Energy Division Staff Workshop – Scenario Planning

April 11-12, 2012

CPUC Auditorium, 505 Van Ness Ave., San Francisco

Background and Purpose of Workshop:

The biennial Long Term Procurement Plan proceedings at the CPUC and the annual Transmission Planning Process conducted by the California ISO rely on scenario planning to inform decisions. This workshop will discuss the approaches used to create scenarios for these studies. Staff intends to gather suggestions and input from participants who are interested in scenario planning, particularly for the 2012 Long Term Procurement Plan Proceeding (R.12-03-014) and 2013-14 Transmission Planning Process.

Call-in Information:

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Agenda:

Wednesday, 4/11/2012	
9:30	Introductions
9:45	What is a Scenario? What is a Portfolio? How are they used?
10:15	Key Questions for Scenarios
	Load forecast
	Demand side programs
	Resource retirements and additions
	What are the right questions?
12:00	Lunch
1:15	Process for creating and updating Scenarios and Portfolios
	What needs public input? How?
	How are scenarios/portfolios updated between public input?
	What data sources/inputs are available?
	Methods: How are data used?
	Top-down vs. bottom-up Portfolios?
4:30	Wrap-up

Thursday, 4/12/2012	
9:30	Introductions
9:45	How to identify the Renewables Net Short?
	Existing resources
	Resource retirements
	Renewables target
10:45	What decisions are "sunk"?
	Generation
	Transmission
12:00	Lunch
1:15	How renewables should be modeled as deliverable vs energy only?
2:15	20 year planning horizon?
3:30	Conclusions and next steps
4:15	Wrap-up

Agenda Details – Scenario Planning Workshop – April, 2012

Background

Planners use scenarios to understand different possible futures, evaluate the success of various potential plans in the likely scenarios, and select a course of action. Of particular interest to this workshop, CPUC's Long Term Procurement Plan (LTPP) proceedings and California ISO's Transmission Planning Process (TPP) rely on scenario planning to approve infrastructure investments for reliability, economics, and policy goals. CPUC, California Energy Commission (CEC), and California ISO collaborate to create scenarios and use them in planning exercises.

In recent years, much of the effort around scenario planning has focused on renewable generation portfolios. While renewable generation may be an important factor in need determination, if the renewable procurement path is unlikely to vary significantly, (i.e. because commitments have been made to a high fraction of the resources needed to meet 33% RPS, even accounting for project failure) renewable portfolios may not be a key factor differentiating likely scenarios.

What are Scenarios, Portfolios, and how are they used?

The term "scenario" is generally applied to a complete, coherent set of assumptions about a plausible future. A "portfolio" is a component of a scenario, specifically the set of generation resources assumed to be operational. In many instances, a portfolio is even more specifically focused on the renewable generator assumptions.

Some noteworthy uses of scenarios and portfolios are:

- Resource authorization in the LTPP, based on:
  - Local area needs
  - System resource needs (including studies of flexible capacity needs)
- Transmission approval in the TPP
  - Informs the "need analysis" component of CPUC's transmission permitting process
  - Allocates ratepayer-funded transmission Deliverability to generators[1]
  - Determines location and quantity of Deliverability available to distribution-voltage generators
- Regional studies done by Western Electricity Coordination Council and others

For a detailed discussion of scenarios, portfolios, and some of the key inputs, see Attachments 1 and 2 to the Scoping Memo in the 2010 LTPP.[2]

[1] Based on the TPP-GIP Integration proposal

[2] Revised on February 10, 2011. http://docs.cpuc.ca.gov/EFILE/RULINGS/130667.htm

Key Questions for Scenarios

There are several key questions for scenario development.

Load forecast: In the past, the CEC's Integrated Energy Policy Report load forecast has been used for scenario planning. CPUC staff recommends that the IEPR continue to be used as the base load forecast. However, there may be additional challenges.

- For many planning purposes, it is necessary to disaggregate the IEPR load forecast to smaller geographic areas. CPUC and CEC staff are developing a proposal for how this may be accomplished.

- In some instances, the most recent adopted IEPR forecast may not be the most recent published IEPR forecast and there may be significant differences between the different forecast vintages. In what cases should an un-adopted forecast be used?

Demand Side Programs: Certain demand side reductions may not be fully accounted for in the load forecast. Nevertheless, it is important to include these load reductions in scenario planning. Examples of these programs may include: incremental uncommitted energy efficiency, behind the meter generation or combined heat and power, and permanent load shifting.

Resource Additions and Retirements: Resources (generation, storage, demand response) are periodically added or removed from the grid, a change that impacts the balance of supply and demand as well as system reliability.

- Once-thru Cooling (OTC) plant retirement dates can be estimated using the announced compliance dates established by the Water Resources Control Board. However, there is uncertainty about retirements versus other compliance options and in cases where a plant requests an extension.

- Economic retirement of generators, either due to old age or lack of certainty of sufficient revenue is difficult to forecast.

- Nuclear plants may not be relicensed.

- Renewable generation additions are represented in the renewable portfolios designed to meet the renewables net short. In recent planning processes, these portfolios have been created using a bottom-up optimization model called the 33% RPS Calculator[3].

- Other generation additions may generally be forecast using contract online dates and other known details from relevant power purchase agreements.

[3] http://www.cpuc.ca.gov/PUC/energy/Procurement/LTPP/LTPP2010/2010+LTPP+Tools+and+Spreadsheets.htm

What are the "right" questions? In order for the scenario planning process to be successful, different scenarios should represent reasonably likely future paths. Comparisons between the different scenarios on key metrics (e.g. cost, reliability, environmental impact) should inform planning and policy decisions. Therefore, the scenarios should be structured to provide useful input to decision makers. Some questions of current interest are:

- What are the reliability needs of the Local Reliability Areas? How do these needs change with assumed transmission additions?
- What additional flexibility is needed to make the system reliable? What electrical characteristics (e.g. ramp rates, regulation speeds) are needed in what quantities? Are these needs location specific?
- How do local and system flexibility needs change with assumed generation retirements?
- How do assumed loads (net of demand side programs) impact reliability needs?
- Additional transmission investment can increase the Resource Adequacy capacity contribution of renewable resources by making additional resources Deliverable. What is the reliability impact of additional transmission capacity? What renewable areas should have additional transmission for Deliverability?
- What are the reliability, transmission, and distribution impacts of placing additional distributed generation near load?

An example scenario framework for examining these questions is shown in Table 1. These scenarios are not a proposal at this time, but merely a conceptual example to illustrate scenarios designed to answer the questions above.

Table 1. Example Scenarios

Scenario	Load	Retirements	Renewables
Trajectory	Mid case (1-in-2) loads, 100% of demand side programs excluding Big Bold Energy Efficiency Strategies	OTC retirements based on compliance dates; other announced retirements	Current procurement path, with preference for additional resources based on low cost and preferred locations; no transmission for Deliverability beyond current PUC approvals
High Load	1-in-10 loads, 50% of demand side programs excluding Big Bold Energy Efficiency Strategies	OTC retirements based on compliance dates; other announced retirements	Current procurement path, with preference for additional resources based on low cost and preferred locations; no transmission for Deliverability beyond current PUC approvals
High Retirement Sensitivity (on High Load case)	Unchanged from High Load Case	OTC retirements based on compliance dates; other announced retirements; 50% reduction in nuclear capacity; 1,000 MW additional system retirements[4]	Unchanged from High Load Case
High DG Sensitivity (on Trajectory case)	Unchanged from Trajectory Case	Unchanged from Trajectory Case	Current procurement path, with preference for additional resource being small photovoltaics near load; no transmission for Deliverability beyond current PUC approvals
High Renewables Deliverability Sensitivity (on Trajectory case)	Unchanged from Trajectory Case	Unchanged from Trajectory Case	Current procurement path, with preference for additional resources based on low cost and preferred locations; additional transmission for Deliverability beyond current PUC approvals

[4] Although stated generally here, these retirement assumptions would likely need to be more specific for actual implementation.

Process for Creating and Updating Scenarios and Portfolios

While scenario and portfolio and scenario development are important steps that merit public participation, a complete public process at every iteration of the various planning processes is a large burden on both staff and participants.

What needs public input? Where? How? In order to allow all participants to effectively focus their attention on key decision points, discussions should not be unnecessarily duplicated. Some input assumptions are developed in public processes that appear sufficien;.for example the CEC load forecast and its components should not need to be re-litigated in the scenario development process because there is an existing stakeholder process addressing this issue.

Similarly, discussion of some inputs should focus on identifying appropriate data sources and methods including a review for completeness and accuracy. For example, the analysis of what renewable generation commitments have become sunk decisions may be based on objective project milestones.

How are scenarios/portfolios updated between public input opportunities? In some cases, it may be appropriate for staff to simply "refresh the data" used to create scenarios and portfolios for planning processes (e.g. annual Transmission Planning Processes) without a public process. Examples of these updates may include: load and demand side program assumptions, renewable project milestones, and updating scenarios to reflect adopted policy changes.

What data sources and inputs are available? Table 2 describes some relevant data sources.

Table 2. Data Sources

Source	Uses	Notes
CEC Load Forecast	Loads, demand side programs	Adopted every 2 years (end of odd numbered years or beginning of even years) ; periodically refreshed by staff in between
Water Resources Control Board, OTC policy and implementation plans	OTC compliance dates	
Renewable Energy Action Team	Renewable project milestones	Confidential Tracks progress of renewable projects in California, particularly toward getting environmental permits
Project Development Status Reports	Renewable project milestones	Confidential Tracks renewable projects in negotiations or contract with the IOUs; updated each February and August.
California ISO Interconnection Queue	List of projects requesting interconnection	Confidential
Load Impact Reports	Demand response program capacity	Filed by the IOUs each April; see D.08-04-050.
NYMEX	Natural gas price future curves	Used previously for Market Price Referent[5]

Methods: How are data used?

The method used to translate any specific data source into a scenario must be considered individually.

[5] http://www.cpuc.ca.gov/PUC/energy/Renewables/mpr.htm

Top-down vs. bottom-up portfolios? In recent scenario planning exercises, CPUC staff has used the 33% RPS Calculator[6] to develop portfolios of renewable resources to meet RPS requirements. The 33% RPS Calculator is a bottom-up optimization model that selects an optimal portfolio of renewable resources to meet the renewable net short. However, a top-down approach is also possible.

Table 3. Top-down vs Bottom-up

	Top-down	Bottom-up
Basics	Use available information to select resource types and locations based on policy goals	Use data about potential projects (either real, generic, or both) to select an optimal set of projects to meet goals
Pros	• Gives choices directly to policy makers • Able to consider qualitative information • Flexible	• Data-driven and objective • Can easily be "refreshed" by updating data without changing goals • A rigorous modeling framework may inform important questions
Cons	• Subjective • Subject to human errors (e.g. focusing overly on one factor among many)	• Analysis limited by capabilities of the model used • Labor intensive to do a full update, especially if making changes to the calculation process • Results only as good as the input data • Inconsistent data sources may be a challenge
Notes	• Potentially simple, but there are many factors to consider	

How to Identify the Renewables Net Short

Regardless of the approach used to develop a portfolio of renewable resources, identifying the renewables net short (RNS) is a necessary step. RNS is the renewables target (e.g. 33% RPS) minus the existing renewable resources.

Existing Resources: Existing resources can be calculated from either physical or contractual data sources. For instance interconnection data (e.g. from California ISO or from a West-wide source such as WECC's LRS data) can be used to measure physically interconnected existing resources. Alternatively, procurement information (e.g. the IOU's Project Development Status Reports) can measure contracted

[6] http://www.cpuc.ca.gov/PUC/energy/Procurement/LTPP/LTPP2010/2010+LTPP+Tools+and+Spreadsheets.htm

online resources, including their contracted future deliveries. In either approach, likely retirements must be considered. Similarly, resources that are likely to deliver their energy and/or renewable attributes to other jurisdictions (i.e. other states' RPS programs)

Renewables Target: Calculating the physical renewables target is a straightforward exercise, once the load forecast and demand side program assumptions are selected. However, given Senate Bill 2's banking provisions, some have suggested that the physical target may significantly exceed the contractual target in some time periods. Should banking be considered in developing the target? Note that this basic question can also be framed on the supply side (i.e. should banking be considered as a resource to meet the RNS in the target year).

What Decisions are "Sunk"?

Sunk decisions constrain our flexibility. For example society's ability to meet the RNS with an optimal pool of RPS generators is limited by commitments that have already been made to certain generators.[7] However, what "test" should be used to identify a sunk decision is an important question.

Generation: In recent RPS portfolios, the test for RPS generators to be considered sunk has relied on PPA and permitting progress. In the 2010 LTPP and 2011-12 TPP, the test was an executed PPA plus a complete application for a major environmental permit; the portfolios proposed for the 2012-13 TPP use a stricter test of an approved PPA and an awarded major environmental permit.

Transmission: Previous LTPP and TPP scenarios have used both California ISO and CPUC approval of new transmission projects as the test for committed transmission.

Deliverable vs Energy-Only Renewables

What are the reliability and cost impacts of investing in transmission to make renewables fully deliverable relative to energy only? Previous LTPP analyses have suggested that additional generic system capacity (the type of Resource Adequacy capacity provided by most renewables) may not be needed in the near term. Should the renewables portfolios incorporated in the scenarios differentiate between some renewable areas (or even specific generators) that should or would be deliverable versus those that would be energy only? How should the two types be distinguished? For example, this question is closely connected with the question of sunk transmission: renewable generators modeled on committed transmission could be considered deliverable, but resources prompting new transmission could be energy only. However, this is an incomplete answer – it is possible to "fit" more resources onto committed transmission, if some of those resources are assumed to be energy only.

20 Year Planning Horizon?

[7] Note: in the context of RPS portfolios, this concept of sunk generation decisions is called the "discounted core."

To develop scenarios and portfolios for a 20 year planning horizon, how do the questions and data sources above change? For data sources and methods used for a 10 year scenario, what are appropriate methods of extending to 20 years? In what situations is simple extrapolation appropriate?