CCA Markets, RA, Risk

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Peninsula Clean Energy
Current Concerns

• Wildfire Utility Issues
• System Reliability/Resource Adequacy
• Distributed Energy Resources (DER)
• A Review of Markets, Reliability and Risk Management
Power Industry

- Why grid?
  - Long distance between utility plants and cities
  - Line loss lesser for high voltage - so grid.
  - Loss of grid lines lead to blackouts
- MICROGRID OPTION
Western Electricity Coordinating Council (WECC)

- Western Interconnection
  - Multiple BAAs
- **Balancing Authority Area (BAA)**
  - Maintain Supply/Demand Balance
    - Demand = Supply + Imported Energy
  - Manage Inter-Tie Tagging
  - Manage System Frequency
  - Manage Coordinated Dispatch of Generation
8 California Balancing Authority Areas

- **CAISO BAA**
  - 45,000 MW
  - 26,000 circuit miles
  - Wholesale Power Market
  - Reliable Operations
  - Grid Planning
How CAISO Manages Grid

• Real-time balancing of supply (generating resources) and demand (load) to ensure grid reliability

• Manages transmission grid and operates power market

• Trading hubs: aggregated pricing nodes corresponding to CAISO transmission zones

• NP-15 and SP-15 are actively traded delivery points in the wholesale power market
Energy

- Transacting Energy
  - Bilateral Wholesale Markets
  - CAISO Day-Ahead Market
  - CAISO Real-Time Market

- Physical / Financial Transactions

- Inter-SC Transactions
Energy Market Price Volatility

- Key Drivers of Energy Market Prices
  - Natural Gas
    - Storage
    - Transport
    - Demand
  - Weather
    - Local and Regional
  - Hydrology
  - Policy and Changing Supply Composition
    - RPS
    - GHG Free Objectives
Power mix by fuel type

Total installed capacity
73,306 MW
as of 11/02/2016

- 56.4% natural gas
- 27% renewables
- 11.6% large hydro
- 3.14% nuclear
- 1.1% other
- 0.7% coal
- 0.4% oil

15,755 MW = Maximum import capacity at summer peak for the ISO
Natural Gas Drives Power Market Prices

Figure 21: Trend of gas and electric prices in the day-ahead market

†EC: Power price – System marginal energy component

†rice: CAISO Price Performance in the CAISO Energy Markets; June 2019
Weather Drives Power Market Prices

- High system load, generally associated with heat waves, is correlated with higher electricity market prices

*Figure 36: Day-head prices correlated to demand level*

*CAISO Price Performance in the CAISO Energy Markets; June 2019*
Integration of Renewables

Net demand trend

Hour ahead forecast: 25,305
Demand: 25,165
Net demand: 23,940

Avg. ramp
~9,145MW in 3 hrs.
Impact of Solar / Wind on Energy Prices
Gas and imports support high loads after sun sets

July 25, 2018 peak load:
46,424 MW at 5:27 p.m.

- Solar down 8,312 MW
- Imports up 4,318 MW
- Natural gas down 2,237 MW
Potential resource shortage\(^1\) starting in 2020

Projected shortfalls at 7 p.m.:
- 2020 = 2,300 MW
- 2021 = 4,400 MW
- 2022 = 4,700 MW

\(^1\) Assumes no transmission outages or other significant events affecting availability of generation
Energy Risk Management

- Risk Management Objectives
  - Mitigate Exposure to Volatility
  - Durable Rates
  - Financial Stability
  - Regulatory Compliance

- Key Energy Market Risks
  - Volumetric Risk
    - Fluctuations in the volume of supply and demand
  - Price Risk
    - Price volatility
Wind & Solar PPA Prices

Wind & Solar Levelized PPA Prices By Contract Year (2015 $/MWh)

**Long Term to Short Term Hedge Strategy**

- **Long Term Hedging**
  - Load Forecasting
  - Coverage Objectives
  - Market Conditions
  - Resource Composition

- **Short Term Hedging**
  - Refined Load Forecast
  - Intra-Month / Intra-Day Shaping
  - Market Conditions

- **Fixed Price Energy Hedging**
  - Inter-SC Trades
Hedging Strategies

• Changing market = more volatility in prices
• Hedging limits PCE’s exposure to market prices
• 2 types of hedges:
  o Financial Hedge
  o Renewable Power Purchase Agreement (PPA)
• Conduct procurements on a quarterly basis

<table>
<thead>
<tr>
<th></th>
<th>% of Load Procured</th>
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<tbody>
<tr>
<td><strong>Hedge Target Levels</strong></td>
<td><strong>Min</strong></td>
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<tr>
<td>Current Year</td>
<td>90%</td>
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<tr>
<td>Year 2</td>
<td>75%</td>
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<tr>
<td>Year 3</td>
<td>65%</td>
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<tr>
<td>Year 4 and Beyond</td>
<td>55%</td>
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Example of Hedging Tools

- Inter-SC Trade of Energy
  - Tool used to fix the costs of energy supply
    - All Hours (7 X 24)
    - On-Peak Delivery (HE 07 to HE 22)
    - Off-Peak Delivery (HE 01 to HE 06 & HE23/24)
    - Shaped DeliveryImports / Exports

- Options

- Generation Resource
MWh Coverage and Value-at-Risk Hedging

- Match Demand with Fixed Price Supply
  - Reduces exposure to market price volatility
  - Form of Insurance
    - May include premium cost similar to insurance

- Establish Coverage within Risk Tolerance
  - Maintain open position based on value-at-risk
  - Value-at-risk is a measure of risk of loss
Resource Adequacy
Current Wholesale Markets Designs

- Clear supply and demand at the marginal cost of supply, while maintaining the reliability of the system.
- Current wholesale market designs have been challenged in providing adequate financial incentives to support efficient entry.
- This in turn has led to the development of “resource adequacy,” pricing mechanism.
RA Program

- Resource Adequacy Requirements
  - Load Serving Entities (LSE) must demonstrate they have purchased a defined amount of capacity

- System Resource Adequacy
  - 115% of LSE monthly peak-demand
  - Supplied from qualified resources
    - Net Qualified Capacity

- Local Resource Adequacy
  - Capacity located in specific geographic locations
  - Sub_requirement (% of overall capacity must be local)

- Flexible Resource Adequacy
  - Capacity with defined operational characteristics
  - Sub_requirement (% of overall capacity with ramping)
2018 RA Requirements (CPUC LSEs)
2018 ISO SUMMER ON-PEAK NQC BY FUEL TYPE

- Gas: 57.9%
- Solar: 15.8%
- Hydro: 15.1%
- Nuclear: 4.4%
- Wind: 2.8%
- Oil: 0.3%
- Coal: 0.0%
- Geo: 1.9%
- Bio: 1.5%
- Battery: 0.3%
Tightening RA Markets

• RA prices doubled between 2018 and 2019.
• Only 463 MW of new resources came online since 2018 significantly less than the capacity retired during that period.
• Nearly 2,000 MW of solar and wind capacity will be lost due to declining ELCC values and several thousand MW of once-through-cooling generators are slated to retire.
Figure E.10  Generation additions and retirements (June 2015- June 2019*)

<table>
<thead>
<tr>
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<th>Capacity (MW)</th>
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<tr>
<td>&lt; Summer 2016</td>
<td></td>
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<tr>
<td>&lt; Summer 2017</td>
<td>-3,000</td>
</tr>
<tr>
<td>&lt; Summer 2018</td>
<td>-2,000</td>
</tr>
<tr>
<td>&lt; Summer 2019*</td>
<td>-1,000</td>
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Key:
- **Solar**
- **Natural Gas**
- **Wind**
- **Battery**
- **Other**
RA Value of Renewable Resources

• Historically based on “exceedance” approach:
  • The minimum amount of generation produced by the resource in a 70% of included hours.
• Now- Effective Load Carrying Capability (ELCC %) and Qualifying Capacity (QC) of wind and solar resources.
• ELCC- derating factor applied to maximum output (Pmax) to determine its QC.
8,609 MW added solar, 1,084 MW added PCap = 12.6% marginal ELCC

16,033 MW of RPS and BTM Solar

5,914 MW of RPS solar

7,424 MW of RPS solar

63% ELCC

58% ELCC

10,506 MW of RPS Solar

34% ELCC

45% ELCC

Perfect Capacity
CalCCA Proposal

• Prescribe the volume of RA each IOU must make available to the market
• Require the IOUs to offer excess RA products for up to a three-year term
• Develop guidance on the use of price floors in IOU requests for offers to ensure the IOUs maximize the volume of RA that can be sold.
Central Procurement Entity (RA-CPE)

• Meet Residual of a three-year forward procurement obligation that is not met by individual LSEs.
• RA-CPE will be a competitively neutral, independent, and creditworthy entity.
• Who will be RA-CPE?