Technology Background of PCE Regulatory Issues

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Overview

- Electric utility systems foundations
  - System configuration
  - Regulation
  - Transmission management
- Business Environment
- PCIA- Review
- IRP Concerns
- Resource Adequacy
UTILITY SYSTEMS
Basic Structure of the Electric System

Color Key:
- Blue: Transmission
- Green: Distribution
- Black: Generation

Transmission Lines:
- 500, 345, 230, and 138 kV

Generating Station
Generator Step Up Transformer
Transmission Customer 138kV or 230kV
Transmission Customer 500, 345, 230, and 138 kV
Substation Step-Down Transformer
Subtransmission Customer 26kV and 69kV
Primary Customer 13kV and 4 kV
Secondary Customer 120V and 240V
Unlike highways, pipelines, and telecom, the flow of electricity on the AC grid cannot be easily routed or controlled. Power flows via the path of least resistance. This is a critical difference in how the grid differs from other transportation mechanisms.
Load profile – January

- ISO peak
- COM/IND
- RES

Source: LM 2012
Supply – Demand Balance: The Goal of the System

Electricity by nature is difficult to store

Supply must equal demand at any given instant

System frequency measures the extent to which supply and demand are in balance

**BIG CONCERN- LOW FREQUENCY FOLLOWING CAPABILITY**
Regulation
U.S. Electricity Regulation: Who is Responsible for What?

**Federal Regulation (FERC)**
- Wholesale sales of electricity for resale.
- Transmission of electricity in interstate commerce
- (Very) Limited transmission siting authority
- Permitting of hydro plants
- Reliability of transmission grid

**State Regulation (PUCs)**
- Retail sales to end users
- Low-voltage distribution
- Siting of power plants and transmission lines
- Resource planning; i.e. the generation types used by a utility to serve customers
Transmission Ownership

- Ownership of the transmission grid is fragmented - hundreds of discrete owners
- Roughly two-thirds of U.S. transmission is owned by investor-owned utilities; roughly one-third is owned by public entities
- Ownership affects regulatory jurisdiction

- Many owners have turned operational control over to regional transmission operators – RTOs or ISOs
- Independent regional operators serve roughly two-thirds of electricity consumers in the United States
- Operational control also affects regulatory jurisdiction
Independent System Operator (ISO)

- Facilitate competition among wholesale electricity suppliers
- Provide non-discriminatory access to transmission by scheduling and monitoring the use of transmission
- Perform planning and operations of the grid to ensure reliability
- Manage the interconnection of new generation
- Oversee competitive energy markets to guard against market power and manipulation
- Provide greater transparency of transactions on the system
ISO-organized Electricity Markets

A megawatt of electricity, like any other commodity, is frequently bought and re-sold many times before finally being consumed. These transactions make up the wholesale and retail electricity markets.
ISO Market Characteristics

- Manage and provide a central clearing house for transactions (transmission and generation) versus bilateral markets with parties working directly to establish terms and conditions.
- Sets hourly prices for next-day’s (Day-Ahead) operations.
- Sets five-minute prices, or spot market prices, in Real-Time during the operating day.
Transmission Project Development

- **Rate Based Projects**
  - Submit project and justification to ISO
  - ISO studies the project
  - If approved, project is funded by all rate payers in the footprint and receives FERC-approved rate of return

- **Participant-Funded Projects**
  - Transmission developer has a participant(s) willing to pay to use transmission line
  - Execute contract with stated terms, payment amounts, etc.
  - Transmission developer uses contract to attract third-party financing
  - All other Rate payers are not affected
Business Environment
Energy Environment Goals

- 50 percent of retail electricity from renewable power by 2030;
- Greenhouse gas emissions reduction goal to 1990 levels;
- Regulations in the next 4-9 years requiring power plants that use coastal water for cooling to either repower, retrofit or retire;
- Policies to increase distributed generation; and
- An executive order for 1.5 million zero emission vehicles by 2025.
Changing Suppliers

- By 2017 - 25% of IOU retail load served by non IOU providers.
- Some estimates - by mid 2020s - 85%.
- NEM - Since 2007, Solar PV increased by 4,500 MW.
- GHG Reductions 40% by 2030 using RPS and 1.5 millions EVs.
Typical Spring Day

Steeper Ramps

Deeper belly

- Actual 3-hour ramp 12,960 MW on December 18, 2016
- Net Load 10,386 MW on April 9, 2017
Requires New Operating Conditions

1) Expand the ISO control area beyond California
2) Increase participation in the western Energy Imbalance Market in which real-time energy is made available in western states
3) Transition cars and trucks to electricity
4) Time-of-use rates that promote using electricity during the day when there is plentiful solar energy
5) Increase energy storage
6) Increase the flexibility of power plants to more quickly follow ISO instructions to change its generation output levels.
Optimal Solution Balances Non-Renewable Solutions with Overbuild

- Storage Build
- Renewable Overbuild
- Anticipated Renewable Build

Dispatch (MW)

0 1 5 9 13 17 21 0 1,000 2,000 3,000 4,000 5,000 6,000

Energy + Environmental Economics
# Inventory of Current Candidate Resources

<table>
<thead>
<tr>
<th>Integration Solution</th>
<th>Examples of Available Options</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy Storage</strong></td>
<td>• Batteries: 1-hr, 2-hr, 4-hr, or 8-hour</td>
<td>• Stores excess energy for dispatch in later hours</td>
</tr>
<tr>
<td></td>
<td>• Pumped Storage: 12-hr, 24-hr</td>
<td>• Contributes to meeting minimum generation and ramping constraints</td>
</tr>
<tr>
<td><strong>Flexible Loads &amp; Advanced Demand Response</strong></td>
<td>• Flexible electric vehicle charging</td>
<td>• Delays and dispatches electric loads based on balancing needs subject to service demand constraints</td>
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<tr>
<td></td>
<td>• Flexible water heaters</td>
<td>• Can be scheduled based on seasonal/diurnal trends or dispatched dynamically</td>
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<tr>
<td></td>
<td>• Flexible building thermal loads (eg. pre-cooling or pre-heating)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Flexible fuel production (electrolysis)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Other flexible loads</td>
<td></td>
</tr>
<tr>
<td><strong>Conventional Demand Response</strong></td>
<td>• LTPP modeled programs ($600/MWh and $1,000/MWh priced resources)</td>
<td>• Provides capacity to avoid unserved energy</td>
</tr>
<tr>
<td></td>
<td>• New demand response programs</td>
<td></td>
</tr>
<tr>
<td><strong>New Flexible Gas Plants</strong></td>
<td>• Simple cycle gas turbines</td>
<td>• Dispatches economically based on heat rate, subject to ramping limitations</td>
</tr>
<tr>
<td></td>
<td>• Reciprocating engines</td>
<td>• Contributes to meeting minimum generation and ramping constraints</td>
</tr>
<tr>
<td></td>
<td>• Flexible combined cycle gas turbines</td>
<td></td>
</tr>
<tr>
<td><strong>Renewables</strong></td>
<td>• Biofuels</td>
<td>• Dynamic downward dispatch (with cost penalty) of renewable resources to help balance load</td>
</tr>
<tr>
<td></td>
<td>• Geothermal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Solar PV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Wind</td>
<td></td>
</tr>
</tbody>
</table>
PCIA Review
Charges Paid by CCAs

- **Energy Cost Recovery Amount (ECRA)**
  - Pays principal and interest on bond costs set by PG&E bankruptcy decision.
- **Dept of Water Resources (DWR) Bond Charges**
  - Recovers under collection of procurements costs during 2001 crisis paid by DWR
- **Competition Transition Charge (CTC)**
  - Charge for legacy contracts prior to 1998, that exceed CPUC market price limit
- **Power Charge Indifference Adjustment (PCIA)**
- **Cost Allocation Mechanism (CAM) Charge**
  - To pay for new resources added for system reliability
- **Nuclear Decommissioning (ND) Charge**
  - Restore closed nuclear plant sites to original conditions.
- **Public Purpose Program (PPP) Charge**
  - Low income ratepayer assistance and energy efficiency
## PG&E 2016 CCA Charges ($)

<table>
<thead>
<tr>
<th>Charge</th>
<th>Residential (KWh)</th>
<th>Large Industrial (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Cost Recovery (ECRA)</td>
<td>0.00002</td>
<td>0.00002</td>
</tr>
<tr>
<td>DWR Bond</td>
<td>0.00539</td>
<td>0.00539</td>
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<tr>
<td>CTC</td>
<td>0.00338</td>
<td>0.00187</td>
</tr>
<tr>
<td>PCIA (2015 Vintage)</td>
<td>0.02323</td>
<td>0.01284</td>
</tr>
<tr>
<td>CAM</td>
<td>0.00255</td>
<td>0.00160</td>
</tr>
<tr>
<td>ND</td>
<td>0.00022</td>
<td>0.00022</td>
</tr>
<tr>
<td>PPP</td>
<td>0.01405</td>
<td>0.00982</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>0.04880</strong></td>
<td><strong>0.03172</strong></td>
</tr>
</tbody>
</table>

### PCIA Costs ($)

<table>
<thead>
<tr>
<th>Charge</th>
<th>PG&amp;E</th>
<th>SCE</th>
<th>SDG&amp;E</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCIA</td>
<td>0.02323</td>
<td>0.00098</td>
<td>0.01278</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.04880</td>
<td>0.03217</td>
<td>0.03247</td>
</tr>
</tbody>
</table>
PG&E is asking $245.9M in 2017 from PCIA accounts. PCIA will rise to about 3 cents/ kwh, 0.65 cents higher than 2016.
For every $1 PG&E will spend on electricity generation, CCA will only be able to spend $0.68 to remain competitive.
Power Charge Indifference Adjustment

- PCIA is a utility exit fee aimed at recovering stranded utility costs resulting from departing customer load. It pays for power that has been contracted by the utility but is no longer needed by departing customers.

- The idea is to keep the bundled ratepayer from being adversely impacted by departing load brought about by CCA and other competitive market options.

- The PCIA methodology is in dire need of reform, greater transparency, fair application, and greater accountability.
PCIA Methodology

- The PCIA represents the difference between the utilities’ contracted rate and the market price benchmark set annually by the CPUC.
- The market price benchmark (MPB) represents what the utility would get in the current market to sell-off unused power contracts.
- RPS adder, a component of MPB, uses average of DOE Survey of Western energy premiums and PG&E’ RPS compliant resources.
- In essence, we pay the difference between power prices of several years ago and wholesale prices today.
PCIA ISSUES

- SB 350- protection of departing customers from costs not incurred on their behalf.
- Information sharing- load forecasting, IOU contracts, non disclosure.
- Data access
- Modify PCIA Methodology
  - Cost inputs
  - Market price benchmarks
  - IOU portfolio to minimize stranded costs
  - PCIA forecasting and cap
  - Sunset of PCIA
  - Accuracy of indifference assumption
- Alternatives
  - PAM
  - Portfolio buy out
  - IOU contracts assigned to CCAs
EQUITABLE ALLOCATION OF ACTUAL BENEFITS

Load Serving Entities (LSEs) would receive a pro-rated allocation of resource attributes, including Resource Adequacy (RA), Renewable Energy Credits (RECs), and any future attributes.

MARKET-BASED DETERMINATION OF ACTUAL COSTS

Pro-rated net costs allocated to customers would be determined on a vintaged portfolio basis, based on forecast portfolio costs and market revenues, and would be trued up to reflect actual costs and revenues.
PAM OVERVIEW

IOU Portfolio

Above Market Cost

Paid for by all customers

Energy & Ancillary Services Value

Monetized through CAISO market and allocated to all customers

Green Attribute (REC)

Allocated to all LSEs

Capacity Value (RA)

Costs and Benefits
CalCCA- Issues with PAM

1. Utility costs higher than sum of RECs, RA, energy.
2. Data unavailable- SFPUC request denied.
3. Regulatory gaps- process to transfer RECs, RA, RPS contracts.
4. Monetization of benefits to LSE-
5. LSEs have contracted for their needs
6. Avoided costs due to departing loads not included.
PUC Order

- Improve transparency
- Methodology to improve stability and certainty
- Address issues related to inputs and calculations
- Alternatives to PCIA
- Consider SB 350
- Bundled customers indifference
- Should be transparent
- Predictable outcomes
- Flexible and stable even though departing customers numbers change
- Should not create unreasonable obstacles to CCAs
- Consistent with California State policies.
Existing Resource Planning

- CEC - Integrated Energy Planning Report for 10 years (IEPR)
- CPUC - Using IEPR, develops Long Term Procurement Process (LTTP) and sets long term resource goals to meet state goals such as RPS or storage.
- CAISO uses IEPR to transmission planning.
CPUC IRP (SB 350)

- Achieve the state’s GHG reduction goals
- Maintain Reliability
- Minimize cost
- Prioritize Air Quality in Disadvantaged Communities
- Best mix of supply- and demand-side resources
- Guide resource investment decisions across all types of load-serving entities (LSEs) and resource programs
PUC Proposed Approach

- CARB establishes GHG targets

- PUC identifies optimum portfolio and action plan called Reference System Plan (RSP)

- LSEs (CCAs also) use RSP to develop their plans for PUC review. (E2)

- PUC aggregates LSE plans to develop Preferred System Plan which replaces RSP.
Prior LTPP Process

New IRP Process
CPUC Staff Guiding Principles

- The IRP process should recognize that filing entities have different governing bodies, procurement processes, and statutory obligations, while also ensuring that the basic content and format of their IRPs are consistent and usable despite those differences.

- Any resulting costs from procurement directed by the IRP process should be allocated in a fair and equitable manner to LSE customers, and there should be no cost shifting between customers of LSEs. (PG&E, SCE, SDG&E)
CCA Concerns

- CCA PROGRAM PROCUREMENT AUTONOMY AND JURISDICTIONAL AUTHORITY MUST BE PRESERVED AS A MATTER OF LAW.
  - CCA programs have broad and exclusive authority to control procurement for their customers.
  - Legislature has granted the Commission limited jurisdiction over CCA programs, such as the renewables portfolio standard, resource adequacy requirements and energy storage mandates.

- SB 350’S REQUIREMENTS FOR CCA PROGRAMS SHOULD NOT BE CONFUSED WITH REQUIREMENTS FOR ELECTRICAL CORPORATIONS
  - LSEs are required to file an integrated resource plan, but an electrical corporation must file a plan that includes an “assessment of the price risk associated with the electrical corporation’s portfolio”. A CCA program, meanwhile, must meet less onerous requirements, and file a plan with “[e]conomic, reliability, environmental, security, and other benefits and performance characteristics” and a “diversified procurement portfolio consisting of both short-term and long-term electricity and electricity-related and demand reduction products.”
Ability to Meet Peak Load and Generation Outage

- Loss of Load Probability- LOLP- one event (3 hours) of firm load shed in 10 years.
- With more solar- ramping has become important
- Traditional- CAISO Reliability Must Run Contracts for reliability
- RA as replacement for CAISO RMR – LSE contracts for capacity required in bilateral manner-
- East coast- Centralized Capacity Markets
Reliability Issues

- CPUC Resource Adequacy covers IOUs, CCAs, ESPs.

- LSEs submit load forecasts- CPUC determines RA requirements.

- Whenever new procurement needed- CPUC orders IOUs to procure capacity.

- Cost is shared by all LSEs through Cost Allocation Mechanism (CAM).

- With growing non IOU load, the RA program of objectives of reliability and policy goals may face issues.
The cost of reliability events increases quickly as reserve margins decline. And different interpretations of the 1-in-10 standard—i.e., either 2.4 hours of lost load per year or one event in 10 years—lead to different production and reserve requirements.
Conclusions

- Electric utility systems foundations
  - System configuration- more focus on DER critical
  - Regulation- collaboration needed
  - Transmission management- wider interconnections and storage
- Business Environment- changes occurring faster
- PCIA- CCA push for new methodology
- IRP Concerns- jurisdiction issues
- Resource Adequacy- double counting