Scenario Development for Long-Term Regional Transmission Planning

Lessons from California

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California's Collaborative Process for Transmission Planning

California Energy Commission – Forecasts electricity demand including load modifiers; Evaluates the impact of state policies on the grid (e.g. transportation electrification, offshore wind development); Conducts longer-term resource planning for addressing state policy goals (SB 100).

California Public Utilities Commission – Develops actionable resource portfolios (IRP); Sets policy objectives related to transmission development (milestones for greenhouse gas reductions, power plant retirements); Conducts environmental review and issues construction permits for transmission projects; Oversees resource procurement by load serving entities.

California Independent System Operator – Provides information on transmission constraints from interconnection cluster study reports and previous transmission plans to CPUC for developing resource portfolios;; models the reliability and economic impacts of resource portfolios; identifies specific needed transmission facilities; conducts periodic stakeholder meetings during the transmission planning process.

Load Forecasting

Historical data is used for hourly, daily and seasonal consumption patterns. Econometric modeling accounts for the impact of population growth, economic activity and demographic change on future electricity demand.

End-use models break down electricity consumption into various sectors and uses for a more granular analysis of future demand drivers and to examine the potential for future load modification.

Multiple scenarios are developed based on assumptions about economic growth, technological advancements and policy interventions.

New and expanded electricity use includes electrified transportation, new industrial technologies and processes and building electrification.

The load forecasting process is dynamic and evolving with new and expanded uses of electricity being introduced over time. The CEC updates its forecasts on a two-year cycle.

Integrated Resource Planning

The California IRP process develops an annual base-case resource portfolio as a key input to transmission planning and one or more alternative portfolios for analysis by the CAISO.

The base-case portfolio is developed using a statewide capacity expansion model in combination with specific IRP plans developed by local Load Serving Entities (there are over 40 load serving entities in California).

The base-case resource portfolio consists of existing resources, resources currently under development and generic future resources.

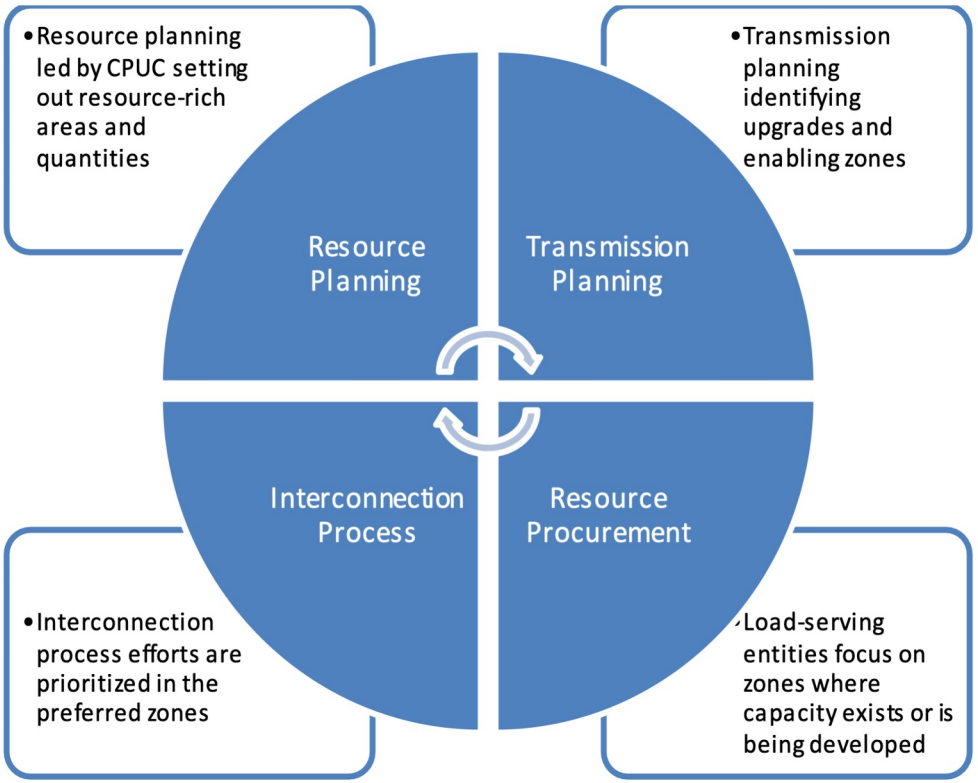
The locational specificity of generic resources is organized initially by the broad geographical zones used by the capacity expansion modeling tool.

To accurately study the performance of the high-voltage grid, the CAISO needs to model the generic resources at specific transmission substation locations.

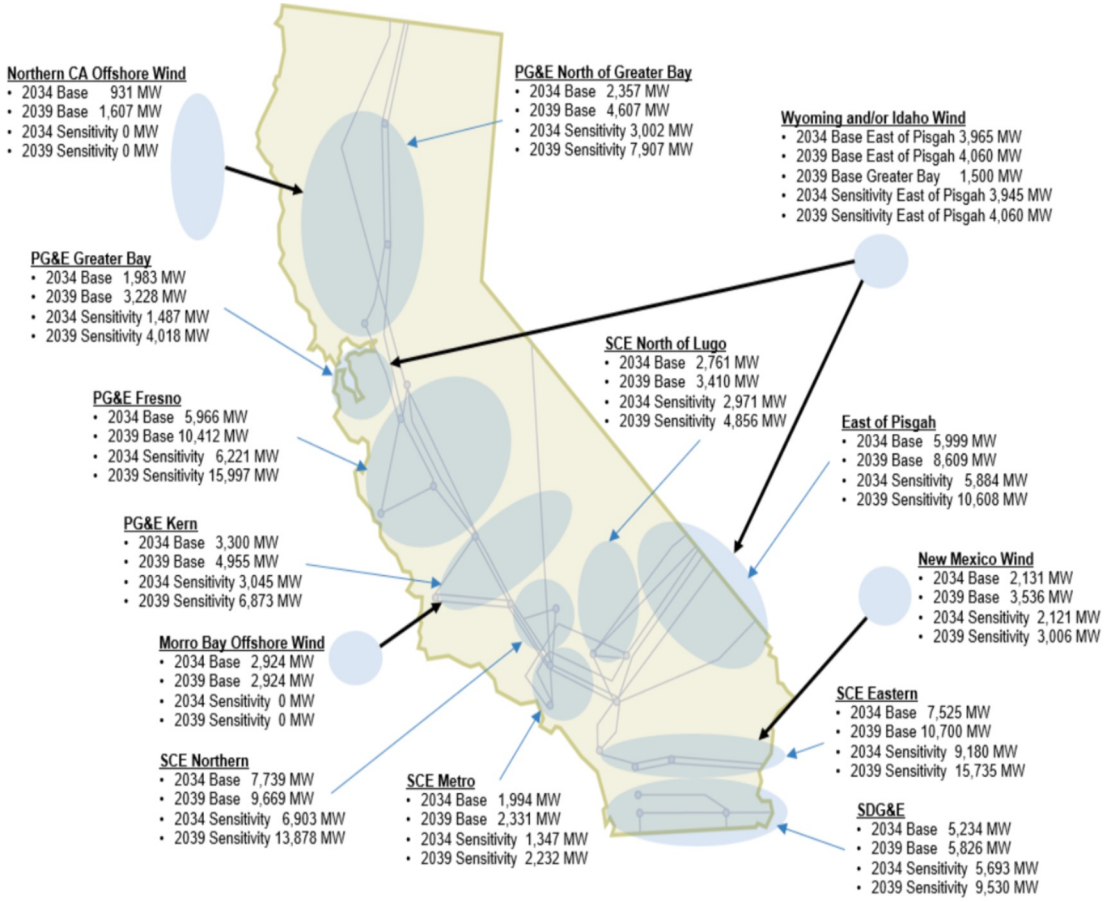
Guiding Principles for Busbar Mapping

- Resource and transmission cost, land use constraints and commercial interests need to be balanced in the busbar mapping process.
- Busbar mapping needs to be consistent with higher-level resource optimization in the IRP development process.
- Busbar mapping needs to account for state-level land use and environmental planning priorities.
- Busbar mapping should reflect, to the extent feasible, commercial interest as expressed in LSE procurement plans and activity in relevant interconnection queues.
- Busbar allocations should minimize transmission congestion by considering transmission constraints and triggering transmission upgrades that are cost-effective and needed to achieve deliverability requirements.

The CAISO Uses an Iterative Process for Planning by Energy Resource Zones



The CAISO Transmission Planning Process Includes Ten Energy Resource Zones



Improvements for Long-Term Energy Development Process

Extend planning horizon from 15 to 20 years

Plan for transportation electrification readiness, particularly for heavy- and medium-duty vehicles

Determine priority energy growth zones for data centers, new industrial development and other load growth

Develop more accurate bottoms-up energy growth forecasts

Improve coordination between distribution system planning and transmission planning

Streamline permitting of transmission projects

Appendices

CAISO Annual Transmission Planning Schedule

Date	Activity
January – First Year	Develop transmission study plan with common set of assumptions
February – First Year	Post draft study plan
March – First Year	Stakeholder meeting and written comments on draft study plan
June – First Year	Final study plan posted
August – First Year	Preliminary reliability results and base case posted
September – First Year	Stakeholder meeting and written comments on base case
October – First Year	Final reliability results posted
November – First Year	Preliminary assessment of policy and economic studies
December – First Year	Stakeholder meeting and written comments on policy and economic studies
March – Second Year	Draft transmission plan posted
April – Second Year	Stakeholder meeting and written comments on draft transmission plan
May – Second Year	Submitted to CAISO Board of Governors for Adoption

Scenarios Studied and Results from CAISO Transmission Plans (2021 through 2024)

Transmission Plan	Scenario	Greenhouse Gas Reduction Goal and Other Policy Drivers	Reliability Projects	Policy-Driven Projects
2021-2022	Base Case	46 MMT by 2031	16	6
	Sensitivity 1	38 MMT by 2031		
	Sensitivity 2	30 MMT by 2030 and 8 GW offshore wind		
2022-2023	Base Case	38 MMT by 2030	24	21
	Sensitivity 1	High Electrification		
2023-2024	Base Case	30 MMT by 2030 and 4.5 GW offshore wind	26	7
	Sensitivity 1	13.4 GW offshore wind		
2024-2025	Base Case	25 MMT by 2035 and 4.5 GW offshore wind	TBD	TBD
	Sensitivity 1	No offshore wind and high gas retirement		