Overview of the CPUC's IRP Cycle

February 2025

California Public
Utilities Commission

Contents

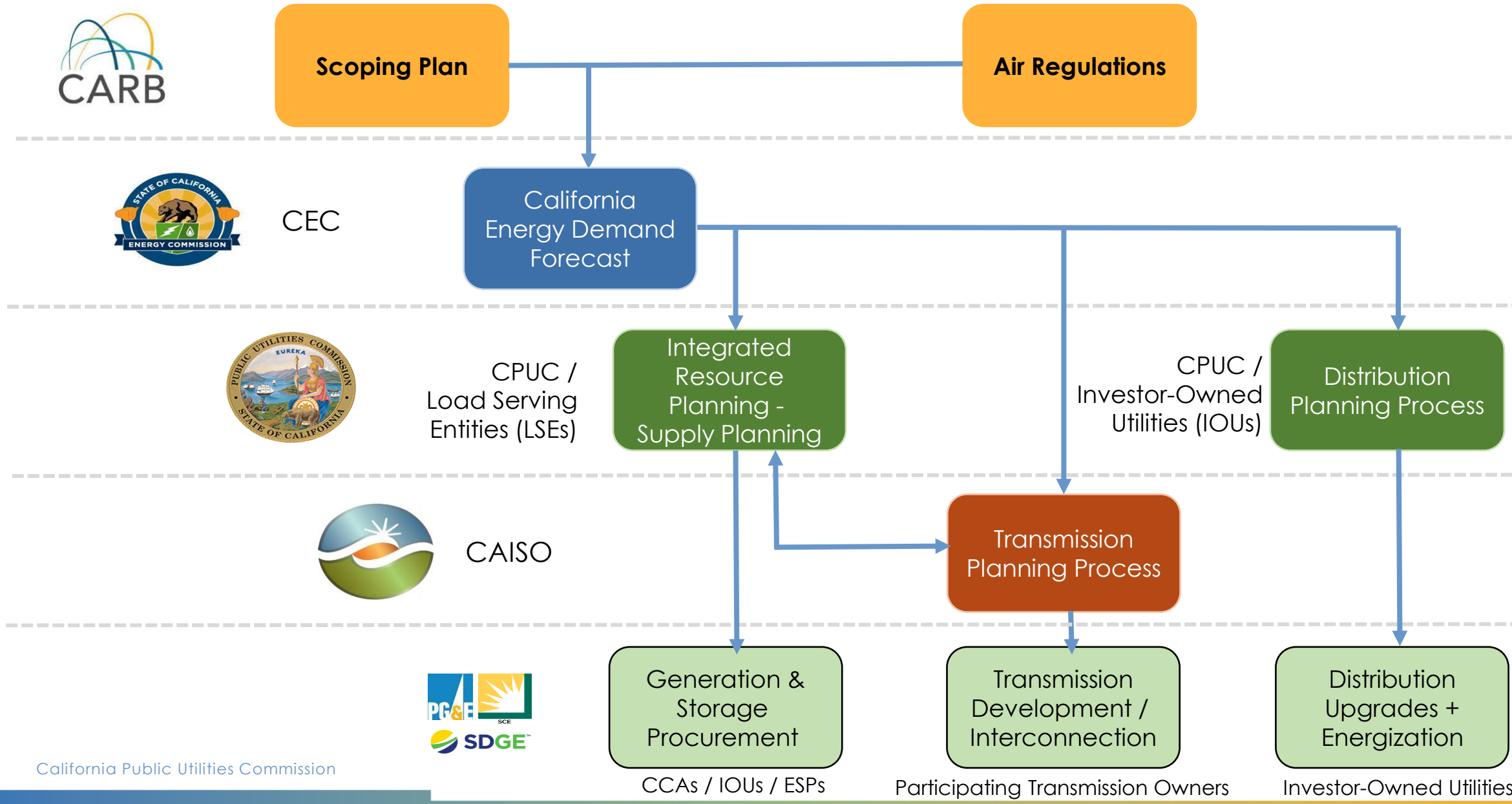
Background

Purpose of this deck

- Meant to provide stakeholders information about state energy planning, the CPUC's IRP cycle, and impact of the CPUC's IRP program.
- The contents included herein are intended to be informational-only and are geared at enabling stakeholders to better understand the context and key functions of the CPUC's IRP cycle.
- The deck covers the core functions of the IRP's Planning, Modeling, and Need Determination and Transmission and Interconnection teams, including resource portfolio development and adoption (i.e., Transmission Planning Process (TPP) portfolios), as well as key developments within the IRP proceeding, including progress on procurement.
  - This deck is not meant to cover every function of the CPUC's IRP team, including ongoing work on compliance with IRP's procurement orders, the Reliable Clean Power Procurement Program, the Assembly Bill (AB) 1373 Need Determination, and others.
- Stakeholders should join current IRP Proceeding's (R. 20-05-003) service list to get most up-to-date information on proceeding-level activity.

State Planning in Context

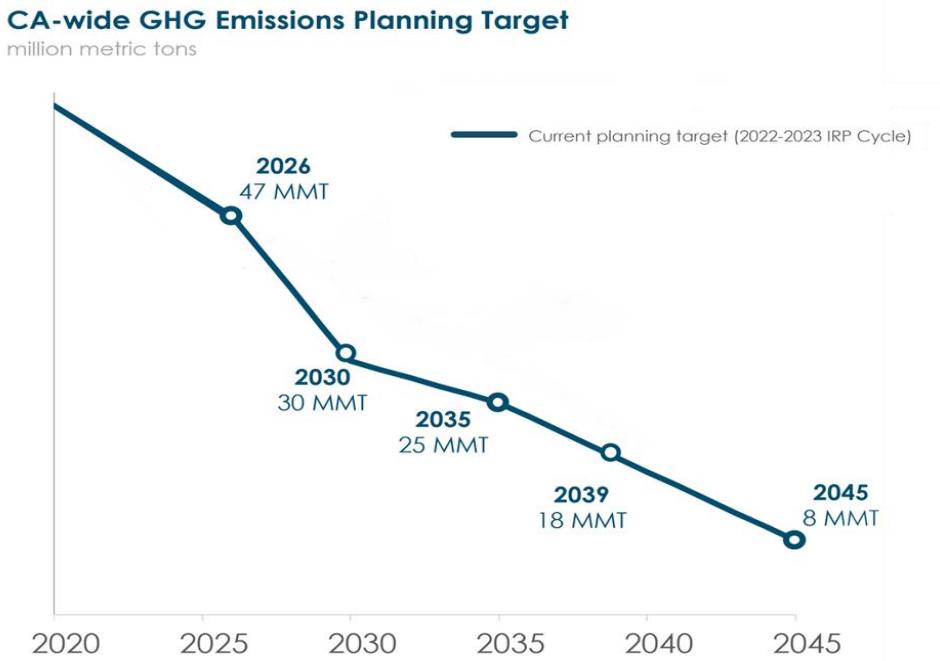
California Statewide Energy Planning Processes – High Level Overview



CPUC's IRP Functions & Teams

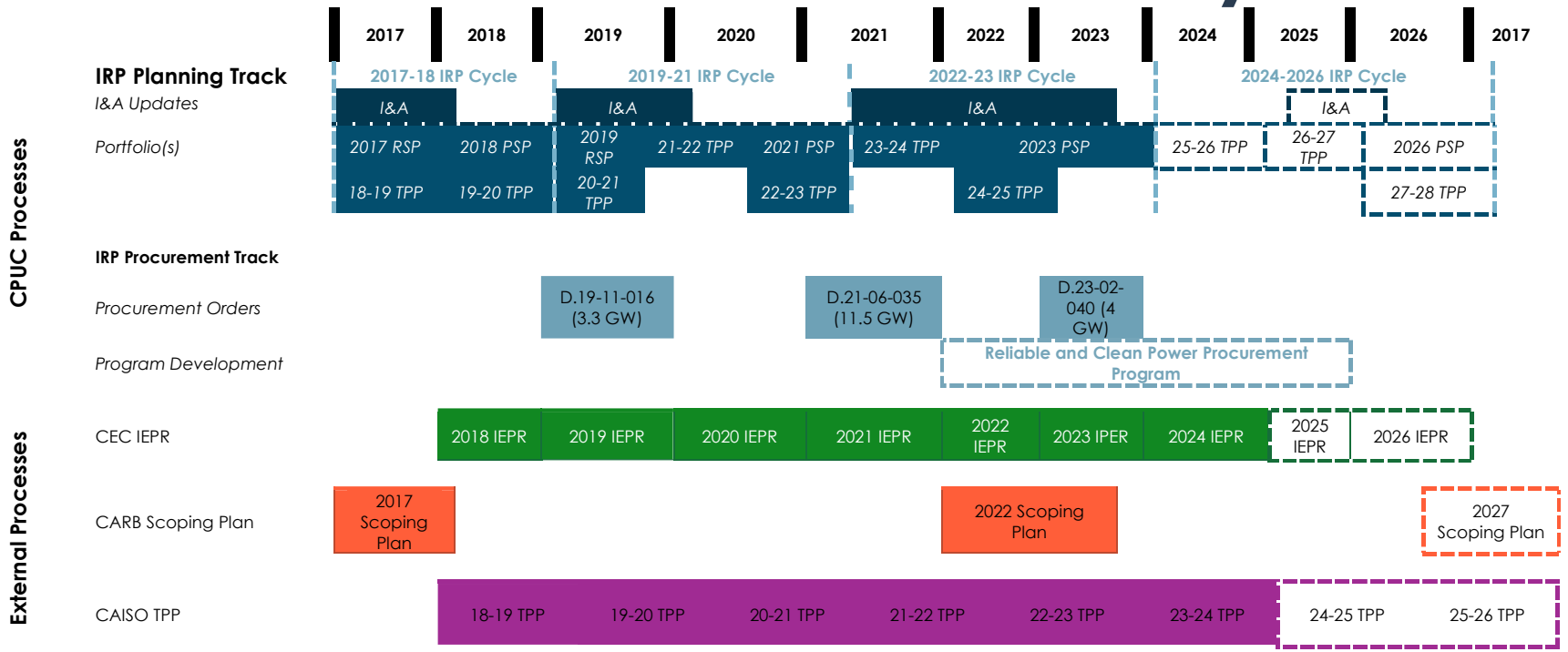
CPUC & Integrated Resource Planning

- 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 per PU Code 454, 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.



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

Historical Overview of CPUC's IRP Cycle



Past IRP Cycles

- Switched from 2-yr to 3-yr, then back to 2-yr cycles; removal of the Reference System Plan (RSP) is one of the most significant recent changes -
- Procurement track was out of sync w/ planning track
- Generally, well aligned w/ IEPR + TPP annual processes

Future IRP Cycles

- Establish a stable, predictable cycle with a clear + sequential set of stages (e.g. 2-years, 1 major I&A update, 1 minor I&A update)
- Integrate procurement + planning activities to streamline LSE filings + CPUC review (Reliable and Clean Power Procurement Program)

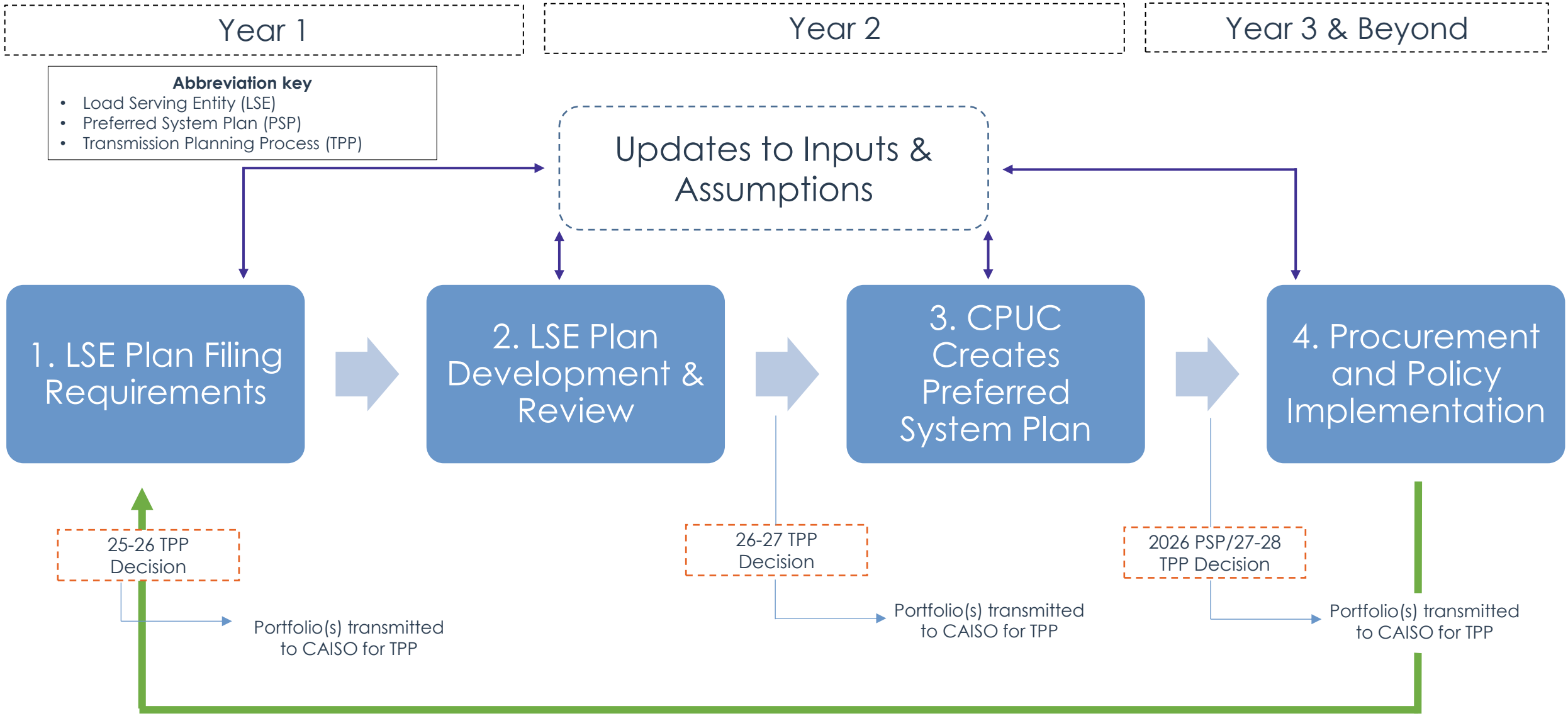
Assigned Commissioner's Amended Scoping Memo And Ruling Extending Statutory Deadline

- In April 2024, a Scoping Memo detailed activities in the IRP Proceeding (R.20-05-003). That Scoping Memo listed the following activities:

Milestone	Approximate Date
2025-2026 TPP Decision	Q1 2025
Inputs and Assumptions updates - Model refinements - Updated NREL ATB resource costs - CAISO White Paper updates	Q4-2024 to Q2-2025
RCPPP Development - Staff Proposal - Webinar/Workshop - Ruling - PD/Decision	Q1-Q2 2025
2024-2026 LSE IRPs - Filing Requirements - IRPs filed	Q2-2025 to Q4-2025

Available via IRP Scoping Memo: https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M529/K525/529525977.PDF

Overview of the 2024-26 IRP Cycle



IRP's Three Teams

- The CPUC's IRP proceeding involves three teams that all work on implementing the IRP cycle.
- IRP's three teams are:
  - Planning, Modeling, and Need Determination
  - Transmission and Interconnection
  - Procurement Oversight and Compliance
- More information about the core functions of the teams and their interactions with the IRP cycle are included in the following slides.

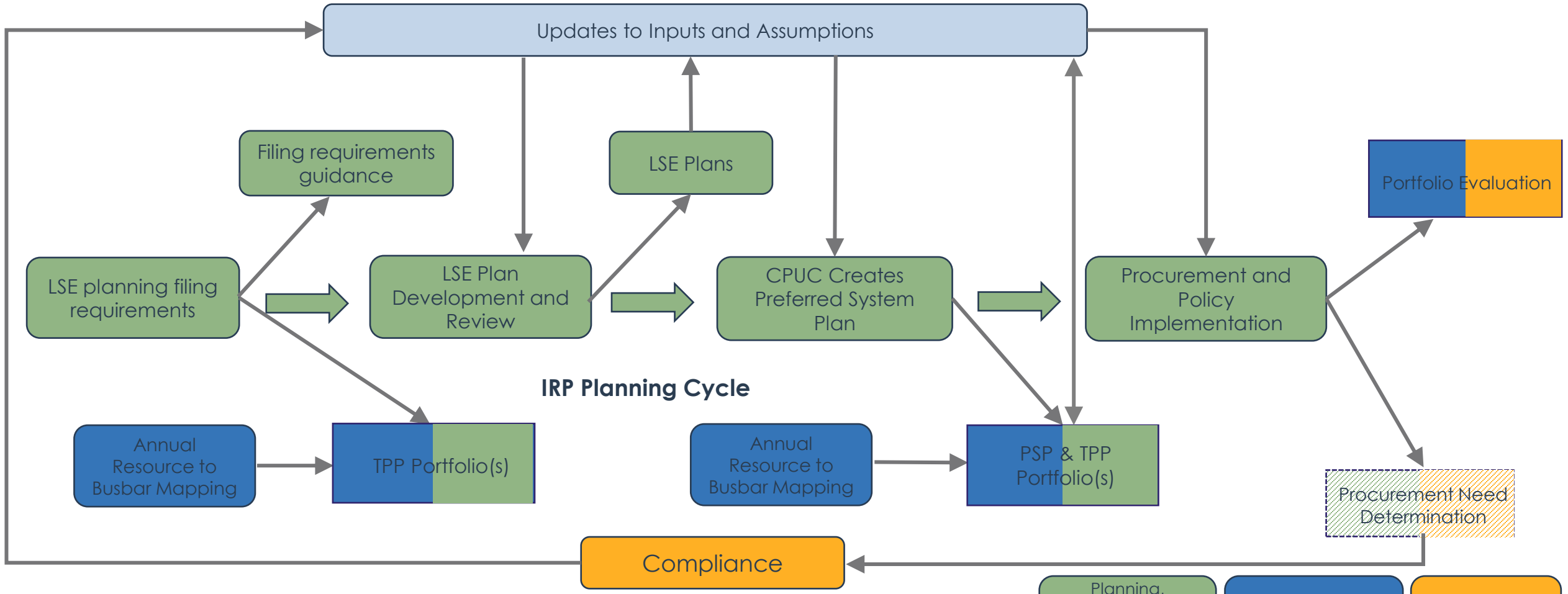
Core Functions of IRP's Planning, Modeling, and Need Determination work

- Planning
  - Manage the IRP Planning Track process.
- Modeling
  - Produce and vet portfolios considered for adoption as Preferred System Plan (PSP) and/or use in the Transmission Planning Process (TPP).
- Need determination
  - Develop and vet analysis that can be used to inform policymaking, such as need determinations (e.g., mid-term reliability (MTR), AB 1373, etc.).

Core Functions of IRP's Transmission & Interconnection work

- Strategy/Policy
  - Engaging on transmission planning and interconnection process enhancements
- Transmission planning
  - Lead consideration of transmission in the IRP Planning Track
  - Busbar mapping for the annual transmittal of the TPP portfolios to the CAISO
  - Contribute to the CAISO's 20-year Transmission Outlook
  - Engage in state-wide offshore wind planning efforts
- Transmission and interconnection delivery
  - Monitoring approved transmission projects for feedback into resource planning and procurement
  - Awarding and implementation of the CHARGE2T grant
  - Coordination with the Tracking Energy Development (TED) Taskforce on delayed interconnection projects

Overview of the Three IRP Teams' Involvement in an IRP Cycle



Overview of an IRP Cycle

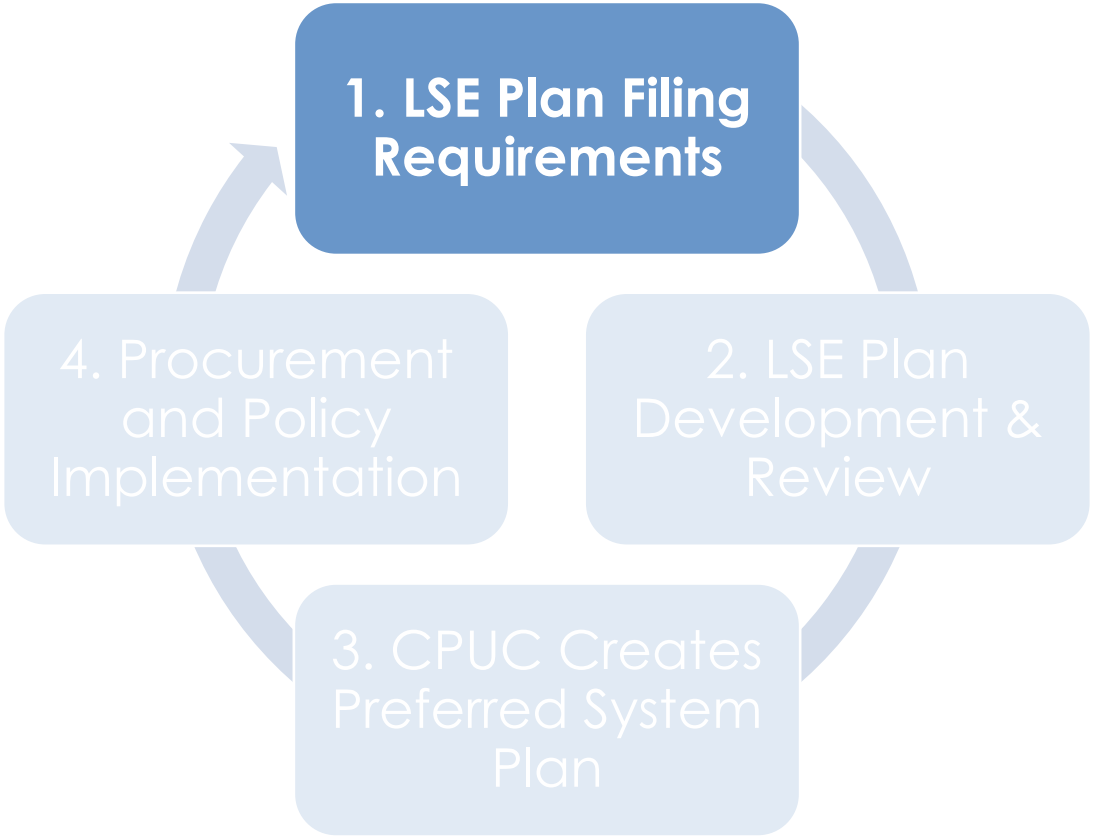
Inputs & Assumptions (I&A) in IRP

- The Inputs and Assumptions (I&A) document describes the key data elements, assumptions, and methodologies for CPUC IRP modeling within a given cycle.
- IRP Staff work with IRP stakeholders to vet and update changes to I&A throughout IRP cycles.
  - In any given I&A update, Staff have to balance all possible updates with what can reasonably be implemented with sufficient time to conduct modeling.
  - Staff also have to balance using propriety data with the need to use best-available public information.
  - Scope of I&A updates can range from significant (e.g., new model functionality) to more routine (e.g., annual resource cost updates).

Scope of Input Updates across Recent TPP cycles

23-24 TPP (2023 PSP)	24-25 TPP	25-26 TPP
• Resource costs • Load inputs (2021 IEPR ATE) • Modeling resource Baseline • Updated NQC values • Transmission deliverability-resource mappings, existing transmission deliverability capacity, and transmission upgrade costs from CAISO 21-22 TPP and CAISO 20-year Study • Secondary system need (SSN) transmission utilization values, per CAISO	• Modeling resource Baseline • Resource cost (2023 NREL) • Load inputs • Resource potential PRM accounting & resource accreditation • Sampling from SERVM's 23-weather year dataset for loads and generation profiles • Resource-transmission representation & deliverability upgrades based on CAISO data • Resource builds in non-CAISO external zones • Modeling and data updates for modeling load shift resources • Emerging technologies as candidate resources	• New Transmission Cluster Constraints • Load Inputs (2023 IEPR) • Geothermal Resource Cost • Arizona Solar Profiles

Step 1: LSE Plan Filing Requirements



- CPUC conducts modeling to determine reliability, GHG, and other filing requirements
  - Use CARB Scoping Plan to derive range of GHG emissions levels for electric sector
  - Determine scenarios LSEs will have to plan for in their individual IRPs
- CPUC issues Filing Requirements to encourage LSEs to plan towards that future
  - Individual LSEs must submit IRPs demonstrating that their plans meet Commission-required scenarios

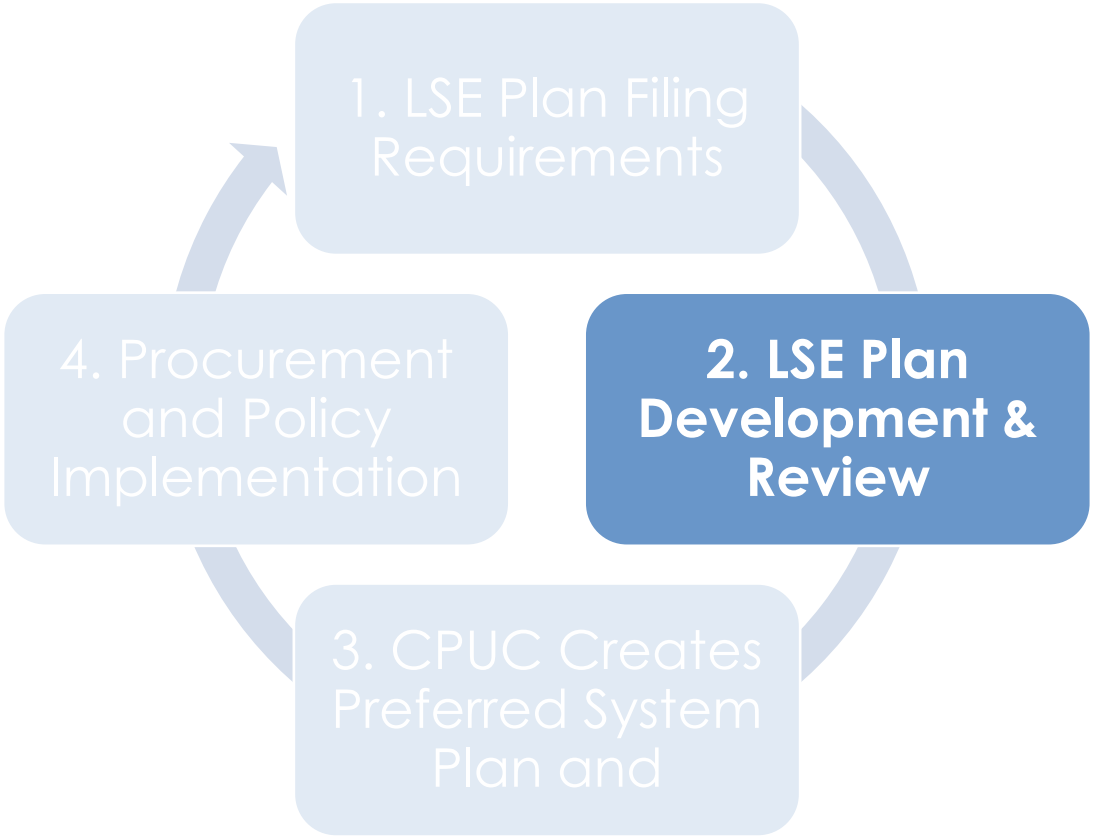
Filing Requirements (FRs) Documents: Purpose

- In the 2022-23 IRP Cycle, LSEs were required to submit the following documents as a part of their individually filed IRPs:
  - **Narrative Templates (NTs)**: To describe how LSEs approached the process of developing its plan, present the result of analytical work, and demonstrate to the Commission and the stakeholders the LSE's action plans
  - **Resource Data Template (RDT)**: To collect planned and existing monthly LSE contracting data, including for future resources which do not exist yet. Provides a snapshot of the LSE contracted and planned monthly total energy and capacity forecast positions over a ten year look ahead period. Also used to verify that LSE portfolios achieve assigned reliability planning standard
  - **Clean System Power (CSP) Calculator**: To use in estimating the GHG and criteria pollutant emissions of LSE portfolios and verify that LSE portfolios achieve assigned GHG planning benchmarks

What have filing requirements looked like across different cycles?

	2017-2018 IRP Cycle	2019-2020 IRP Cycle	2022-2023 IRP Cycle
# of portfolios LSEs submitted	1	2	2
Driver of plan differences	Conforming Portfolio (align with 2017 IEPR) Alternative Portfolio	38 MMT by 2030 46 MMT by 2030	25 MMT by 2035 30 MMT by 2035
Required documents	RDT Clean Net Short (CNS) calculator NTs	RDT CSP NTs	RDT (including reliability standard) CSP NTs
# of planning years	10	10	15
Emerging/new techs available		OSW	

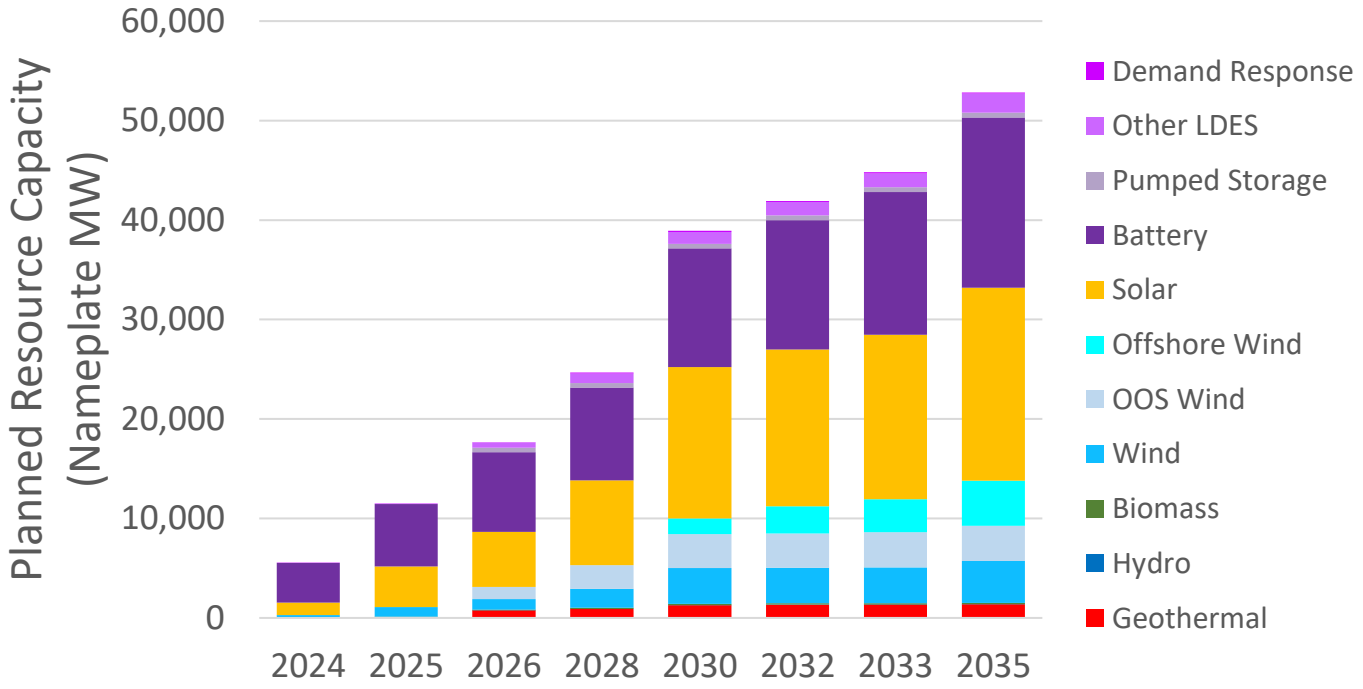
Step 2: LSE Plan Development & Review



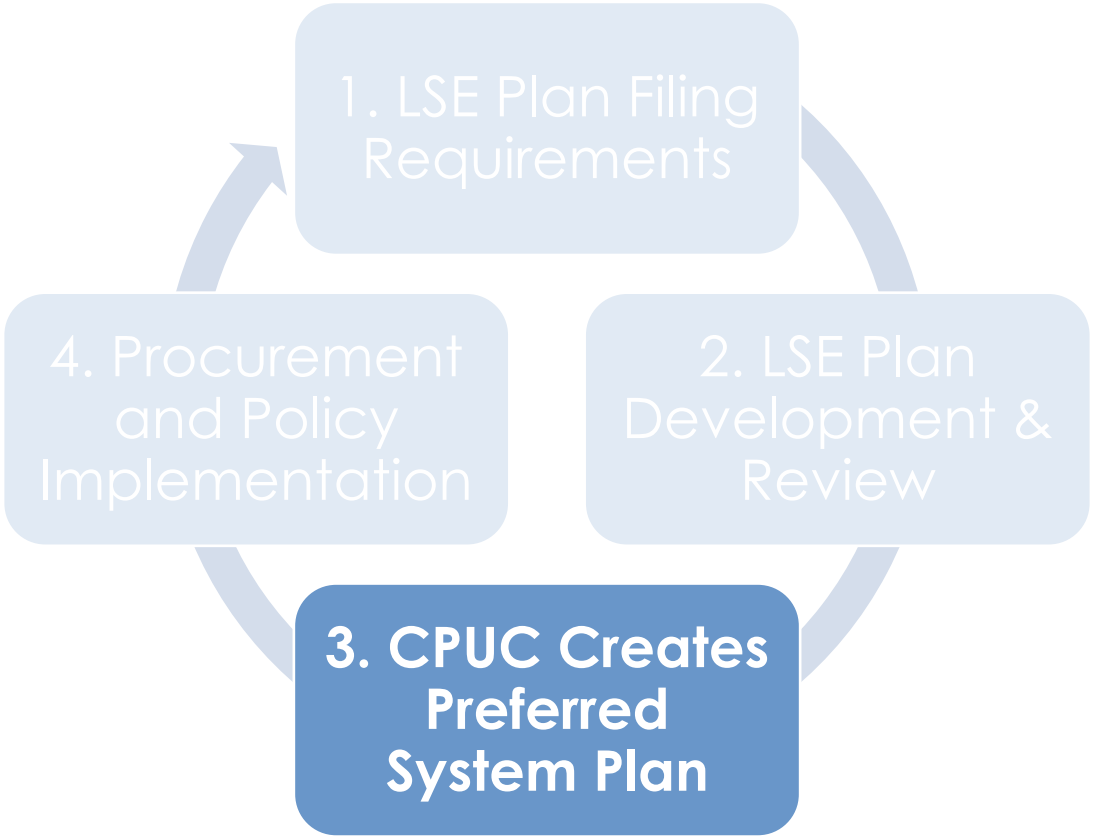
- LSE submit individual IRPs, which contain portfolios, clean system power calculators, and narrative templates that reflect state goals and satisfy Filing Requirements
- IRP stakeholders review LSE IRPs
- CPUC checks aggregated LSE plans for GHG, reliability, and cost goals

Overview of LSEs's Planned Resource Additions - Aggregated 25 MMT plans in 2023 PSP

- CPUC staff take individual LSE plans, aggregate them, and evaluate aggregated portfolio against overall electric system needs
- This aggregated portfolio is evaluated against reliability and GHG constraints, while seeking to meet these constraints at the lowest reasonable cost to ratepayers
- The aggregation of the individual LSE portfolios also serves to determine if there are gaps in the collective portfolio that will require action by the Commission to address
- All LSEs met their assigned GHG benchmarks, with some achieving emissions well below their assigned benchmarks:
  - LSE Emissions in 2030, per aggregated LSE CSP results: **15.1 MMT**
  - LSE Emissions in 2035, per aggregated LSE CSP results: **12.2 MMT**
- When aggregated, CPUC Jurisdictional LSEs demonstrated collective intentions to exceed their proportional GHG requirements. Their aggregated 25 MMT Portfolios reduced GHG emissions by ~3 MMT below their GHG emissions targets



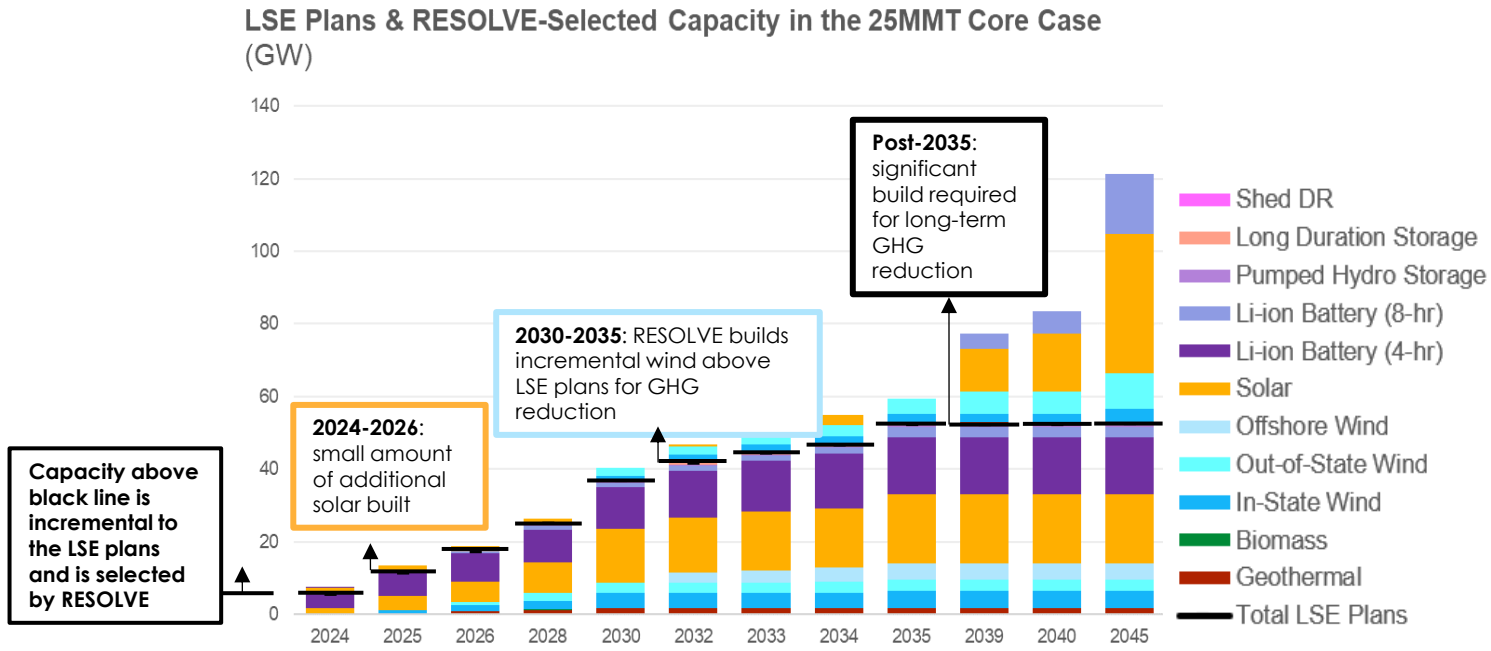
Step 3: CPUC Creates Preferred System Plan



- **CPUC Conducts Modeling**
  - *Capacity Expansion Modeling* that identifies portfolios to meet identified policy constraints, including sensitivity analysis
  - *Production Cost Modeling* evaluates the system reliability, operational performance, emissions, and operating cost of a given projection of future resource mix and load
  - *Busbar mapping* takes CPUC derived resource portfolios and assigns them to specific interconnection locations
- **CPUC Seeks Stakeholder Input on Potential Portfolios**
  - Proposed PSP portfolio and TPP sensitivity are released via ALJ Ruling
  - Staff conduct stakeholder workshop on proposed PSP portfolio and supplementary analysis
  - Staff adjust portfolio as needed based on stakeholder feedback
- **CPUC Adopts PSP Portfolio via Decision**
  - Adopted PSP portfolio also usually serves as TPP portfolio
  - Portfolio goes through CPUC busbar mapping process and is passed to CAISO for TPP process

Capacity Expansion Modeling (RESOLVE)

- Optimizes investments in new resources, as well as economic retention of existing resources, subject to a host of constraints (PRM, transmission line upgrade limits, SB 100, etc.)
  - New generation expansion helps identify additional transmission needs via TPP
- Selection of resources depends on a number of modeling paraments
- Used to generate a portfolio of new capacity that feeds into SERVM
- Key metrics:
  - RESOLVE-selected capacity
  - RPS & SB 100 policy
  - GHG emissions



Production Cost Modeling (SERVM)

- The SERVM model generates load and resource reports that summarize the load and resource balance by generation category for the study year and includes unit-level data on monthly nameplate capacity and region where the generator is located.
- SERVM takes RESOLVE portfolios and evaluates portfolios for a host of things, include reliability (i.e., meeting a 0.1 LOLE standard)
  - 0.1 LOLE = 1 day with an event in 10 years

Reliability and GHG Results – 25 MMT Core, Proposed PSP portfolio – Production Cost Modelling (PCM)

25 MMT CORE	2026		2030		2034		2035		2039		
Category	RESOLVE	SERVM	RESOLVE	SERVM	RESOLVE	SERVM	RESOLVE	SERVM	RESOLVE	SERVM	Units
LOLE		0.015		0.001		0.012		0.021		0.130	days/year
CAISO emitting generation	59,916	72,578	36,793	44,477	22,361	40,104	18,080	37,643	6,365	37,577	GWh
CAISO generator emissions	23.5	30.0	14.5	19.0	8.8	16.4	7.1	15.3	2.5	15.1	MMT CO2
Unspecified imports	18,185	7,295	12,060	11,665	18,291	10,570	20,454	9,438	27,214	8,594	GWh
Unspecified imports emissions	7.8	3.1	5.2	5.0	7.8	4.5	8.8	4.0	11.7	3.7	MMT CO2
CAISO BTM CHP emissions	4.8	4.8	4.7	4.7	4.5	4.5	4.4	4.4	0.9	0.9	MMT CO2
Total CAISO emissions	36.1	37.9	24.3	28.6	21.1	25.3	20.3	23.8	15.0	19.6	MMT CO2
Difference in GHG emissions		1.8		4.3		4.2		3.5		4.6	MMT CO2

- Note: The RESOLVE portfolio was designed to meet the 25 MMT by 2035 statewide target, which equates to 20.3 MMT attributed to CAISO. The 2035 CAISO emissions result in SERVM was 23.8 MMT, which equates to about 29.4 MMT statewide.
- These results include the RESOLVE and SERVM modeling changes since the October 5, 2023 Ruling, described earlier in this deck

Role of Busbar Mapping in IRP and TPP

- **Resource to Busbar Mapping** ("busbar mapping"): The process of refining the geographically coarse portfolios developed through IRP to specific interconnection locations (i.e., substations) for analysis in the CAISO's annual Transmission Planning Process (TPP).
  - Joint effort by a working group comprised of CPUC, CEC, and CAISO staff.
  - Mapping focuses on utility-scale generation and storage resources that are not already in baseline.
  - First conducted as "proof of concept" for the 2018-2019 TPP portfolio (CEC proof of concept report).
  - Guided by the stakeholder-vetted mapping methodology, a document that states guiding principles, establishes mapping criteria, and outlines the iterative inter-agency mapping process.
    - Current Mapping Methodology for the 25-26 TPP.

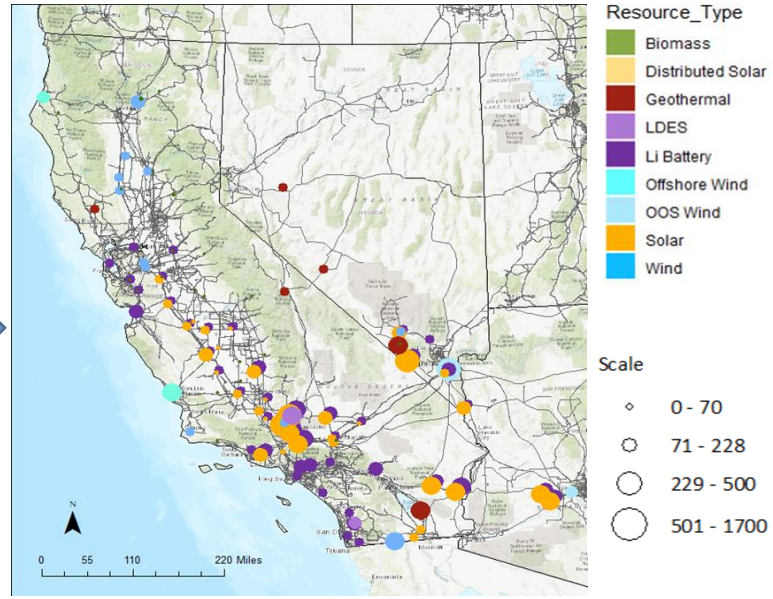
Input: Portfolio developed from LSE plans & RESOLVE model results

Resource Type	MW by 2032
Biomass	134
Geothermal	1,160
Wind	3,531
Wind OOS New Tx	1,500
Offshore Wind	1,708
Utility-Scale Solar	17,506
Battery Storage	13,571
Long-duration Storage	1,000
Shed Demand Response	441
Total	40,551

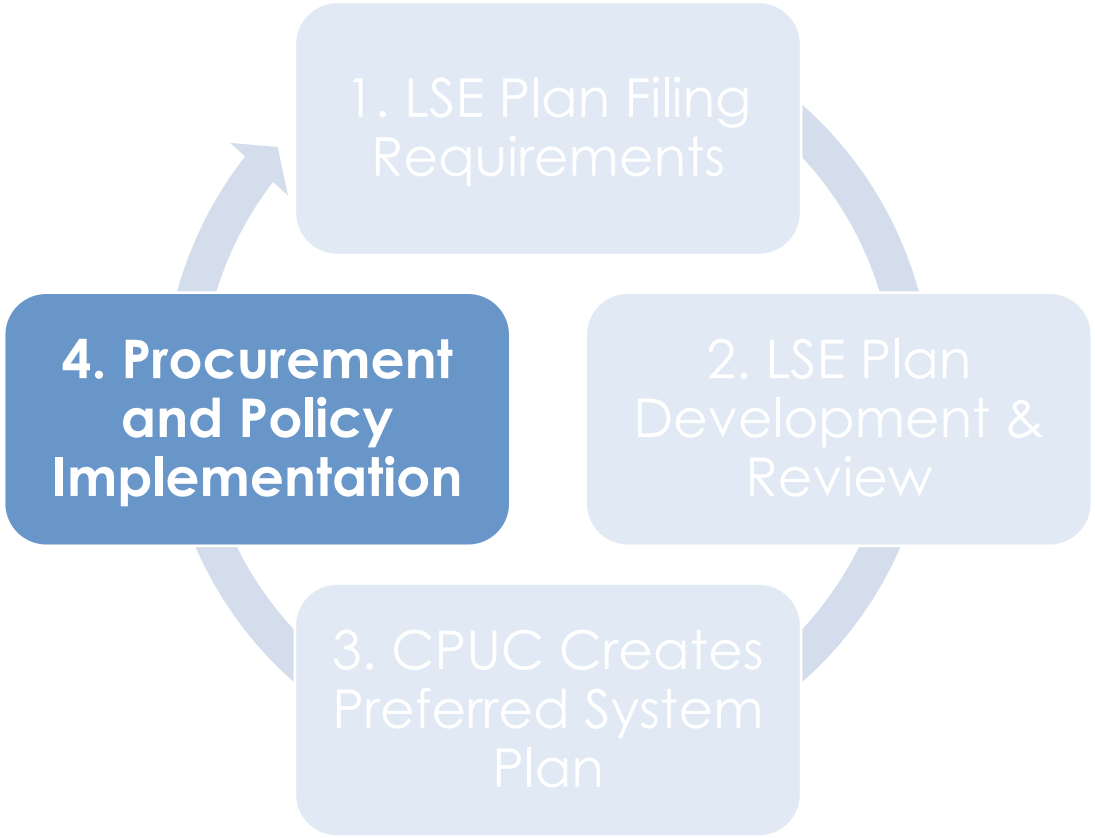
RESOLVE Resource Name	2032 Total (MW)
Greater_LA_Solar	1
Northern_California_Solar	-
Southern_PGAE_Solar	1,238
Tehachapi_Solar	2,969
Greater_Kramer_Solar	3,166
Southern_NV_Eldorado_Solar	7,382
Riverside_Solar	4,001
Arizona_Solar	-
Imperial_Solar	-

Mapping Process

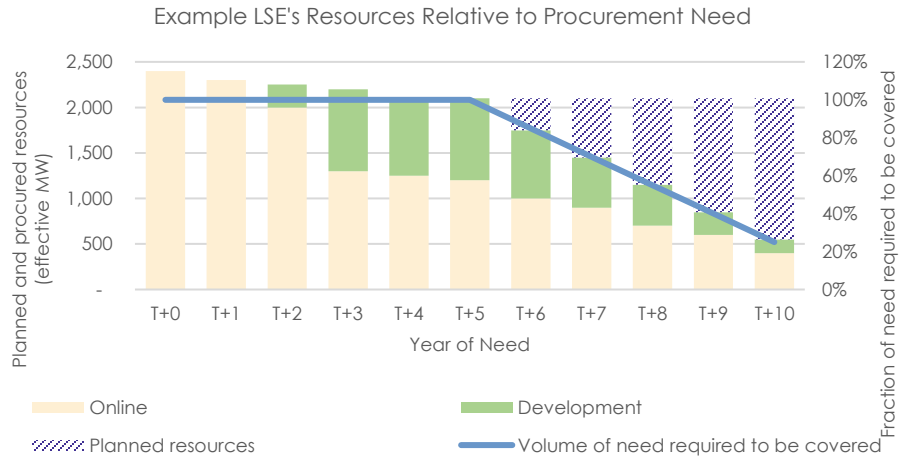
Output: Substation-level location for resources



Step 4: Procurement and Policy Implementation



- LSEs conduct procurement
- CPUC monitors progress and decides if additional action is needed
- Sample procurement after RCPPP is adopted could look like this



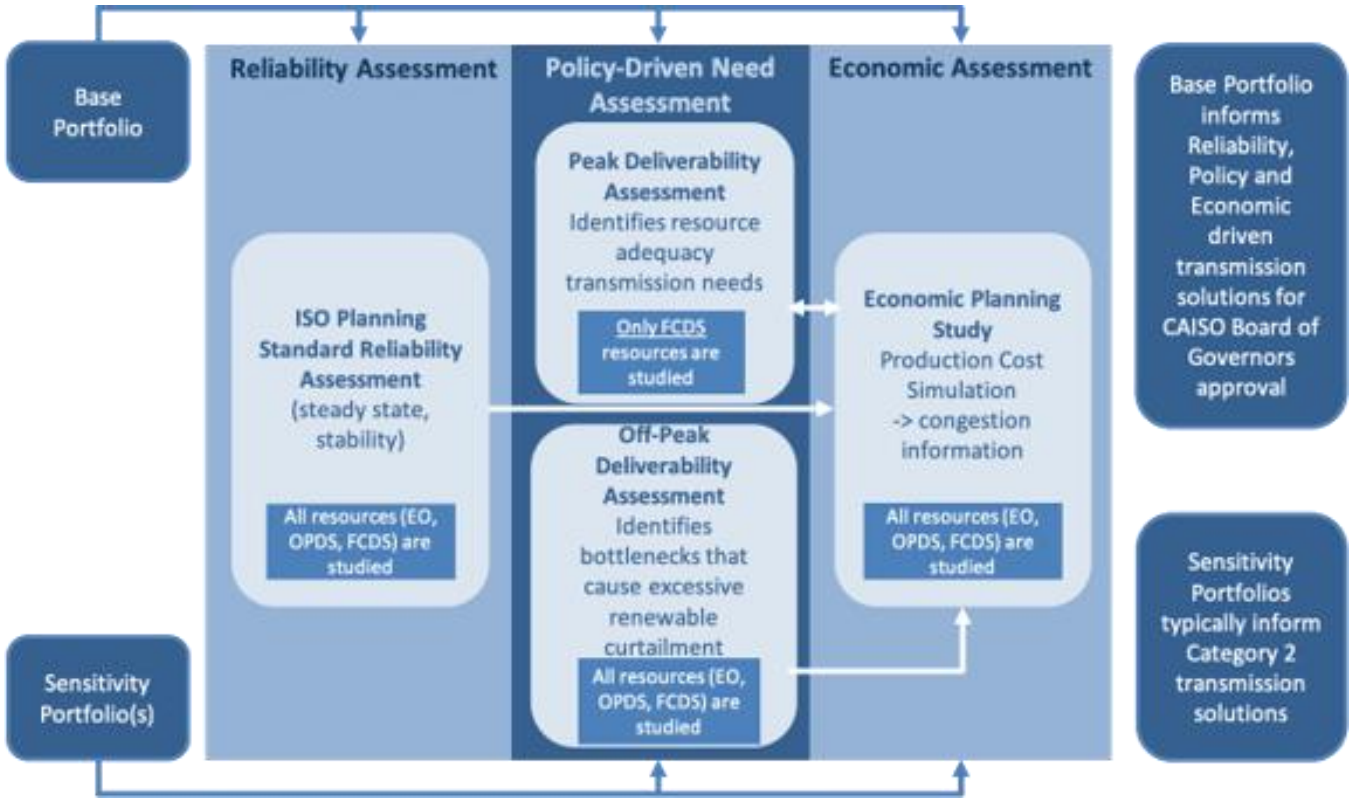
Where does IRP Modeling Go?

What does IRP Planning, Modeling, and Need Determination Inform?

- **LSE planning:** In the 2019-21 IRP cycle, the 2021 Preferred System Plan (PSP) was used as the basis for developing LSE IRP filing requirements for the 2022-23 IRP cycle.
- **CAISO Transmission Planning Process (TPP):** The PSP is typically adopted and transmitted to CAISO for assessing transmission needs as a TPP base case. Other portfolios may also be transmitted for study as sensitivities in TPP
- **Avoided Cost Calculator (ACC):** The PSP will likely be used as the basis for the 2024 ACC update. This update may also inform the NEM proceeding
- **Gas forecasting:** The PSP is the basis for the gas forecasts used in other proceeding, such as the Aliso Proceeding (I.17-02-002)
- **SB 100:** The SB 100 analysis will incorporate the adopted PSP portfolio

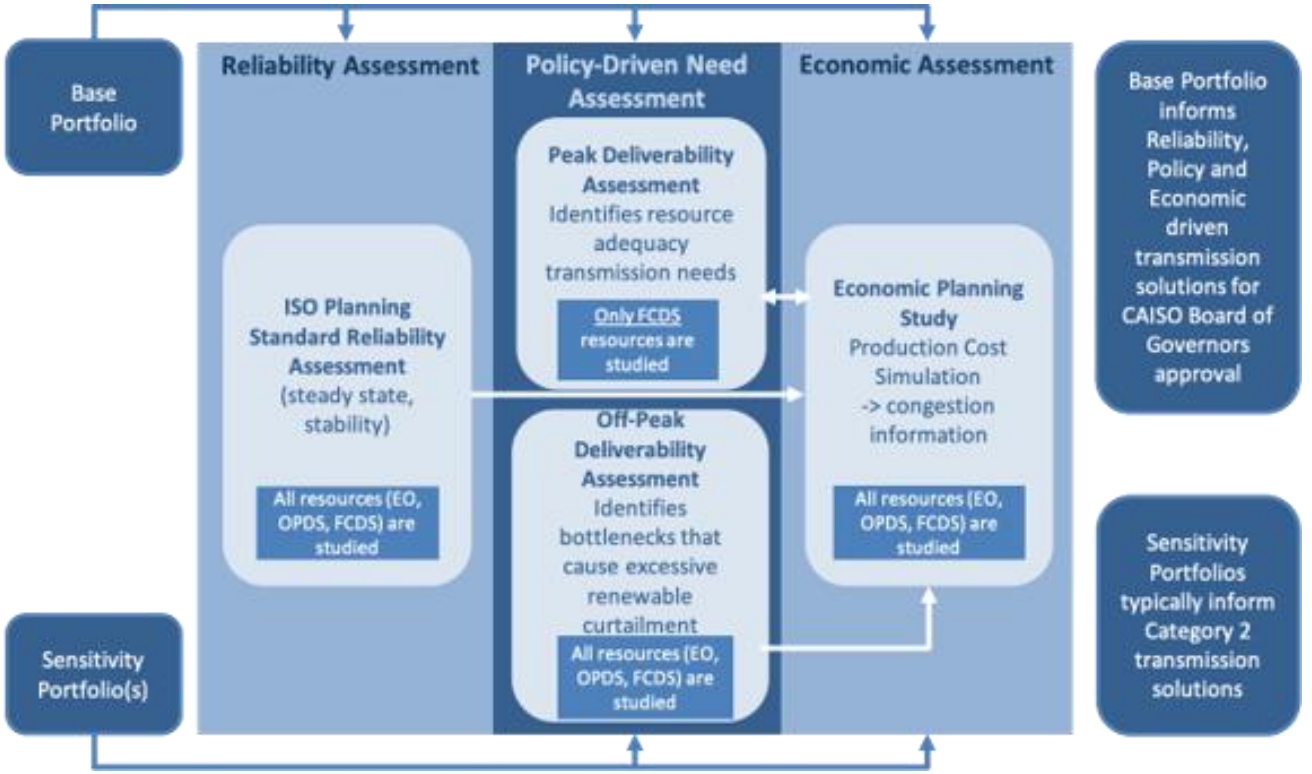
IRP's Role in the CAISO's Transmission Planning Process (1 of 2)

- The CAISO's TPP is an annual comprehensive evaluation of the CAISO's transmission grid to:
  1. Address grid reliability requirements,
  2. Identify projects needed to successfully meet California's policy goals, and
  3. Explore projects that can bring economic benefits to consumers
- CPUC develops resource portfolios and CEC develops load scenarios for use by CAISO in the TPP
  - In accordance with CPUC-CEC-CAISO Memorandum of Understanding agreed to in December 2022
  - Replaced and expanded on the May 2010 MOU between the CAISO and the CPUC.



IRP's Role in the CAISO's Transmission Planning Process (2 of 2)

- The CPUC typically transmits multiple distinct portfolios developed in the IRP process:
  - Reliability and Policy-Driven Base Case portfolio
  - Policy-Driven Sensitivity portfolio(s)
- Base Cases are designed to reflect CPUC policy guidance, including reliability and GHG reduction targets, and provide regulatory certainty for transmission planning
  - Lead to identified transmission solutions going to the CAISO Board of governors for approval
- Policy-Driven Sensitivities are designed to either:
  - Support a "least regrets" approach that provides a reasonable range of future scenarios that can be linked to the base case, or
  - Gather additional transmission information to support future portfolio development and explore incremental optionality or risk
- Identified transmission solutions in Policy-Driven Sensitivities do not directly go to the CAISO board for approval, but can help inform base



Key Achievements of IRP

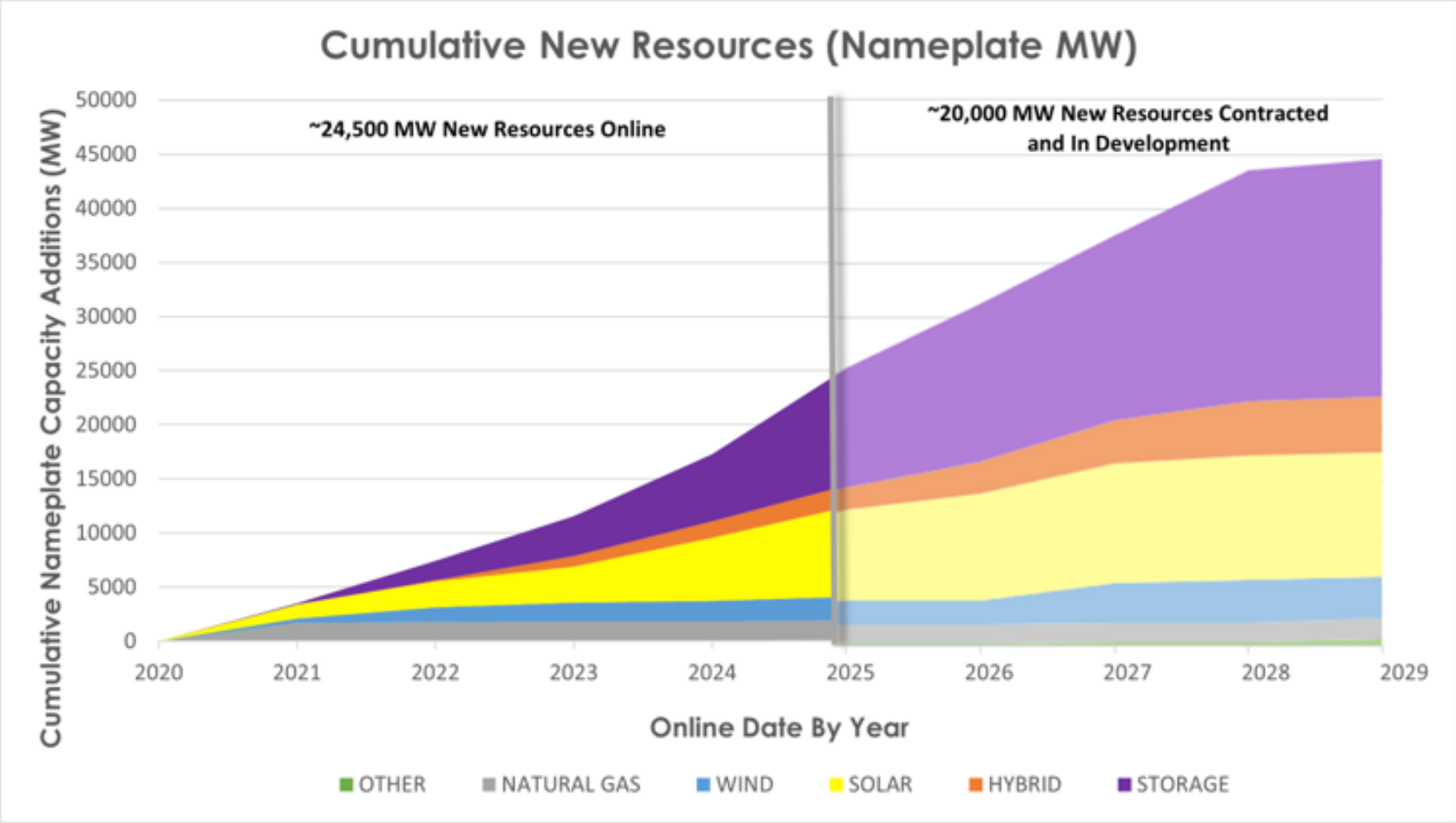
Key Achievements of IRP to Date

- 2017-18 cycle:
  - **Proof of concept** enabled design of regulatory process at CPUC and w/ other agencies
  - Clarified CPUC **jurisdictional boundary**
  - Developed innovative **new modeling techniques** (RESOLVE, SERVM, transmission constraint modeling)
  - Consider initial cost and resource needs of a **range of GHG targets**
  - Facilitated alignment of IRP w/ CPUC avoided cost processes, etc.
  - Successful RSP, PSP did not meet state goals and was replaced by RESOLVE portfolio
    - Set the system up and publication of each of the system-wide plans
- 2019-2021 cycle:
  - Refined modeling tools and regulatory processes (storage ELCCs, more detailed transmission needs, etc.)
  - **Broader scope of analyses** (cross sector / electrification studies, cost + affordability, SCT, air quality, risk management, etc.)
  - Established a **procurement track**
  - Focus on **reliability needs** amidst tightening western markets: D.19 (3.3 GW) and D.21 (11.5 GW) reliability procurement orders
  - RSP, followed by successful PSP (w/ some RESOLVE support)
  - Trajectory of **lowering of GHG target** from 46 MMT to 38 MMT + **expansion of model years** through 2045
  - Improved integration between IRP and TPP

Key Achievements of IRP to Date, continued

- 2022-2023 cycle:
  - Jettisoned the RSP (simplified the PSP cycle)
  - Reduced the statewide yearly GHG emissions to 25 MMT by 2035 compared to the previously adopted 38 MMT by 2030 planning target
  - Achieves clean energy production well-beyond the SB 100 interim targets:
    - In 2030: 101% (compared to the SB 100 90% target)
    - In 2040: 105% (compared to the SB 100 95% target)
    - In 2045: 113% (compared to the SB 100 100% target)
  - Adopted a **reliability framework methodology** in IRP
  - Addressed 2 procurement-focused petitions for modification (PFMs)
  - Models reduction of gas plant usage in CAISO-system
    - Decreases 71% by 2035 (from 2024, the first modeled year)
    - Decreases 90% by 2039 (from 2024 modeled usage)
  - Modeled portfolios show reduced criteria pollutants as the state adds increasing amounts of clean energy

New Energy Resources Online and Under Contract

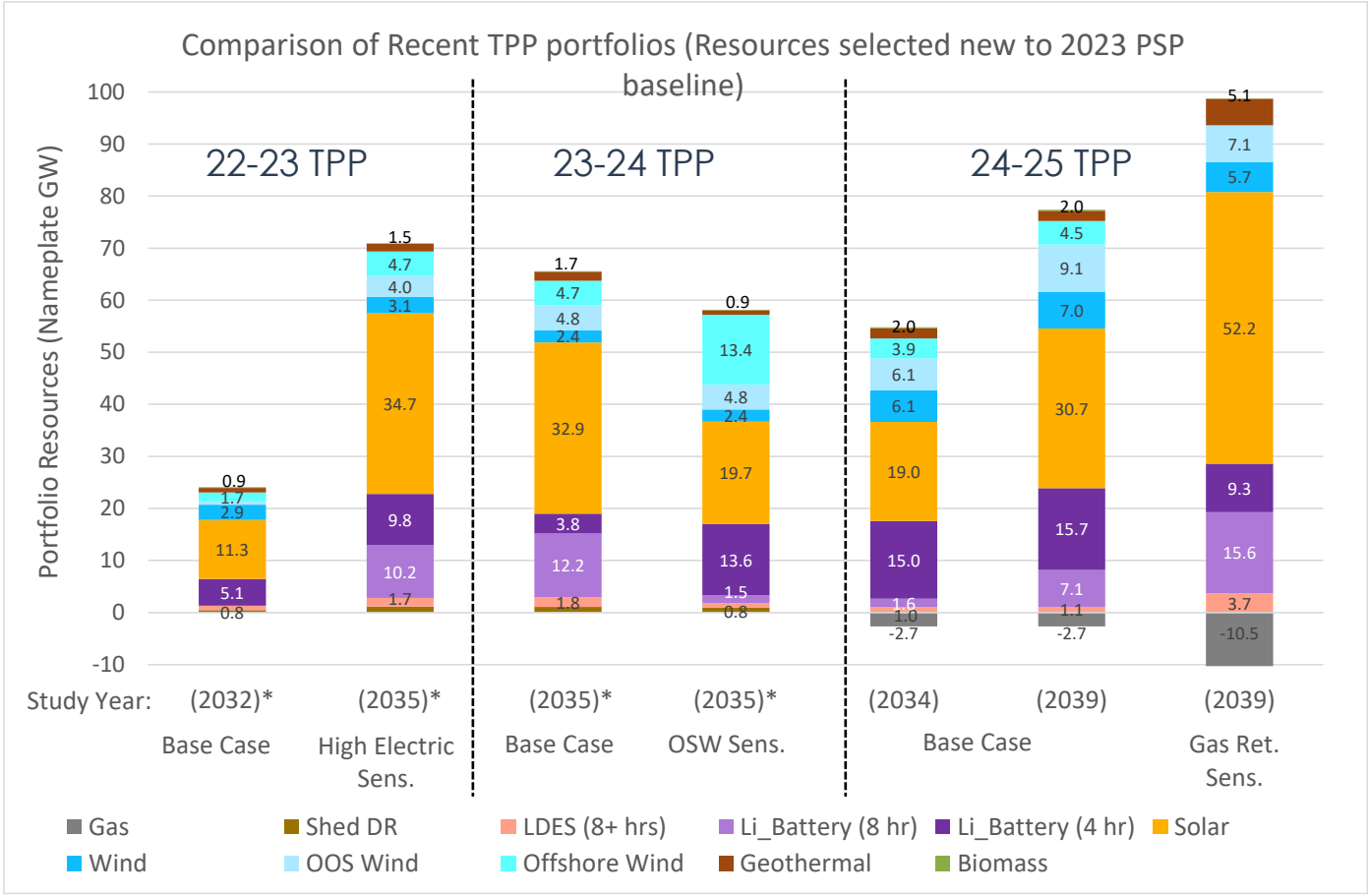


Note: 1000 MW = 1 Gigawatt (GW)
Data shown here shows a snapshot of new resources added to the CAISO grid Jan 2020 – Dec 2024, including specified CAISO imports. Also shown is a projection of future new resources through 2028 based on contracts in place by December 2024. "Other" resources includes geothermal, biomass, biogas, and hydropower.
Based on Resource Planning Portfolio, there could be as much as 50,000 MW of nameplate capacity online by 2030.

Recent TPP and Busbar Mapping Results

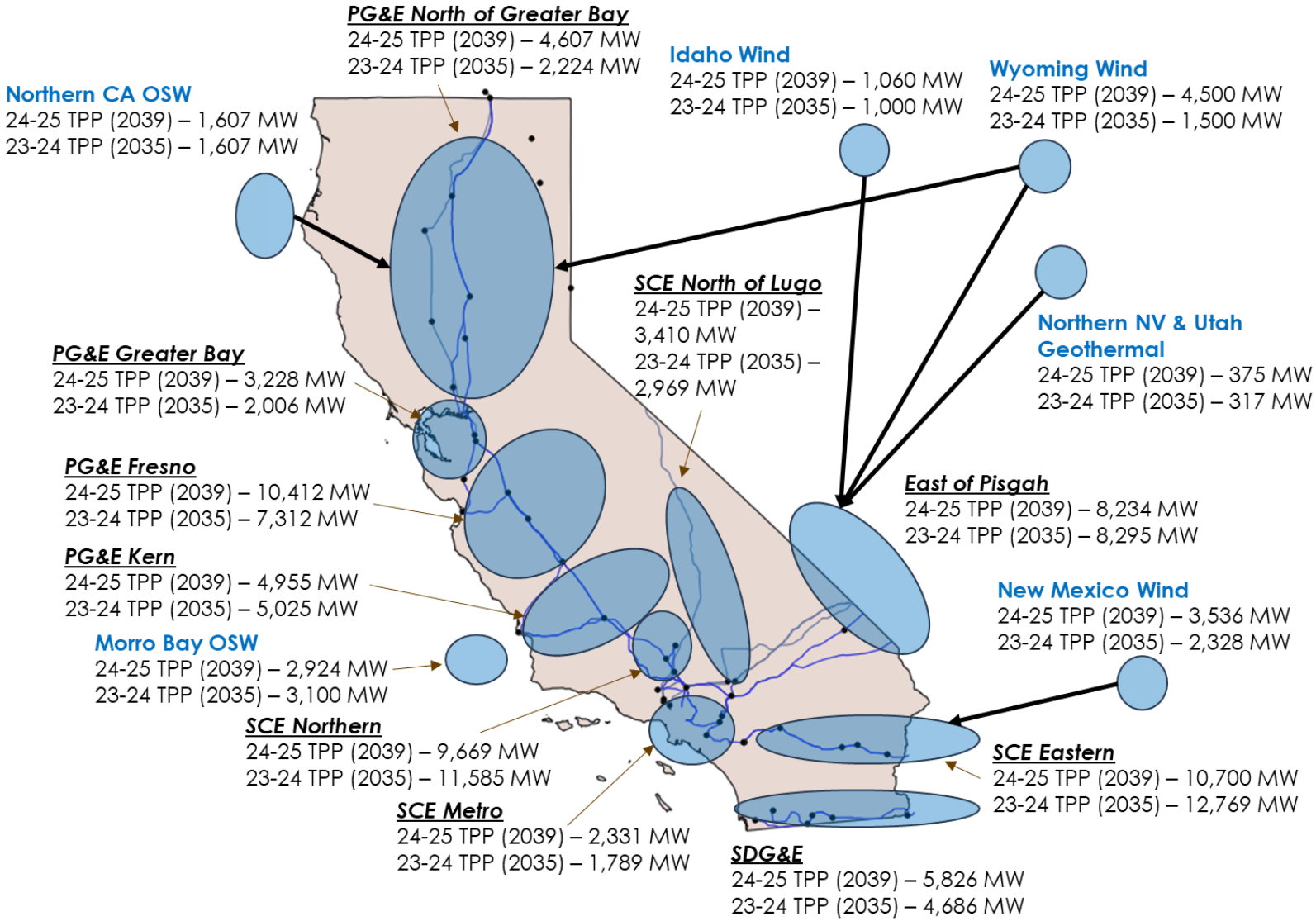
- For the past few TPP cycles, the CPUC has mapped and passed a base case and one sensitivity:
  - 22-23 TPP
    - Base Case: 2021 PSP – 38 MMT by 2030 w/ 2020 IEPR High EV
    - High Electrification Sensitivity: 30 MMT by 2030 w/ Additional Transportation Electrification (ATE)
  - 23-24 TPP
    - Base Case: 30 MMT by 2030 w/ 2021 IEPR ATE
    - Offshore Wind Sensitivity: Forced in 13.4 GW of OSW
  - 24-25 TPP
    - Base Case: 2023 PSP – 25 MMT by 2035 w/ 2022 IEPR
    - Gas Retirement Sensitivity: Forced in 10.5 GW of gas retirements

TPP/PSP Cycle	Base Portfolio Size	No. Of Tx Projects	Potential Investment (Identified Costs)	GHG Target (if applicable)
2021-22	28 GW	23	$3B	-
2022-23 (2021 PSP)	40 GW	45	$7.3B	35 MMT by 2032
2023-24	70 GW	26	$4-6.1B	-
2024-25 (2023 PSP)	53 GW	Results Pending	Results Pending	25 MMT by 2035



* Resource amounts adjusted to account for updated baseline used for 24-25 TPP portfolios. The 23-24 TPP and earlier portfolio modeled Li Battery durations aggregated. These have been separated to 4- and 8 hr for comparison to 24-25 TPP portfolios.

Mapping Results for Recent IRP Portfolios



Appendix

Acronyms

Abbreviation	Name
AB	Assembly Bill
ACC	Avoided Cost Calculator
BAA	Balancing Authority Area
CAISO	California Independent System Operator
CARB	California Air Resources Board
CEC	California Energy Commission
CPUC	California Public Utilities Commission
CSP	Clean System Power (calculator)
GHG	Greenhouse gas
I&A	Inputs and Assumptions
IEPR	Integrated Energy Policy Report
IRP	Integrated Resource Planning
LOLE	Loss of Load Expectation

Acronyms

Abbreviation	Name
LSE	Load serving entity
MMT	million metric ton
NREL ATB	National Renewable Energy Laboratory Annual Technology Baseline
NT	Narrative template
PCM	Production Cost Modeling
PD	Proposed Decision
PSP	Preferred System Plan
RA	Resource Adequacy
RCPPP	Reliable and Clean Power Procurement Program
RDT	Resource data template
RPS	Renewables Portfolio Standard
RSP	Reference System Plan
SB	Senate Bill
TPP	Transmission Planning Process