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Joint CCA Integrated Resource Planning: Objectives and Assumptions

Contractor: Siemens Energy Business Advisory

December 18, 2019

Agenda

Project Background and Overview

Approach to Modeling and Analysis Assumptions

Discussion and Questions

Background

- **California statute requires all load-serving entities to prepare IRPs**
  - Each CCA, as well as each IOU and ESP, is required to file its IRP with the CPUC on a biennial basis (2-year cycle)
  - First year of cycle: CPUC develops a Reference System Portfolio (RSP) – used in the CAISO Transmission Planning Process and in LSE IRPs
  - Second year of cycle: LSEs file IRPs at the CPUC; CPUC aggregates, evaluates, and uses IRPs to form a recommended Preferred System Portfolio (PSP)
- **First IRPs were due in 2018; next IRPs are due May 1, 2020. Takeaways from last time:**
  - IRPs were developed as individual plans but with no understanding of the collective impact of plans
  - By planning jointly, CCAs can understand where their reliance on resources in their plan is duplicative, to avoid this situation
  - Joint IRP planning may also highlight opportunities for future joint procurement
  - Additional detailed modeling may supplement the information developed by the CPUC

Project Objectives

- **Questions we seek to answer:**
  - What is the ideal mix of resources for each party to achieve the goals of both the state and its own goals?
  - How much renewable energy and flex capacity is needed to achieve each LSE's renewable targets?

- **Create a joint Integrated Resource Plan (IRP) reference portfolio for the CCAs; this IRP will:**
  - Conform with the CPUC reference case
  - Meet CPUC required inputs and regulations
  - Achieve additional priorities and goals of the CCAs
- **Potentially develop a second preferred joint portfolio to achieve CCA objectives while managing risk and cost**
- **Prepare disaggregated IRP information and report for each CCA**

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Joint CCA Goals for 2020 IRP

1. Identify cost-effective, feasible, reliable, equitable and robust options to achieve our respective communities' goals and objectives, and to minimize carbon emissions
2. Inform and engage stakeholders in the IRP process
3. Allow the IRP process to inform the selection of a preferred portfolio
4. Use one model for consistency in optimization, simulated dispatch, and probabilistic functions
5. Test a range of portfolios in scenario modeling and ultimately in risk analysis
6. Meet CPUC requirements
7. Timely obtain necessary Board and Council approvals

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IRP Objectives & Measures

- Purpose of the IRP is to evaluate CCAs' current energy resource portfolio & a range of alternative future portfolios to meet customers' electrical energy needs in an affordable, system-wide manner that also takes into account

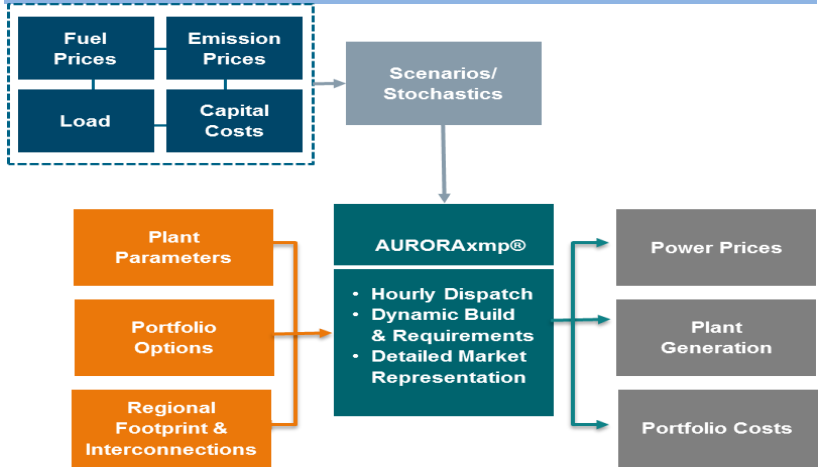
- Each objective is important & worthy of balanced consideration in the IRP process; taking into account uncertainty, some objectives are better captured in portfolio construction than as a portfolio measure

- The measures allow the analysis to compare portfolio performance and potential risk on an equal basis

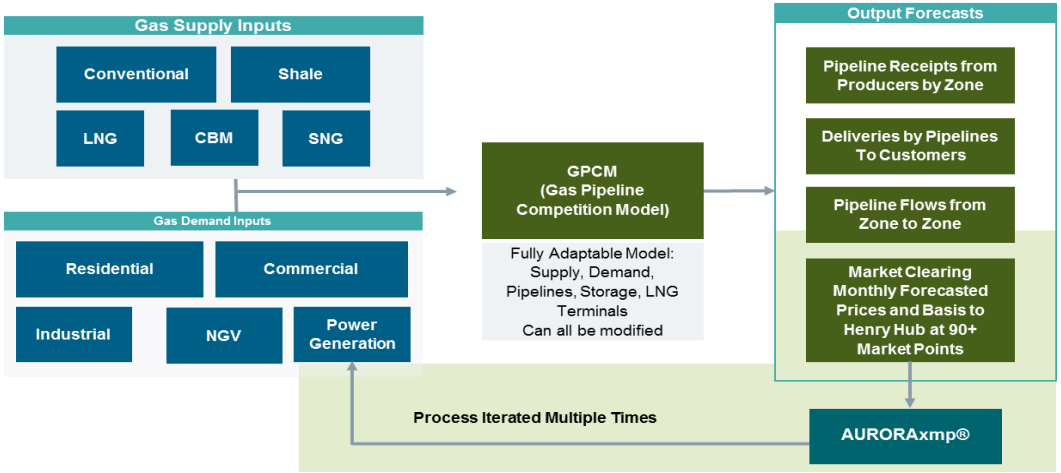
IRP Objectives
Affordability
Meeting GHG Emissions Reduction Targets
System Reliability
Resource Diversity

IRP Modeling and Analysis Process

AURORAxmp® as a Modeling Framework



GPCM Modeling Framework



- Power modeling using AURORAxmp hourly dispatch model:
  - simulate economic dispatch of power plants within all US power markets for forecast horizon, assess the economics of existing & future generation technologies for future builds and retirements in order to maintain minimum reserve margins and meet RPS targets.
- Natural gas fuel price inputs are produced using GPCM:
  - dynamic model that incorporates natural gas supply, demand, and infrastructure inputs to solve for expected prices and flows throughout North America.
- Iterations are performed between the two models to ensure gas prices and power sector natural gas demand is in balance.

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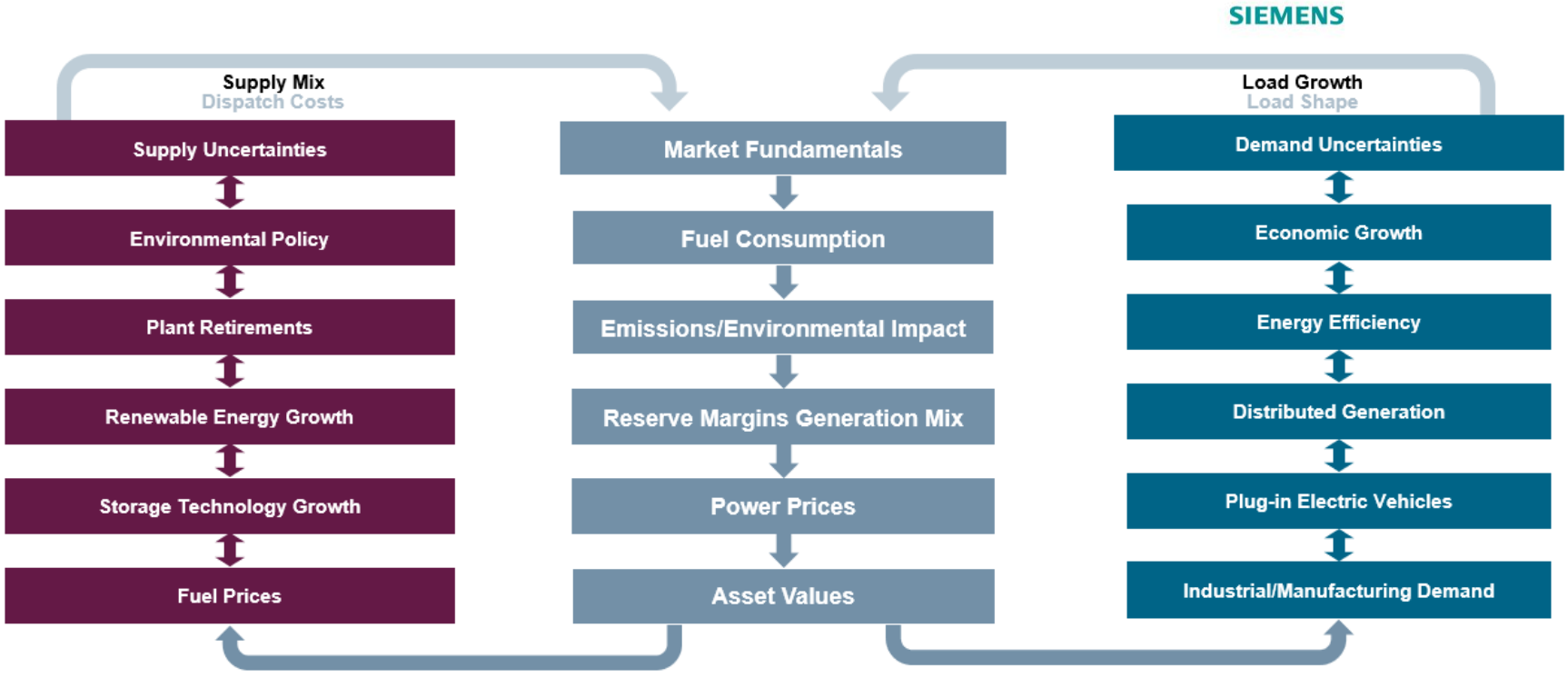
Key Market Drivers



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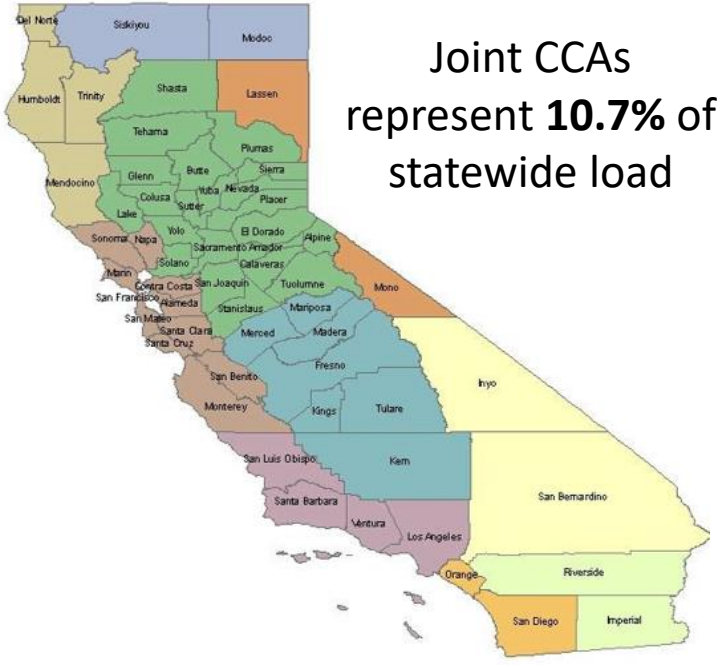
Load & Load Modifiers



Joint CCAs represent **10.7%** of statewide load

Required Forecast: IEPR

- Includes a long-term forecast for customer programs:
  - Energy efficiency
  - Demand response
  - EV penetration
  - BTM generation

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Resource Cost Assumptions

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- Natural Gas
  - Only simple gas-cycle units considered for economic development in the future.
  - Forecast prices at SoCal Citygate hub (south) and PG&E Citygate hub (north) both projected above Henry Hub
- Solar
  - Falling LCOE driven by technology improvements, growing economies of scale, and technology maturation. CapEx expected to decline at 2.6% CAGR per-year
- Wind
  - Falling LCOE driven by improved performance and dispatch. CapEx projected to decline at 0.7% CAGR per-year.

Other Drivers:

- Energy Storage (Lithium Ion)
  - LCOE reductions driven by technology improvements and economies of scale. CapEx expected to decline at 3.6% CAGR per-year
- Coal
  - Continues to be significant resource in non-CA WECC
- Carbon
  - Changes to Cap & Trade not expected
  - Anticipate CA carbon prices to be above other programs

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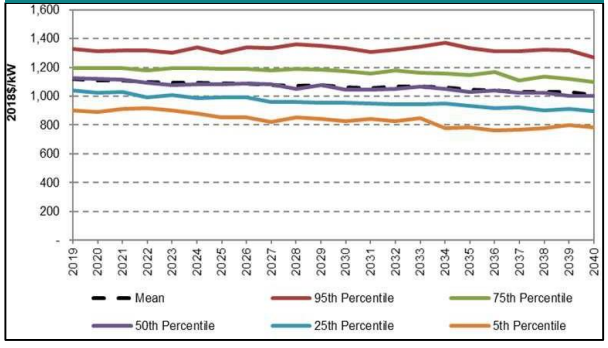
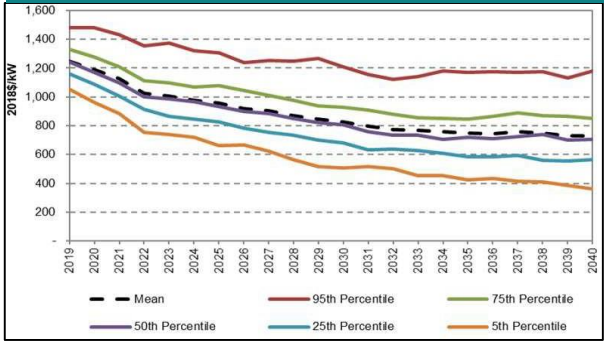
Resource Cost Assumptions

Capital Cost Stochastics: Conventional CT Aero



Capital Cost Stochastics: Solar PV



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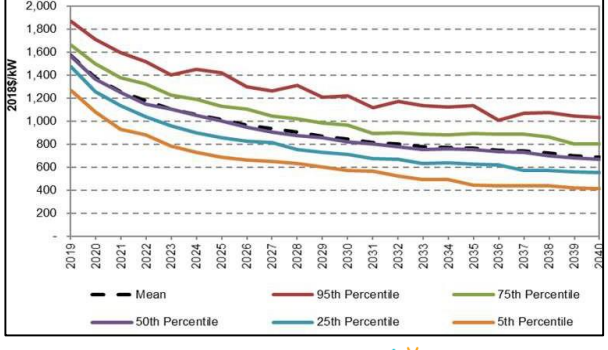
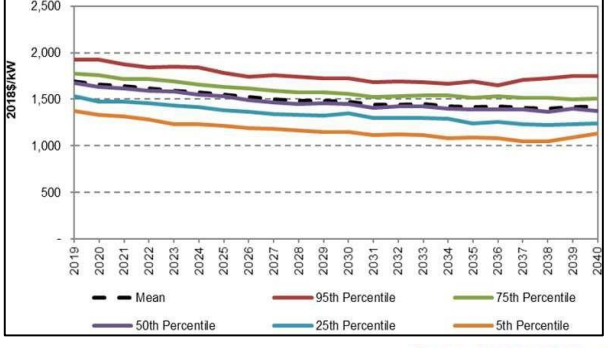
Capital Cost Stochastics: Li Ion Battery Systems



Capital Cost Stochastics: Wind Turbines



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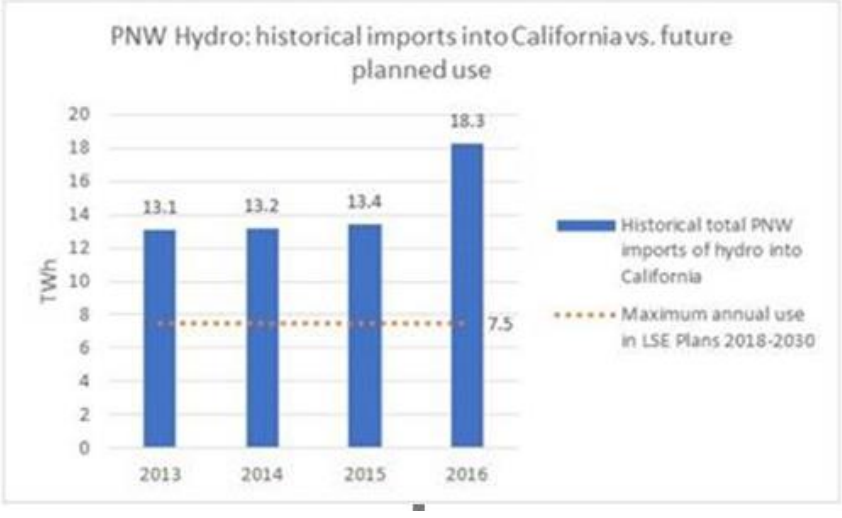
Resource Availability Assumptions (For discussion)

- Hydro imports from the Pacific Northwest benchmark to historical levels of ~13 TWh.
- Land restrictions for on-shore wind development included in the model to reflect county ordinances (Los Angeles, San Bernardino and San Diego,) and federal land restrictions in California's deserts (3 GW limit over study period for all CaISO).
- No new gas CCCG units allowed to be built economically by the Aurora model.
- Only 2 simple cycle gas-fired units maximum per-year allowed for each of three largest IOUs until 2026.
- Minimum Planning Reserve Margin for CaISO of 13.5% in shoulder months and 16.2% for summer.



Discussion and Questions

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