Technical Workshop #2 – Aliso OII I.17-02-002 Final Econometric Modeling, Hydraulic Modeling Updates, and PCM Updates

California Public Utilities Commission Hearing Room, 5th Floor

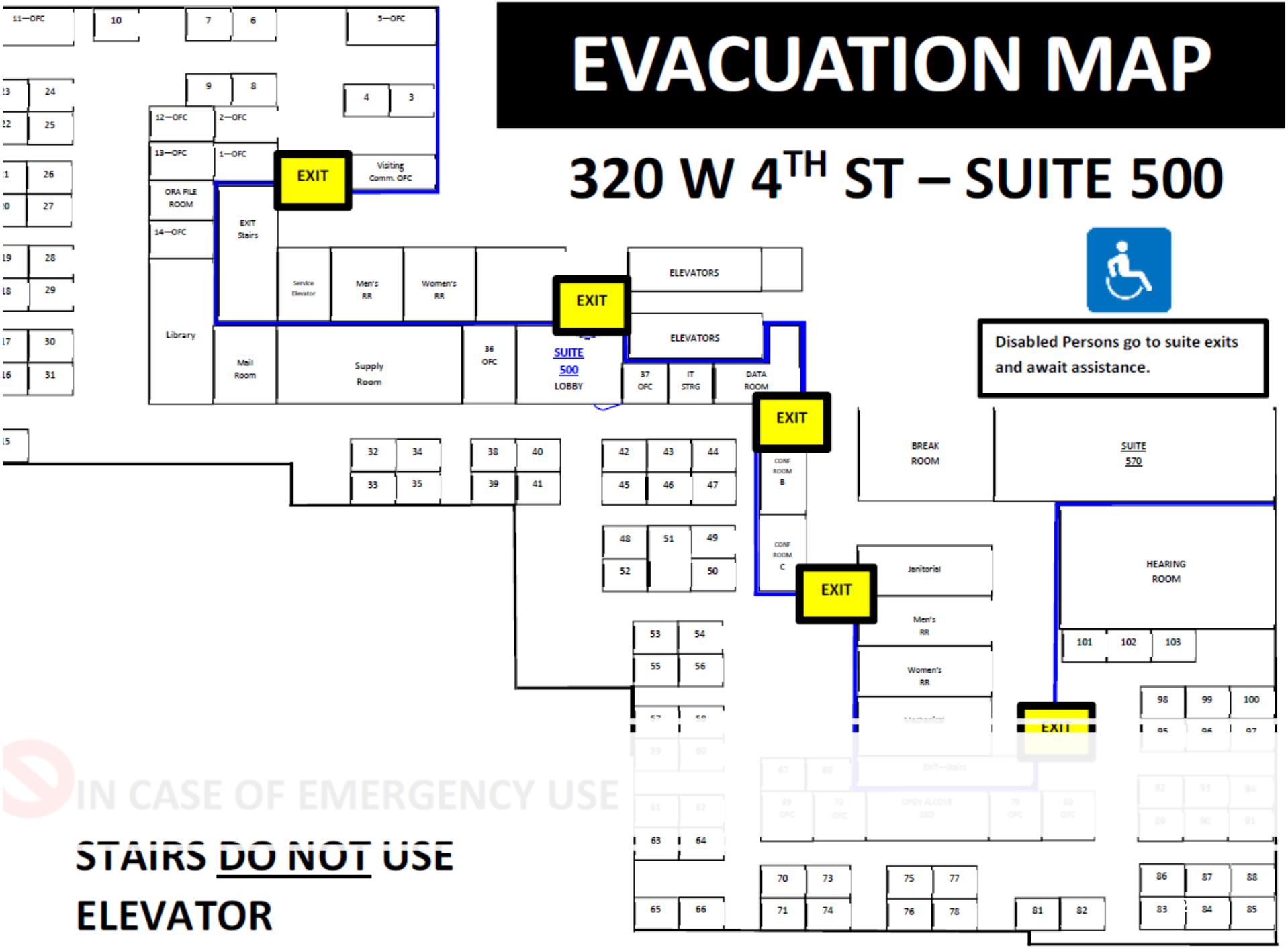
320 W. 4th Street, Los Angeles, CA 90013

Los Angeles, CA

November 13, 2019

EVACUATION MAP

320 W 4TH ST – SUITE 500



IN CASE OF EMERGENCY USE

STAIRS DO NOT USE

ELEVATOR

TODAY'S AGENDA

9:30 a.m. – 9:45 Introduction. Ground Rules, Review Purpose and Goals

Donald Brooks, *Program and Project Supervisor*

9:45 – 10:15 Review of Phase II Schedule and order of modeling steps

Donald Brooks, *Program and Project Supervisor*

10:15 – 11:30 Economic Modeling – results of Difference in Difference and Volatility Analysis

Mounir Fellahi, *Regulatory Analyst*

- 45 min presentation / 30 min Q/A

11:30 – 1:00 Hydraulic Model Input Data Development– Near peak day design

Khaled Abdelaziz, Ph.D., *Utilities Engineer*

- 45 min presentation / 30 min Q/A

1:00 – 2:00 Lunch Break

2:00 – 3:00 – Hydraulic Model Input Data Development– Long term peak day design and hourly gas demand profiles

Khaled Abdelaziz, Ph.D., *Utilities Engineer*

- 45 min presentation / 30 min Q/A

3:00 - 3:45 - Production Cost Modeling – Reference System Plan and Hourly Gas Demand Profiles

Donald Brooks, *Program and Project Supervisor*

- 30 min presentation / 15 min Q/A

3:45 – 4:00 – Wrap Up/Next Steps

Webex information

- Join Webex

https://centurylinkconferencing.webex.com/centurylinkconferencing/j.php?MTID=m0b579f054c3f1d5371d169bc91fe1ef4

- Meeting number: 713 575 361
- Meeting password: !Energy1
- Join by phone
  - Call-in: 866-632-6544
  - Participant code 1983535#

Discussion Logistics

- Parties to the Proceeding:
  - Please line up at the mic during the comment period.
  - We will stop midway through the discussion to take questions related to the modeling received via email: AlisoCanyonOII@cpuc.ca.gov
- Members of the Public:
  - To speak during the Public Comment period, please sign up with our Public Advisor.

Workshop Objectives

- Information sharing:
  - Review overall objectives and analysis required for I.17-02-002
  - Present results for steps 1 (Volatility) and 2 (Difference in Difference) of the Econometric Analysis section of the Scenarios Framework
  - Present validation of SoCalGas's near and long term gas use forecasts and CPUC staff's development of core gas use profiles for hydraulic modeling
  - Present the proposed Reference System Portfolio in the Integrated Resource Plan (IRP) proceeding and status of power flow modeling from the CAISO and LADWP, which both feed into the Production Cost Modeling analysis outlined in the Scenarios Framework.
  - Solicit feedback, answer questions from parties, and promote open, informal discussion

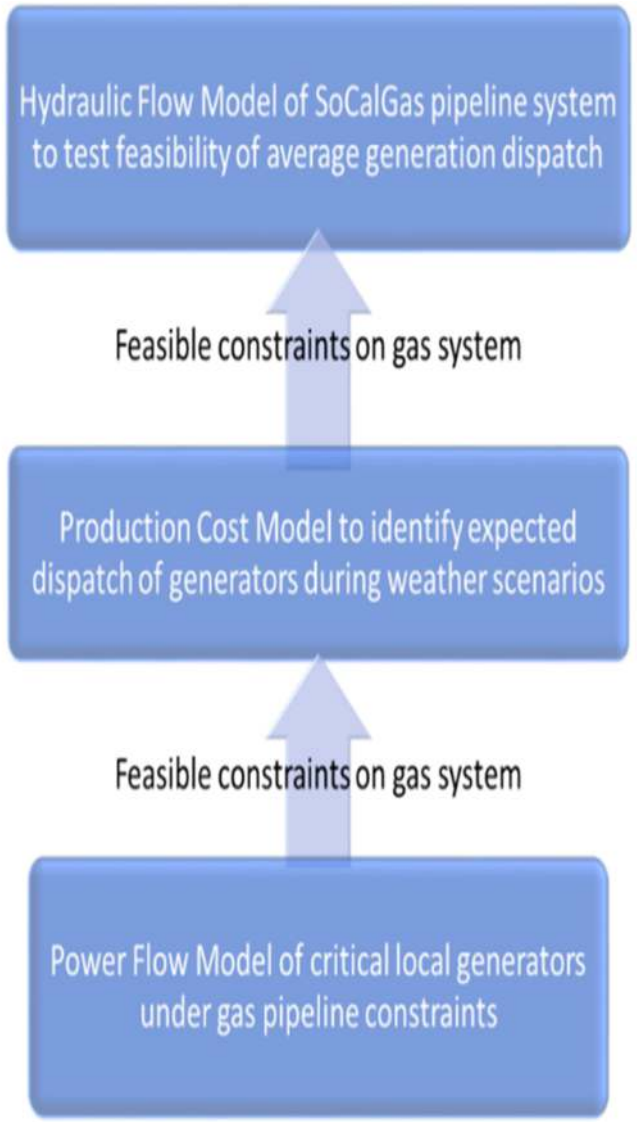
Review of Objectives for Proceeding

- The CPUC opened I.17-02-002 pursuant to SB 380 to "determine the feasibility of minimizing or eliminating the use of the Aliso Canyon Natural Gas Storage Facility while maintaining energy and electric system reliability."
- Extensive stakeholder process to evaluate the effects of minimizing or eliminating Aliso. The CPUC published a Final Scenarios Framework on Jan 4, 2019 which described the overall sequence and process of studies.
- The Scenarios Framework sought answers to specific questions called for in the proceeding:
  - Is the Aliso Canyon storage field needed for reliability and if so, what is the minimum inventory level needed?
  - What are the cost impacts to gas and electric customers if the Aliso storage field is closed or operated at a level of inventory lower than historical norms?
- The studies are designed to identify the gaps or the needs that could result if Aliso Canyon is minimized or eliminated. Once we identify these gaps or needs, then we can begin stakeholder discussions of replacement scenarios, replacement infrastructure, and a transition toward replacement.

Overview of Study Process – Bottom Up Process

The Scenarios Framework calls for three types of analysis:

- (1) Hydraulic/gas flow modeling – study the impact that closure of Aliso Canyon has on gas flows and pressure in SCG's system and whether Aliso closure prevents reliable gas flows and pressures.
- (2) Production cost/electricity generation modeling – Study impact that closure of Aliso Canyon has on the economics of operation of the electric grid. Also using this to predict EG required gas supply and proving data to hydraulic modeling
- (3) Economic/customer cost impact and gas price volatility modeling – study rate impacts and economic effects for core gas customers caused by minimizing or closing Aliso Canyon.



Next Steps

- CPUC staff have completed several steps of the Scenarios Framework including:
  - All three analyses outlined in the economic modeling section
  - Validation of SCG gas forecasts and development of hourly gas use profiles
  - Development of the Reference System Plan in the IRP proceeding, meaning we can now forecast gas use from electric generation out to 2030
- CPUC staff will to begin the next phase of modeling including:
  - Hydraulic modeling of the cases outlined in the Scenarios Framework
  - Develop hourly gas demand shapes for electric generation using the production cost model and test cost and reliability impacts of Aliso
- Planned completion date for modeling and analysis is Q2 2020.

Update on Production Cost Modeling

Presented by - Donald Brooks

Energy Resource Modeling Team

Energy Division

Outline of Presentation

1. Review of Production Cost Modeling Status – Objectives and where are we now?
2. Background on CPUC IRP Process
3. Update on PCM modeling – Baseline modeling case and new resources selected
4. Role of Power Flow modeling – update on LADWP and CAISO Power Flow modeling cases
5. Unconstrained Scenario and MinLocalGen Scenario
6. Next Steps for PCM Modeling
7. Questions and Answers

Review – why are we doing Production Cost Modeling?

1. Production Cost Modeling serves two necessary purposes in the Aliso Proceeding
   - Assess cost or reliability effects of closing or minimizing the use of the Aliso Canyon storage field in near term and long-term study years (2020, 2025, and 2030).
     1. Reliability expressed in Loss of Load Expectation (LOLE) greater than 0.1 LOLE (one event in ten years)
     2. Economic costs calculated as increased production cost ($/MWh)
2. Provide hydraulic modeling with gas demand profiles from electric generation in future study years. Gas demand is meant to reflect two scenarios of near term and future electric operation
   - Minimum Local Generation Scenario allows curtailment of natural gas generation in SCG area preserving only what is needed for local reliability. This is used for 1-in-35 gas use profiles
   - Unconstrained Gas Scenario is used for 1-in-10 conditions and protects all gas generation in SCG that is economically reasonable
3. Hydraulic modeling will determine the feasibility and reliability of the natural gas system to support these two scenarios under proposed reliability planning assumptions.

Background on the CPUC IRP Process

- Commission Decision (D.18-02-018) established IRP as a two-year planning cycle designed to ensure LSEs are on track to achieve GHG reductions and maintain electric grid reliability at least cost while meeting the state's other policy goals.
- Year One:
  - Optimal resource portfolios at the CAISO system-level
  - Adopting one portfolio as the Reference System Portfolio to be used in statewide planning, including the CAISO transmission planning process
  - Identifying actions needed to implement the selected portfolio, such as new procurement authorization
  - Developing filing requirements for LSEs to submit individual IRPs
- Year Two is focused on:
  - LSE development of individual IRPs
  - Staff evaluation of LSE IRPs both individually and in aggregate
  - Commission adoption of a Preferred System Portfolio to be used in statewide planning, as well as actions needed to implement the portfolio (Preferred System Plan).

Status – where are we now?

- Integrated Resource Planning process is underway – CPUC Staff have published production cost modeling datasets to the CPUC website for study years 2020-2030 and for all regions in WECC. Datasets include:
  - List of electric generators (both existing and planned, thermal and renewable) in service in each study year across California and outside of California
  - Hourly profiles of electricity demand that incorporate variation in weather
  - Hourly production profiles for wind and solar generators given variation in weather
  - Hydroelectric production given variations in weather
  - Transmission limits between areas
  - Fuel prices and carbon emissions curves from the CEC
  - Other data needed to run a full production cost model

IRP in California Today

- The value proposition of integrated resource planning is to reduce the cost of achieving GHG reductions and other policy goals by looking across individual LSE boundaries and resource types to identify solutions to reliability, cost, or other concerns that might not otherwise be found.
- Goal of 2019-2020 IRP cycle is to ensure that the electric sector is on track to help California reduce economy-wide GHG emissions by 40% from 1990 levels by 2030, and to explore how achievement of SB 100 2045 goals could inform IRP resource planning in the 2020 to 2030 timeframe.
- California today is a complex landscape for resource planning:
  - Multiple LSEs including utilities, CCAs, and ESPs
  - Multiple state agencies (CPUC, CEC, Air Resources Board) and CAISO
  - Partially deregulated market

Progress on PCM modeling

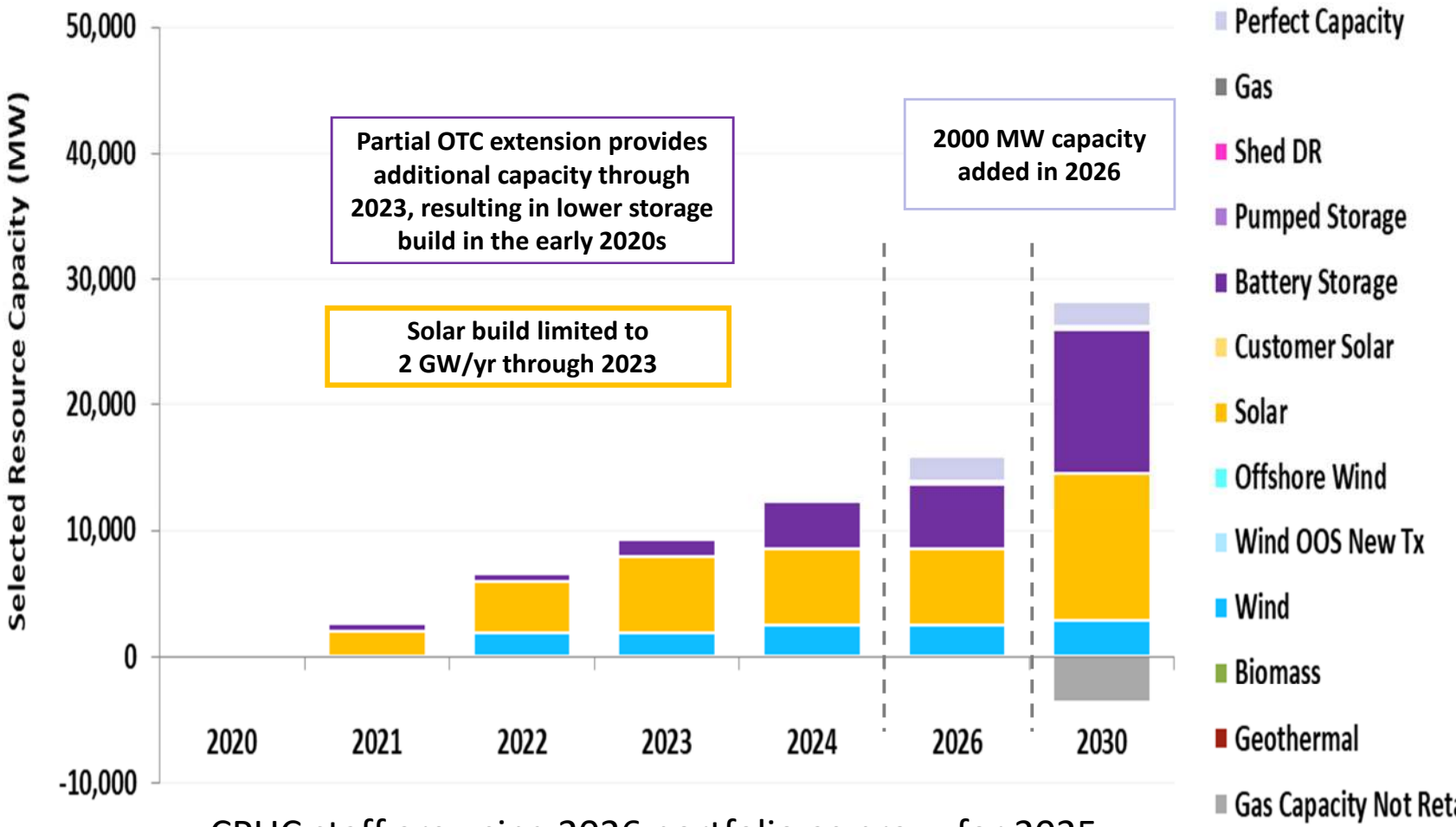
CPUC staff has made progress in setting up PCM modeling. CPUC staff is ready to begin PCM modeling.

- Receiving power flow studies from CAISO and LADWP to create Minimum Local Generation Constraints in PCM model.
- The CPUC has proposed a Reference System Plan in the Integrated Resource Plan proceeding that establishes the baseline of generation which will be online in the future (2020, 2025, 2030) as well as proposed additions and retirements.
- CPUC staff will be using the Reference System Plan to create gas demand profiles to use in Hydraulic Modeling.

Contents of Reference System Plan

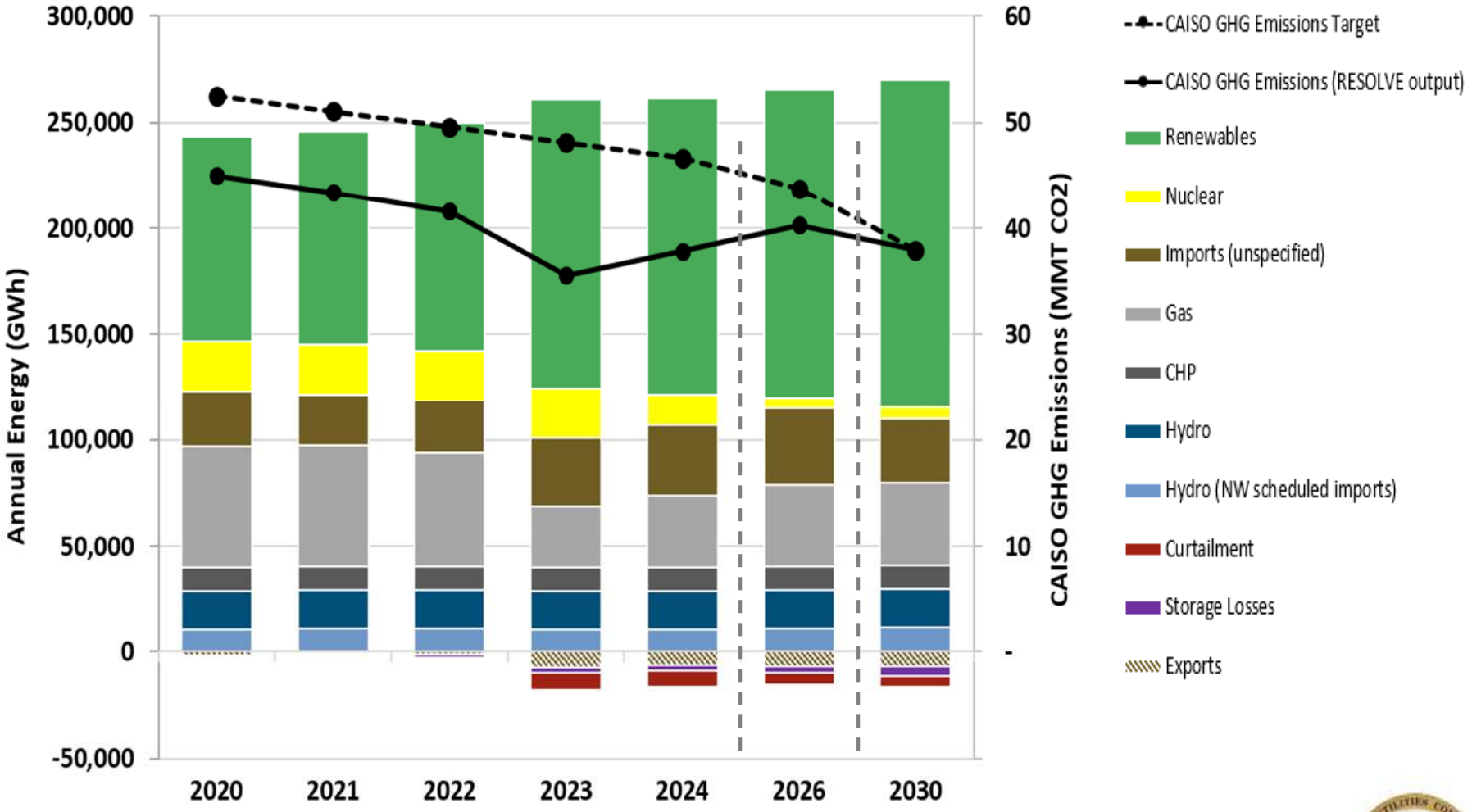
- The Reference System Plan includes four key recommendations:
  - A GHG Planning Target to use for the electric sector in IRP that is consistent with 40% statewide reductions below 1990 levels by 2030. This RSP is consistent with that target, resulting in a California statewide GHG Planning Target of **46 MMT of CO2e by 2030.** Statewide target translates to 38 MMT for the CAISO system (serving about 82% of total electric load in California)
  - A Reference System Portfolio – a **single portfolio of resources** that represents a least-cost, least-risk pathway to achieving the recommended GHG planning target and other SB 350 requirements
  - A GHG Planning Price that represents the marginal cost of GHG abatement associated with the Reference System Portfolio and that will enable the CPUC and load-serving entities to consistently value both demand and supply-side resources
  - Near-term Commission policy actions to ensure that the results from IRP modeling inform other CPUC proceedings and lead to the development or procurement of adequate resources

Proposed RSP - 46 MMT Limited Solar and Partial OTC new resources - 46 MMT Alternate



CPUC staff are using 2026 portfolio as proxy for 2025 modeling

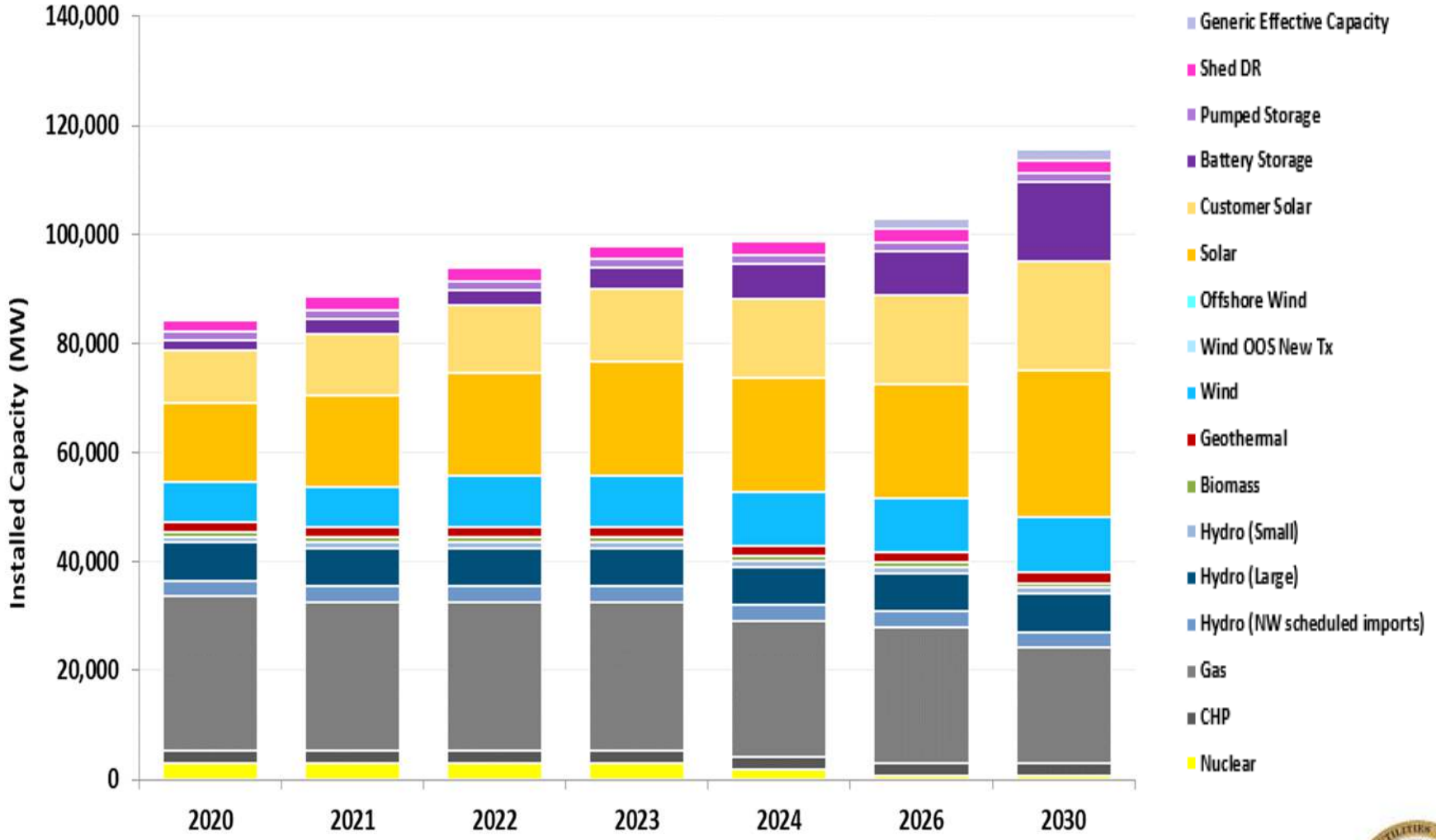
46 MMT RSP CAISO Energy Balance - decline in thermal, growth of renewables



CAISO proportion of 46 MMT is about 82% or 38 MMT, RSP reaches emissions below target in 2023, but with retirement of Diablo, emissions rise again.

Renewable generation (green) is net of curtailment. Curtailment is shown separately on the graph to demonstrate its magnitude.

Total Resource Stack: Proposed RSP – 46 MMT Alternate



Breakdown of 46 MMT Alternate new resources

Case	2020	2022	2026	2030	Resource Types (MW)
46 MMT "Default"	-	1,950	2,372	2,837	Wind (in-state)
		-	-	-	Wind (out of state)
		-	11,807	11,807	Solar PV
		2,960	5,796	11,376	Battery storage
		-	-	-	Pumped Storage
		222	222	222	Shed DR
		-	-	-	*Generic Effective Capacity for reliability*
2019 Proposed Reference System Portfolio (46 MMT "Alternate")	6	1,950	2,550	2,837	Wind (in-state)
	-	-	-	-	Wind (out of state)
	-	4,006	6,006	11,774	Solar PV
	-	624	5,193	11,384	Battery storage
	-	-	-	-	Pumped Storage
	-	222	222	222	Shed DR
	-	-	*2,000*	*2,000*	*Generic Effective Capacity for reliability*

2019 46 MMT Alternate RSP

- The 2019 Proposed Reference System Portfolio differs substantially from the portfolio adopted in 2017-18 IRP, mainly in that it:
  - Has substantially more solar and battery resources by 2030
  - Largely driven by cost declines assumed for those resources and the ability for RESOLVE to now "economically not retain" gas generation
  - Shows a need for procurement in near-/medium-term to meet capacity needs
  - Largely driven by a drop in the RA imports assumption (from ~10 GW last IRP cycle to 5 GW now} and thermal retirements over next few years

Use of RSP in Aliso Proceeding

- The Reference System Plan is a vision of what electric demand and electric generation will occur on each year leading up to 2030.
- Create hourly gas demand shapes based on likely electric demand and electric generation patterns.
- Determine if Aliso can be minimized or closed between now and 2030 without raising costs or increasing reliability stress for electricity customers

Overview of Steps in Aliso PCM

- Simulate operation of electric generation (both thermal and renewable generation) to meet expected electric demand
- Ensure local and system reliability
  - Loss of Load study and maintaining Minimum Local Generation
- Calculate natural gas demand on an hourly basis and from each power plant so we can have granular and accurate hourly gas demand profiles

Preserving Minimum Local Generation in PCM modeling

1. PCM studies simulate hourly conditions across entire years, but not geographically granular enough to illustrate power flow constraints.
2. To implement local transmission limits and preserve local generation for electric reliability, take outputs of power flow study and program the needed generation into PCM model.
3. CPUC staff received power flow studies for summer and winter electric reliability from LADWP and CAISO, and ensured that PCM modeling kept gas to run those local generation units from being curtailed.

PCM Next Steps

- Prepare gas demand shapes for electric generators based on 2019 RSP 46 MMT Alternate and combine with other hourly gas demand shapes for hydraulic modeling
- Determine if gas demand for electric generation can be met feasibly without Aliso and if not, at what level of storage in Aliso is required to preserve reliable electric service
- PCM modeling is expected to be finished in early 2020

Thank you

Questions?