WECC Power Supply Assessment

November 24, 2004

A. Executive Summary

Purpose and Synopsis

The purpose of this report is to present the results of the power supply assessment that was conducted in October 2004. The studies cover the summer period from 2005 through 2013, and the winter period from 2004/05 through 2013/14. The input data represent the control area Loads and Resources (L&R) data, updated through September 2004. A synopsis of the aggregated results is presented in Table #1. Information regarding the area definitions, topology, and scenario descriptions/results are presented in the body of the report.

Table #1 – Year of First Deficit (changes from previous assessment are in bold characters)

Area	**Scenario**				
	1	2	3	4	6
Canada	none	none	none	none	**2012**
Northwest	none*	none	none	**2012**	none
Rockies	2009	**2011**	**2008**	2007	none
No. California	2010	2010	2008	**2006**	none
So. California/Mexico	2009	2011	2007	2005	**2011**
Desert Southwest	2008	**2012**	2005	2005	none
Parameters					
Month	August	August	August	August	January
Demand Escalation	7%	7%	12%	15%	7%
Uncommitted Units	no	yes	no	no	no

* Although the aggregated Northwest area remained surplus, a deficit condition developed in the Utah zone (one of the zones in the Northwest area) beginning in 2008, due to insufficient committed generation and transmission constraints. The Utah zone became deficit earlier in scenarios #3 and #4. Note that PacifiCorp approved the release of this zone level result information.

The base summer case is scenario #1 and the base (and only) winter case is scenario #6. Note that uncommitted units (planned generation additions that are not currently under active construction) are excluded from scenarios 1, 3, 4, and 6. The "year of first deficit" could also be considered as the year that additional resources must be online to avoid margin deficiencies. Scenario #4 represents an extreme, "worst-case" study that roughly approximates a 20% planning reserve margin requirement.

Methodology

The assessment utilized a deterministic approach in evaluating the **power supply margin**[1] in meeting the total peak demand (firm plus non-firm) requirements for the peak hour of the study

[1] Power Supply margin is the amount of resource capability (including imports) in excess of the demand requirements, after the specified adjustments to both demand and resources are applied.

month. Uncertainties associated with such factors as resource availability and seasonal demand variations were considered explicitly by running additional scenario cases. The primary input variations were:

- The "**peak demand escalation**" (the percent that the peak demand forecasts for each zone were increased to account for reserve requirements and uncertainties pertaining to the demand forecasts).
- The inclusion or exclusion of resource additions that are not **committed**[2].
- The treatment of resource outages such as scheduled maintenance and forced outages.

The peak demands represent the control area expected peak demand forecasts (1-in-2 probability, defined as 50% probability of not being exceeded) for the study months. It was assumed that the forecast monthly non-coincidental peak demands for each zone will occur at the same time (no diversity). The peak demand escalation was applied directly to the peak demand forecasts. For example, if the peak demand escalation for a summer scenario was 7%, the August peak demand forecast for each year was multiplied by a factor of 1.07. Peak demand escalation should not be confused with the load growth escalation that is already represented in the peak demand forecasts.

An equation for the power supply margin calculation is represented below. The internal resources are adjusted to account for scheduled maintenance, inoperable units, forced outages, and hydro deratings. The demand is adjusted as previously described. The combination of all of the adjustments may seem overly conservative, but this helps to compensate for the idealistic nature of the SAM model.

Power Supply Margin = Internal Resources (adjusted) + Imports – Demand (adjusted) - Exports

<u>Results</u>

The results that are reported in this report are a measure of the amount of unused generation capacity (**power supply margin**) in each of the defined areas under the specified conditions. The input data for the individual zones included reported generation and demand values, but excluded the reported firm contracts with entities in other zones. The model calculates the transfers between the zones based on the solution criteria and the provided transfer capabilities. A negative power supply margin for a zone or area is indicative of resource shortages and/or transmission constraints.

The results of the base summer study case (scenario #1) indicate that power supplies in WECC should exceed demands through 2007, provided that conditions do not change beyond those studied. The study used a 7% demand escalation to evaluate whether generation resource margins were sufficient to cover such a contingency or other uncertainties that would necessitate use of additional resources. A 5% de-rate was applied to non-hydro generation (8% for CAISO and LADWP) [3] to simulate forced outages, and the hydro capacities were reduced to model an adverse hydro condition. Resources included all existing generation plus generation additions and retirements that are committed (additions that are currently under active construction and

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[2] Committed resource additions are projects that are currently under active construction or in startup.

[3] These utilities have suggested that older generating plants and more stringent environmental limits increase the likelihood for forced outages of non-hydro units physically located within their defined zones.

retirements that have a high probability of occurring). The available resources were further reduced to reflect scheduled maintenance. The zonal transfer capabilities were set at the restricted levels (transfer capabilities that may reasonably be expected to apply under simultaneous high seasonal transmission loading conditions).

Three additional summer scenarios were run as sensitivity studies with various combinations of generation and peak demand escalation. These other scenarios provide sensitivity analysis for higher peak demands and/or the addition of uncommitted resources. In the studies where deficiencies developed in later years, surplus capacity in the northwest was stranded by transmission constraints as depicted in the graphic on page 33.

A winter study case (scenario #6) was run using resource and demand data for January, and similar parameters to the base summer case. The restricted transfer capabilities for winter conditions were used for this case. Under the conditions studied, winter power supplies in WECC exceeded demands through 2011.

Notable Changes since previous assessment

The peak demands and available resources were adjusted to reflect updated data submittals from the control areas for the winter L&R seasonal assessment. Generally, the demand forecasts were slightly higher, and resource capabilities were slightly lower due to canceled and delayed projects. For example, the updated total unadjusted WECC forecast demand for August 2005 is 144,313, an increase of 973 MW compared to the previous assessment. The total unadjusted committed resource projection for August 2005 is 190,695 MW, a decrease of 382 MW.

To address a recommendation from CREPC, charts were added to compare the supply margins for scenarios #1, #2, and #3 at the area (or sub-region) level.

A firm contractual import from the Southwest Power Pool to the New Mexico zone is now modeled as a resource adjustment of 150 MW. This contract was ignored in previous assessments.

A bug in the visual basic code of SAM was found and fixed. The bug prevented the model from accurately calculating the supply margin in the Southern Nevada, Utah, and Wyoming zones. Due to the aggregation definitions and the north/south transmission constraints, the impact on previous assessments is minimal.

Qualifications

The assessment model is designed to measure the power supply margin based on forecasts of peak demands and seasonal resource capacity. While peak demand forecasts for several years into the future are readily available from the WECC control areas, the forecasts of resource additions are only accurate for a few years into the future. There is a point where the results shift from a determination of supply margin to a determination of future needs.

The California Energy Commission (CEC) has stated in their "2004 Integrated Energy Policy Update" a concern regarding the potential retirement of several older generation plants in California. Only the portion of these potential retirements that have been officially scheduled and reported to WECC are represented in the data used for this assessment. As more retirements are announced and reported, they will be represented in future assessments.

There is an important distinction between capacity and energy that must be considered, particularly for the northwest zone. While a peak capacity study such as is reported here may show surplus capacity in the northwest area, the capacity may not be available for a prolonged period due to the limited availability of water. The Reliability Subcommittee (RS) has formed a task force to develop a methodology for preparing an energy assessment that would help to evaluate the impact of adverse water conditions.

Although the power supply margin appears to be similar to an operating reserve or planning reserve, the power supply margin is simply the remaining margin after the various adjustments to generation and demand. The adjustments to generation and demand in this assessment are intended to model uncertainties associated with a power system. A detailed breakdown of the adjustments is provided in this report at the end of the 'results' section.

A determination of a positive supply margin for a zone does not necessarily mean a positive margin for all demand centers within that zone. Transmission constraints internal to a zone may limit electricity transfers to local demand areas, leaving them without a positive margin. These transmission-constrained local demand areas may include one or more major metropolitan areas within a zone and may include most of the total population within a zone. WECC's seasonal assessments and Ten-Year Coordinated Plan Summaries address potential intra-zonal resource inadequacies based on information provided by representatives from the various areas.

Status of Recommended Enhancements

- Consistent 1-in-2 demand forecasts – control areas representing over 96% of the total demand have verified that they reported a 1-in-2 peak demand forecast.
- Temperature based extreme peak case – development of an extreme, temperature based scenario is on hold until a source of reasonably priced weather data is identified, and a proposed methodology is better defined. In the meantime, refer to scenarios #3 and #4 for sensitivity studies related to higher than expected demands.
- Probabilistic studies – the sensitivity factors to support probabilistic studies have not been requested from the WECC members. The Reliability Subcommittee (RS) has requested that the WECC staff experiment with probabilistic studies using some generic assumptions as time permits.
- Energy assessment – the RS has formed a task force to formulate a methodology for preparing an energy assessment. WECC is also working with two government agencies to develop a temporary model to evaluate energy issues in the Western Interconnection.

Conclusions

The results shown in Table #1 identify the years in which deficiencies occur for each of the five scenarios. Without adequacy criteria, no conclusions regarding adequacy can be made.

Based on the concern raised by the CEC and referenced above, the results for Northern and Southern California may be derived from data that is already outdated. Both areas are subject to generation retirements that may not be wholly reflected in this assessment, as the scheduling of these retirements is an ongoing process. As data regarding future retirements are reported, they will be incorporated into future assessments.

Although there continues to be a concern regarding the valuation of hydro capacity in the Northwest, the assessment results for the January case (scenario #6) show no deficiencies until 2011 or 2012.

B. Introduction and Background

The WECC Power Supply Assessments address the need to study the power supply margins on a Council-wide basis and to identify areas within WECC that have the potential for electricity supply shortages based on reported demand and resource data and considering transmission constraints between areas.

The WECC Reliability Subcommittee has the responsibility to establish the tools, methodology, and data requirements for conducting the power supply assessments. This responsibility is described in the attached document entitled "WECC Power Supply Assessment Policy."

The WECC staff was given the assignment to use the WECC Loads and Resources (L&R) data as input for the California Energy Commission (CEC) model and utilize the model's results to measure the power supply margin in the sub-areas or zones within the WECC.

C. Reserve Margin

Reserve margin is a measure of the resource capability in excess of demand requirement. The industry commonly refers to two kinds of reserve margin, namely, operating reserve margin for day to day operations, and planning reserve margin for short or long term planning purposes. A planning reserve margin is generally higher than an operating reserve margin since it must account for all of the uncertainties. A planning reserve margin includes the margin for an operating reserve margin plus an additional margin for planning purposes.

The Minimum Operating Reliability Criteria Work Group (MORCWG) of WECC has defined an operating reserve requirement (operating reserve margin or contingency reserve) that requires a control area to maintain sufficient operating reserve as quoted below from the WECC Reliability Criteria Document.

"This Contingency Reserve shall be at least the greater of:

> (1) The loss of generating capacity due to forced outages of generation or transmission equipment that would result from the most severe single contingency (at least half of which must be spinning reserve); or
>
> (2) The sum of five percent of the load responsibility served by hydro generation and seven percent of the load responsibility served by thermal generation (at least half of which must be spinning reserve)."

WECC does not currently have a planning reserve margin requirement. However, the Power Supply Assessment Policy (see attachment 1) defines a requirement to "project whether enough resources exist, at any price, to meet load and possible reserves while considering the transmission transfer capabilities of major paths." In the absence of a planning reserve margin requirement, this assessment provides a measure of resources against the predicted demands in the form of “what-if” analyses for various demand scenarios and for various resource scenarios that include or do not include uncommitted resources.

The tables at the end of the ‘results’ section provide an estimation of a planning reserve margin for WECC overall, which includes resources that would be used for operating reserve. Note that the planning reserve margins shown in the ‘Base Capacity’ tables exclude other listed adjustments used in the individual scenarios. The values for an overall WECC reserve margin or power supply margin are not necessarily representative of the margins in each zone or area as transmission constraints can limit the export capabilities from the zones with surplus resources.

The sum of the peak demand escalation and the forced outage rate provide a rough estimate of the amount of planning margin that is represented by each scenario. A demand escalation of 7% and a forced outage rate of 5% would approximate a planning margin of 12%.

D. Model Topology

The topology of the CEC model is shown in the bubble diagram on page 9 (Bubble Diagram #1). The lines between zones are intended to represent transmission connections between the zones and the listed numbers are the transfer path capabilities as reported by the control area representatives. The model observes these maximum capabilities as it calculates the solutions for each scenario.

Transfer capabilities have been reported based on the following criteria:

- Maximum Transfer Capabilities are the rated path capabilities associated with ratings found in the WECC Path Rating Catalog.
- Nominal OTC Transfer Capabilities are the transfer limits used in day-to-day operations based on seasonal thermal and/or stability limits.
- Restricted Transfer Capabilities are the limits that may reasonably be expected to apply under simultaneous high seasonal transmission loading conditions.

Only the Restricted Transfer capabilities were used for this assessment. The values shown on Bubble Diagram #1 are the restricted capabilities for the summer season (winter capabilities are represented in Bubble Diagram #2). The capabilities shown with yellow highlighting reflect changes in transfer capability during the study period (see list below). Transfers with other regional councils such as MAPP and SPP are ignored in this assessment (with the exception of a 150 MW firm purchase in the New Mexico zone), as this would require an assumption regarding the amount of surplus or deficit generation in those councils.

For this assessment, the following transfer capability changes (selected from the Phase 3 projects of the WECC Three-Phase Rating Process) were represented.

- Utah – Northern Nevada, new restricted capability of 440 MW east to west (235 MW west to east) due to planned addition of Falcon-Gonder line, effective May 2004.
- California, Central – California, North, new restricted capability of 5,000 MW south to north due to Path 15 upgrade, effective December 2004.

A limitation on the Pacific DC Intertie (PDCI) during 2004 was accounted for in the model. It was assumed that the line was back in service by January 2005.

E. Recommendations For Future Assessments

1. The WECC member systems should continue to be involved in the verification of the data.

2. The dynamic status of new generating plants in the WECC has introduced some additional uncertainty to the power supply assessment. The WECC members should be encouraged to provide information about planned resources in a timely manner to WECC for the purpose of conducting power supply assessments. Information regarding the retirement of existing units should also be provided. For merchant plants, the host control areas need to assume the responsibility for collecting and submitting the relevant data.

3. The hydro generation capability in the Northwest may have limitations beyond those assumed for this assessment. The seasonal operation of the coordinated hydro system is subject to dozens of parameters to accommodate the various interests in the river systems. If the effect of these factors can be determined, they should be addressed in future assessments.

4. Future plans for the model may include conducting probabilistic or stochastic studies to study the effects of random uncertainties. This would require that the members provide additional information such as resource forced outage rates, resource operating costs, demand variations, transmission loss data, and transmission wheeling costs.

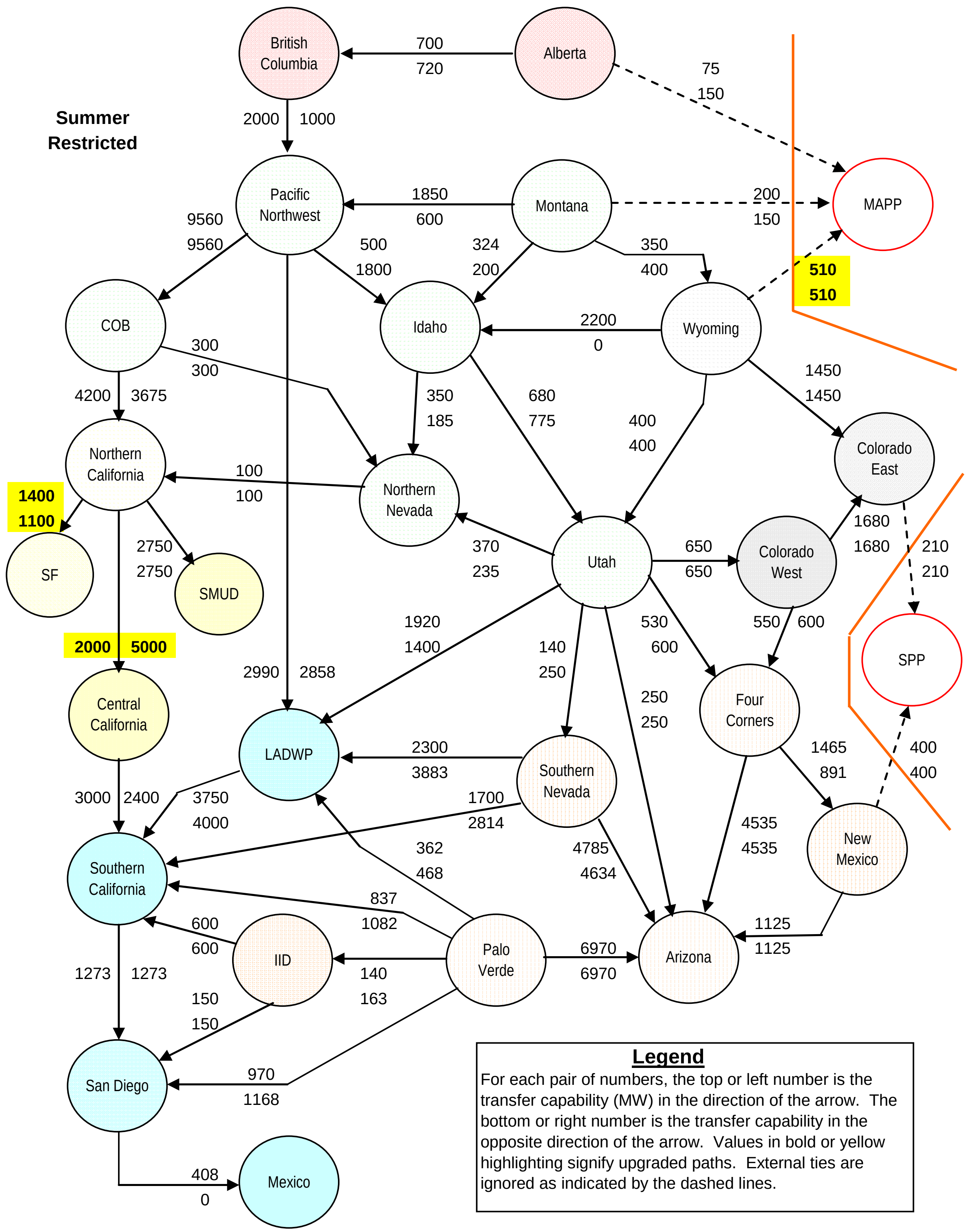
5. Planned changes to the transfer path capabilities must be reflected in the model to accurately measure their effect on the results. Since they would usually directly affect the results, only changes that are highly probable should be taken into consideration.

6. The effects of fuel diversity and availability should be modeled in future assessments. The prevalence of natural gas fired generation in WECC has raised concerns about the interdependencies of gas and electricity. One or more scenarios should evaluate the impact of gas shortages due to pipeline interruptions or demand spikes.

7. The studies described in this report do not address the energy supply in WECC. While WECC recognizes the need for an assessment of energy supplies, it is expected that the data and manpower requirements would be significantly higher than for this peak hour assessment. A more sophisticated model would also be needed. Some of the concepts that would have to be addressed are:

   - What is the minimum time resolution that must be studied?
   - What generation parameters would be required? Minimum and maximum hydro availability for each hour, each day, each week, and each month may be required. Emissions limitations should be taken into account. Economic dispatch and startup requirements should be addressed.
   - The model would also need to consider interchange and transmission constraints.

<u>Bubble Diagram #1 – Zone Topology (Summer – Restricted)</u>



F. Study Cases and Results

The criteria used in the study cases are summarized in the following table. Note that "additions" refers to generation additions and retirements.

Table #2 – Scenario Criteria

	Study Scenarios							
Criteria	**#1**	**#2**	**#3**	**#4**		**#6**		
Generation								
Existing as of 9/30/04	yes	yes	yes	yes		yes		
Committed Additions (units that are under active construction)	all	all	all	all		all		
Uncommitted Additions (units that have not yet started construction)	no	yes	no	no		no		
Non-Hydro De-rate (%) to model forced outages *	5%	5%	5%	5%		5%		
L&R Sched. Maint. and Inoperable	yes	yes	yes	yes		yes		
Adverse Hydro de-rate	yes	yes	yes	yes		yes		
Peak Demands								
Peak Month	Aug	Aug	Aug	Aug		Jan		
Peak Demand Escalation (%)	7%	7%	12%	15%		7%		
Transfer Capability								
Maximum Path Rating	no	no	no	no		no		
Seasonal OTC Limit	no	no	no	no		no		
Restricted Limit	yes	yes	yes	yes		yes		

*The non-hydro de-rates were set at 8% for the following zones (due to age of plants and environmental issues): Northern California, Central California, Southern California, San Diego, San Francisco, and LADWP. See "Resource Adjustments" section for the restrictions used for hydro generation.

The following pages present the detailed results of each of the scenarios, including graphical representations of the annual supply margin by WECC area (areas are defined in Table #3). Note that the extent of the supply surplus or deficiency for a given area is subject to the inherent problems associated with the simplistic methodology. If multiple areas are in need of additional capacity, several factors may determine which area(s) get access to any surplus capacity. Generally, the model will make excess capacity available first to the deficit area that is closest to the surplus area.

Table #3 – Area definitions

Area	Zones in Area	Area	Zones in Area
Canada	Alberta, British Columbia	No. CA	Central CA, Northern CA, San Francisco, SMUD
Northwest	COB, Idaho, Montana, No. Nevada, Northwest, Utah	Desert SW	Arizona, IID, New Mexico, Four Corners, Palo Verde, So. Nevada
Rockies	Colorado-East, Colorado-West, Wyoming	So. CA/MX	CFE-Mexico, Southern CA, San Diego, LADWP

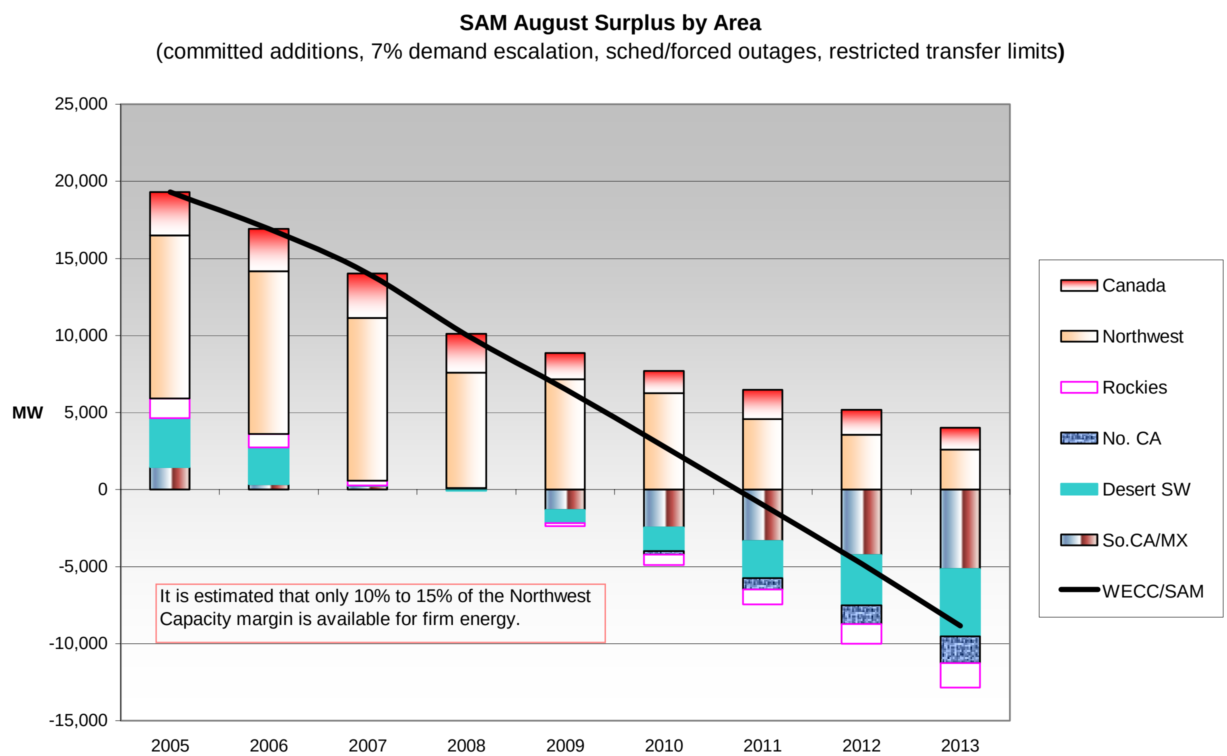
Scenario #1 – Results

Criteria: August peak demands, 7% Peak Demand Escalation, Generation Additions reflect only those additions that are Committed[4], Scheduled Outages & Inoperable, Non-hydro generating unit capabilities are de-rated by 5% (or 8% in California due to the age of the units and the more stringent environmental restrictions), Adverse Hydro, Restricted transfer limits.

The results of this case predict that under the studied conditions, power supplies in WECC will exceed demands through 2007. Beginning in 2008, transmission constraints prevent a surplus in the north (see north – south division in Bubble Diagram #3 on page 33) from reaching the deficit areas in the south. By 2011, the south deficit is larger than the north surplus, resulting in an overall deficiency for WECC.

The following graph presents the results by WECC area. When the surplus for an area is zero (0) and no bar is shown on the graph, the area is in resource/demand balance, or else it is importing to meet its demand. Although the aggregated Northwest area remained surplus, a deficit condition developed in the Utah zone (one of the zones in the Northwest area) beginning in 2008, due to insufficient committed generation and transmission constraints. Note that PacifiCorp approved the release of this zone level result information.

Graph 1 - Scenario #1 Margin Graph



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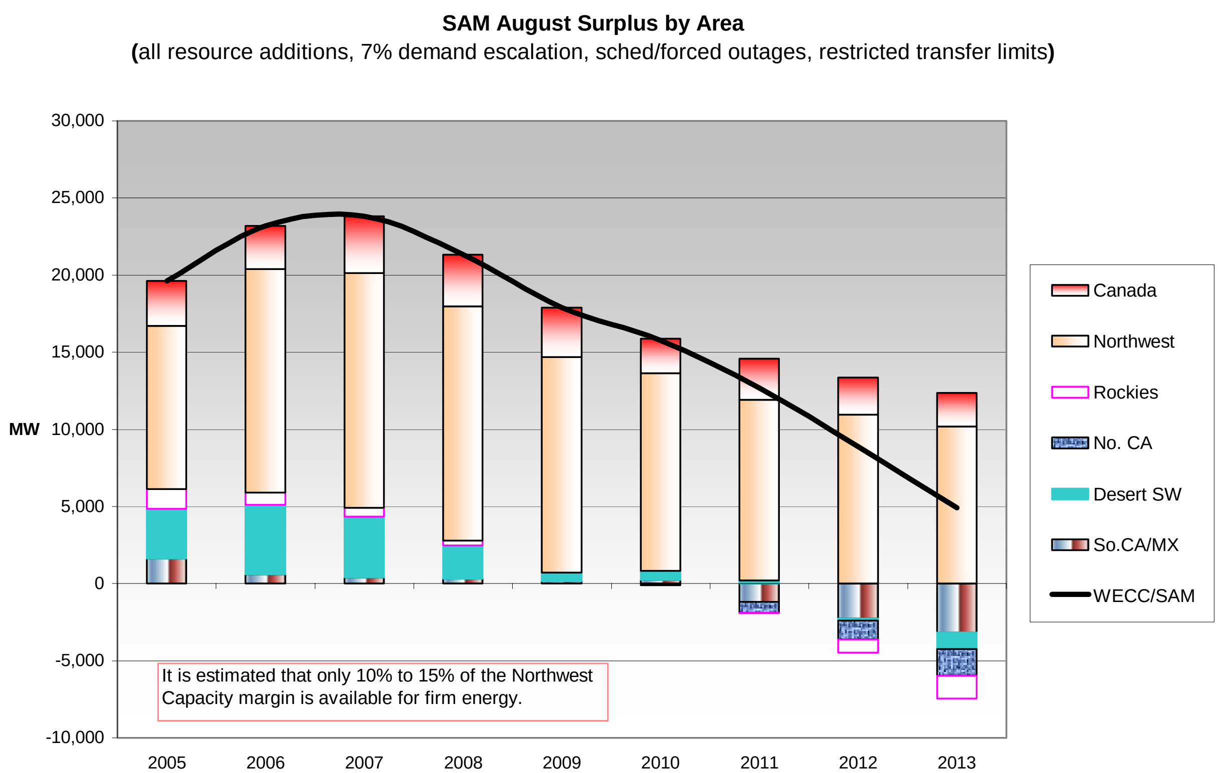
[4] Committed generation is generation that is currently in start-up or under construction.

Scenario #2 – Results

Criteria: August peak demands, 7% Peak Demand Escalation, Generation Additions reflect all planned additions (Committed + Uncommitted), Scheduled Outages & Inoperable, Non-hydro generating unit capabilities are de-rated by 5% (or 8% in California due to the age of the units and the more stringent environmental restrictions), Adverse hydro, Restricted transfer limits.

The results of this case predict that with the inclusion of the uncommitted generation additions (see table #10) and under the studied conditions, area power supplies will exceed demands through 2009. Since the uncommitted additions have not started construction, there is a higher likelihood that a portion of them will be delayed or canceled. The following graph presents the results by WECC area. Note that the increased capacity from generation additions is partially offset by several planned retirements (see table #8).

Graph 2 - Scenario #2 Margin Graph



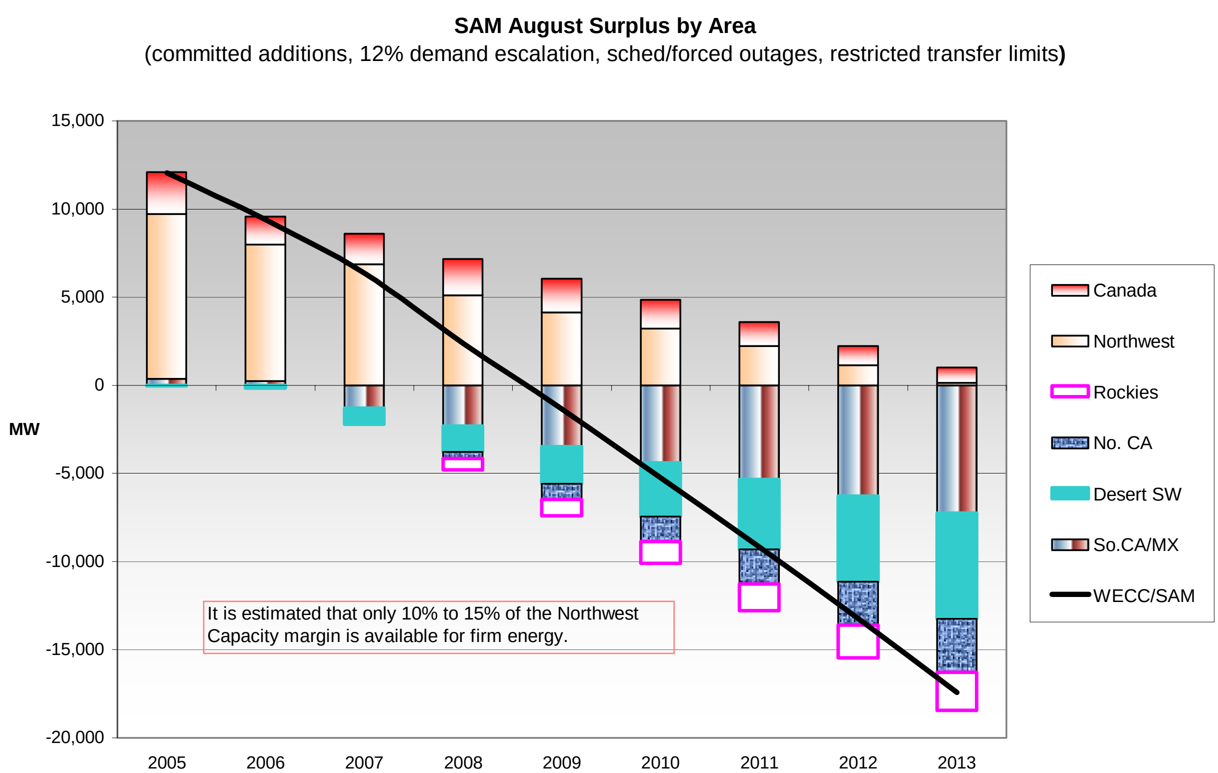
As described in the graph inset, only a portion of the Northwest capacity margin is available for firm energy. With the planned addition of uncommitted thermal generation in the Northwest, the amount of firm energy availability is higher here than in the previous scenario.

Scenario #3 – Results

Criteria: August peak demands, 12% Peak Demand Escalation, Generation Additions reflect only those additions that are Committed, Scheduled Outages & Inoperable, Non-hydro generating unit capabilities are de-rated by 5% (or 8% in California due to the age of the units and the more stringent environmental restrictions, Adverse hydro, Restricted transfer limits.

With a 12% peak demand escalation, the north/south split (see Bubble Diagram #3) developed in 2006 and prevented a surplus in the north from reaching the deficit areas in the south. By 2009, the southern deficit is larger than the northern surplus, resulting in an overall deficiency for WECC. The following graph presents the results by WECC area.

Graph 3 - Scenario #3 Margin Graph

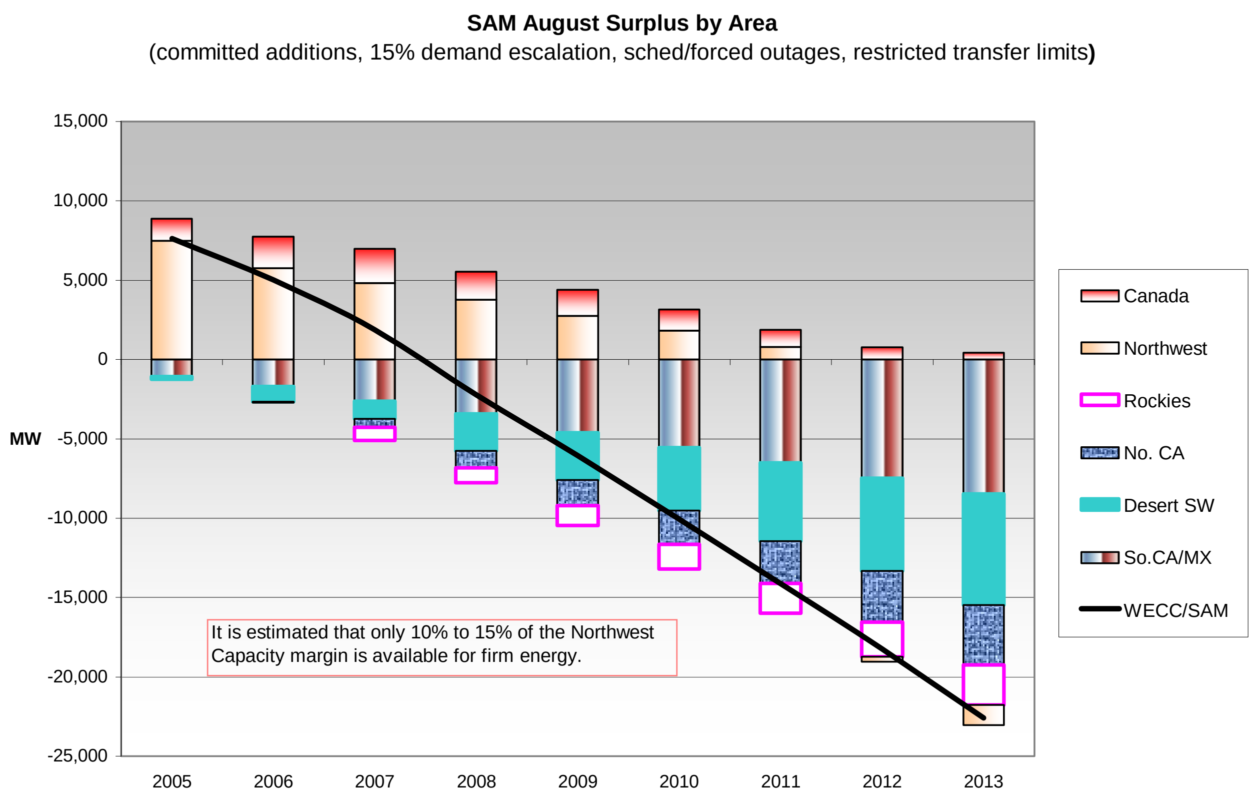


Scenario #4 – Results

Criteria: August peak demands, 15% Peak Demand Escalation, Generation Additions reflect only those additions that are committed, Scheduled Outages & Inoperable, Non-hydro generating units are de-rated by 5% (or 8% in California due to the age of the units and the more stringent environmental restrictions), Adverse hydro, Restricted transfer limits.

With a 15% peak demand escalation, the familiar north/south split (see Bubble Diagram #3) begins in 2005 and prevents a surplus in the north from reaching the deficit areas in the south. By 2008, the southern deficit is larger than the northern surplus, resulting in an overall deficiency for WECC. The following graph presents the results by WECC area.

Graph 4 - Scenario #4 Margin Graph

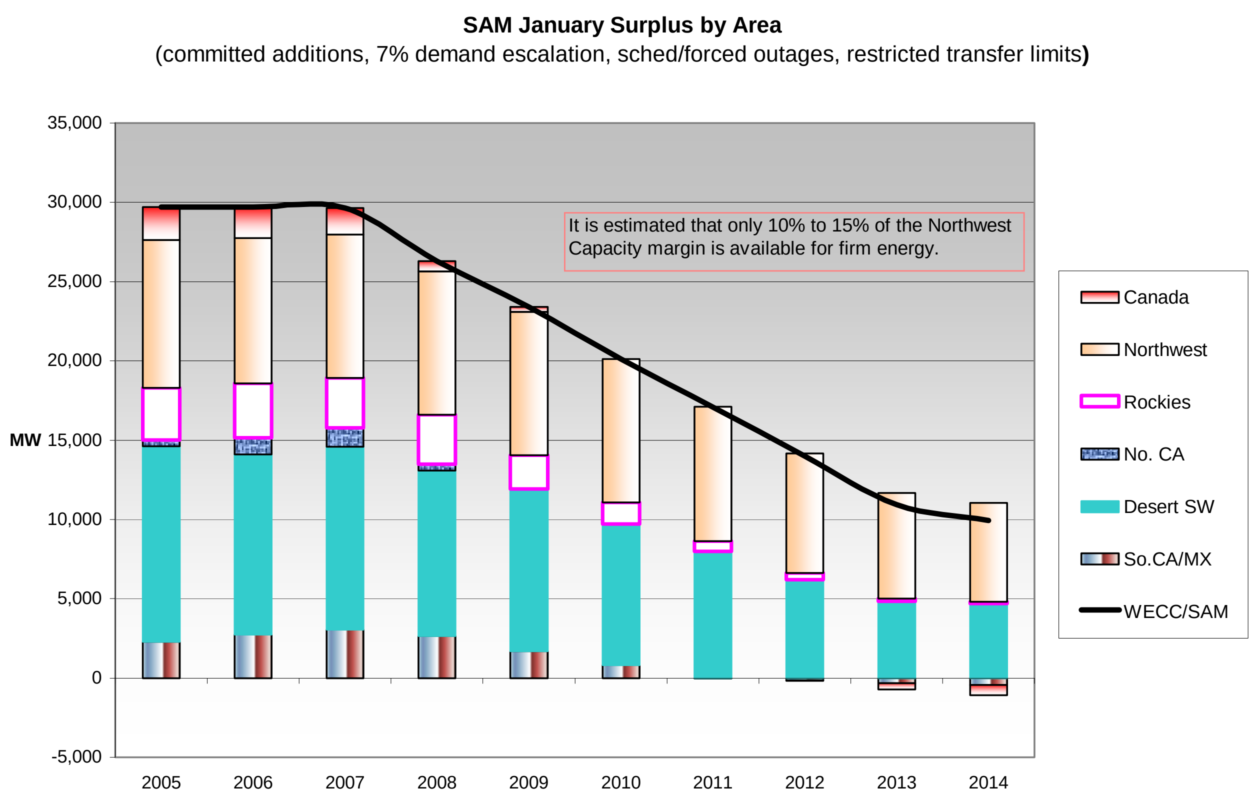


Scenario #6 – Winter Results

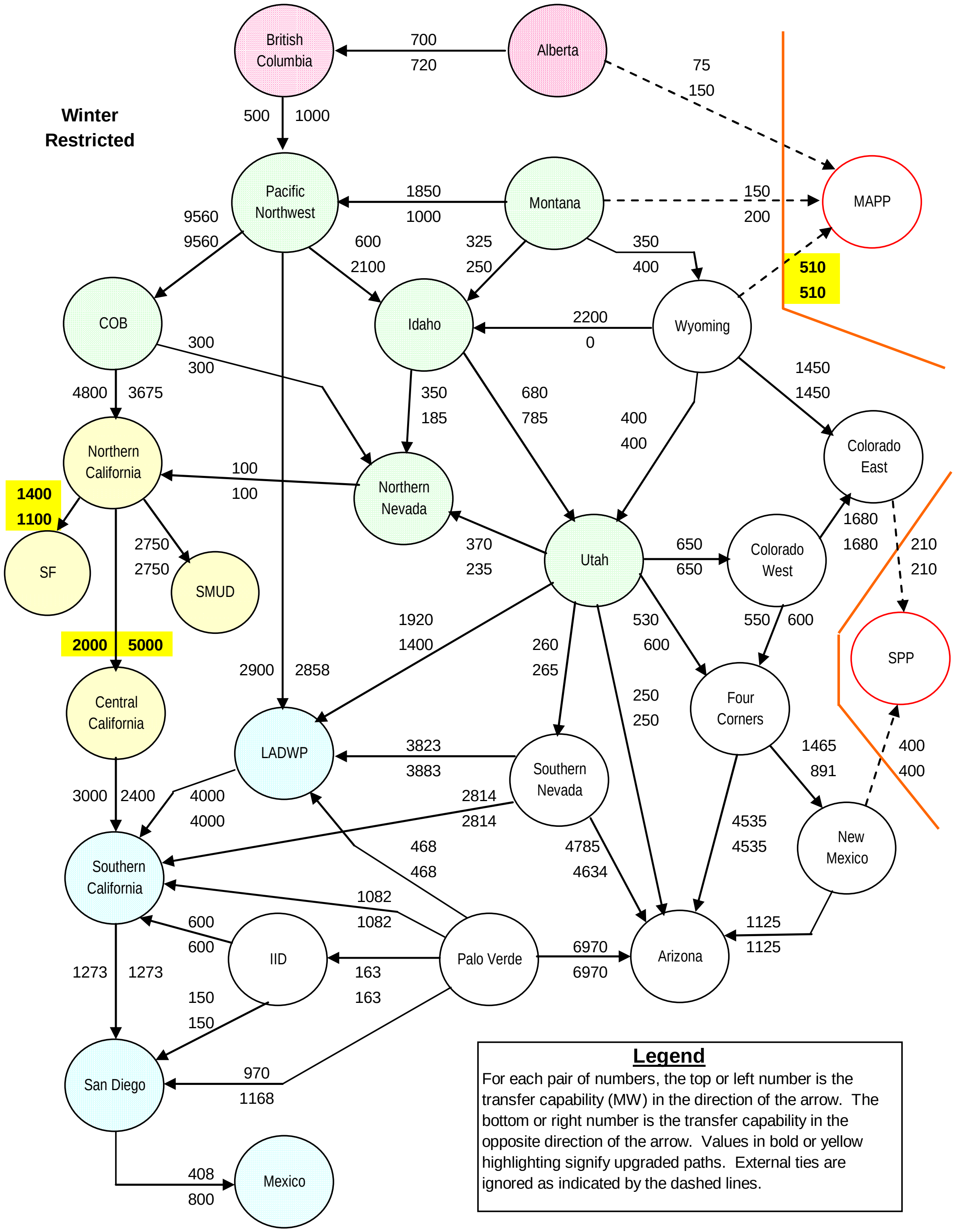
Criteria: January peak demands, 7% Peak Demand Escalation, Generation Additions reflect only those additions that are committed, Scheduled Outages & Inoperable, Non-hydro generating units are de-rated by 5% (or 8% in California due to the age of the units and the more stringent environmental restrictions), Adverse hydro, Restricted transfer limits.

The results of this case predict that under the studied conditions, winter power supplies in WECC will exceed demands through 2011 (winter is the December to February period). Deficits in Southern California/Mexico and Canada developed in 2012 and 2013, respectively. The following graph presents the results by WECC area, and Bubble Diagram #2 represents the winter restricted transfer capabilities.

Graph 6 - Scenario #6 Margin Graph



Bubble Diagram #2 – Zone Topology (Winter – Restricted)



Legend

For each pair of numbers, the top or left number is the transfer capability (MW) in the direction of the arrow. The bottom or right number is the transfer capability in the opposite direction of the arrow. Values in bold or yellow highlighting signify upgraded paths. External ties are ignored as indicated by the dashed lines.

Summary of Adjustments (August)

WECC - Total Area	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Base Capacity (August)	(all values in megawatts unless otherwise designated)									
Total Unadjusted Committed Generation capacity	186,888	190,545	191,723	192,091	192,254	191,981	191,982	191,984	191,984	191,984
Fixed Adjustments	372	150	150	150	150	150	150	150	150	150
Adverse Hydro Derate	-4,148	-4,151	-4,273	-4,242	-4,216	-4,218	-4,218	-4,218	-4,218	-4,218
Total De-rated Generation	183,112	186,544	187,600	187,999	188,188	187,913	187,914	187,916	187,916	187,916
Total Unadjusted Demand	140,676	144,313	147,528	151,013	154,558	157,877	161,369	164,921	168,523	172,154
Estimated Planning Margin (%)*	30.2%	29.3%	27.2%	24.5%	21.8%	19.0%	16.4%	13.9%	11.5%	9.2%

*Estimated Planning Margin (%) is (Total De-rated Generation - Total Unadjusted Demand) / Total Unadjusted Demand

Scenario #1

Uncommitted Additions	0	0	0	0	0	0	0	0	0	0
Scheduled Maintenance	-3,779	-3,713	-3,635	-3,155	-3,415	-3,155	-3,155	-3,155	-3,155	-3,318
Forced Outages	-7,707	-7,714	-7,809	-7,853	-7,847	-7,847	-7,847	-7,847	-7,847	-7,834
Adjusted Generation Capacity	171,626	175,117	176,156	176,991	176,926	176,911	176,912	176,914	176,914	176,764
Demand Escalation (%)	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Escalated Demand + Losses	151,930	155,815	159,252	162,969	166,904	170,411	174,120	177,899	181,735	185,603
Power Supply Margin (MW)**	19,696	19,302	16,904	14,022	10,022	6,500	2,792	-985	-4,821	-8,839
Power Supply Margin (%)	13.0%	12.4%	10.6%	8.6%	6.0%	3.8%	1.6%	-0.6%	-2.7%	-4.8%

Scenario #2

Uncommitted Additions	0	336	6,642	10,315	11,735	11,986	13,781	14,465	14,509	14,553
Scheduled Maintenance	-3,779	-3,713	-3,635	-3,155	-3,415	-3,155	-3,155	-3,155	-3,155	-3,318
Forced Outages	-7,707	-7,736	-8,164	-8,407	-8,472	-8,484	-8,573	-8,583	-8,585	-8,574
Adjusted Generation Capacity	171,626	175,431	182,443	186,752	188,036	188,260	189,967	190,643	190,685	190,577
Demand Escalation (%)	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Escalated Demand + Losses	151,930	155,812	159,235	162,919	166,718	170,356	174,194	177,968	181,794	185,655
Power Supply Margin (MW)	19,696	19,619	23,208	23,833	21,318	17,904	15,773	12,675	8,891	4,922
Power Supply Margin (%)	13.0%	12.6%	14.6%	14.6%	12.8%	10.5%	9.1%	7.1%	4.9%	2.7%

Scenario #3

Uncommitted Additions	0	0	0	0	0	0	0	0	0	0
Scheduled Maintenance	-3,779	-3,713	-3,635	-3,155	-3,415	-3,155	-3,155	-3,155	-3,155	-3,318
Forced Outages	-7,707	-7,714	-7,809	-7,853	-7,847	-7,847	-7,847	-7,847	-7,847	-7,834
Adjusted Generation Capacity	171,626	175,117	176,156	176,991	176,926	176,911	176,912	176,914	176,914	176,764
Demand Escalation (%)	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%
Escalated Demand + Losses	159,011	163,071	166,751	170,618	174,559	178,260	182,150	186,110	190,135	194,194
Power Supply Margin (MW)	12,615	12,046	9,405	6,373	2,367	-1,349	-5,238	-9,196	-13,221	-17,430
Power Supply Margin (%)	7.9%	7.4%	5.6%	3.7%	1.4%	-0.8%	-2.9%	-4.9%	-7.0%	-9.0%

Scenario #4

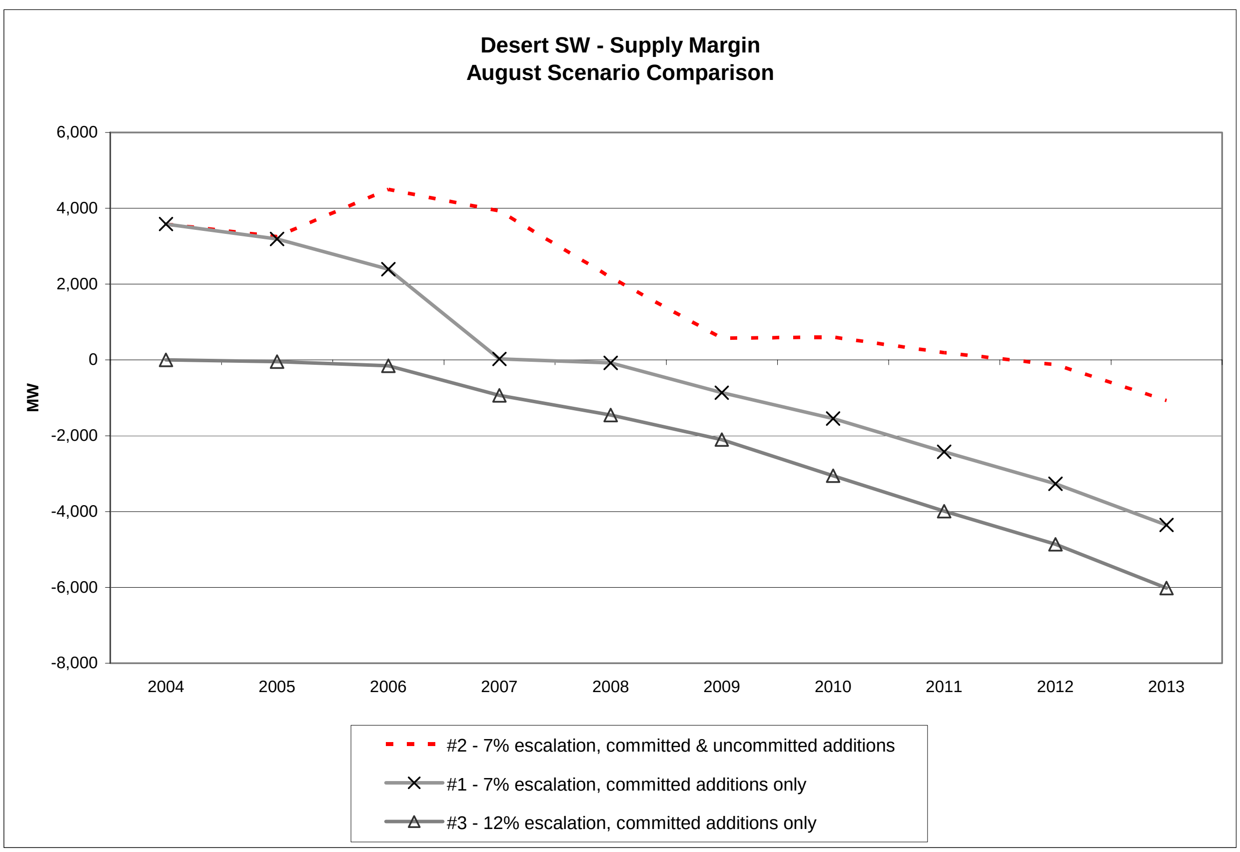
Uncommitted Additions	0	0	0	0	0	0	0	0	0	0
Scheduled Maintenance	-3,779	-3,713	-3,635	-3,155	-3,415	-3,155	-3,155	-3,155	-3,155	-3,318
Forced Outages	-7,707	-7,714	-7,809	-7,853	-7,847	-7,847	-7,847	-7,847	-7,847	-7,834
Adjusted Generation Capacity	171,626	175,117	176,156	176,991	176,926	176,911	176,912	176,914	176,914	176,764
Demand Escalation (%)	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Escalated Demand + Losses	163,256	167,480	171,131	175,119	179,173	182,976	186,970	191,045	195,181	199,352
Power Supply Margin (MW)	8,370	7,637	5,025	1,872	-2,247	-6,065	-10,058	-14,131	-18,267	-22,588
Power Supply Margin (%)	5.1%	4.6%	2.9%	1.1%	-1.3%	-3.3%	-5.4%	-7.4%	-9.4%	-11.3%

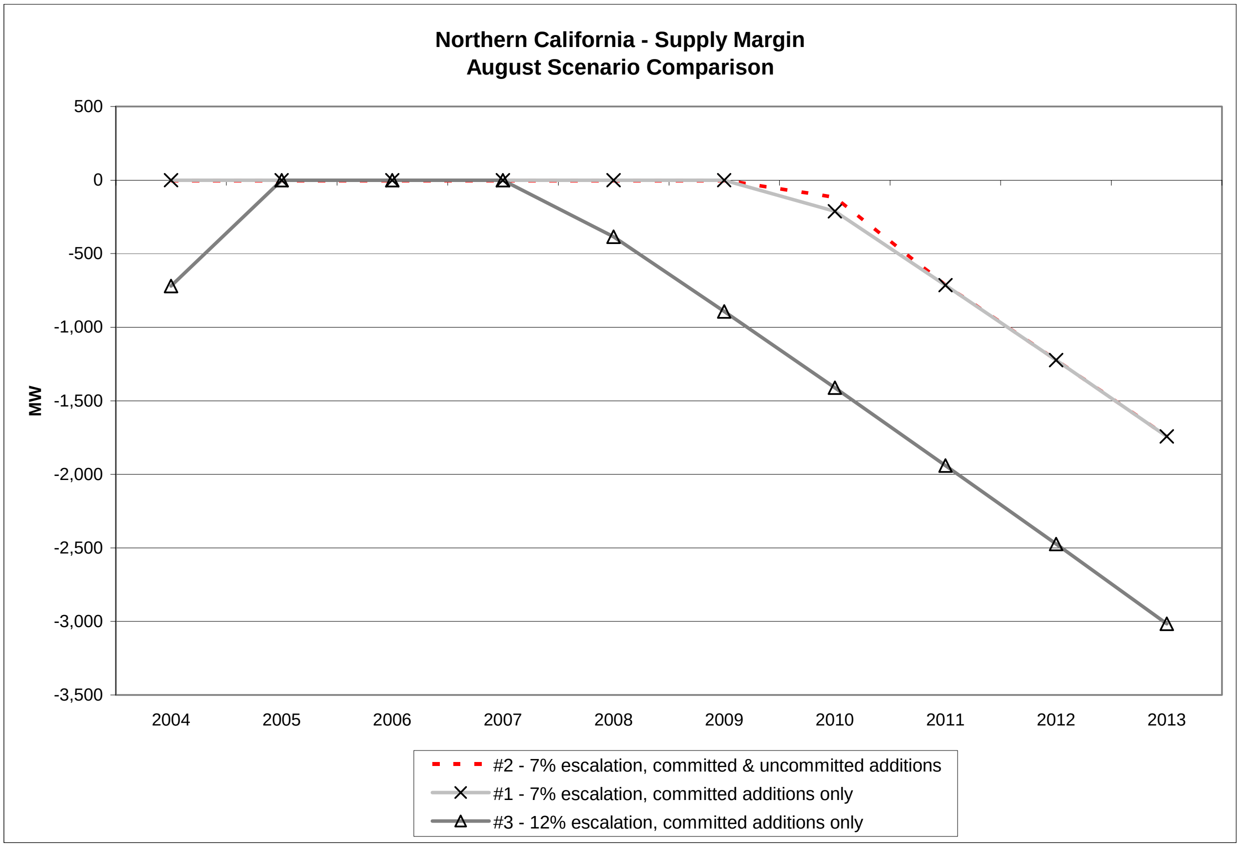
**Power Supply Margin is the available resource capacity in excess of the escalated demand, after resources are adjusted for outages

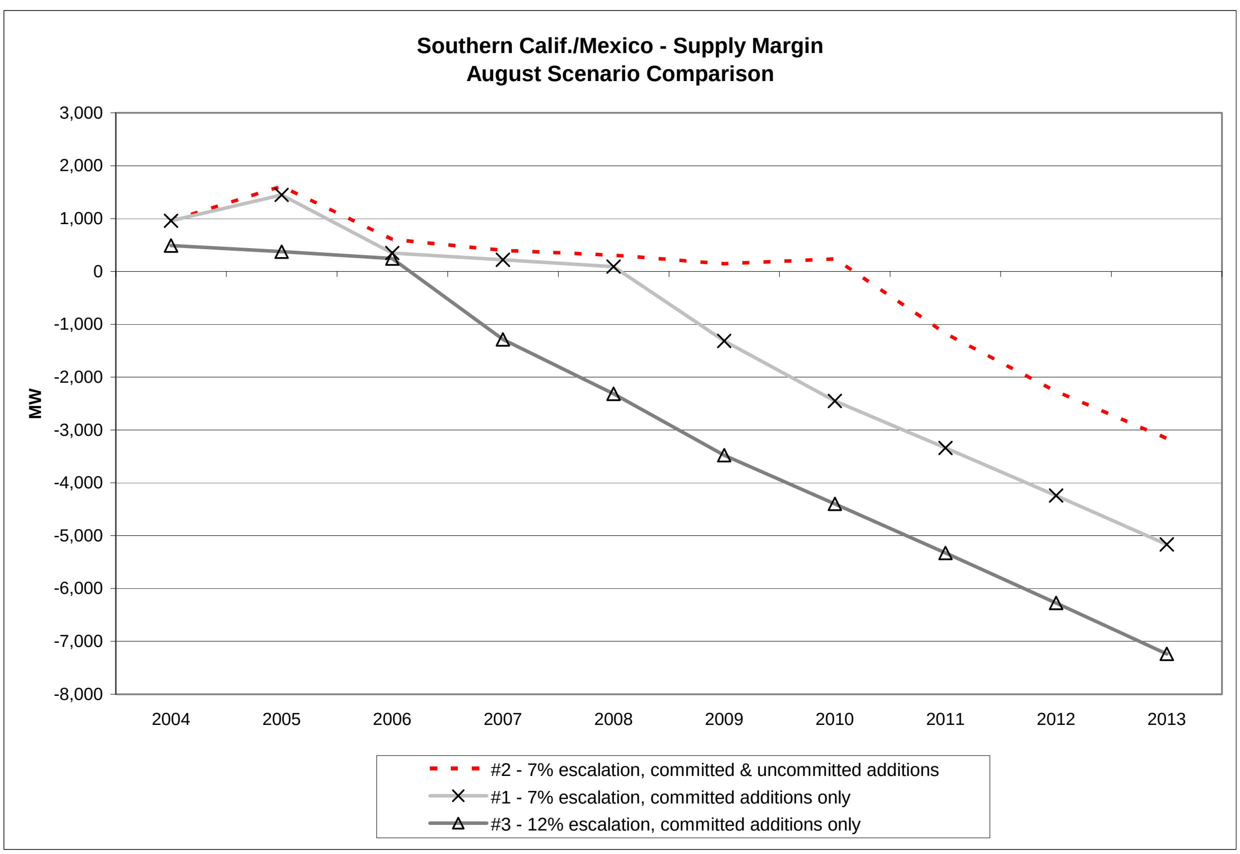
Summary of Adjustments (January)

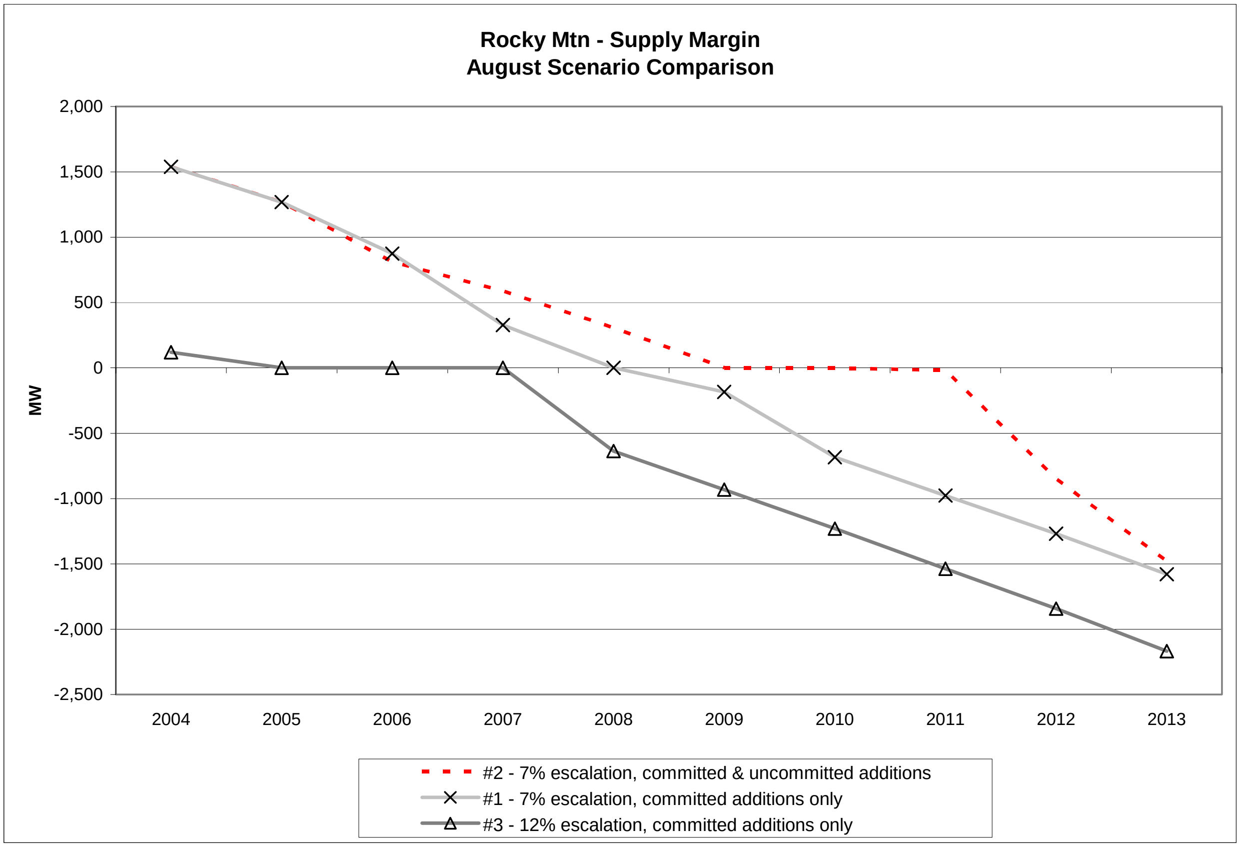
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Base Capacity (January)										
Total Unadjusted Committed Generation capacity	187,011	189,612	192,079	192,145	191,981	191,982	191,984	191,984	191,984	191,984
Fixed Adjustments	-293	150	150	150	150	150	150	150	150	150
Adverse Hydro Derate	-5,248	-5,266	-5,355	-5,305	-5,309	-5,309	-5,309	-5,299	-5,288	-5,288
Total De-rated Generation	181,470	184,496	186,874	186,990	186,822	186,823	186,825	186,835	186,846	186,846
Total Unadjusted Demand	124,684	127,639	130,453	133,284	135,972	138,776	141,633	144,415	147,255	148,149
Estimated Planning Margin (%)	45.5%	44.5%	43.3%	40.3%	37.4%	34.6%	31.9%	29.4%	26.9%	26.1%
(all values in megawatts unless otherwise designated)										
Scenario #6										
Uncommitted Additions	0	0	0	0	0	0	0	0	0	0
Scheduled Maintenance	-10,928	-10,386	-9,616	-10,060	-9,921	-10,199	-10,149	-10,207	-10,149	-10,226
Forced Outages	-6,905	-7,558	-7,764	-7,749	-7,749	-7,732	-7,735	-7,731	-7,733	-7,734
Adjusted Generation Capacity	163,637	166,552	169,494	169,181	169,152	168,892	168,941	168,897	168,964	168,886
Demand Escalation (%)	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Escalated Demand + Losses	134,002	137,146	140,149	143,177	146,059	149,068	152,163	155,205	158,323	159,243
Resource Margin (MW)	29,635	29,406	29,345	26,004	23,093	19,824	16,778	13,692	10,641	9,643
Resource Margin (%)	22.1%	21.4%	20.9%	18.2%	15.8%	13.3%	11.0%	8.8%	6.7%	6.1%

To address a recommendation from CREPC, the following six charts were added to compare the supply margins for scenarios #1, #2, and #3 at the area (or sub-region) level. It is important to note that when the supply margin for an area is zero (0), the area is in resource/demand balance, or else it is importing to meet its demand. At the point where the supply margin becomes negative, transmission constraints are preventing the area from importing additional capacity.

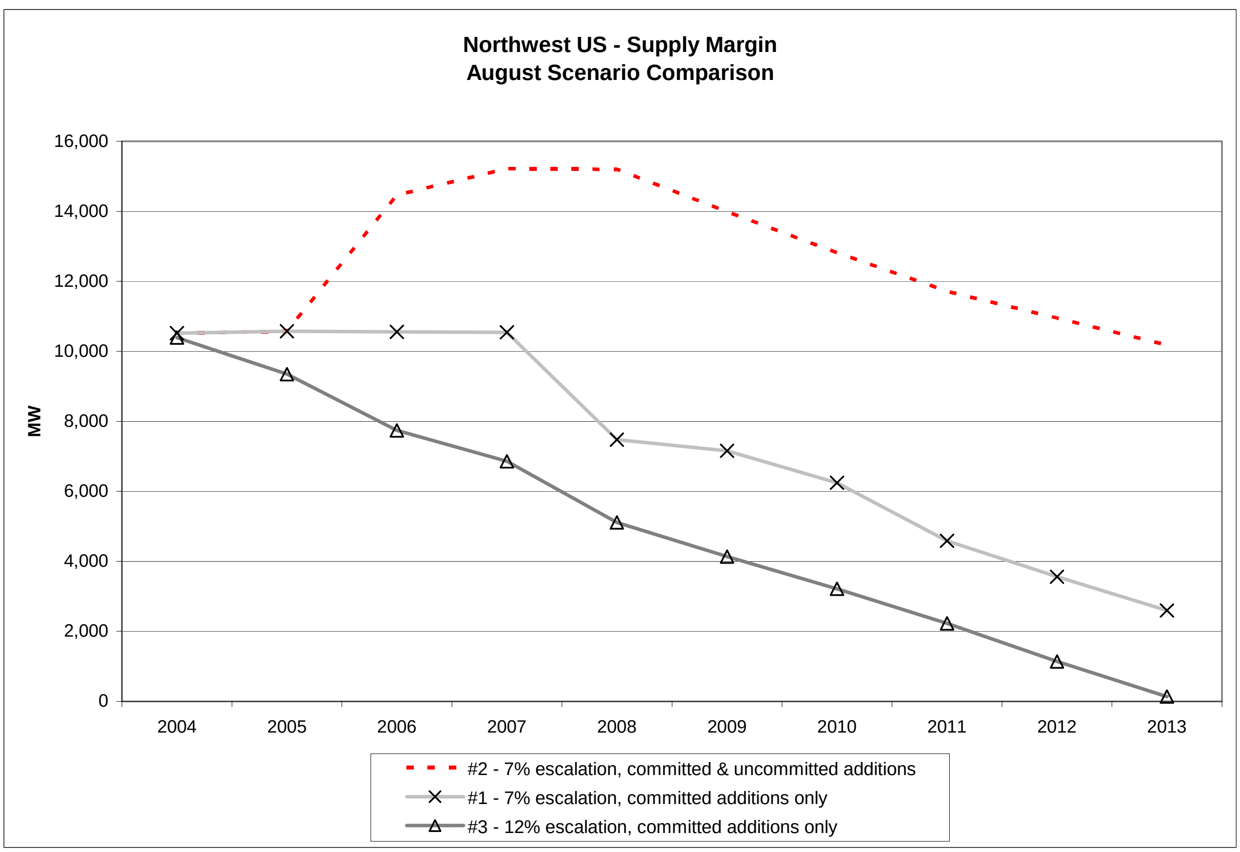



Northern California - Supply Margin
August Scenario Comparison
MW
500
0
-500
-1,000
-1,500
-2,000
-2,500
-3,000
-3,500
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
#2 - 7% escalation, committed & uncommitted additions
#1 - 7% escalation, committed additions only
#3 - 12% escalation, committed additions only

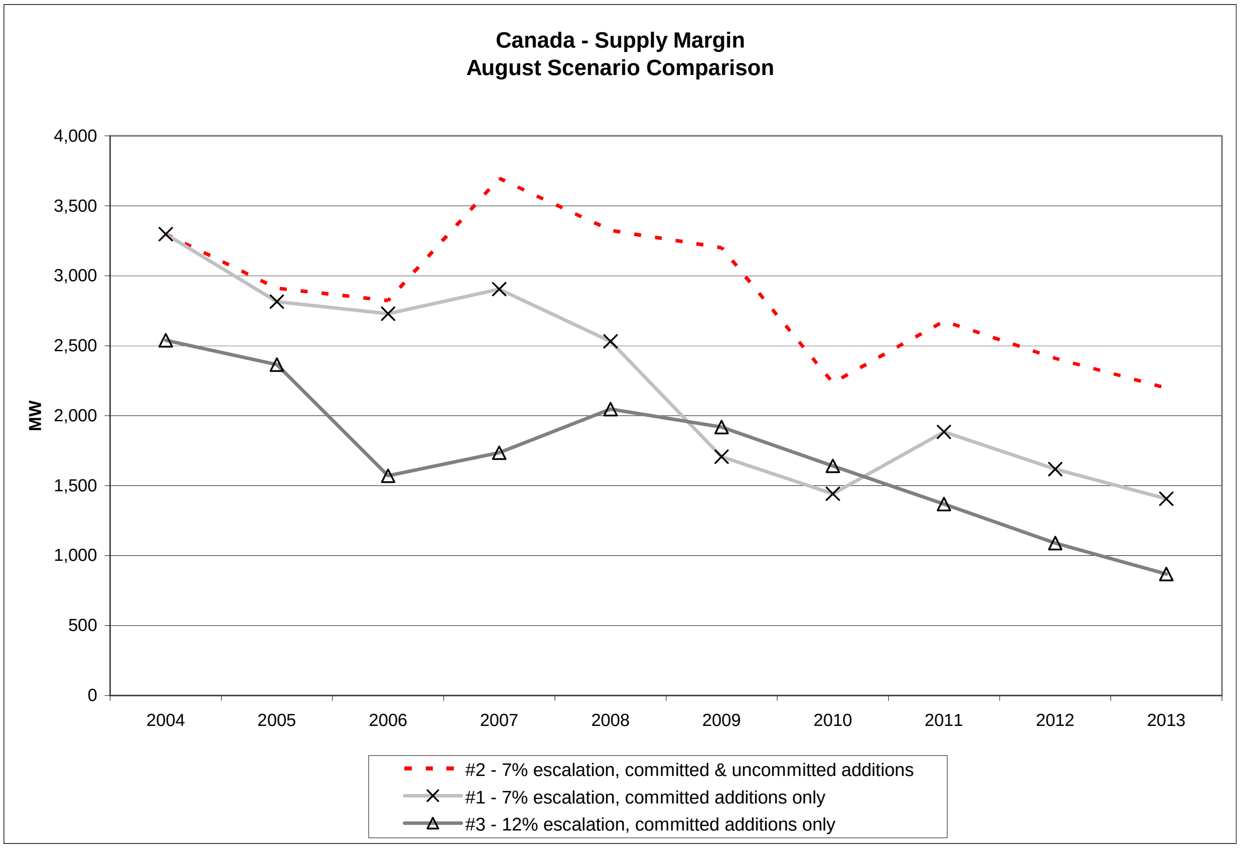

Southern Calif./Mexico - Supply Margin
August Scenario Comparison
MW
3,000
2,000
1,000
0
-1,000
-2,000
-3,000
-4,000
-5,000
-6,000
-7,000
-8,000
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
#2 - 7% escalation, committed & uncommitted additions
#1 - 7% escalation, committed additions only
#3 - 12% escalation, committed additions only



Rocky Mtn - Supply Margin
August Scenario Comparison
MW
2,000
1,500
1,000
500
0
-500
-1,000
-1,500
-2,000
-2,500
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
#2 - 7% escalation, committed & uncommitted additions
#1 - 7% escalation, committed additions only
#3 - 12% escalation, committed additions only



Northwest US - Supply Margin
August Scenario Comparison
MW
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
#2 - 7% escalation, committed & uncommitted additions
#1 - 7% escalation, committed additions only
#3 - 12% escalation, committed additions only



Canada - Supply Margin
August Scenario Comparison
MW
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
#2 - 7% escalation, committed & uncommitted additions
#1 - 7% escalation, committed additions only
#3 - 12% escalation, committed additions only

G. Description of Model

The "Supply Adequacy Model" (SAM) was developed by the CEC to study the balance between projected demands and resources in California and other WECC areas, taking into consideration transmission limitations between sub-areas. The model has the capability to perform either multiple-iteration probabilistic (stochastic) studies or single-iteration deterministic studies. Per instructions from the Reliability Subcommittee, all of the studies conducted for this report were deterministic. If probabilistic studies are requested in the future, it will be necessary to collect additional information.

For the purposes of this model, the WECC region is divided into the following sub-areas or zones. The zones are configured around demand centers and transmission hubs. Refer to the topology bubble diagram for connections between zones.

Alberta	California, SMUD	Nevada, North
Arizona	California, South	Nevada, South
British Columbia	CFE-Mexico	New Mexico
California, Central	COB	Northwest
California, IID	Colorado, East	Palo Verde
California, LADWP	Colorado, West	Utah
California, North	Four Corners	Wyoming
California, San Diego	Idaho	
Calif., San Francisco	Montana	

The COB, Four Corners, and Palo Verde zones have no load assigned to them.

The following acronym definitions apply to this report.

AZ-NM-SNV	Arizona – New Mexico – Southern Nevada
CA-MX	California – Mexico (CFE –WECC)
CFE	Comision Federal de Electricidad
CAISO	California Independent System Operator
COB	California Oregon Border
CREPC	Committee on Regional Electric Power Cooperation
IID	Imperial Irrigation District
LADWP	Los Angeles Department of Water and Power
MAPP	Mid-Continent Area Power Pool
NWPP	Northwest Power Pool
PSC	Public Service of Colorado
RMPA	Rocky Mountain (Colorado – Wyoming)
SMUD	Sacramento Municipal Utility District
SPP	Southwest Power Pool
WACM	WAPA – Colorado / Missouri
WALC	WAPA – Lower Colorado

Demands

Estimated monthly total (firm plus non-firm) peak demands for each SAM zone are included in the input data. These peak demands are derived from the peak demand forecasts that were submitted with the L&R data, and represent a 1-in-2 year probability forecast (50% probability of not being exceeded). The non-firm demands include interruptible and load management demands as reported with the L&R data.

The peak demand escalation was applied directly to the peak demand forecasts. For example, if the peak demand escalation for a summer scenario was 7%, the August peak demand forecast for each year was multiplied by a factor of 1.07. Peak demand escalation should not be confused with the load growth escalation that is already represented in the peak demand forecasts.

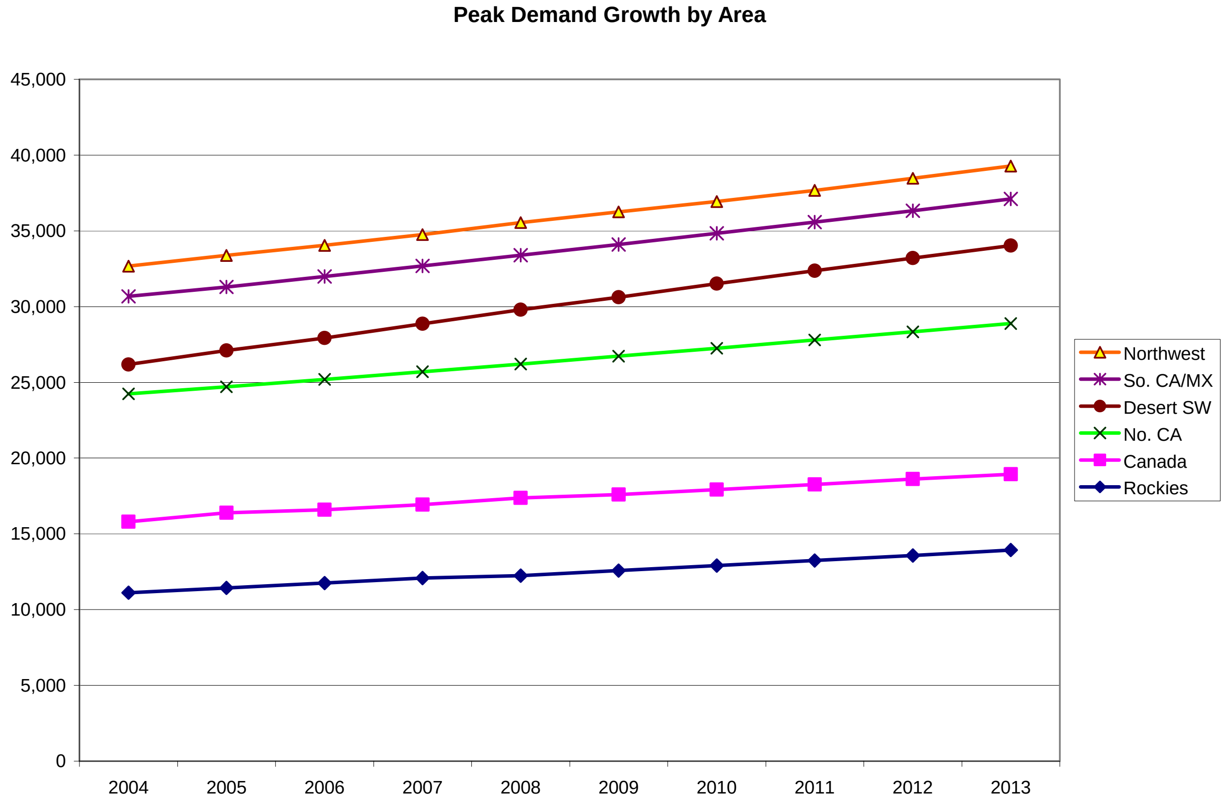
The current methodology assumes that every zone will experience its monthly peak demand at the same time. This non-coincidental approach has a tendency to overstate the peak demands where geographical and temperature diversity decrease the likelihood of simultaneous peaks across an area or region. Demand diversity may be accounted for in future assessments, provided that the necessary data can be gathered.

Where control areas spanned more than one zone, the demands were allocated by percentages (see details in Assumptions). The following table (Table #6) is an area summary of the forecast total (firm plus non-firm) August peak demands through 2013.

Table #6 - Total August Peak Demands by Sub-Region (MW)

Area	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Canada	15,793	16,395	16,599	16,934	17,375	17,588	17,920	18,253	18,620	18,938
Northwest	32,677	33,371	34,049	34,748	35,541	36,256	36,938	37,678	38,461	39,270
Rockies	11,111	11,431	11,753	12,082	12,250	12,577	12,902	13,244	13,577	13,937
No. CA	24,247	24,710	25,203	25,696	26,213	26,729	27,256	27,791	28,332	28,883
So. CA/MX	30,673	31,303	31,992	32,684	33,389	34,106	34,839	35,582	36,333	37,102
Desert SW	26,175	27,103	27,932	28,869	29,790	30,621	31,515	32,373	33,200	34,024
Total	140,676	144,313	147,528	151,013	154,558	157,877	161,369	164,921	168,523	172,154

Graph #7 – Peak Demand Growth



Resources

The resource data includes the existing generation units, the generation additions, the generation retirements, the scheduled maintenance, the inoperable generation, the forced outages, and miscellaneous deratings. The net resource capacities were summarized by zone and type (hydro or non-hydro) before being copied into the model. The detailed generation data are available in the WECC publication (*Existing Generation and Significant Additions and Changes to System Facilities 2003 – 2013*).

The tables below are a summary of the generation additions/retirements that became available or unavailable from 2004 through 2013 (months are inclusive). Committed generation is generation that is currently in start-up or under active construction. Uncommitted generation is generation that has not started construction. Although the plans could change, generation retirements were considered as committed, unless the associated (replacement) generation additions were uncommitted.

Table #7 - Generation Additions (committed and uncommitted) by Area (MW)							
Area	1/04-8/04	9/04-8/05	9/05-8/06	9/06-8/07	9/07-8/08	9/08-8/09	9/09->
Canada	24	593	205	739	4	2	500
Northwest	164	873	4,298	1,684	525	0	575
Rockies	650	0	274	0	0	0	750
No. Calif.	24	693	848	1,200	0	0	0
So. Calif./Mex	639	1,931	2,203	610	228	255	783
Desert SW	552	618	2,027	1,135	875	46	492
Total	2,053	4,708	9,855	5,368	1,632	303	3,100

Table #8 - Generation Retirements (committed and uncommitted) by Area (MW)							
Area	1/04-8/04	9/04-8/05	9/05-8/06	9/06-8/07	9/07-8/08	9/08-8/09	9/09->
Canada	0	0	0	0	0	0	0
Northwest	-64	0	-280	0	0	0	0
Rockies	0	0	0	0	0	0	0
No. Calif.	0	0	-163	-679	0	0	0
So. Calif./Mex	-702	-304	0	-600	0	-277	-358
Desert SW	-52	0	-1,580	-48	-48	-48	0
Total	-818	-304	-2,023	-1,327	-48	-325	-358

Table #9 - Net Generation Additions (committed and uncommitted) by Area (MW)							
Area	1/04-8/04	9/04-8/05	9/05-8/06	9/06-8/07	9/07-8/08	9/08-8/09	9/09->
Canada	24	593	205	739	4	2	500
Northwest	100	873	4,018	1,684	525	0	575
Rockies	650	0	274	0	0	0	750
No. Calif.	24	693	685	521	0	0	0
So. Calif./Mex	-63	1,627	2,203	10	228	-22	425
Desert SW	500	618	447	1,087	827	-2	492
Total	1,235	4,404	7,832	4,041	1,584	-22	2,742

Scenario #2 is the only study case that included the uncommitted generation additions and retirements in the resource capacity calculations. The following tables break out the generation additions that are uncommitted, or that have not started construction. These additions represent projects that are in various stages of planning and/or permitting, and generally have a higher likelihood of being canceled or postponed than projects that are actively under construction.

Table #10 - Uncommitted Generation Additions/Retirements by Area (MW)							
Area	1/04-8/04	9/04-8/05	9/05-8/06	9/06-8/07	9/07-8/08	9/08-8/09	9/09->
Canada	0	100	0	734	0	0	500
Northwest	0	9	3,773	1,150	0	0	0
Rockies	0	0	274	0	0	0	750
No. Calif.	0	0	252	521	0	0	0
So. Calif./Mex	0	176	559	0	228	255	425
Desert SW	0	60	1,700	734	667	-4	489
Total	0	345	6,558	3,139	895	251	2,164

Table #11 - Committed Net Generation Additions by Area (MW)							
Area	1/04-8/04	9/04-8/05	9/05-8/06	9/06-8/07	9/07-8/08	9/08-8/09	9/09->
Canada	24	493	205	5	4	2	0
Northwest	100	864	245	534	525	0	575
Rockies	650	0	0	0	0	0	0
No. Calif.	24	693	433	0	0	0	0
So. Calif./Mex	-63	1,451	1,644	10	0	-277	0
Desert SW	500	558	-1,253	353	160	2	3
Total	1,235	4,059	1,274	902	689	-273	578

In table #11, the negative committed net generation addition for the Desert SW in early 2006 is due to the planned retirement of the Mohave Generating plant (see table #8). Although Mohave is sited in southern Nevada, 66% of its output is owned by utilities in southern California.

Scheduled maintenance and inoperable generation as reported in the L&R data were included as indicated in the studies. The majority of the August outages are scheduled for generation in Alberta and British Columbia. Other areas try to have all their units available for the summer peak. The generation owners in the summer peaking zones usually schedule their maintenance in the fall or spring.

Resource Adjustments - Hydro

In addition to the individual hydro generation capacities (seasonal median output) submitted with the L&R data, aggregate hydro capacities to reflect adverse water conditions are provided by the WECC control areas. The differences in total capacity represent the hydro capacity de-rates for each control area. The following tables present the hydro de-rates by sub-region for January and August.

Table #12 – January Hydro De-rates by Area (MW)

Sub-Region	2005	2006	2007	2008	2009	2010	2011
Canada	1,498	1,539	1,662	1,665	1,669	1,669	1,669
Northwest	2,632	2,619	2,586	2,534	2,534	2,534	2,534
Rockies	123	123	123	123	123	123	123
No. Calif.	685	685	685	685	685	685	685
So. Cal./Mexico	318	317	316	315	315	315	315
Desert SW	0	0	0	0		0	0
Total WECC	5,256	5,283	5,372	5,322	5,326	5,326	5,326

Table #13 – August Hydro De-rates by Area (MW)

Sub-Region	2004	2005	2006	2007	2008	2009	2010
Canada	406	429	552	555	559	561	561
Northwest	3574	3562	3529	3500	3500	3500	3500
Rockies	3	3	3	3	3	3	3
No. Calif.	0	0	0	0	0	0	0
So. Cal./Mexico	165	157	156	155	154	154	154
Desert SW	0	0	0	0	0	0	0
Total WECC	4,148	4,151	4,273	4,242	4,216	4,218	4,218

The hydro generation unit capabilities submitted by the CAISO were generally nameplate capabilities. These were reduced to nominal levels in accordance with data found in the CAISO seasonal assessments.

Resource Adjustments – Non-hydro

The non-hydro generation capacities were de-rated in all of the scenarios to model forced outages. An 8% de-rate was applied to the zones associated with the CAISO and LADWP due to a high proportion of older thermal units and stringent environmental levels. In all of the other zones the seasonal non-hydro capacities were reduced by 5%. This 3% differential is supported by historical Loads and Resources data for actual year forced outage capabilities. As more of the older plants are retired in California, the forced outage rate will likely be decreased.

Wind De-rates

The generation capacity of wind powered resources is unpredictable, especially for the monthly peak hour. WECC has not developed a standard de-rate and generally accepts the capacity values provided by each control area. The reported capabilities vary between a 30% de-rate and a 100% de-rate from the installed/nameplate capacities. For WECC overall, the summer de-rate is approximately 86% and the winter de-rate is approximately 77%. The wind capabilities are also subject to the specified non-hydro forced outage rates for each zone.

Transfer Paths

The transfer paths used by the program are based on the SAM zones, with paths connecting one SAM zone to another SAM zone where applicable. The model has data fields for the path, transfer capability, wheeling cost, and loss factor. The wheeling costs for each path are used to calculate the transfer costs for any imports into a zone. The loss factors are used to calculate the net transfer after losses for any imports into a zone.

A request was sent out to a key control area in each zone to provide information on the transfer capabilities between zones. The responses were used to update the capabilities in the model based on the values provided. If the responses conflicted, the RS determined appropriate values.

Solution

Microsoft Solver, a third-party tool included with Excel for solving constraint-based problems, is used to solve the demand/resource balance and calculate the surplus generation in each zone. The solution seeks the lowest overall resource cost subject to the following constraints:

- the demand requirements of each zone must be met (surplus >= 0); but it's possible for a zone to be deficit before solver starts
- the resource solution for each zone must be equal to or greater than zero
- the resource solution for each zone must not be greater than the available resources
- the resource solution for each zone must not be less than the minimum resource allocation

The solution uses transfers between zones to export resources from surplus zones to deficit zones. If a deficit is greater than the available transfer capability from the connected zones, then the zone will have a net deficit. The solution will also back off internal generation in a zone if a connecting zone has a surplus that is less expensive and the transfer path has available capability. Lower cost resources such as hydro resources are given priority within a zone and as imports, to serve local load and to displace more expensive generation.

The assessment model is designed to measure the supply/demand margins based on forecasts of peak demands and resources. While peak demand forecasts for several years into the future are readily available from the WECC control areas, the forecasts of resource additions only exist for a few years into the future. Therefore, the validity of the results decreases the further out one looks. The assessment results for the period beyond 2006 or 2007 are not a realistic picture of future supply margins. The addition of generation plants that are not accounted for in the current data should be expected. There is a point where the results shift from a determination of supply margin to a determination of future needs.

H. Application Summary

The SAM program uses an iterative methodology to determine the supply/demand margin. By design it isn't intended to perform a sophisticated engineering analysis. The solver add-in attempts to find a solution where resources and imports satisfy the demand requirements in each zone. The stochastic solutions model the system uncertainties based on historical demand and outage factors. The deterministic solutions simply compare total resources to total demands without modeling the uncertainties. For these studies, surplus is defined by the following formula.

Surplus = Internal Resources (adjusted) + Imports - Demand (adjusted) - Exports

While the model does consider transfer capabilities between zones, it is not designed to perform any sophisticated analysis of transfer limitations involving simultaneous flows or loop flows.

WECC Workarounds / Enhancements

WECC has implemented workarounds and enhancements to address problems with using the WECC L&R data in SAM, and problems with external resources and the posting of summary results. An intermediate spreadsheet was developed that reads the L&R data from the standard WECC data files and aggregates the demands and resources by SAM zone.

A workaround to account for external resources was developed to force the transfer of some jointly owned generation (such as Palo Verde, Colstrip, and others) from the host zones to the appropriate participants' zones.

An enhancement to account for changes to transfer path capacities was also added.

Assumptions

The following assumptions were used for the WECC studies:

- The input data represents demand forecasts and resource plans as of April 2004.
- Non-coincidental demands were used such that the monthly peak zonal demands are the sum of the control area peak demands for each zone.
- August data was used for the summer peak period for each year. January data was used for the winter peak period.
- This assessment assumes that the demand for a given zone is the sum of the control area customer demands within that zone. This differs from the "load requirement" concept where the load that must be served is the customer demand plus the firm exports. Under most circumstances, the application of "forced transfers" to accommodate firm exports would tend to undermine the model solution.
- Peak demands for CISO, PSC, WACM, and WALC were allocated to SAM zones based on the following ratios reported by the PCC representatives as part of their semi-annual review.

Table #14 - Percent of Control Area Demand Allocated to Zones

Zones \ Control Area	CISO	PACE	PSC	WACM	WALC
Arizona					72%
Colorado, East			88%	50%	
Colorado, West			12%	28%	
Idaho		8.2%			
New Mexico					28%
Utah		77.3%			
Wyoming		14.5%		22%	
California, North	39.4%				
California, Central	6.5%				
California, South	43.0%				
California, San Diego	8.6%				
California, San Fran.	2.5%				

- Since insufficient data were available for a detailed economic solution, the summary resources in each zone were all assigned the same costs (Hydro = $5/MWH, Non-hydro = $20/MWH), with the exception of Palo Verde ($15/MWH).
- The adjustments (forced transfers) for external generation that were used in the studies were for Bridger, Colstrip, Craig, Four Corners, Hayden, Hoover, Intermountain, Mohave, Navajo, Palo Verde, San Juan, and San Onofre. No other adjustments were made for other joint plants or firm purchases.
- Except for the 150 MW contractual import into New Mexico from SPP, ties to MAPP and SPP are not modeled since this would require generation and/or demand to be associated with these external areas. Additional long term contracts that result in consistent imports or exports could be represented in the model if the Reliability Subcommittee determines that this is appropriate.
- The model freely transfers resources from areas with surplus generation to deficit areas, considering transfer path constraints and transmission losses. Simultaneous flows, loop flows, and other transfer restrictions are approximated by the restricted transfer limits that were used in the studies.
- The model is not intended to measure the supply margins in the individual control areas (unless the zone definition and transfer capabilities exactly match the control area). The model assumes that there are no constraints internal to a zone.

I. Observations

1. Using non-coincidental demands tends to overstate the simultaneous demand. Preliminary studies indicate that the simultaneous combined peak demand for WECC has a variance of 1% to 3%, compared to the non-simultaneous demand.
2. Surplus generation in the Pacific Northwest was often stranded due to transmission limitations (see Bubble Diagram #3 on page 33 for constraint points). The accuracy of the stranded surplus is uncertain, in light of the complicated hydro restrictions that apply to the northwest. For example, in the spring and early summer hydro flows are increased to

simulate to some degree natural spring runoff for fish migration. The goal of filling the reservoirs for summer recreation use and winter power generation is often unrealized.

3. There were cases where surplus resources were available, but transfer path limitations prevented the surplus from reaching the areas with deficits. Whenever an individual zone became deficit while the Interconnection overall had a surplus (sum of zonal surpluses/deficits were greater than zero), there were one or more transfer path limitations between the surplus area(s) and the deficit area(s). The predominant locations of these constraints are shown in Bubble Diagram #3 on page 33.
4. The assessment results for the period beyond 2006 do not represent a realistic picture of future power supply margins, but do represent a picture of future resource needs for the given load forecast and transmission system. The addition of generation plants that are not accounted for in the current data should be expected. There is a point where the results shift from a determination of supply margin to a determination of future needs.
5. The model assumes an idealistic efficiency where resources and transmission become immediately available as necessary to meet demand requirements. Economical system operation and other conditions could adversely affect the availability of resources, and could impact the amount and timing of power supply deficiencies.
6. The most common approaches for resolving power supply deficiencies are the addition of generating capacity or the addition of transmission capability. Given the projected rate of load growth and the difficulties in financing and siting transmission lines, it may be more practical to add generation capacity in the areas that are anticipating supply deficits.

J. Conclusions

The results shown in Table #1 identify the years in which deficiencies occur for each of the five scenarios. Without adequacy criteria, no conclusions regarding adequacy can be made.

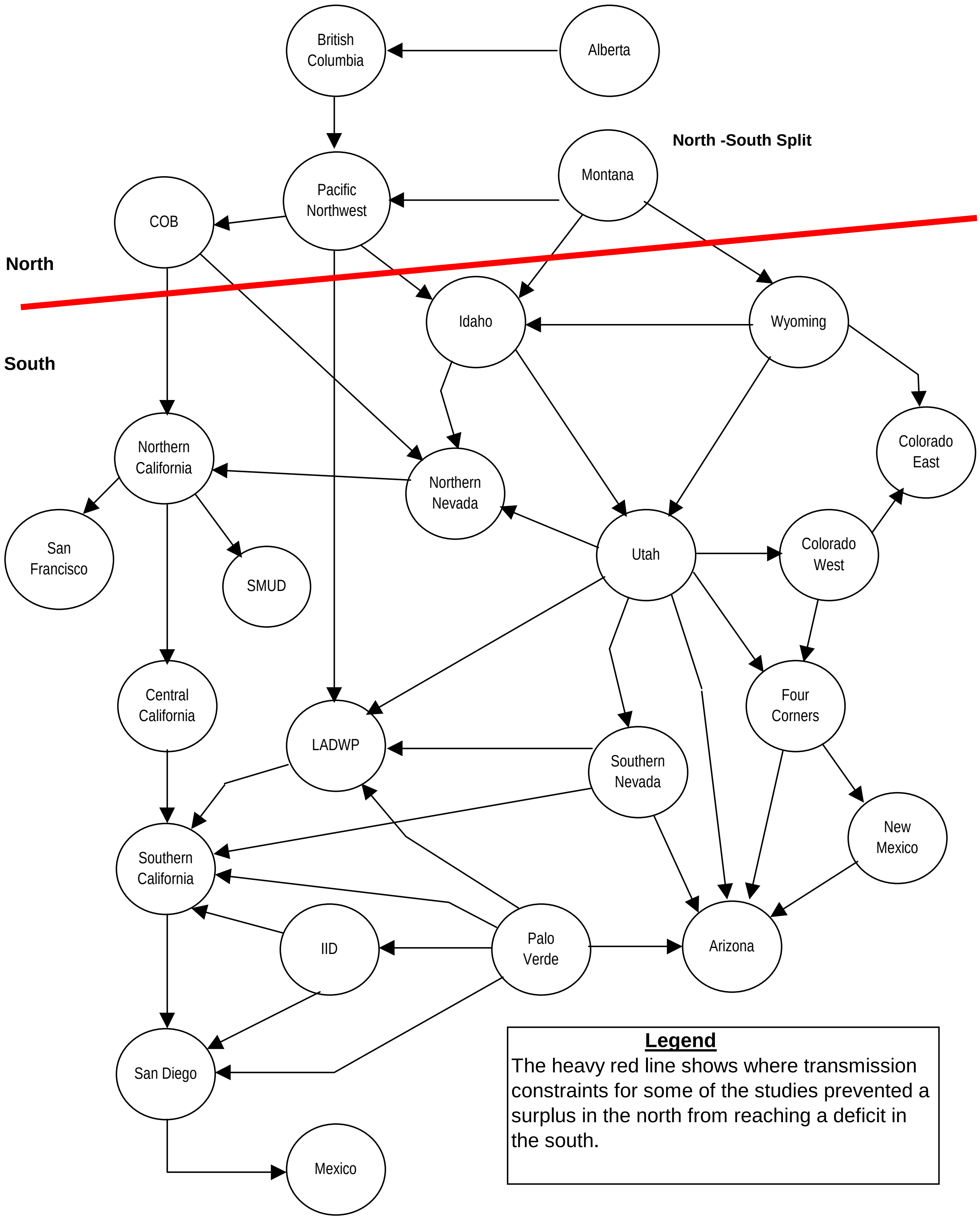
The results of scenario #1 do not indicate any deficiencies in meeting the August peak demand requirements for the near term (2005 – 2007), in WECC, subject to the assumptions and adjustments identified in the previous sections of the report. In order to meet the projected demand growth after 2007, additional resources (including the uncommitted additions already identified) will be needed in the Desert Southwest, Rockies, and Southern California/Mexico areas, and in the Utah zone of the Northwest area.

The other summer scenarios provide a sensitivity analysis to changes in the defined parameters. The inclusion of the uncommitted resource additions in scenario #2 essentially postpones the deficiencies for two to four years, except for Northern California. Increasing the peak demand escalation in scenarios #3 and #4 accelerates the years that the deficiencies occur.

Based on the concern raised by the CEC and referenced in the Executive Summary, the results for Northern and Southern California may be derived from data that is already outdated. Both areas are subject to generation retirements that may not be wholly reflected in this assessment, as the scheduling of these retirements is an ongoing process. As data regarding future retirements are reported, they will be incorporated into future assessments.

Although there continues to be a concern regarding the valuation of hydro capacity in the Northwest, the assessment results for the January case (scenario #6) show no deficiencies until 2011 or 2012.

Bubble Diagram #3 – Constrained Paths (Summer)



Legend

The heavy red line shows where transmission constraints for some of the studies prevented a surplus in the north from reaching a deficit in the south.

Attachment 1

WESTERN ELECTRICITY COORDINATING COUNCIL

POWER SUPPLY ASSESSMENT POLICY

INTRODUCTION

The Western Electricity 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.

The Planning Coordination Committee assigned the Reliability Subcommittee the task of developing an Adequacy of Supply Assessment Methodology. This document establishes the policy for conducting power supply assessments using the methodology developed by the Reliability Subcommittee. This policy shall be periodically reviewed and revised as experience indicates.

PURPOSE OF POWER SUPPLY ASSESSMENT

To ensure the reliability of the interconnected bulk electric system, it is necessary to assess both the security and the adequacy of the overall Western Interconnection. This document is focused on the portion of the assessment dealing with the adequacy of power supply. As electric industry restructuring has begun to break apart the traditional model of the vertically integrated utility, the responsibility for maintaining the adequacy of the power supply is moving toward market mechanisms. Though there may not be specific entities entrusted to plan for adequate resources, there exists a need to assess whether projected resources will be sufficient to reliably meet demand. Such information will allow regulators and policy makers to anticipate potential shortfalls so that determinations can be made as to whether impediments or insufficient incentives exist in the market.

It is not the intent of an adequacy assessment to replace the market, create sanctionable criteria or anticipate future energy prices. Its purpose is to project whether enough resources exist, at any price, to meet load and possible reserves while considering the transmission transfer capabilities of major paths. Such an assessment is required to comply with the NERC Planning Standards. These standards require that each region perform a regional assessment of existing and planned (forecast) adequacy of the bulk electric system.

It is recognized that it is impossible to provide 100% adequacy of power supply. It is the purpose of this document to establish a uniform policy for assessing the adequacy of installed and planned resources within the WECC region for the purposes of reporting within the Council, and to outside agencies. The assessments shall cover a period encompassing the next 5 years.

Attachment 1

ASSESSMENT METHODOLOGY

The Power Supply Assessment Methodology shall be developed and maintained by the Reliability Subcommittee. Adequacy of supply may be defined and measured in terms of generating reserve margins and transmission limitations between load and resource areas and/or based on probabilistic methods. Appropriate technical tools shall be developed and utilized in conducting the assessments. The assessments shall account for diversity of load and generation, and account for transmission constraints between load and resource areas.

DATA REQUIREMENTS

To aid WECC in assessing resource adequacy, the following information shall be provided by the WECC member systems:

Load Forecasts

- Electricity demand and energy forecasts, including uncertainties
    - Variations due to weather
    - Variations due to other factors affecting forecasts

Demand Side Management (DSM) Programs

- Existing and planned demand-side management programs
    - Direct controlled interruptible loads
    - Aggregate effects of multiple DSM programs

Resource Information

- Supply-side resource characteristics, including uncertainties
    - Consistent generator unit ratings, including seasonal variations and environmental considerations affecting hydro and thermal units
    - Availability of generating units
    - Fuel type

Transmission Information

- Capabilities, availability of transmission capacity, and other uncertainties

Attachment 1

REPORTING OF POWER SUPPLY ADEQUACY

The assessment of generating reserve margins and transmission limitations between load and resource areas as well as probabilities of supplying expected load levels, accounting for uncertainties, shall be developed and the results reported on a seasonal basis. The assessment shall be consistent with the requirement for maintaining operating reserves as defined in the *WECC Minimum Operating Reliability Criteria* and NERC Operating Policies.

Approved by Reliability Subcommittee June 16, 2000
Approved by Planning Coordination Committee June 30, 2000
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