<table>
<thead>
<tr>
<th><strong>Docket Number:</strong></th>
<th>17-IEPR-14</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Title:</strong></td>
<td>Existing Power Plant Reliability Issues</td>
</tr>
<tr>
<td><strong>TN #:</strong></td>
<td>217263</td>
</tr>
<tr>
<td><strong>Document Title:</strong></td>
<td>Joint Agency Workshop on Risk of Early Economic Retirement</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>4.24.17 Presentation by Michel Kito of CPUC</td>
</tr>
<tr>
<td><strong>Filer:</strong></td>
<td>Raquel Kravitz</td>
</tr>
<tr>
<td><strong>Organization:</strong></td>
<td>California Energy Commission</td>
</tr>
<tr>
<td><strong>Submitter Role:</strong></td>
<td>Commission Staff</td>
</tr>
<tr>
<td><strong>Submission Date:</strong></td>
<td>4/24/2017 7:25:59 AM</td>
</tr>
<tr>
<td><strong>Docketed Date:</strong></td>
<td>4/24/2017</td>
</tr>
</tbody>
</table>
Joint Agency Workshop on Risk of Early Economic Retirement

Michele Kito

April 24, 2017

Resource Adequacy and Procurement Oversight Section

CPUC, Energy Division
Agenda

- CPUC’s Current Forward Procurement Requirements
- Early Economic Retirement
  - Background of the Joint Reliability Plan (JRP) proceeding
  - Planned v. unplanned retirements
  - Energy Division forward contracting data collection efforts
  - Energy Division forward contracting results
- Forward Procurement: Uncertainties and Challenges
- Reliability, Cost and the Changing Structure of the Grid
RA program developed in response to the 2001 California energy crisis
The initial program implemented in 2006 (system)
Local requirements added in 2007
Flexible capacity requirements added in 2015
Designed to ensure that CPUC-jurisdictional load serving entities (LSEs) have sufficient capacity to meet:
- Peak load with a 15% planning reserve margin (PRM)
- Local area reliability needs
- Flexible ramping needs associated with renewable integration
One-year forward requirement
CPUC-Jurisdictional LSEs in the CAISO

- CPUC-jurisdictional LSEs serve about 90% of load in CAISO
- Currently 26 LSEs
  - 3 Investor Owned Utilities (IOUs)
  - 8 Community Choice Aggregators (CCAs)
  - 15 Electric Service Providers (ESPs)
CPUC Jurisdictional Breakdown

Based on 2014 year ahead load forecasts (MWs) from the CEC

Based on 2017 August revised load forecasts (MWs) from the CEC
Resource Adequacy Requirements

• System – Based *monthly* forecasted 1-in-2 load, with a 15% planning reserve margin

• Local – Determined *annually* by CAISO and adopted by the CPUC based on 1-in-10 forecast

• Flexible – Determined *monthly* based on largest 3-hour net load ramp
2016 RA Resource Mix

MW

January  |  February  |  March  |  April  |  May  |  June  |  July  |  August  |  September  |  October  |  November  |  December  
---|---|---|---|---|---|---|---|---|---|---|---
Bio/Geo/Hydro/Imp/Nuc/CHP | Natural Gas | Demand Response | Wind | Solar
Local Capacity Requirements (LCR)

- CAISO performs an annual LCR study, based on a 1-in-10 weather year and a N-1-1 contingency
- Adopted annually by CPUC decision
- Total of 5 local areas - Bay Area, Other PG&E Areas, LA Basin, Big Creek-Ventura, and San Diego
- Six of the local areas are combined into “PG&E Other Areas” to address market power - Sierra, Fresno, Humboldt, North Coast, Stockton, and Kern Local RA
- Allocated based on CPUC-juridical load share in each TAC area
## 2017 LCR Requirements

<table>
<thead>
<tr>
<th>Area</th>
<th>2017 Total LCR (MW)</th>
<th>Peak Load (1 in10) (MW)</th>
<th>2017 LCR as % of Peak Load</th>
<th>Total Dependable Local Area Resources (MW)</th>
<th>2017 LCR as % of Total Area Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humboldt</td>
<td>157</td>
<td>188</td>
<td>84%</td>
<td>218</td>
<td>72%</td>
</tr>
<tr>
<td>North Coast/North Bay</td>
<td>721</td>
<td>1311</td>
<td>55%</td>
<td>850</td>
<td>85%</td>
</tr>
<tr>
<td>Sierra</td>
<td>2043</td>
<td>1757</td>
<td>116%</td>
<td>2066</td>
<td>99%**</td>
</tr>
<tr>
<td>Stockton</td>
<td>745</td>
<td>1157</td>
<td>64%</td>
<td>598</td>
<td>125%**</td>
</tr>
<tr>
<td>Greater Bay</td>
<td>5617</td>
<td>10477</td>
<td>54%</td>
<td>9862</td>
<td>57%**</td>
</tr>
<tr>
<td>Greater Fresno</td>
<td>1779</td>
<td>2964</td>
<td>60%</td>
<td>3303</td>
<td>54%**</td>
</tr>
<tr>
<td>Kern</td>
<td>492</td>
<td>1139</td>
<td>43%</td>
<td>551</td>
<td>89%</td>
</tr>
<tr>
<td>LA Basin</td>
<td>7368</td>
<td>18890</td>
<td>39%</td>
<td>10575</td>
<td>70%</td>
</tr>
<tr>
<td>Big Creek/Ventura</td>
<td>2057</td>
<td>4719</td>
<td>44%</td>
<td>5463</td>
<td>38%</td>
</tr>
<tr>
<td>San Diego/Imperial Valley</td>
<td>3570</td>
<td>4840</td>
<td>74%</td>
<td>5310</td>
<td>67%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24549</strong></td>
<td><strong>47442</strong></td>
<td><strong>52%</strong></td>
<td><strong>38796</strong></td>
<td><strong>63%</strong></td>
</tr>
</tbody>
</table>

Source: CAISO 2017 Local Capacity Technical Analysis, Final Report and Study Results
2017 Flexible Requirements

CPUC Flexible Capacity Allocation - By Flexible Capacity Category

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW</td>
<td>664</td>
<td>612</td>
<td>646</td>
<td>588</td>
<td>580</td>
<td>515</td>
<td>468</td>
<td>465</td>
<td>525</td>
<td>538</td>
<td>721</td>
<td>714</td>
</tr>
<tr>
<td>Super-Peak Flexibility</td>
<td>5,930</td>
<td>5,464</td>
<td>5,768</td>
<td>5,253</td>
<td>3,558</td>
<td>3,156</td>
<td>2,873</td>
<td>2,850</td>
<td>3,221</td>
<td>4,805</td>
<td>6,441</td>
<td>6,374</td>
</tr>
<tr>
<td>Peak Flexibility</td>
<td>6,687</td>
<td>6,162</td>
<td>6,504</td>
<td>5,923</td>
<td>7,462</td>
<td>6,619</td>
<td>6,025</td>
<td>5,977</td>
<td>6,755</td>
<td>5,418</td>
<td>7,263</td>
<td>7,188</td>
</tr>
</tbody>
</table>

Source: CAISO Final Flexible Capacity Needs Assessment for 2017
Net Ramps Differ by Season

Monday, Aug. 29, 2016

Friday, April 14, 2017

Source: CAISO, Renewable Watch
# Net Load Ramp Drivers

<table>
<thead>
<tr>
<th>Month</th>
<th>Average of Load contribution 2017</th>
<th>Average of solar PV contribution 2017</th>
<th>Average of BTM Solar contribution 2017</th>
<th>Average of Wind contribution 2017</th>
<th>Average of OOS Wind contribution 2017</th>
<th>Total percent 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>49.09%</td>
<td>-47.68%</td>
<td>-2.66%</td>
<td>-0.52%</td>
<td>-0.05%</td>
<td>100%</td>
</tr>
<tr>
<td>February</td>
<td>31.99%</td>
<td>-63.00%</td>
<td>-3.77%</td>
<td>-0.77%</td>
<td>-0.47%</td>
<td>100%</td>
</tr>
<tr>
<td>March</td>
<td>27.28%</td>
<td>-63.69%</td>
<td>-8.15%</td>
<td>-1.28%</td>
<td>0.40%</td>
<td>100%</td>
</tr>
<tr>
<td>April</td>
<td>23.01%</td>
<td>-68.11%</td>
<td>-9.61%</td>
<td>0.71%</td>
<td>0.02%</td>
<td>100%</td>
</tr>
<tr>
<td>May</td>
<td>23.87%</td>
<td>-64.15%</td>
<td>-9.83%</td>
<td>-1.65%</td>
<td>-0.50%</td>
<td>100%</td>
</tr>
<tr>
<td>June</td>
<td>8.76%</td>
<td>-79.58%</td>
<td>-11.52%</td>
<td>-0.55%</td>
<td>0.41%</td>
<td>100%</td>
</tr>
<tr>
<td>July</td>
<td>11.66%</td>
<td>-78.87%</td>
<td>-11.11%</td>
<td>1.47%</td>
<td>0.17%</td>
<td>100%</td>
</tr>
<tr>
<td>August</td>
<td>-0.72%</td>
<td>-94.04%</td>
<td>-12.81%</td>
<td>5.93%</td>
<td>0.21%</td>
<td>100%</td>
</tr>
<tr>
<td>September</td>
<td>6.27%</td>
<td>-82.42%</td>
<td>-10.82%</td>
<td>-0.28%</td>
<td>-0.21%</td>
<td>100%</td>
</tr>
<tr>
<td>October</td>
<td>18.23%</td>
<td>-72.80%</td>
<td>-11.45%</td>
<td>1.61%</td>
<td>0.86%</td>
<td>100%</td>
</tr>
<tr>
<td>November</td>
<td>34.75%</td>
<td>-55.91%</td>
<td>-8.69%</td>
<td>-0.51%</td>
<td>-0.15%</td>
<td>100%</td>
</tr>
<tr>
<td>December</td>
<td>42.28%</td>
<td>-48.62%</td>
<td>-6.05%</td>
<td>-2.02%</td>
<td>-1.04%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: CAISO Final Flexible Capacity Needs Assessment for 2017
2016 RA Requirements (CPUC LSEs)

2016 YA Load Forecast
System MA RAR (115% of Forecast)
Local RAR
Flexible Requirements

MW

Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec

31,570
50,368
2017 RA Requirements (CPUC LSEs)

- 2017 LSE Load Forecasts
- System MA RAR (115% of Forecast)
- Local RAR
- Flexible Requirements

MW

Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec

0 10,000 20,000 30,000 40,000 50,000

Jan  | 30,471
Aug  | 47,587
# Preliminary 2016 RA Price Report

## Table 7. Aggregated RA Contract Prices, 2016-2020

<table>
<thead>
<tr>
<th></th>
<th>All RA Capacity Contracts</th>
<th>Local RA Capacity Contracts</th>
<th>CAISO System RA Capacity Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>304,684</td>
<td>263,908</td>
<td>40,776</td>
</tr>
<tr>
<td>NP-26</td>
<td>118,907</td>
<td>85,801</td>
<td>33,106</td>
</tr>
<tr>
<td>SP-26</td>
<td>185,777</td>
<td>178,107</td>
<td>7,670</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td>263,908</td>
<td>40,776</td>
</tr>
<tr>
<td>NP-26</td>
<td></td>
<td>85,801</td>
<td>33,106</td>
</tr>
<tr>
<td>SP-26</td>
<td></td>
<td>178,107</td>
<td>7,670</td>
</tr>
<tr>
<td>Contracted Capacity (MW)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of Total Capacity in Data Set</td>
<td>100%</td>
<td>87%</td>
<td>13%</td>
</tr>
<tr>
<td>Number of Monthly Values</td>
<td>2,241</td>
<td>1,944</td>
<td>297</td>
</tr>
<tr>
<td>Weighted Average Price ($/kW-month)</td>
<td>$3.10</td>
<td>$3.20</td>
<td>$2.44</td>
</tr>
<tr>
<td>Average Price ($/kW-month)</td>
<td>$2.77</td>
<td>$2.91</td>
<td>$1.82</td>
</tr>
<tr>
<td>Minimum Price ($/kW-month)</td>
<td>$0.15</td>
<td>$0.27</td>
<td>$0.15</td>
</tr>
<tr>
<td>Maximum Price ($/kW-month)</td>
<td>$26.54</td>
<td>$26.54</td>
<td>$5.80</td>
</tr>
<tr>
<td>85% of MW at or below ($/kW-month)</td>
<td>$4.19</td>
<td>$4.19</td>
<td>$3.00</td>
</tr>
</tbody>
</table>

Source: Preliminary CPUC Data
How Much do these Requirements Cost?

- At $3.10/kW-month: ~$1.5 billion, annually

- At CPM cap, $6.31/kW-month: ~$3.0 billion, annually

- At CONE, ~$14/kW-month: ~$6.5 billion, annually
Agenda

- CPUC’s Current Forward Procurement Requirements
- Early Economic Retirement
  - Background of the Joint Reliability Plan (JRP) proceeding
  - Planned v. unplanned retirements
  - Energy Division forward contracting data collection efforts
  - Energy Division forward contracting results
- Forward Procurement: Uncertainties and Challenges
- Reliability, Cost and the Changing Structure of the Grid
Background and History

- Joint Reliability Proceeding (R.14-02-001) opened to:
  - Consider policy proposals to refine California’s existing reliability framework for electric procurement
  - Ensure that California’s electric reliability framework continues to adapt as needed to meet the changing requirements of the grid

- Closed pending development of a permanent flexible product D.16-01-033
  - “The RA proceeding has the permanent flexible capacity issue scoped, and that effort needs to be finalized before a two- or three-year RA requirement can be determined.”
  - Ordered Energy Division to gather and disseminate information regarding the expected electric resource availability and the forward contracting of such resources, and to make that information available to the public (OP 4)

- Issues moved into the CPUC’s RA proceeding, R.14-10-010
Planned v. Unplanned Retirements

- Significant planned retirements are expected through 2022
- CPUC authorized additional procurement to address local reliability needs

<table>
<thead>
<tr>
<th>Plant Location</th>
<th>Once Through Cooling</th>
<th>Net Qualifying Capacity (in MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encina 1-5</td>
<td></td>
<td>950</td>
</tr>
<tr>
<td>Pittsburg 5-7</td>
<td></td>
<td>1,159</td>
</tr>
<tr>
<td>Moss Landing 6-7</td>
<td></td>
<td>1,509</td>
</tr>
<tr>
<td>Huntington Beach 1-2</td>
<td></td>
<td>450</td>
</tr>
<tr>
<td>Redondo Beach 5-8</td>
<td></td>
<td>1,356</td>
</tr>
<tr>
<td>Alamitos 1-6</td>
<td></td>
<td>2,010</td>
</tr>
<tr>
<td>Ormond Beach</td>
<td></td>
<td>1,516</td>
</tr>
<tr>
<td>Mandalay 1-2</td>
<td></td>
<td>430</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>9,380</strong></td>
</tr>
</tbody>
</table>
Energy Division Data Collection

- Issued report in the fall of 2016 regarding contracting
- Issued new data requests and received responses in 2017 on forward contracting practices from IOUs, CCAs and ESPs
- Currently analyzing the data
- Preliminary results available and discussed below
Results from 2016 Contracting Report (data collected Oct. 2015)

Contracted System Capacity Compared to Forecasted Demand and System RA Obligations (August)

- Forecasted Supply
- Contracted Capacity
- Forecasted Need
- RA Req
- adjusted UOG
- Adjusted IEPR Demand Forecast
Preliminary Results from 2017 Contracting Data (Data Received April 2017)

**Contracted System Capacity Compared to Forecasted Demand and System RA Obligations (August Values Reported)**

- **Forecasted Supply** (UOG reported 2016 IEPR mid AAEE for CPUC jurid.)
- **Contracted Capacity** (2016 IEPR mid AAEE for CPUC jurid.)
- **Forecasted RA Req (Load * 1.15%)**
Preliminary Results from 2017 Contracting Data

Local North Capacity

MW

- UOG
- Contracted Capacity
- Forecasted RA Req
Preliminary Results from 2017 Contracting Data

Local South Capacity

- UOG
- Contracted Capacity
- Forecasted RA Req

MW

Agenda

- CPUC’s Current Forward Procurement Requirements
- Early Economic Retirement
  - Background of the Joint Reliability Plan (JRP) proceeding
  - Planned v. unplanned retirements
  - Energy Division forward contracting data collection efforts
  - Energy Division forward contracting results
- Forward Procurement: Uncertainties and Challenges
- Reliability, Cost and the Changing Structure of the Grid
Forward Procurement: Uncertainties and Challenges

➢ System RA
  – Load forecast uncertainty for 1-in-2 (economic growth, solar PV and energy efficiency penetration)
  – Load migration

➢ Local RA
  – Load forecast uncertainty for 1-in-10 (economic growth, solar PV and energy efficiency penetration)
  – Changing contingencies, N-1-1
  – Load migration
  – Changes in topology of the grid (e.g., change in local area boundaries)

➢ Flexible RA
  – Not clear what resources are needed to integrate variable resources
  – Durable flexible product not yet developed
Agenda

- CPUC’s Current Forward Procurement Requirements
- Early Economic Retirement
  - Background of the Joint Reliability Plan (JRP) proceeding
  - Planned v. unplanned retirements
  - Energy Division forward contracting data collection efforts
  - Energy Division forward contracting results
- Forward Procurement: Uncertainties and Challenges
- Reliability, Cost and the Changing Structure of the Grid
Reliability, Costs and the Changing Structure of the Grid

- CPUC’s mandate is to ensure safe and reliable service at just and reasonable rates (PU Code 380)
- Requires consideration of reliability and cost
- Requires consideration of the changing nature of the grid
  - Increasing penetration of renewables
  - Retirement of OTC units
  - Gas supply issues
  - Growth of CCAs
Thank you!
For Additional Information:

Michele Kito
Supervisor, Resource Adequacy and Procurement Oversight Section
Michele.Kito@cpuc.ca.gov

Jaime Gannon
Senior Analyst, Resource Adequacy and Procurement Oversight Section
JaimeRose.Gannon@cpuc.ca.gov