Resource Adequacy Briefing Paper

ATTACHMENTS

Attachment 1: Adequacy Approaches in Other NERC Regions
Attachment 2: Summary of California Resource Adequacy Framework
Attachment 3: WSCC Power Supply Design Criteria

March 23, 2004

Attachment A

*Planning/Operating Reserve Levels by Agency/NERC Region**
(Note: Work in progress for WECC, SERC, NPCC…) Lawrence Berkeley National Lab 3/04 ***DRAFT***

	FERC SMD	WECC	MAPP	SPP	ERCOT	MAIN	ECAR	FRCC	NPCC
Planning Reserve Margin	At least 12% above peak load [1]	WECC is in the process of developing criteria	15%, (10% for a hydro system) [2]	13.6% (9-10% if member is 75% hydro) [3]	15% [4]	15-20% [5]	No regional planning criteria [6]	15%, (moves to 20% in 2004) [7]	Unspecified
Regional resource adequacy criteria	1–in–10 year LOLP	Unspecified	Unspecified	1–in–10 year LOLP	Unspecified	1–in–10 year LOLP	1–in–10 year dependence on supple-mental capacity	Unknown	1–in–10 year LOLP [8]
Methodology	Unspecified	Unspecified	Based on numerous consider-ations, including LOLP studies	Reviews LOLE analyses performed by SPP working group	Based on LOLP and LOLH studies	Based on LOLP and LOLE studies	Based on numerous consider-ations, including LOLP studies	Based on net of the total peak demand minus the effects of DSM	Based on LOLP and LOLE studies

[1] FERC 2002 NOPR. "Remedying Undo Discrimination through Open Access Transmission Service and Standard Electricity Market Design," Rulemaking No. 01-12-000. Note that the proposed resource adequacy criteria in the FERC SMD have been retracted.
[2] Planning reserve margin is measured above peak demand of end-use load on a rolling 12-month basis. MAPP 2002. "Generation Reserve Sharing Observations and Recommendations," Reserve Task Force, January 8.
[3] SPP 2003. "Southeast Power Pool: Criteria," October 28.
[4] NERC 2001. "Draft Comparison of NERC Regional Resource Adequacy Approaches," October 15 (Appendix F in NERC Minutes, August 11, 2003). Note that much of the data in NERC's study comes from the NERC RAS Regional Resource Criteria Survey, November 2000, and the NERC Reliability Assessment 2000-2009, October 2000. ERCOT's reserve margin was revisited in a planning reserve margin rulemaking in 2002.
[5] MAPP 2002.
[6] NERC 2001.
[7] NERC 2001.
[8] NPCC 1995. "Basic Criteria for Design and Operation of Interconnected Power Systems," NPCC Document.

Attachment B

SUMMARY OF CALIFORNIA'S RESOURCE ADEQUACY APPROACH

Background

In a rulemaking that began in October 2001, the CPUC has been working to return the energy procurement function to IOUs and displace the state agency that temporarily undertook that function when the IOUs filed for bankruptcy. In **D.04-01-050**, the CPUC[9] adopted a long-term procurement decision that includes: (1) reserves and resource adequacy threshold decisions to guide further development in workshops, (2) guidance to IOUs for procurement activities, (3) preferences for the EAP "loading order" of resources, (4) expansion of IOU obligations to enter into QF contracts, (5) and initial instructions to IOUs to guide a spring 2004 long-term filing. It had earlier adopted **D.03-12-062** addressing short-term issues necessary to allow IOUs to continue to procure resources for 2004.

The municipal utilities with in the CAISO control area and those large municipalities with their own control areas (LADWP, SMUD, and IID) are not under the jurisdiction of the CPUC. The CEC has examined resource adequacy for municipal utilities, but no body of requirements comparable to those established for IOUs has been enacted for them.

Overview of Resource Adequacy

D.04-01-050 creates a framework for a full set of resource adequacy requirements. Some fundamental "threshold" issues are resolved, but a series of workshops is planned to review additional topics, examine options, and propose additional requirements. The CPUC expects these workshops in the time period of February – May 2004 (p. 176).

Threshold Issues

Key issues creating a framework for resource adequacy requirements which are resolved by D.04-01-050 include:

- All LSEs (IOUs, ESPs and community aggregators) are required to acquire reserves for the load they expect to serve (pp. 10-11 and p. 42).
- 15-17% planning reserve margin to be achieved by 2008 and maintained thereafter (p. 21).
- Beginning in 2005, IOUs are required to cover 90% of peak demand plus reserves through forward commitment made one year in advance (p. 11) for the five summer months, but IOUs can seek permission to opt-out on a case by case basis (p. 29).

- IOU reliance upon spot markets to acquire capacity is restricted to the 5% level previously adopted in D.02-12-062, but IOUs can go beyond this for energy if market prices are below capacity contract call options (pp. 31-32).

[9] CPUC decisions are available from the CPUC website – www.cpuc.ca.gov

RA Workshops

Resource adequacy workshops, deferred until after a long-term decision, will now be scheduled and conducted. These workshops will be guided by the long-term "threshold" decisions (above).

Topics to include:

- a "template" for evaluating each LSE's resource adequacy (suggesting reporting requirements to permit this assessment),
- load forecasting protocols and resource counting conventions (especially for the "soft" resources like energy efficiency and demand response),
- IOU reliance upon spot capacity and energy,
- non-utility LSE obligations,
- Deliverability of energy to serve load,
- confidentiality, and
- penalties (pp.42-49).

Following these workshops the topics of reporting requirements and deliverability will be addressed as part of a successor rulemaking to begin in 2Q2004.

Coordination of Procurement with the Planning Process

A biennial cycle of common IOU procurement planning will be developed that allows use of the CEC IEPR results, and the details will be examined as part of the 2004 long term filings expected in spring 2004, which are to have a ten year time horizon (p. 90).

IOUs are required to use CEC IEPR demand forecasts as the base case, but they have the option to choose an alternative as their base case, but must justify this choice (p. 90). If they choose an alternative, they must still use the CEC views as one scenario.

A wide range of alternative scenarios must be filed to cover various uncertainties (p. 91) at both the service area and regional level (p. 93), including fuel price uncertainty (p. 95).

IOUs must develop and implement programs to ensure that actual delivered energy efficiency impacts meet or exceed those which were planned, which will require improved measurement and evaluation efforts. (p. 100).

IOUs must include a local reliability component in their next long term plan (p. 125).

Attachment C

WESTERN SYSTEMS COORDINATING COUNCIL

POWER SUPPLY DESIGN CRITERIA

(suspended—not currently in effect)

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WESTERN SYSTEMS COORDINATING COUNCIL

POWER SUPPLY DESIGN CRITERIA

INTRODUCTION

The Western Systems Coordinating Council was established to promote the reliable operation of the interconnected bulk power system by the coordination of planning and operation of generating and interconnected transmission facilities.

Article V, Section 1, of the Council Agreement reads, "For the guidance of the members and subject to the review of the Executive Committee, the Planning Coordination Committee shall recommend criteria for such elements of system design as affect the reliability of the interconnected bulk power systems, and the Operations Committee shall recommend such operating procedures as affect the reliability of the interconnected bulk power systems."

In order to accomplish its assignment, the Planning Coordination Committee established the Reliability Criteria for System Design Subcommittee (now called Reliability Subcommittee). This document is the result of work by the Subcommittee.

PURPOSE OF CRITERIA

The criteria in this document are intended to provide, for the guidance of members, recommended minimum levels of installed and planned generation for systems and areas within the WSCC in order to permit evaluation, upon a common basis, of the relative reliability of the interconnected bulk power systems. The criteria do not purport to establish any measure of industry design standards as to member systems, nor are they created for such purpose, it being recognized that the systems of members, pools, or other groups of Council members, may be properly and adequately designed to different criteria.

It is recognized that it is impossible to provide 100% reliability of power supply. It is anticipated that each member will, insofar as practical, protect its customers against loss of service. With the development of the complex interconnected systems, it is likely that the design and performance of one system will be reflected in varying degrees on other systems. Subject to the foregoing, it is the purpose of the criteria to provide:

1) Recommended minimum standards and a uniform method for assessing the adequacy of installed and planned generation within the WSCC for the purposes of reporting to the Council, and to outside agencies.
2) A means for evaluating the possible effect of one system or area on other systems or areas.

The WSCC members will assess resource adequacy in accordance with the *North American Electric Reliability Council (NERC) Planning Policies and Principles* or the *WSCC Power Supply Design Criteria*, whichever is more specific or stringent.

CRITERIA FOR SYSTEM DESIGN

The criteria are based on the principle that for the more common contingency outages there should be no loss of load in a system or area nor adverse effect on neighboring systems or areas. The criteria recognize the necessity for load shedding for those outage contingencies that are credible but of such low probability that it is not feasible to protect the systems against loss of load.

Power supply criteria may be defined and measured in terms of generating reserve margins, ability to withstand contingency outages, or minimum reliability index values derived from probabilistic computations based on capacity.

Each member of the Council, and each Pool or other group of Council members, may utilize criteria which differ from the criteria presented in this document. Such differences may be based upon the geography of the area, type of load being served, system configuration, customer expectations based upon past performance, or other reasons considered appropriate by such member, Pool or group, as long as the minimum requirements of the WSCC criteria are met.

It is recommended that the following criteria be utilized in the design of each member system or area.

1) Each member system or area should provide sufficient generating capacity to serve its load and meet its obligation to others without imposing an undue degradation of reliability on any other system or area.
2) If two or more systems form a group or responsible area for the specified purpose of applying WSCC Power Supply Criteria, they should demonstrate that any inter- or intra-area generating capacity support levels utilized are achievable and that sufficient transmission capacity is available to allow delivery at these levels of generating capacity support.

Assessments of future resource adequacy should generally include the following:

- Electricity demand and energy forecasts, including uncertainties
- Existing and planned demand-side management programs (DSM) including in-service dates and life-cycle
- Demand-side management program characteristics should include the following:
- **Consistent ratings (demand and energy), including seasonal variations**
    - Effect on annual system load shape
    - Availability, effectiveness, and diversity of DSM programs
    - Contractual arrangements
    - Expected program duration

- Aggregate effects (demand and energy) of multiple DSM programs
- Existing and planned supply-side resources including in-service dates and life-cycle
- Supply-side resource characteristics should include the following:
- Consistent generator unit ratings, including seasonal variations
- Availability of utility and independent power producer generator units
- Dependability of and contractual obligations, including assignment of system losses, for capacity and energy purchases and sales
- Abnormal or adverse water conditions for hydro and thermal generator units
- "Net" capacity after deduction of electrical supply for station or auxiliary services
- Fuel availability, deliverability, and diversity
- Retirement of resources
- Delays in resource in-service dates
- Availability and performance characteristics of all resources
- Resource type; include energy profile and any environmental or regulatory restrictions
- Availability of emergency assistance from neighboring systems
- Resources not under a system's control should be addressed in the planning process as to availability, capacity, emergency assistance, scheduling, and deliverability
- Purchasers, transmitters, and sellers of electricity should coordinate and agree with each other on the characteristics and level of dependability of their electricity transactions for reliability assessment purposes, including such factors as:
- Contractual commitments
- Duration of the transaction
- Dependability of the transaction
- Availability of dedicated generator units
- Availability of transmission capacity
- Effect of the transaction on deliverability of emergency assistance

Technical studies should be performed to periodically evaluate these criteria and that the criteria be periodically reviewed and revised as experience indicates.

RECOMMENDED MINIMUM PERFORMANCE LEVELS

The recommended level of installed and planned generating supply reserve is presented in the Recommended Minimum Performance Table. This table defines recommended minimum power supply reserve levels for reporting systems or areas in the WSCC.

Because reliability reserve levels vary between WSCC member systems, three alternative recommended minimum criteria are provided. In planning and installing resources, each member should endeavor to maintain a balanced relationship among resource type, size, capacity, and location. It is recommended that Member Systems with a significant percentage of independent power producer owned generation utilize probability methods for reserve planning and reporting. It is further recommended that all systems ultimately report installed and planned reserve levels using probability methods.

In order to provide a level of performance consistent with the expectations of their customers and with system experience, individual systems or areas may adopt minimum design performance levels which differ from those presented herein.

Prepared and Submitted by the Adequacy of Supply Task Force
Approved by Planning Coordination Committee - March 7, 1974
Approved by Executive Committee - November 21, 1974
Revised August 11, 1987
Approved by Planning Coordination Committee - October 26, 1995
Approved by Board of Trustees - November 30, 1995

WSCC POWER SUPPLY DESIGN CRITERIA
RECOMMENDED MINIMUM PERFORMANCE TABLE

	Criteria	Minimum Design Performance
1.	Monthly Reserve Capacity After Deducting Scheduled Maintenance (MW)	Greater of R, or the largest Risk plus 5 percent of Load Responsibility
2.	Monthly Reserve Capacity After Deducting Scheduled Maintenance	2 largest Risks
3.	*Annual reliability criterion based on probability of loss of load, either	
	a. Frequency of loss of load or,	one day in ten years
	b. probability of meeting all loads in a year	0.90

Definitions

$$R = \frac{(.05\ H + .15\ T)}{H + T} \times L$$

H = Monthly hydro capability after deducting scheduled maintenance.

T = Monthly non-hydro generating capability after deducting scheduled maintenance.

L = Load Responsibility: System or area monthly firm peak load demand plus those firm sales minus those firm purchases for which reserve capacity must be provided by the supplier.

Reserve Capacity After Deducting Scheduled Maintenance = H + T - L

Risk: Capacity reduction caused by outage of a generator (including independent power producer owned) or transmission line.

* Independent power producer owned generation shall be included when assessing adequacy of power supply using this Criterion.

Revised August 11, 1987
Revised October 26, 1995

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