

CEC Demand Scenarios Project



Michael R. Jaske, Ph.D., Project Principal

Anitha R. Rednam, P.E., Project Technical Lead

April 7, 2022



Why Develop this Capability Now?

- California policymakers are generally in agreement that massive reductions in GHG emissions are needed by mid-century
- Since GHG emissions are largely a result of burning carbon-based fuels, a major reduction in GHG emissions means a large shift from high carbon fuels to low- or no-carbon energy forms
- Although GHG emission inventories reveal that most GHG emissions result from final end-user energy consumption, substantial energy is used extracting, transforming, transmitting, and distributing energy to end-users
- Understanding energy demand and the pattern of change from one energy form to another is critical to assuring reliability for each energy form
- There are numerous uncertainties about how various policy goals will actually be achieved, when they will be achieved, and what their energy demand impacts will be. A demand scenario capability can assist in such studies



Demand Scenarios Project Scope & Approach

- Demand Scenarios are being developed to support SB 100 analyses and interests of other agencies.
- The scope includes:
 - Developing demand scenario specifications
 - Assessing these in both final demand and supply-side dimensions
 - Developing key insights
 - Communicating results to sister agencies and stakeholders
- This capability will develop a product each biennial IEPR cycle, and may become adopted similar to demand forecasts



Our Aspiration

- Develop and assess scenarios explicitly quantifying impacts of programs, standards, and policies impacting energy demand by, and GHG emissions from, selected customer sectors
- Understand what existing programs, standards, and policies are expected to achieve, and compare these results to our goals
- Contribute to thoughtful development of additional policy initiatives to “close the gap” between expected outcomes and goals



Phased Development Plans

- 2021 IEPR
 - Develop and assess scenarios stressing a high electrification theme
 - Adapt/create modeling capabilities that can assess scenario consequences:
 - Through time out to 2050
 - Address all significant energy fuel types
 - Compute GHG consequences
 - Build off of existing demand forecasting models, ancillary projections tools developed for AAEE and AAFS and other fuel substitution assessments and rely on E3's PATHWAYS model for other sectors/fuels
- 2022 IEPR
 - Complete the original 2021 IEPR Scope
 - Geographically disaggregated to planning area and/or major utility
 - Create/adapt hourly 8760 load impacts needed for electric generation sector assessments



Comparison To CARB Scoping Plan

CARB conducted a workshop on March 15, 2022 to unveil the preliminary analysis undertaken for the draft 2022 Scoping Plan

CARB

- Full scope of all GHG sources
- Uses E3 PATHWAYS model
- Full representation of “supply-side” feedback inducing total energy demand
- Relies upon assumed penetration of technologies to show feasibility of achieving GHG policy goals

CEC

- Only energy consumption sources for GHG emissions.
- Uses Adapted-PATHWAYS (selected CEC model results bypass internal computations)
- Partial representation of “supply-side” feedback
- Attempt to project impacts from known programs that induce changes in energy consumption
- Stepping stone for developing an Inter-Agency Scenario to conduct electricity analysis at the level needed for resource and transmission planning



Adapting Plans Mid-Stream

- While the EAD was developing the original project, discussions started among energy agencies about higher electrification scenarios than was anticipated for the 2021 IEPR demand forecast.
- As a result, the EAD team adapted plans so that:
 - The original CEC project would proceed unchanged, but on a slower track (was not completed in 2021 IEPR)
 - A new **Inter-Agency High Electrification Demand Scenario** would be developed focusing on energy agency needs to understand infrastructure implications of a higher electrification future
- Today's workshop will focus on the original CEC project, but briefly explain the nature and status of the inter-agency high electrification scenario and its assessment.



CEC Demand Scenarios Overview

- **Purpose:** Scenarios enable more comprehensive examination of demand-side fuel shifts, and the supply-side consequences of demand changes.
- **Time Horizon:** Scenarios will extend to 2050.
- **Scope:** Scenarios will reflect a full set of fuel types.
- **Number:** Three primary scenarios which enable a more complete assessment of uncertainties.
- **Methods:** Using mid demand forecast and load modifier projection tools for this analysis.



CEC Demand Scenarios Involvement

- Need for objective, independent information that convey a range of solution sets that can achieve California's energy and GHG emission reduction goals.
 - Provides a sense of how easy or difficult it may be for each sector to achieve those goals.
 - Provides insights into where incentives or programs need to be targeted.
 - Provide the demand analysis projections that the CPUC and CAISO need to undertake their infrastructure planning responsibilities.



CEC Demand Scenario Process

- Demand Scenarios Process will focus on the higher degrees of electrification than the CEC's 2021 IEPR demand forecast.
- Combinations of energy efficiency and fuel substitution programs are used to modify baseline demand forecast to produce final demand projections.
- The outputs of this process is modified energy consumption projections and corresponding GHG emissions by sector.



Proposed Scenario Types

- **Reference Scenario by IEPR Vintage**

- This scenario uses the same core assumptions as the CEC adopted, managed Mid-Mid demand forecast through 2035.
- Beyond 2035, this scenario assumes continuation of the same set of standards, programs, and policies reflected in the CEC adopted managed demand forecast with the same degree of compliance.

- **Policy/Compliance Scenario**

- Serve as sensitivities to the Reference Scenario by testing varying degrees of compliance with the same set of standards, programs, and policies, or aspirational policies not yet enacted.

- **Mitigation Scenario (Additional Policies, Not Goal Constrained)**

- Adds additional standards, programs, policies and what-if assumptions with impacts beyond those already included in the Policy/Compliance Scenario.
- Reflects incremental impacts of programs relative to the previous scenarios.



Scenario Modeling Framework

Sectors	Inputs	Electricity	Natural Gas	Traditional Fuels In Transportation	Traditional Fuels Outside Transportation	
Residential/Commercial	Baseline Forecast	Residential/ Commercial Model		N/A	Adapted PATHWAYS Model	
	Energy Efficiency Impacts	AAEE /AAFS Programmatic Tool		N/A		
	Fuel Substitution	Programmatic Impacts	AAEE /AAFS Programmatic Tool			N/A
		Speculative Impacts	Fuel Substitution Scenario Assessment Tool			N/A
Transportation	Baseline Forecast	Transportation Models			N/A	
Other Sectors (Industrial, O&G, Agriculture, Petroleum Refining, TCU)	PATHWAYS	Adapted PATHWAYS Model		N/A	Adapted PATHWAYS Model	



Final Reference Scenario Design

Sectors	Inputs	Electricity	Natural Gas	Traditional Fuels In Transportation	Traditional Fuels Outside Transportation	
Residential/Commercial	Baseline Forecast	2021 IEPR Mid Residential/ Commercial Forecast	2021 IEPR Mid Residential/ Commercial Forecast	N/A	PATHWAYS Assumptions	
	AAEE (Programmatic Contributions From EE/FS Tool)		Mid- Mid Business-As-Usual BAU (Scenario 3)		N/A	PATHWAYS Assumptions
	AAFS	Programmatic Contributions From EE/FS Tool	Mid- Mid Business-As-Usual BAU (Scenario 3)		N/A	PATHWAYS Assumptions
		Additional Speculative FS Contribution From FSSAT Tool	None		N/A	
Transportation	Baseline Forecast	2021 IEPR Mid Transportation Forecast	2021 IEPR Mid Transportation Forecast	2021 IEPR Mid Transportation Forecast	N/A	
Other Sectors (Industrial, O&G, Agriculture, Petroleum Refining, TCU)	PATHWAYS Model	PATHWAYS Assumptions	PATHWAYS Assumptions	N/A	PATHWAYS Assumptions	



Final High Electrification Policy/Compliance Scenario Design

Sectors	Inputs		Electricity	Natural Gas	Traditional Fuels In Transportation	Traditional Fuels Outside Transportation
Residential/Commercial	Baseline Forecast		2021 IEPR Mid Residential/ Commercial Forecast	2021 IEPR Mid Residential/ Commercial Forecast	N/A	PATHWAYS Assumptions
	AAEE (Programmatic Contributions From EE/FS Tool)		Mid-High (Scenario 4)	Mid -Mid (Scenario 3)	N/A	PATHWAYS Assumptions
	AAFS	Programmatic Contributions from EE/FS Tool	Mid –Mid Plus (Scenario 4)		N/A	PATHWAYS Assumptions
		Additional Speculative FS Contribution From FSSAT Tool	Incorporate WH & SH NOx control measures from CARB 2022 SIP Strategy beginning in 2029 for BAAQMD and 2030 for the rest of the State		N/A	
Transportation	Baseline Forecast		2021 IEPR Mid Transportation Forecast	2021 IEPR Mid Transportation Forecast	2021 IEPR Mid Transportation Forecast	N/A
	CARB State SIP Strategy (ACC II for LDV, ACF for MD-HD)		Incremental Impacts Beyond Reference Scenario	Incremental Impacts Beyond Reference Scenario	Incremental Impacts Beyond Reference Scenario	
Other Sectors (Industrial, O&G, Agriculture, Petroleum Refining, TCU)	PATHWAYS Model		PATHWAYS Assumptions	PATHWAYS Assumptions	N/A	PATHWAYS Assumptions



Final High Electrification (GHG) Mitigation Scenario Design

Sectors	Inputs	Electricity	Natural Gas	Traditional Fuels In Transportation	Traditional Fuels Outside Transportation	
Residential/Commercial	Baseline Forecast	2021 IEPR Mid Residential/ Commercial Forecast	2021 IEPR Mid Residential/ Commercial Forecast	N/A	PATHWAYS Assumptions	
	AAEE (Programmatic Contributions From EE/FS Tool)	Mid - High Plus (Scenario 6)	Mid -Mid (Scenario 3)	N/A	PATHWAYS Assumptions	
	AAFS	Programmatic Contributions From EE/FS Tool	Mid -High Plus (Scenario 6)		N/A	PATHWAYS Assumptions
		Additional Speculative FS Contribution From FSSAT Tool	CARB Scoping Plan Scenario (Alternate 4)		N/A	
Transportation	Baseline Forecast	2021 IEPR Transportation Forecast	2021 IEPR Transportation Forecast	2021 IEPR Transportation Forecast	N/A	
	CARB Mobile Source Strategy (Default Case)	Incremental Requirements Beyond Policy/Compliance Scenario	Incremental Requirements Beyond Policy/Compliance Scenario	Incremental Requirements Beyond Policy/Compliance Scenario		
Other Sectors (Industrial, O&G, Agriculture, Petroleum Refining, TCU)	PATHWAYS Model	PATHWAYS Assumptions	PATHWAYS Assumptions	N/A	PATHWAYS Assumptions	



Thank You!