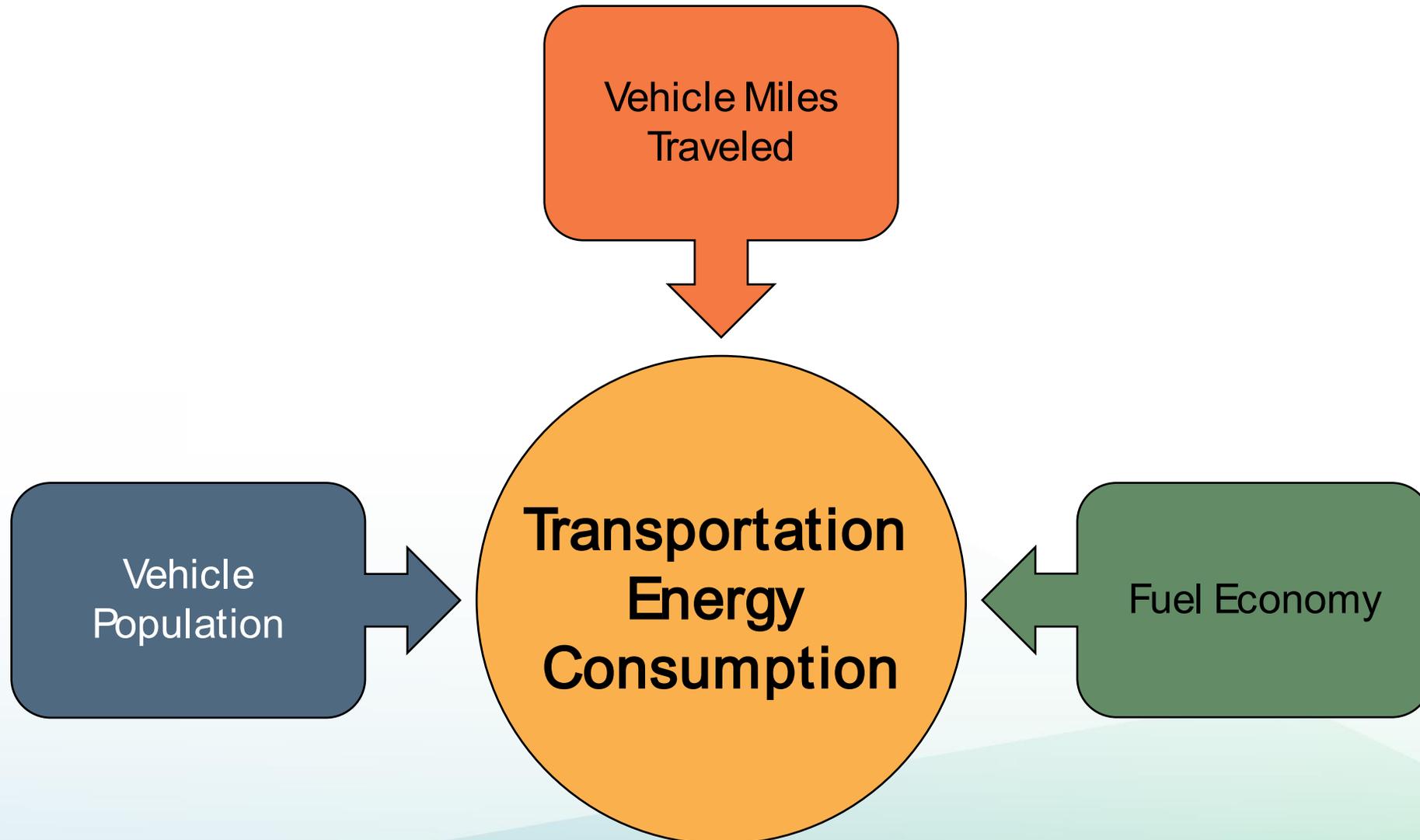


California Zero-Emission Vehicle and Infrastructure Webinars

Chapter 2: Planning a Reliable Grid for Charging
ZEVs

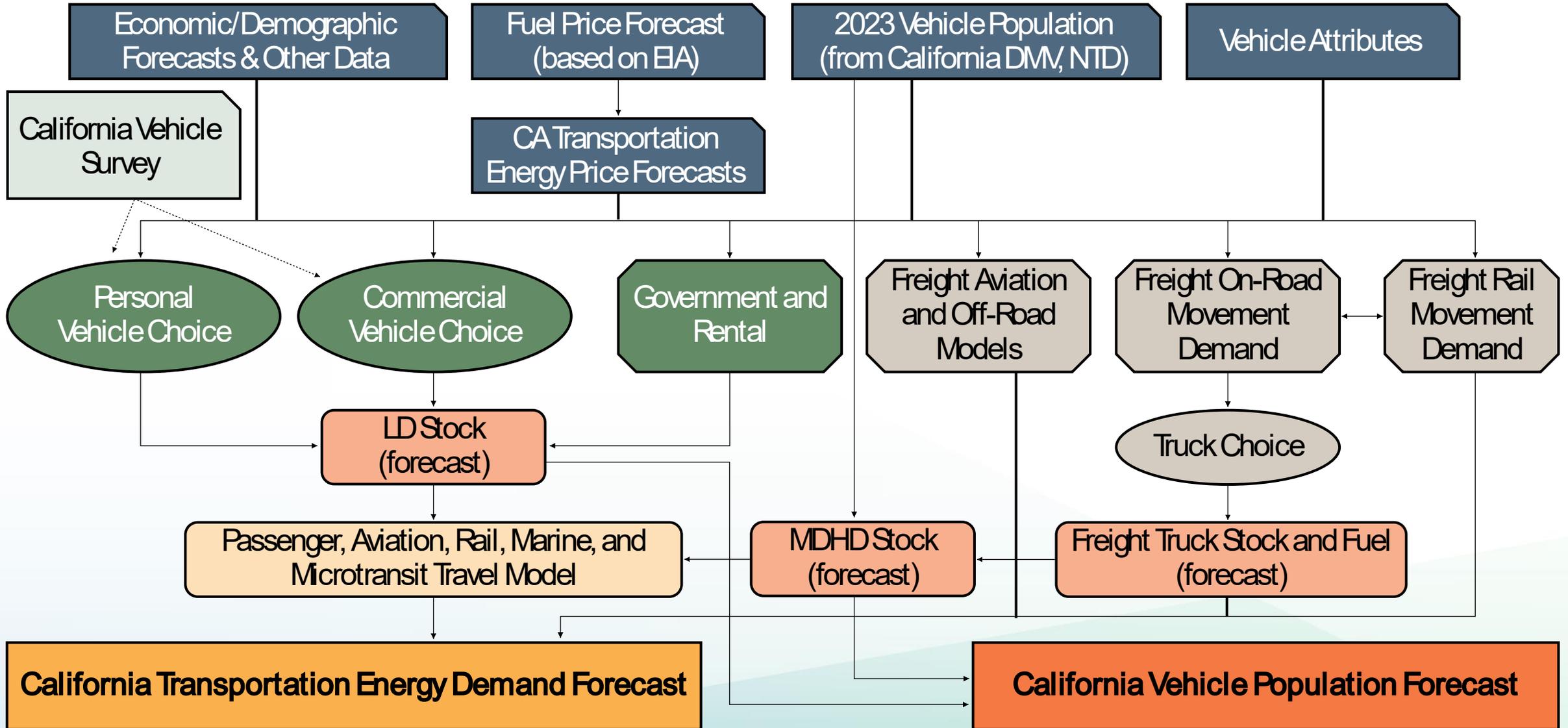


Transportation Energy Consumption





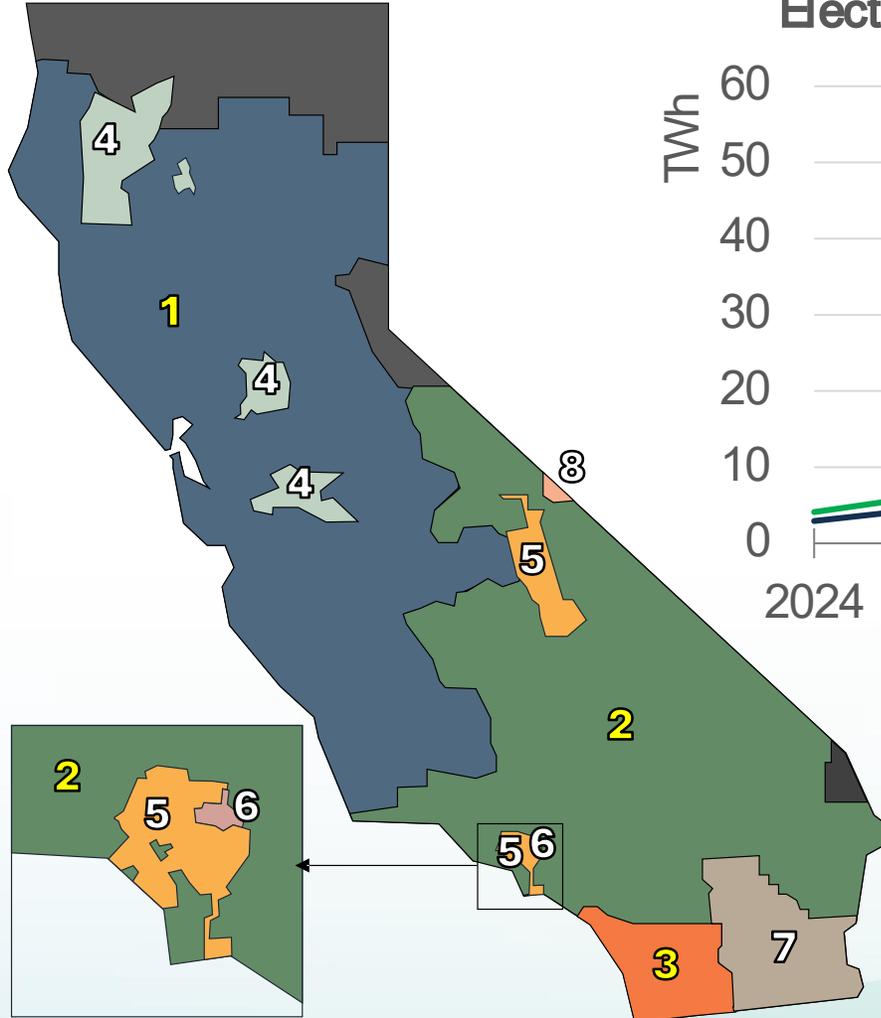
Transportation Energy Demand Forecast



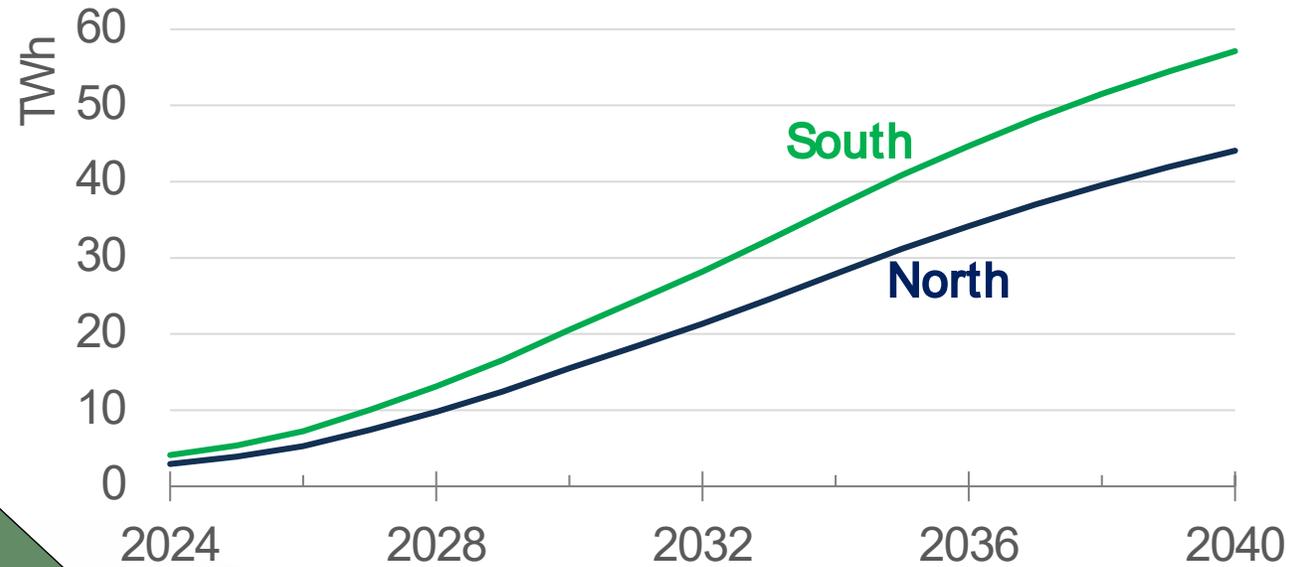


Assigning TWh to Northern and Southern Areas

PA	Name	North-South
1	PG&E	North
2	SCE	South
3	SDG&E	South
4	NCNC	North
5	LADWP	South
6	BUGL	South
7	IID	South
8	VEA	North



Electricity Demand by North-South Planning Areas



Source: CEC staff

Note: Not all TE TWh demand is assigned by planning area.



Goals used for the AB 2127 Assessment



Source: CEC

- 2035: 100% ZEV light-duty sales

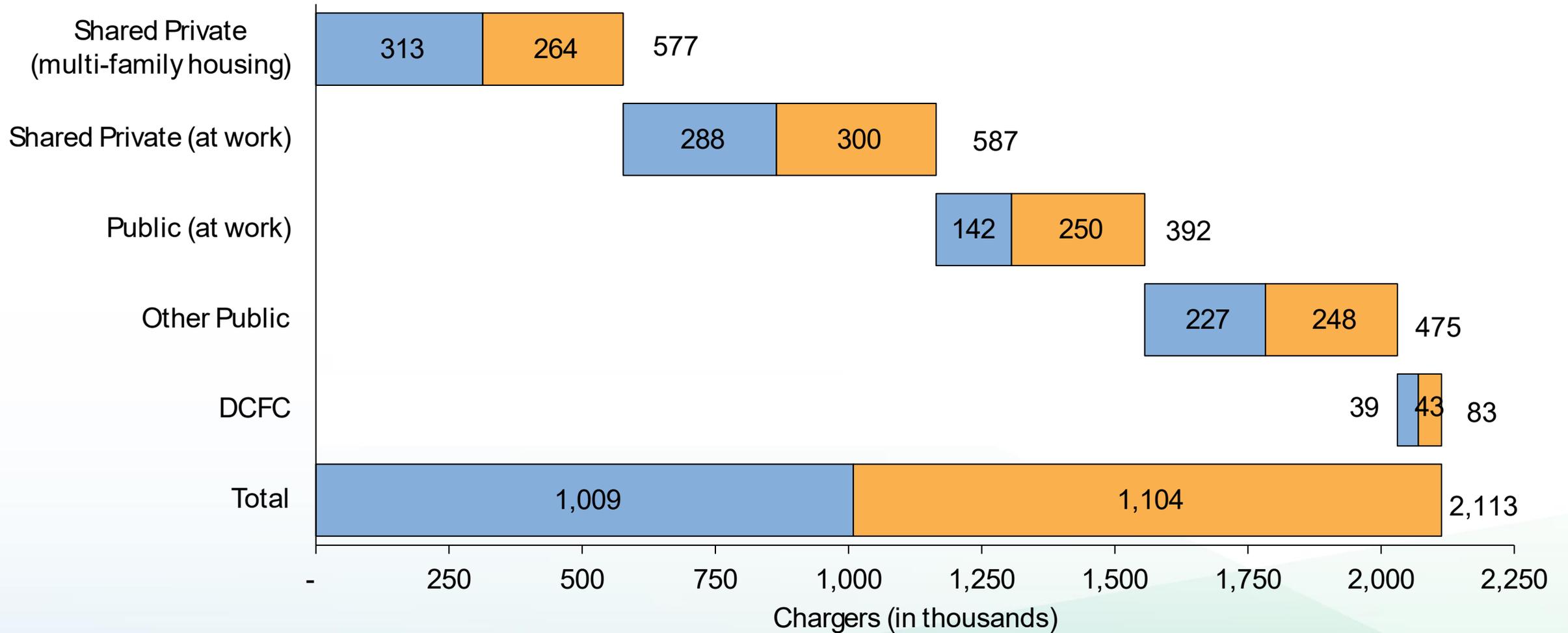


Source: CEC

- 2035: 100% ZEV operations for drayage trucks
- 2035: 100% ZEV off-road vehicles and equipment, where feasible
- 2045: 100% ZEV operations for medium- and heavy-duty vehicles, where feasible.



Light-duty vehicle charging needs

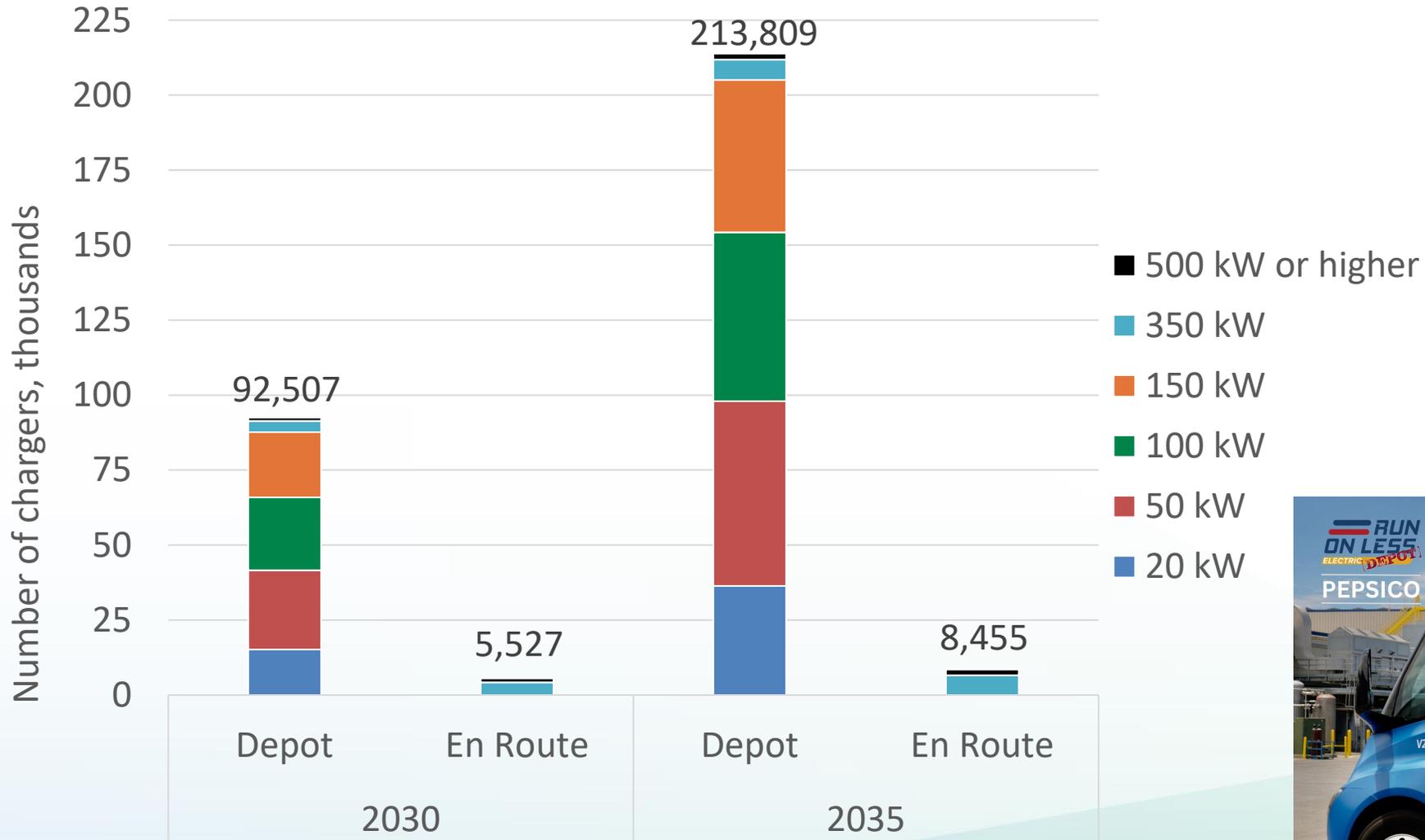


■ Chargers needed for 7.1 million PEVs in 2030

■ Additional chargers needed for 15.2 million PEVs in 2035



High-speed depot alternative future scenario



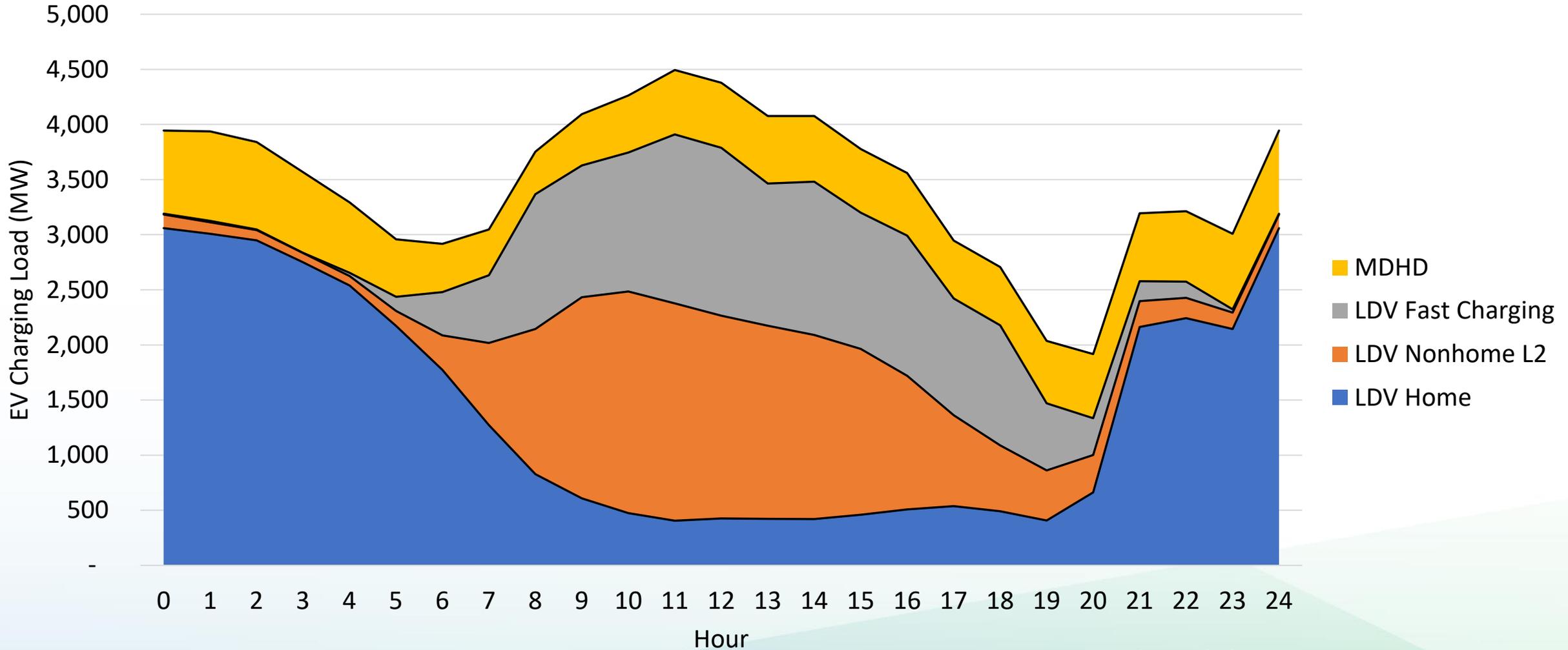
Source: CEC



Source: <https://nacfe.org/news/62779/>



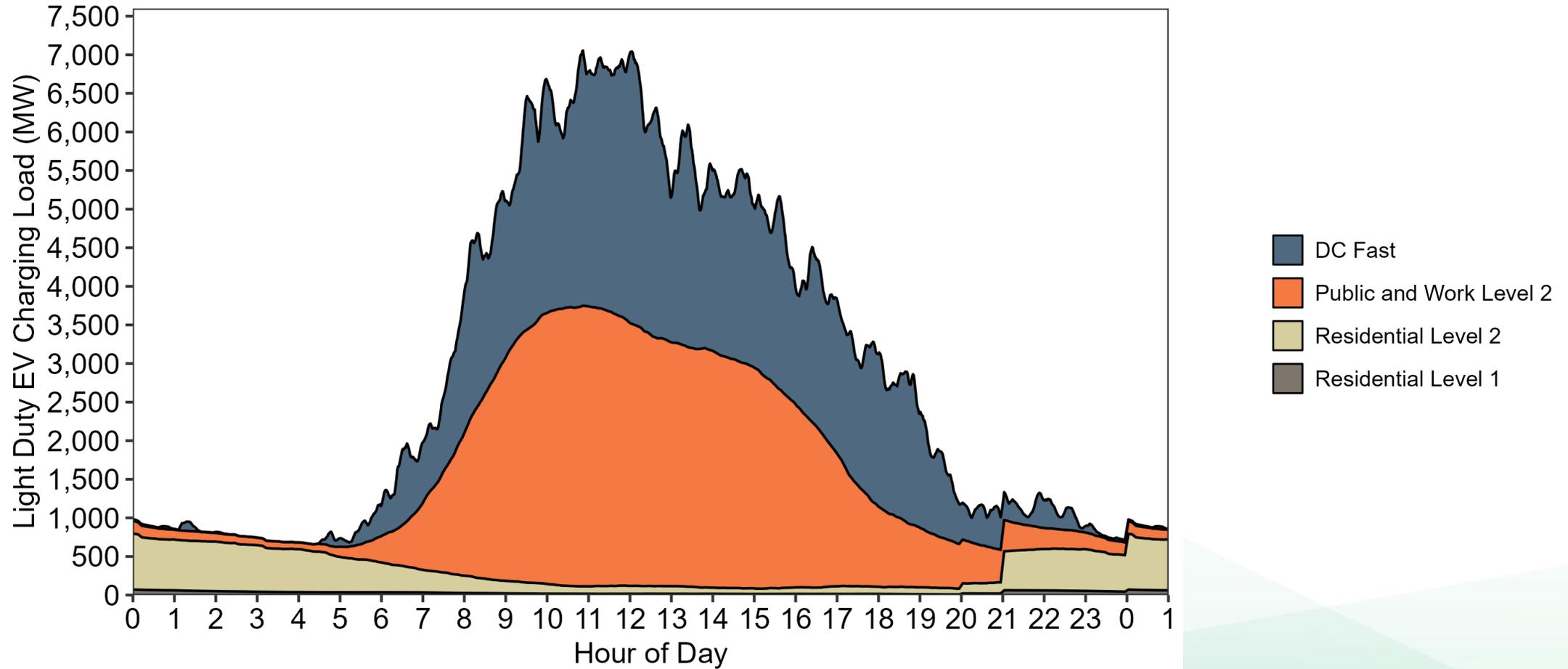
Combined EV charging load



Source: CEC



Scenario Analysis: How much could be shifted to Midday?



Source: CEC



Possible Analysis: V2H Arbitrage

- How much home load could EVs provide during peak hours while keeping travel schedules intact? Ie works like a Tesla Powerwall.
- How to home loads compare to available EV battery capacity?
- What are the load effects on the grid to charge the EV back up?
- What power bidirectional chargers are needed?



EVSE Deployment and Grid Evaluation (EDGE) Tool

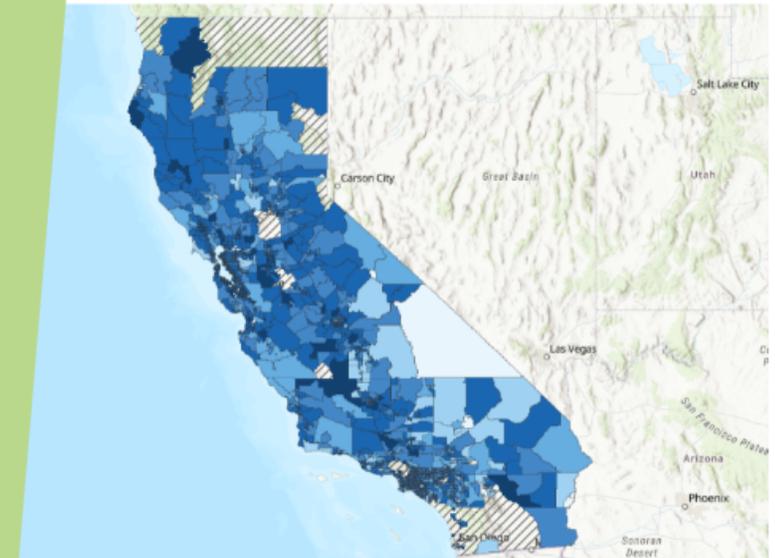
- Where EV chargers and load are going to grow relative to primary circuit capacity
- Tool that helps view charging infrastructure within the context of the CEC's [EV Infrastructure Project Tracker](#)
- Assist with charging infrastructure funding solicitations, grid readiness analyses, and EV charging assessment (e.g. [AB 2127](#))

EVSE Deployment and Grid Evaluation (EDGE) Tool

EDGE helps users identify regions of the grid that could suitably host EV chargers or may need capacity upgrades. It is recommended to view the EDGE tool on a desktop computer for best experience.

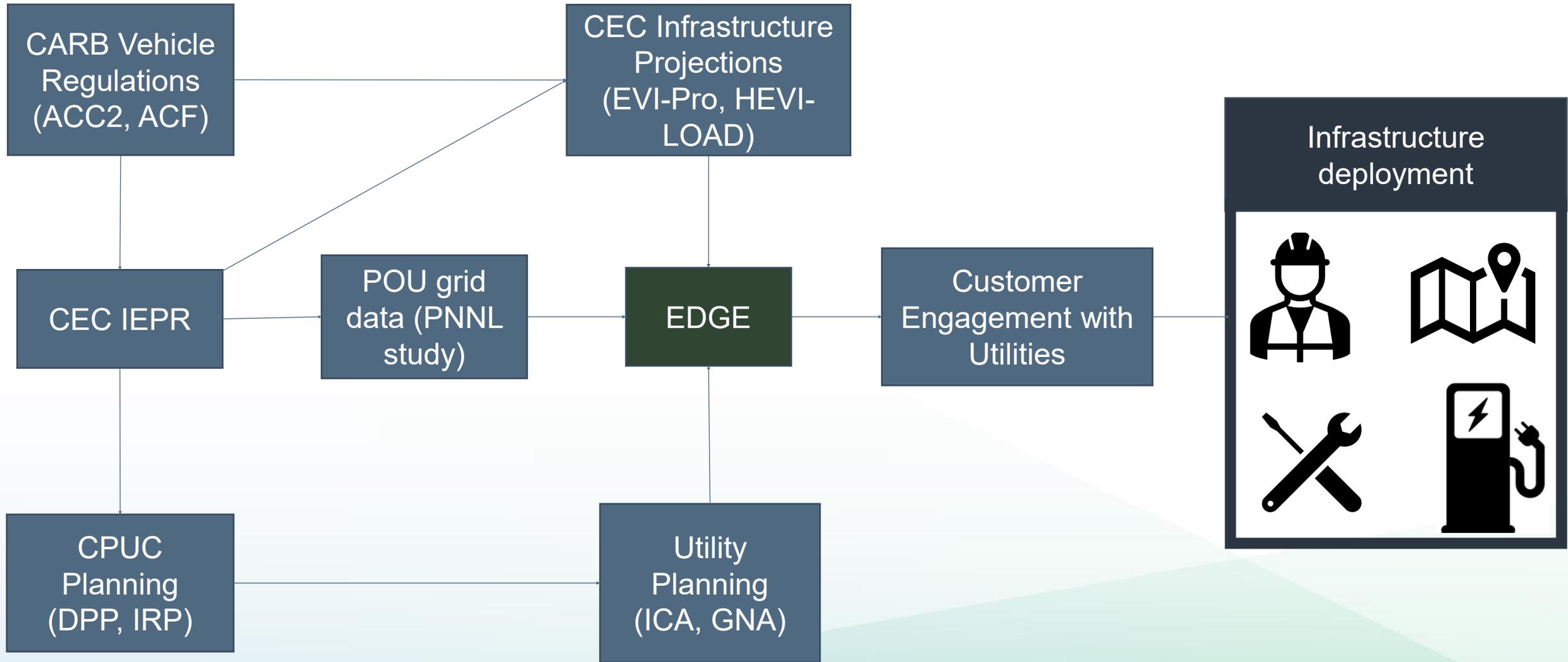
[Download data](#) 

[ACCESS THE TOOL](#) >





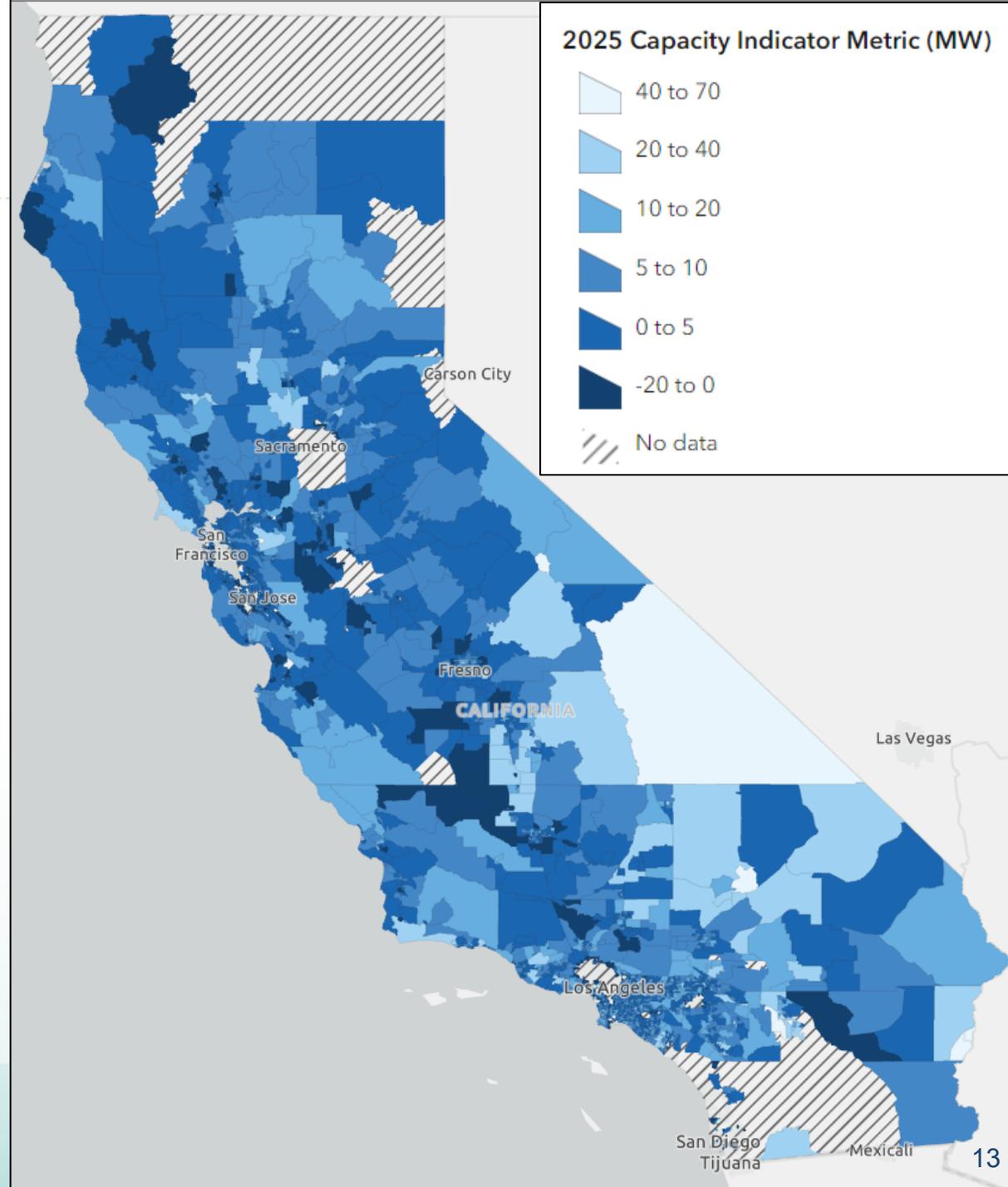
Process Interactions





Goals of EDGE Analysis

- Flagging tool – will not replace existing utility processes
- EV charging load vs utility-forecasted grid capacity
- Where EV load could grow and where capacity is limited
- Early utility engagement for charging infrastructure projects
- Highlight projected equipment upgrade investment locations
- Expand analysis into POU territories



California Public Utilities Commission Overview

- The CPUC regulates privately owned electric, natural gas, telecommunications, broadband, water, rail, and passenger transportation companies.
- We empower California through access to safe, clean, and affordable utility services and infrastructure.



California Public Utilities Commission Commissioners



**Alice Busching
Reynolds,
President**



**Darcie L.
Houck**



John Reynolds



Karen Douglas



Matthew Baker

CPUC Energy Division

- The CPUC's Energy Division **develops and administers energy policy and programs** to serve the public interest, advise the Commission, and **ensure compliance with the Commission decisions and statutory mandates**. The Energy Division provides objective and expert analyses that promote reliable, safe and environmentally sound energy services at lowest reasonable rates for the people of California.
- The Energy Division provides technical support to the Commissioners and their offices, and the Administrative Law Judges. The Energy Division drafts resolutions for formal consideration by the Commission. Resolutions generally result from informal utility requests called Advice Letters, which are submitted by utilities to request rate and tariff adjustments.
- The Energy Division through its **Federal Policy and Ratemaking Section represents the Commission in Federal Energy Regulatory Commission (FERC) and state and federal court proceedings**.
- The Energy Division assists the Commission in its regulation of four types of Investor-Owned Utilities (IOUs): Electric, Natural Gas, Steam and Petroleum Pipeline Companies. Commission-approved tariffs (official rates and terms of service) for these four types of IOUs are maintained by the Energy Division.

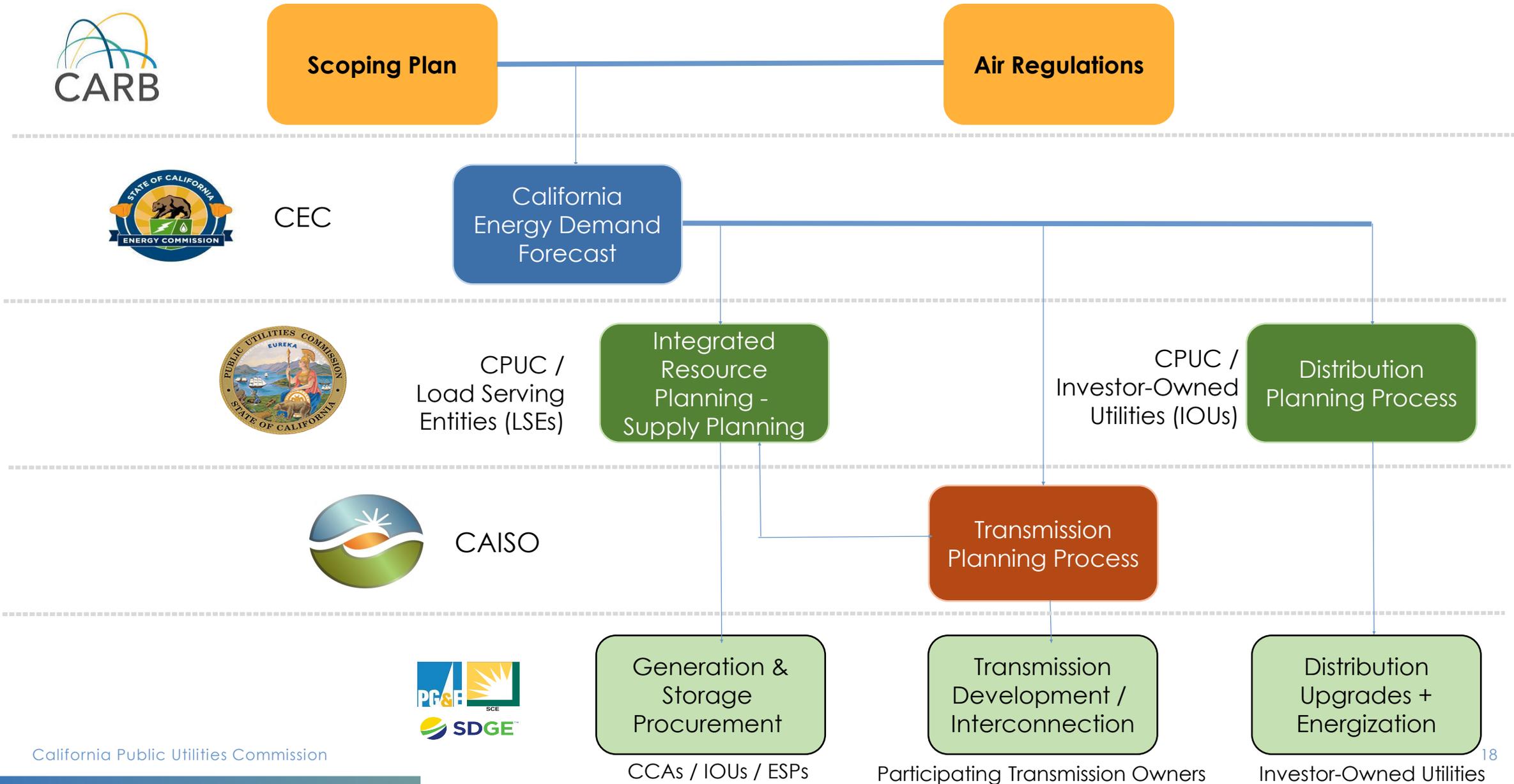
California State Agencies Commitment to EV Infrastructure

On April 20, 2023, multiple state agencies signed a Zero Emission Vehicle Infrastructure Joint Statement of Intent.



[Zero-Emission Vehicle Infrastructure Joint Statement of Intent \(ca.gov\)](https://www.ca.gov/zero-emission-vehicle-infrastructure-joint-statement-of-intent)

California Statewide Energy Planning Processes – High Level Overview

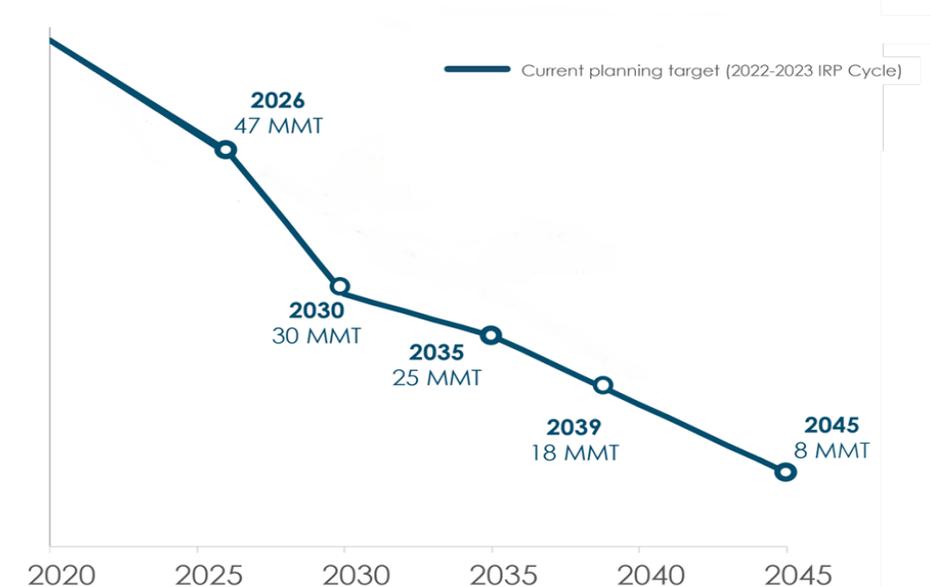


CPUC & Integrated Resource Planning

- CPUC established the **Integrated Resource Planning** process for setting electricity resource planning targets for CPUC-Jurisdictional LSEs in CAISO's BAA.
- **Planning process build Resource Portfolios** with input from LSEs and stakeholders, as directed by SB 350 (2015) and SB 100 (2018)
 - "...adopt a process for each load-serving entity...to file an integrated resource plan...to ensure that load-serving entities..." meet a host of policy aims and objectives (PU Code 454.52).
- **Reliability and GHG Reduction** ensured via identification of portfolio of resources to meet reliability for long term forecast & other assumptions.
 - "Identify a diverse and balanced portfolio of resources...that provides optimal integration of renewable energy in a cost-effective manner" (PU Code Section 454.51).
- **IRP Procurement Orders** drive contracting of new resources by LSEs to support statutory goals and RA or RPS obligations.
- **Transmission Planning** at CAISO is informed by CPUC IRP resource portfolios.

CA-wide GHG Emissions Planning Target

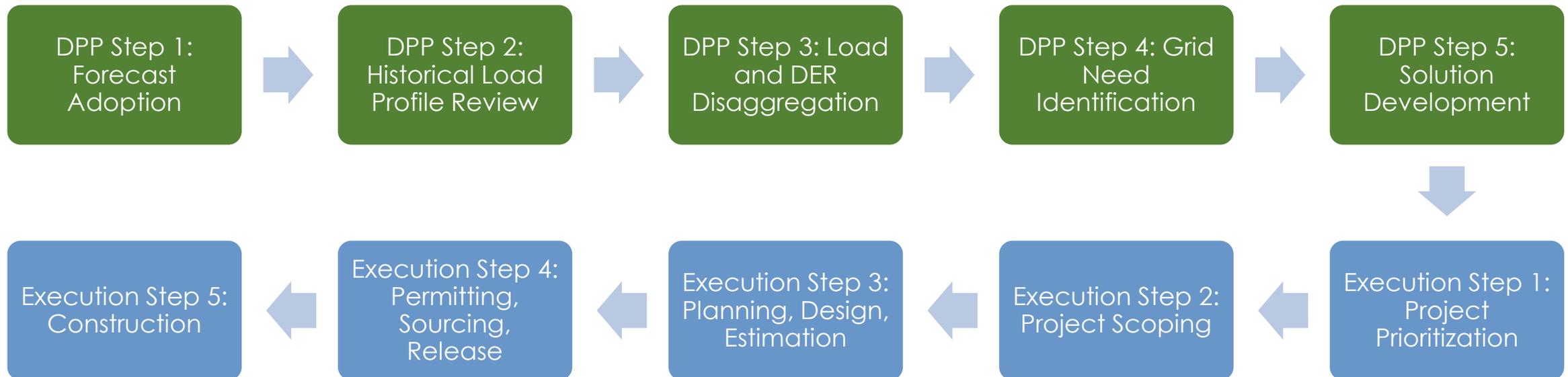
million metric tons



Source: CPUC February 2024 Preferred System Plan Portfolio, <https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2022-irp-cycle-events-and-materials>

Electric Distribution Planning and Execution Process

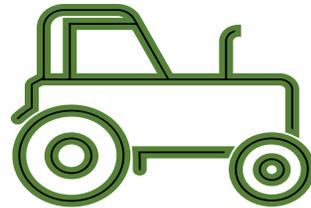
Process is dependent on utility, customer, and permitting authority



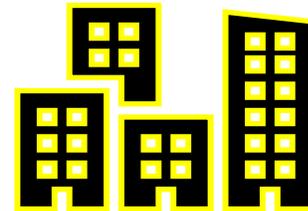
Timely Energization: Critical to California's Economy and Policies

There are significant concerns about current and future energization delays across all of California's major economic sectors.

Agricultural



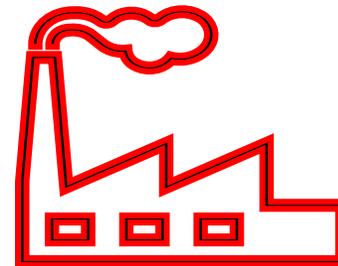
Buildings



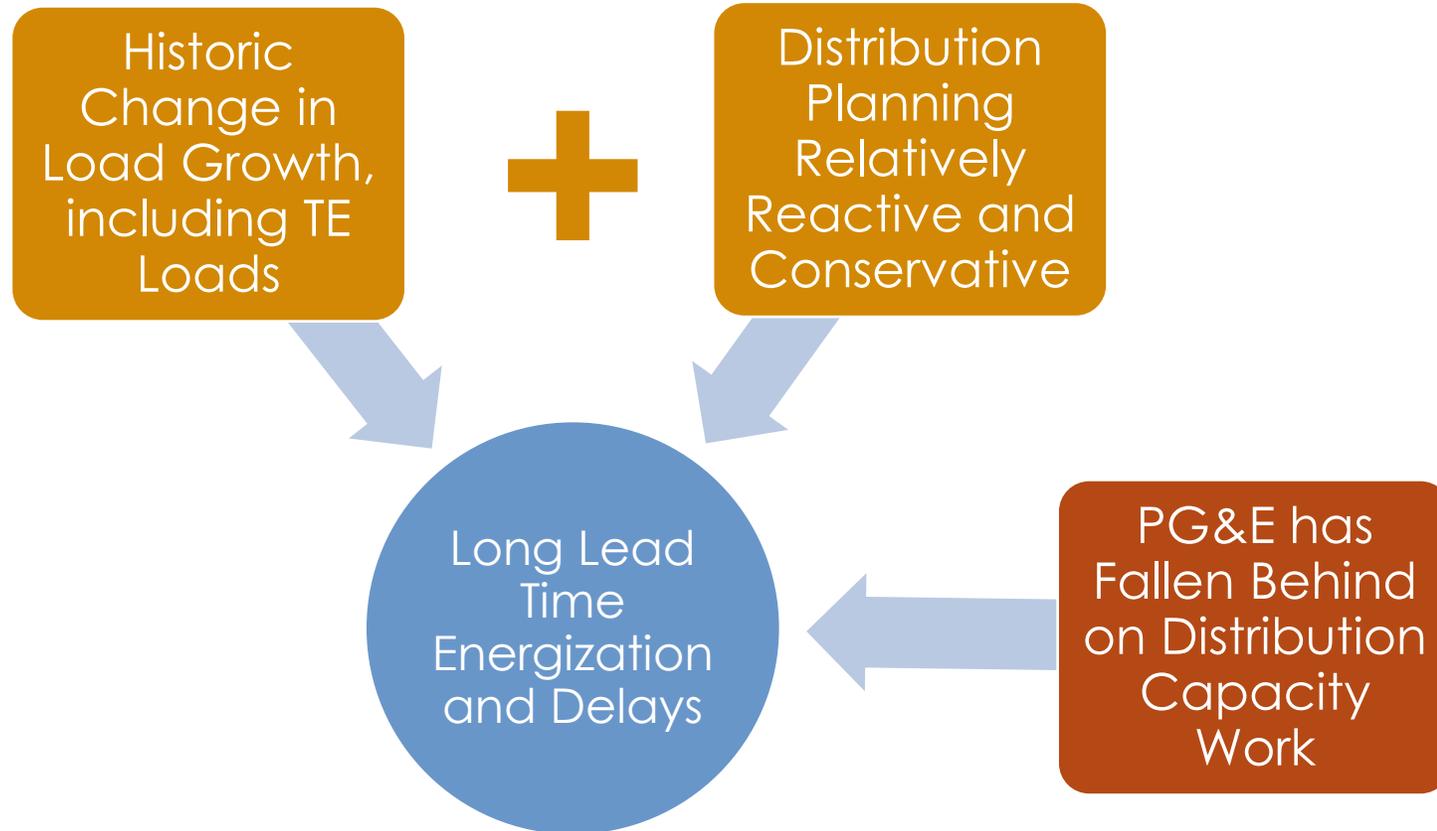
Transportation



Industrial



High Level Narrative Around Capacity Delays



MD/HD Electrification Planning Challenges

- Long lead timelines for new MD/HD infrastructure requires immediate statewide planning and coordination, which does not exist in the current paradigm
- Timing of statewide planning efforts vary and may result in delays in between planning cycles
- Infrastructure planning process at this stage doesn't fully consider the significant interactive effects between transportation electrification, building electrification, electric sector decarbonization, grid hardening, and affordability
- There is no infrastructure planning process for renewable hydrogen: There is not a set of unified transportation electrification inputs and assumptions that informs the various planning processes
- Significant market/tech uncertainty (e.g., electrical infrastructure supply chain constraints, public chargers vs. catenary/overhead charging) will impact state's ability to proactively authorize infrastructure solutions
- Historically planning and cost recovery has been "just-in-time", i.e., only authorize infrastructure when need is certain. This doesn't provide enough flexibility to consider long lead time assets

Active CPUC Planning Proceedings

The CPUC is actively engaged in efforts to ensure needed infrastructure is available in the future.

Distribution Planning Process Improvements

High DER Proceeding
R.21-06-017

Energization Process Improvements

Energization
R.24-01-018

Energization Cost Recovery Mechanism

PG&E: A.21-06-021
SDG&E: A.25-04-015

Large Load Energization (e.g. MD/HD Charging)

PG&E Rule 30 Application



CPUC's Focus on Transportation Electrification

The CPUC's activities on transportation electrification primarily fall into six main categories:

- Strategic planning on Zero Emission Vehicles (ZEV) policy and investments
- Electricity rates and cost of fueling
- Distribution infrastructure and planning to support charging infrastructure
- Vehicle-grid integration (VGI) policy, pilots, and technology enablement
- Charging infrastructure deployment and incentives
- Program evaluation and interagency coordination



CAISO's core responsibilities

- The CAISO is a federally-regulated **nonprofit**, **independent**, **technology-neutral** organization that manages the high-voltage electric grid for 80% of California and a portion of Nevada.



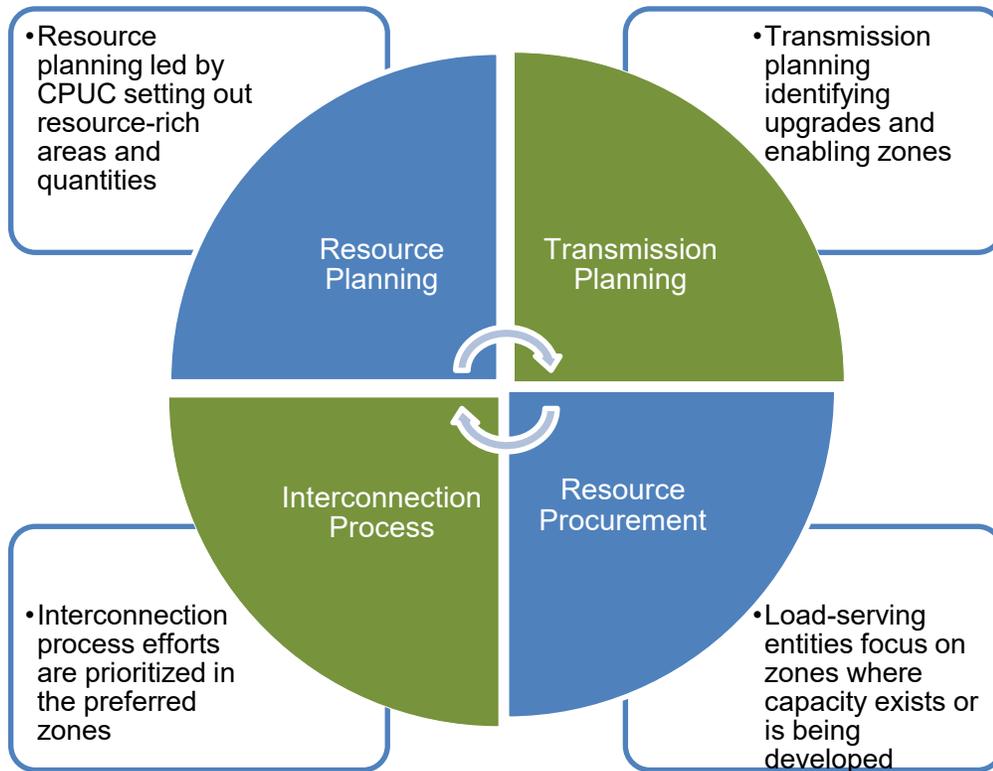
California ISO balancing authority

The CAISO manages the flow of electricity across high-voltage transmission lines for 80 percent of California, and a part of Nevada.

These lines deliver energy to load serving entities including investor-owned and publicly utilities, and community choice aggregators.



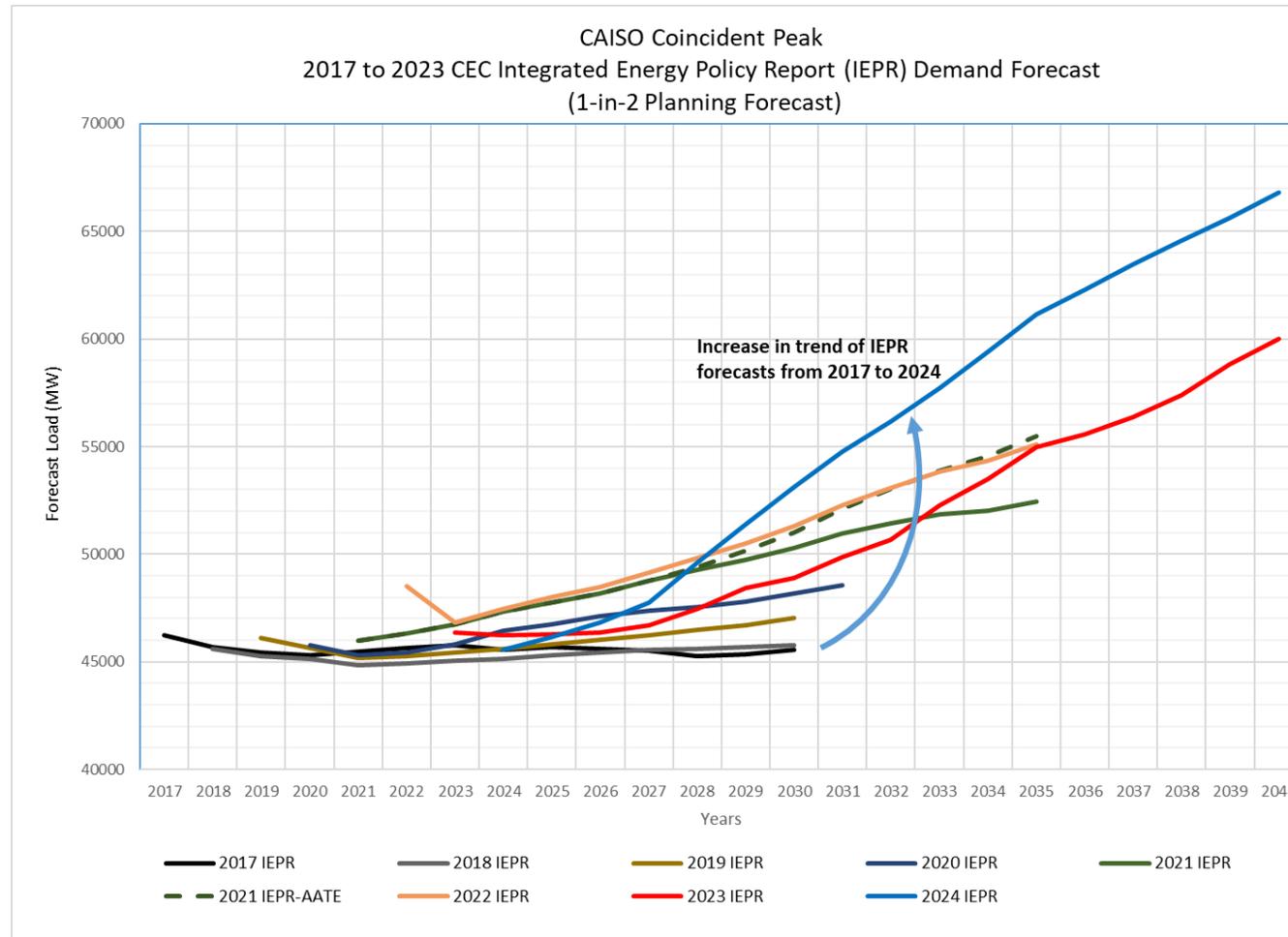
Memorandum of Understanding between the CAISO and California energy agencies establishes a strategic direction for long-term electric system planning to meet reliability targets and state policy goals



MOU signed in December 2022 among the CAISO, CPUC, and CEC:

- Tightens the linkage between resource and transmission planning, procurement direction, and the CAISO interconnection process to the greatest extent possible.
- Creates formal linkage between CEC SB 100/long-term demand forecasting activities and CAISO and CPUC processes
- Reaffirms existing state agency and CAISO coordination

Demand forecasts used in energy planning processes are growing, driving new resource and infrastructure needs

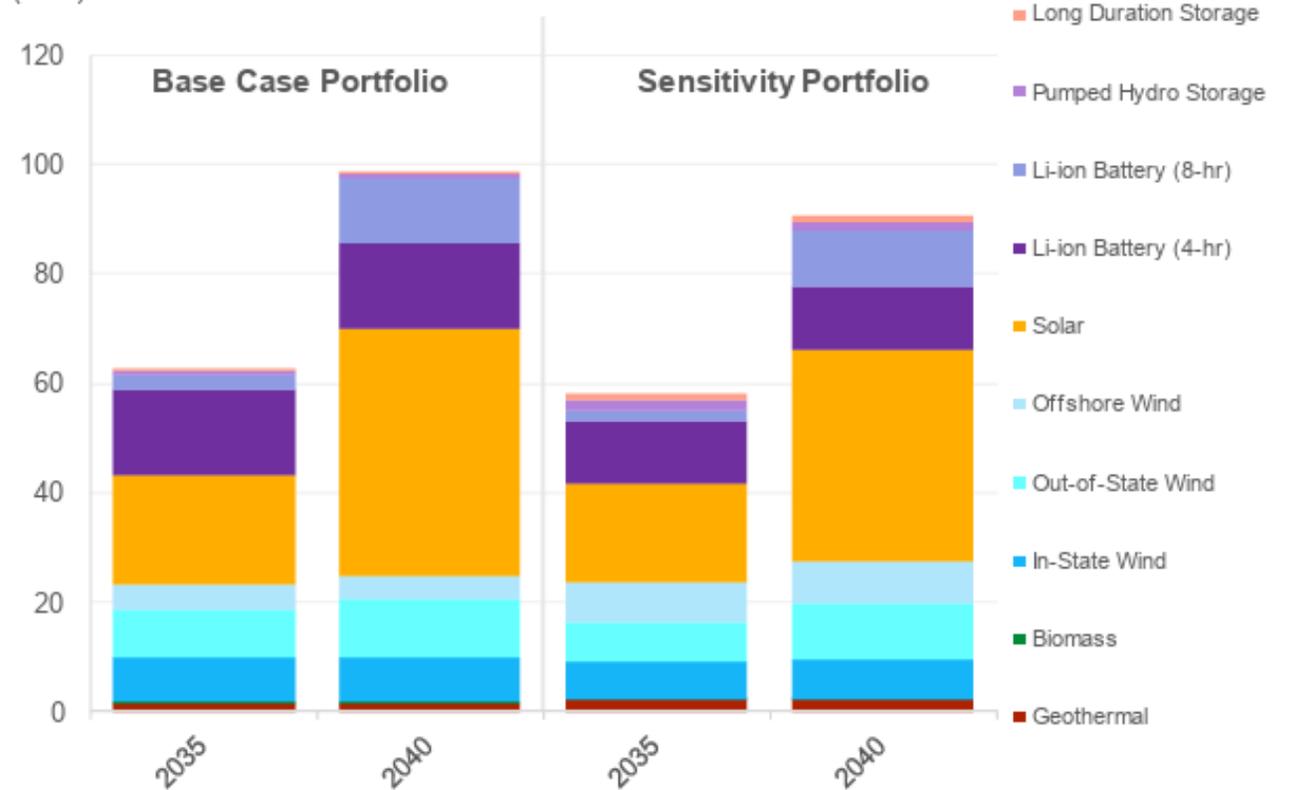


- The California Energy Commission's (CEC) demand forecast is used in downstream resource planning and procurement processes, and in the CAISO's transmission planning process (TPP)
- Increases in the CEC demand forecast driven by transportation and building electrification, and growth of data center loads

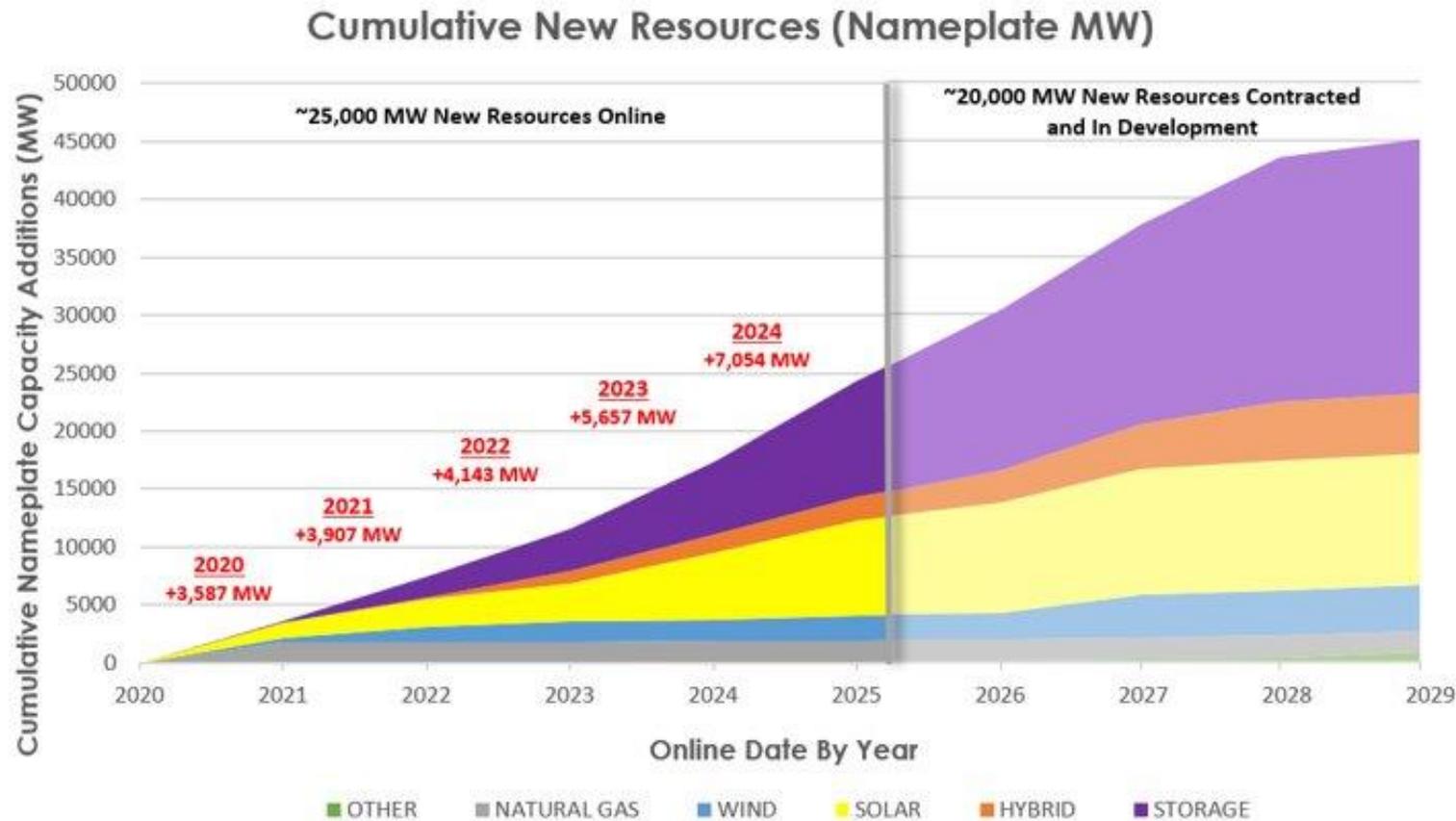
Projected new capacity needs through 2040 on the CAISO system

- The California Public Utility Commission's (CPUC) latest integrated resource plan calls for an additional 98.8 GW of new clean nameplate capacity by 2040
- Includes 45 GW solar, 29 GW storage (short and long-duration storage), 23 GW wind (in-state, out of state, and offshore wind), 1.6 GW geothermal, and biomass generation by 2040
- The CAISO will model the CPUC's latest portfolio and information on resource plans from publicly-owned utilities in the 2025-2026 TPP

New Resource Buildout in 25-26 TPP Cases (GW)



Rapid growth of new, clean resources on the CAISO grid



About 25 GW new nameplate capacity added between 2020 and April 2025

By 2029, about 20 GW additional new resources expected online

Over 12 GW of grid-scale battery storage currently online

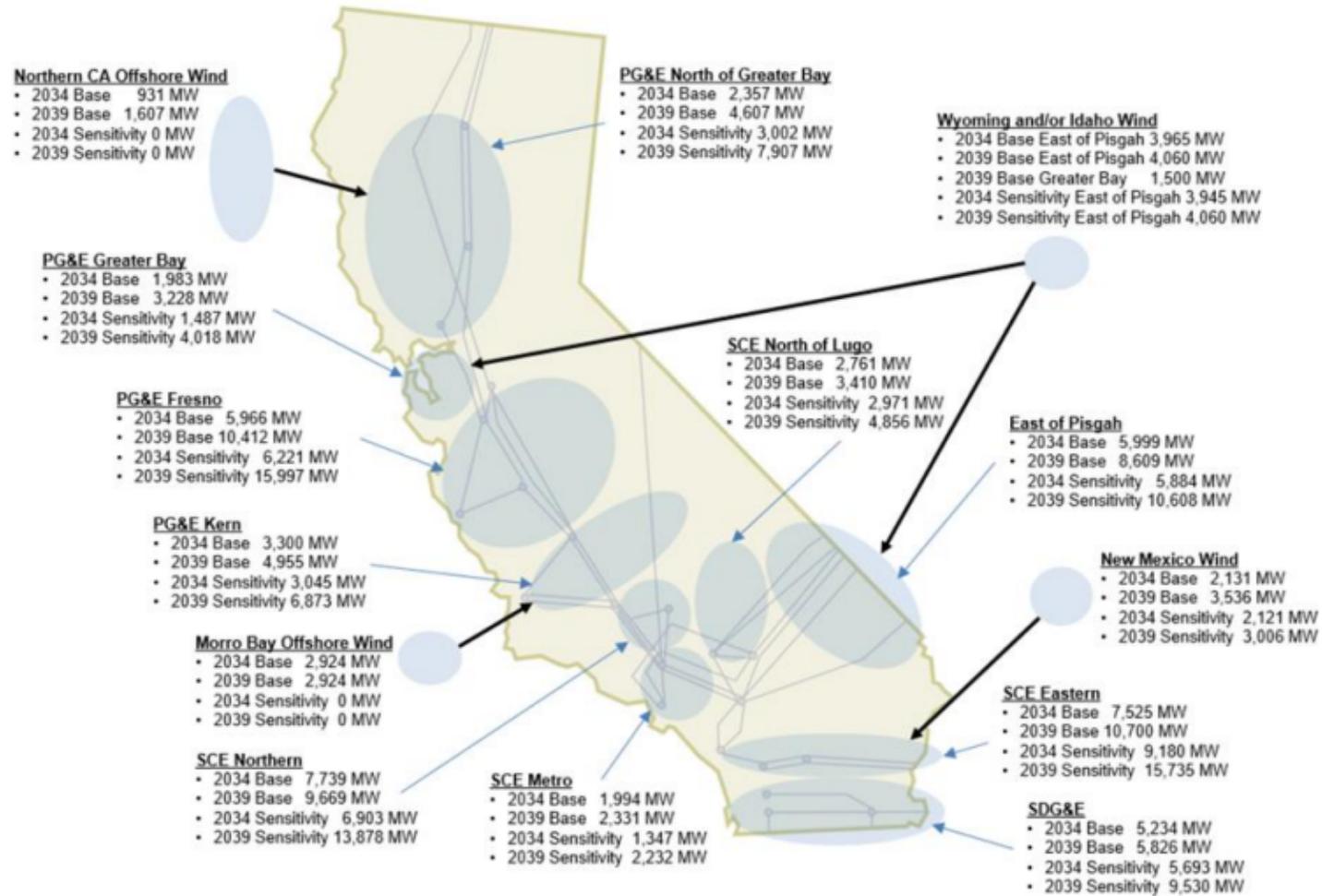
Source: CPUC: <https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/summer-2021-reliability/tracking-energy-development/resource-tracking-data-march-2025-release.pptx>

The CAISO leads the transmission planning process for our footprint, coordinated with load forecasts from the CEC and resource planning from the CPUC



- Annual 10-Year transmission plan is the formal approval document for expansion planning in our footprint
 - Ramped from 10-year average of \$650 million per year to an average of \$5.3 billion across the last four transmission plans
 - Responding to accelerating load growth and escalating clean energy needs
 - Focuses on most efficient and effective long-term solutions – including grid enhancing technologies and non-transmission solutions
- 20 Year Outlook assesses longer term needs
 - First prepared in 2022, updated in 2024
 - Establishes a longer term direction and strategy
 - Provides context for nearer term decision
- FERC Order No. 1920 will require changes and add new considerations to regional transmission planning

The CAISO transmission planning process identifies critical new investments to meet reliability, economic, and policy needs



The CAISO works bilaterally as well as through established processes to explore transmission opportunities



Questions & Answers