SB 100
  - Policy Scenario
  - Policy Scenario (High DER/DF)
  - Policy Scenario (High Hydrogen Use in Transportation)

Enhanced Policy Scenario (Not Part of SB 100)

- Additional standards, programs, policies and assumptions beyond the Policy Scenario
  - Pipeline Hydrogen Sensitivity has been developed

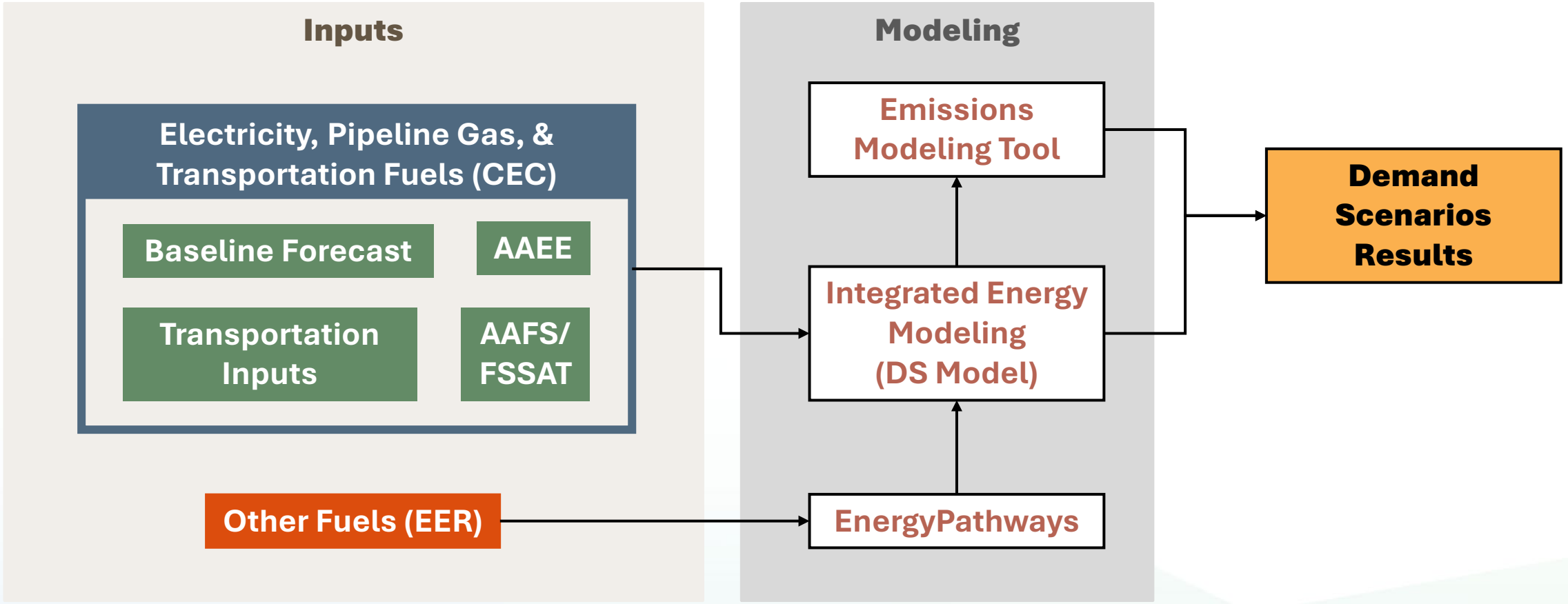
Scenario Modeling Framework

Sectors	Inputs		Electricity	Natural Gas	Traditional Fuels In Transportation	Traditional Fuels Outside Transportation
Residential-Commercial-Industrial	Baseline Forecast		Residential-Commercial-Industrial Model		N/A	Demand Scenarios Model (DSM)
	Energy Efficiency Impacts		AAEE-AAFS Programmatic Tool		N/A	
	Fuel Substitution	Programmatic Impacts	AAEE-AAFS Programmatic Tool		N/A	
		FSSAT Modeling Of Combustion Control Measures	FSSAT Tool		N/A	
Transportation	Baseline Forecast		Transportation Models		Transportation models and post processing	Ocean Going Vessels

Scenario Modeling Framework (2)

Sectors	Inputs	Electricity	Natural Gas	Traditional Fuels In Transportation	Traditional Fuels Outside Transportation
Agriculture & Water Pumping	Baseline Forecast	Agricultural Model		N/A	Demand Scenarios Model (DSM)
	Energy Efficiency Impacts	AAEE-AAFS Programmatic Tool		N/A	
TCU	Baseline Forecast	TCU Model		N/A	
BTM PV-Storage	Baseline Forecast	dGen, Title 24, Standalone Storage Models		N/A	N/A

Demand Scenarios Model Structure



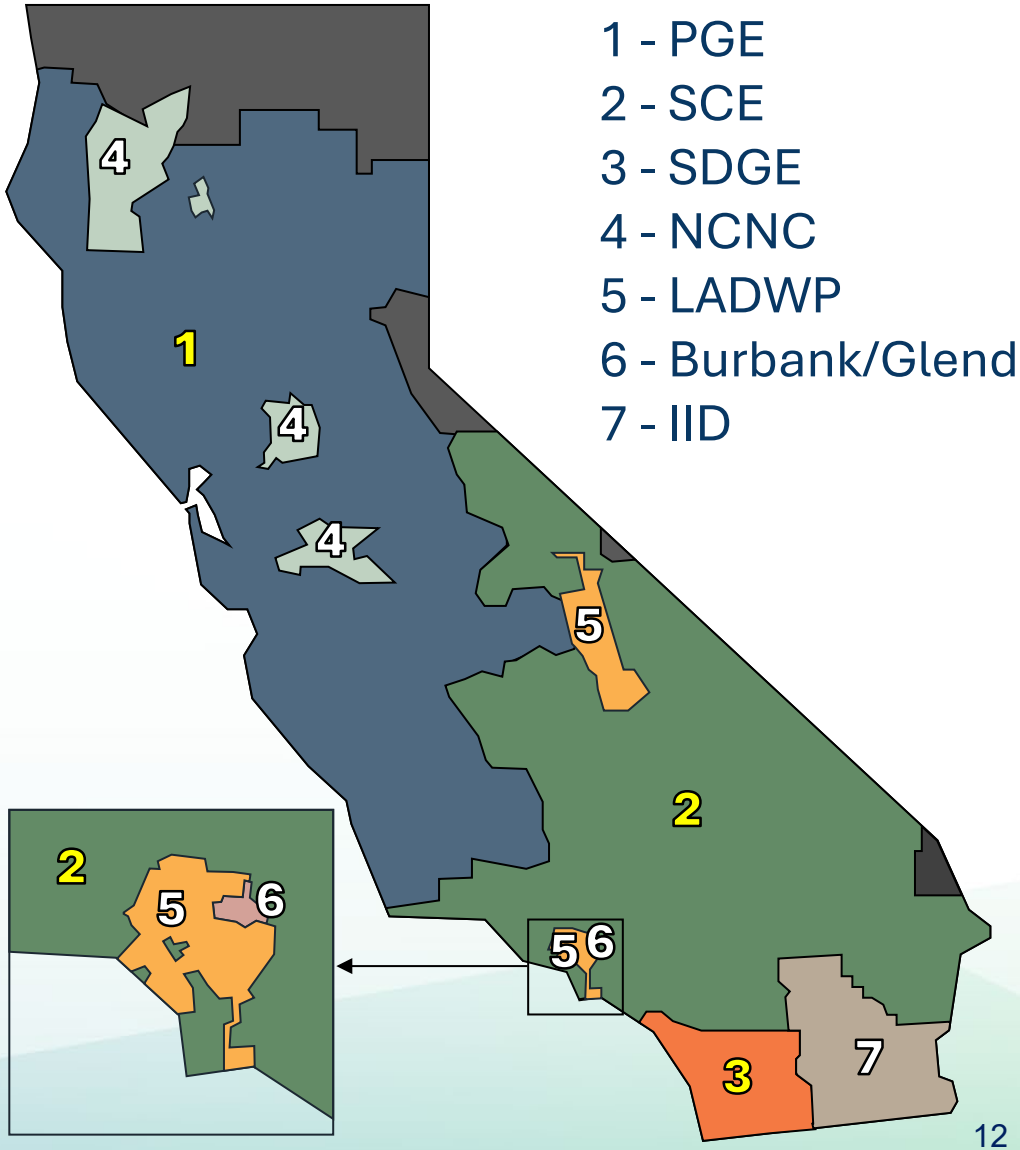
Note: Electricity, pipeline gas, and transportation fuels datasets from the CEC and datasets on other fuels (from EER) are aggregated and fed into the Integrated Energy Model (DS Model). The resulting outputs are then used to run the Emissions Modeling Tool.

Data Source by Fuel/Sector

	Agriculture	Commercial	Industrial	Oil & Gas Extraction	Petroleum Refining	Residential	TCU	Transportation
Electricity	CEC*	CEC	CEC	CEC	CEC	CEC	CEC	CEC
Natural Gas	CEC	CEC	CEC	CEC	CEC	CEC	CEC	CEC
Diesel	EP	EP	N/A	EP	N/A	EP	N/A	CEC*
Gasoline	EP	EP	EP	N/A	N/A	N/A	N/A	CEC
Steam	EP	EP	EP	EP	EP	N/A	EP	N/A
Biomass/ Wood	N/A	EP	N/A	N/A	N/A	CEC	N/A	N/A
LPG	N/A	EP	EP	EP	N/A	CEC	N/A	N/A
Coal	N/A	N/A	EP	N/A	N/A	N/A	N/A	N/A
Hydrogen	CEC	N/A	CEC	CEC	EP	CEC	N/A	CEC*
Still gas	N/A	N/A	N/A	N/A	EP	N/A	N/A	N/A

Demand Scenarios Project Outputs

- Annual energy and hourly electricity load (with losses)
- Hourly loads for four additional POU planning areas (plus forecast's three IOUs)



Reference Scenario Key Characteristics

- Baseline forecasts and load modifier adjustments are taken from 2023 IEPR (2023 Planning Forecast) for electricity, pipeline gas, and transportation fuels
  - Other fuels projected from EER's Energy Pathways model
- Adjustments for Reference Scenario
  - Reduced refinery energy demand to reflect lower transportation demand

Policy Scenario Key Characteristics

Adjustments to the Reference Scenario

- More aggressive energy efficiency and fuel substitution program impacts in buildings
- Industrial fuel substitution from pipeline gas to electricity or hydrogen based on federal incentives and tax credits
- Aviation fuel substitution to electricity, hydrogen, and SAF
- More electrification for off-road and freight
- Locomotive Electrification from the In-Use Locomotive Regulation
- BTM PV and BTM Storage are maintained at 2023 IEPR levels

Enhanced Policy Scenario Key Characteristics

Adjustments to the Policy Scenario

- Higher energy efficiency and fuel substitution in buildings
- 100 percent electrification of new buildings
- Higher levels of industrial fuel substitution
- Higher electrification of off-road vehicles and reduced LD VMT
- Higher use of electricity and hydrogen in aviation
- Additional BTM PV & Energy Storage

Enhanced Policy Scenario Sensitivity- Pipeline Hydrogen Characteristics

- The assumptions of the Enhanced Policy scenario is the starting point for this sensitivity
- Hydrogen pipeline routes are assumed to connect large industrial customers in three regions.
- The mix of hydrogen sent through the pipelines using renewable electrolysis is assumed to increase over time.

Thank You!

Questions?

Anitha Rednam

Energy Assessments Division

Anitha.Rednam@energy.ca.gov