CALIFORNIA ISO

California Independent
System Operator

California ISO

Five-Year Assessment

(2004-2008)

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Operations Engineering
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I. Introduction

This report is the first Five Year Assessment published by the California Independent System Operator (ISO). Since the California Energy Crisis of 2000-01, the ISO has regularly developed a forecasted mix of Loads, Resources, and Transmission in the ISO Control Area for the near-term season. In addition, the ISO has collaborated with State, Federal, and other agencies to help California plan to meet future electricity needs and to avoid future shortages such as those that the ISO experienced in 2001. While contributing in these processes, the ISO has received many requests to provide a long-term assessment of electricity needs in the ISO Control Area. This Five-Year Assessment provides a baseline forecast of ISO electricity needs and evaluates potentially adverse conditions, and additional risks and sensitivities.

This Five Year Assessment provides valuable input for the ISO's contribution in a variety of reliability-related forums concerning operations, grid planning, and transmission maintenance. The ISO shares in and coordinates the annual Grid Planning process with the ISO's Participating Transmission Owners. The ISO contributes to the SEAMS Steering Group Western Interconnection, planning towards a seamless regional transmission system. The ISO also supports the development of a statewide resource adequacy policy that assures sufficient supply of electricity (generation and import commitments) and transmission is in place to continually meet all electricity demands. The ISO has provided recommendations to the California Public Utilities Commission (CPUC) for developing a formal long-term and short-term electric resource (generation, transmission, and demand-side) planning process (Docket No. R.01-10-024.). The ISO has also provided input to the California Energy Commission's Integrated Energy Policy Report (IEPR), which identifies historic and current energy trends, forecasts and analyzes potential future energy developments, and recommends new policies for current and pressing energy issues facing the State.

II. Executive Summary

This report provides a five-year assessment of Loads, Resources, and Transmission in the California Independent System Operator (ISO) Control Area for the summer and winter seasonal peaks forecasted for the years 2004 through 2008. Much of the information provided in this assessment will change over time, and the values reported represent the best knowledge available to the ISO at the time of this report's publication.

The resource forecast in this report assumes availability of existing resources will be similar to historical patterns unless changes in supply have been reported to the ISO. This assessment also estimates anticipated changes in resource levels due to new and retired generation[1], and changes in import levels as a result of new out of state generation and known transmission expansion projects.

This Assessment anticipates that adequate supply will most likely be available to meet the peak demands for the next five years, based upon a comparison of base resource capacity and forecasted base peak demand. The base forecast represents the most likely economic growth rate and average temperatures. Because the independent factors that affect economic growth, temperatures, and resource availability can vary widely, the ISO has developed a range with an upper and lower boundary at which actual seasonal peaks are reasonably expected to fall (the base forecast falls within this range). The ISO has also analyzed resource availability under a set of adverse conditions. The ISO is concerned that reserve shortages could return as early as Summer 2004 under a scenario of high demand and adverse available capacity [2] (See Figure 1). For example, this condition could exist if the ISO Control Area were to experience "1998" temperatures combined with "year 2000" California economic growth conditions. Alternatively, reserve shortages could occur under moderate demand levels coupled with excessive/major generation or transmission outages. Increased energy conservation and/or new transmission and generation construction can help to alleviate the ISO's exposure to potential reserve shortages.

Figure 1 summarizes forecasted supply and demand conditions for both adverse and base (normal) summer conditions for the years 2004 through 2008.

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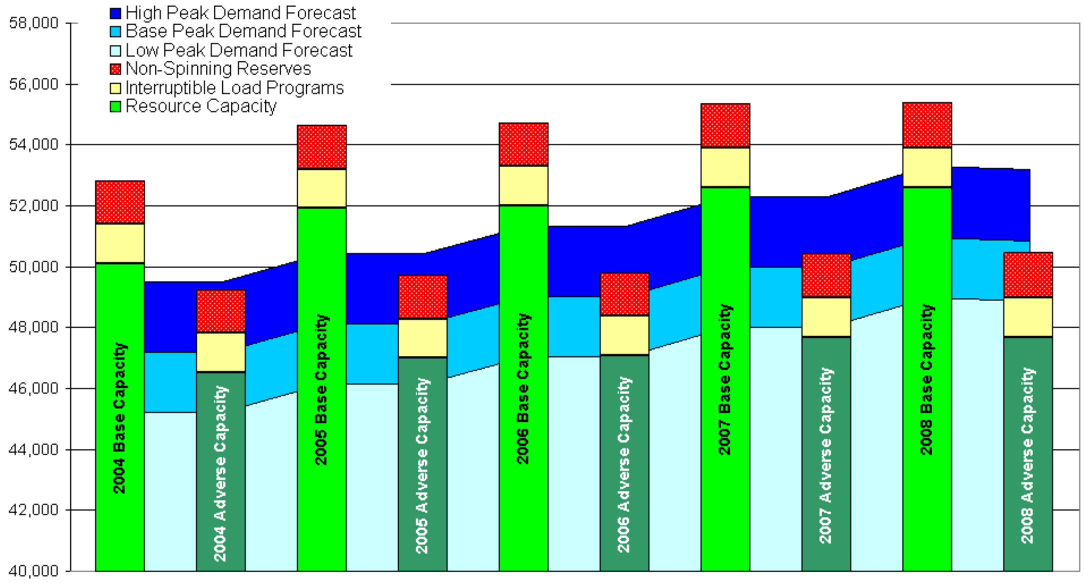
[1] There is currently over 5,500 MW of new generation projects that have applied to the California Energy Commission (CEC) for certification. However, often projects that have applied for certification are not built due to changes in available financing, environmental impacts, and transmission accessibility. For the purpose of this report, new generation is only considered if it has started construction.

[2] Shortages challenge the ISO's ability to operate a reliable transmission grid and Control Area. In the event of a resource deficiency, the ISO implements its emergency mitigation measures. These emergency mitigation measures include calling on interruptible load customers to curtail their electric usage. The last measure taken prior to interrupting firm load is to convert Non-Spinning Reserve to energy. Both of these are short-term temporary measures, lasting on the order of minutes to hours.

Figure 1
ISO Control Area Capacity Outlook
2004 to 2008 Summer Peaks



Peak Demand Forecast: Three scenarios were analyzed to develop a range for the ISO's five-year forecast of summer and winter peak demands. The forecasted range is based on preliminary economic indicators (released in June 2003), historical peak temperatures, and other demographic census data.

Base Capacity Scenario: Assumes average historical capacity levels (further detailed in Section III, Table 1).

Adverse Capacity Scenario: Assumes higher than average outages, low import levels (for example, due to low hydro conditions in the Northwest), no capacity reductions from Participating Loads, and unavailability of 1,037 MW of generation due to increasingly restrictive air quality standards.

The adverse scenario discussed above is based on a series of known adverse conditions. Beyond the adverse conditions shown, the ISO Operations faces additional exposures to resource shortages, including: further generation retirements, natural gas shortages, or extended gas pipeline outages. More than 3,870 MW of thermal generation is potentially at risk of retiring over the next several years. These Generating Units are over 40 years old, have high heat rates, and ran less than 40% of the time last year. Additionally, 56% of the capacity in the ISO Control Area runs on natural gas. Natural gas shortages have occurred in the past under conditions of high demand coupled with low gas storage and low hydro availability. In addition, gas-fired Generating Units may be exposed to potential future gas line outages as the gas utilities adhere to Federal Bill HR3609, issued at the beginning of 2003, that requires inspection and repair of all critical gas pipelines over a 10-year period.

Over the next five years there will be a continuing need for additional transmission capacity expansions to increase import levels, support new generation, and mitigate congestion. Four notable transmission projects anticipated in the coming years include: a new 500/230 kV transformer bank at Miguel Substation that is projected to be complete by January 2005 and is estimated to increase import capabilities from Mexico by approximately 300 MW; a new SDG&E 230 kV line between Miguel and Mission substations that is projected to be complete prior to the summer of 2006 and is estimated to increase import capabilities from Mexico by an additional 260 MW; the addition of a third 500 kV line at Path 15 is anticipated for late 2004; and the Jefferson-Martin 230 kV transmission project (proposed for 2005) is expected to increase imports into the San Francisco Peninsula area. Other mitigation plans under review for local areas of congestion include re-conductoring of 115 kV lines in the vicinity of Rio Oso, and both Moss Landing-Metcalf 230 kV lines.

Until implementation of a new market mechanism, mitigation of inter- and intra-zonal congestion will continue to be handled in real time. The most significant congestion continues to be caused by the Mexican generation connected at Imperial Valley substation, where congestion charges roughly average $88,000 per day.

Other transmission constraints that often require flow mitigation actions include the Southwest Power Link (SWPL), Path 26, South of Lugo, the total Southern California Import Transmission (SCIT), and the California-Oregon Intertie (COI). Various transmission system improvements are approved or underway to reduce the amount of inter and intra-zonal congestion, and to mitigate various local area constraints.

III. ISO Control Area Peak Load and Resource Forecast 5-Year Summary

Table 1
ISO Control Area Capacity Outlook
2004 to 2008 Summer Peaks

	(MW)	Summer 2004	Winter 2004-2005	Summer 2005	Winter 2005-2006	Summer 2006	Winter 2005-2006	Summer 2007	Winter 2007-2008	Summer 2008	Winter 2008-2009
1	Forecasted Peak Demand - (Base Case)	44,380	33,179	45,253	33,906	46,144	34,649	47,052	35,408	47,978	36,184
2	Operating Reserve Requirement	2,797	1,992	2,855	2,040	2,860	2,035	2,920	2,085	2,981	2,137
3	Estimated Control Area Capacity Requirement	47,177	35,171	48,108	35,946	49,004	36,684	49,972	37,493	50,959	38,321
	ISO Control Area Generation Resources										
4	Maximum Net Dependable Capacity of Participating Thermal Units	34,682	34,682	34,682	34,682	34,682	34,682	34,682	34,682	34,682	34,682
5	Maximum Capacity of Non-Participating Thermal Units	8,593	8,593	8,593	8,593	8,593	8,593	8,593	8,593	8,593	8,593
6	Maximum Capacity of Solar Units	466	466	466	466	466	466	466	466	466	466
7	Maximum Net Dependable Capacity of Pump Storage Units	2,734	2,734	2,734	2,734	2,734	2,734	2,734	2,734	2,734	2,734
8	Maximum Capacity of Hydro Units	8,507	8,507	8,507	8,507	8,507	8,507	8,507	8,507	8,507	8,507
9	Maximum Capacity of Wind Units	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820
10	Accumulative New Generation Capacity Under Construction (after August 29, 2003)	110	1,007	1,607	1,607	1,607	1,607	2,222	2,222	2,222	2,222
11	**Total ISO Control Area Generation Resources**	**56,912**	**57,809**	**58,409**	**58,409**	**58,409**	**58,409**	**59,024**	**59,024**	**59,024**	**59,024**
12	Net Dynamic Schedules into the ISO Control Area	1,312	1,312	1,312	2,007	2,007	2,007	2,007	2,007	2,007	2,007
13	**Total Generator Capacity including Dynamic Schedules**	**58,224**	**59,121**	**59,721**	**60,416**	**60,416**	**60,416**	**61,031**	**61,031**	**61,031**	**61,031**
	ISO Control Area Generation Base Capacity De-Rates										
14	Scheduled/Forced Outages Participating Thermal, Pumped Storage, Dynamics	(3,500)	(8,500)	(3,500)	(8,500)	(3,500)	(8,500)	(3,500)	(8,500)	(3,500)	(8,500)
15	Estimated Non-Participating Thermal	(4,600)	(4,600)	(4,600)	(4,600)	(4,600)	(4,600)	(4,600)	(4,600)	(4,600)	(4,600)
16	Estimated Solar Limitations	(169)	(370)	(169)	(370)	(169)	(370)	(169)	(370)	(169)	(370)
17	Estimated Hydro Limitations	(2,000)	(3,000)	(2,000)	(3,000)	(2,000)	(3,000)	(2,000)	(3,000)	(2,000)	(3,000)
18	Wind Limitations	(1,820)	(1,620)	(1,820)	(1,620)	(1,820)	(1,620)	(1,820)	(1,620)	(1,820)	(1,620)
19	Estimated Transmission Constrained Generation	(309)	(9)	(9)	(9)	-	-	-	-	-	-
20	Accumulative Retirements	(745)	(745)	(745)	(2,325)	(2,325)	(2,325)	(2,325)	(2,325)	(2,325)	(2,325)
21	Environmental Constraints	(150)	(150)	(150)		-	-	-	-	-	-
22	**Total Generation Limitations**	**(13,294)**	**(18,995)**	**(12,994)**	**(20,425)**	**(14,414)**	**(20,415)**	**(14,414)**	**(20,415)**	**(14,414)**	**(20,415)**
23	Estimated Control Area Resource Base Capacity (at time of peak)	44,931	40,127	46,728	39,992	46,002	40,001	46,617	40,616	46,617	40,616
24	Surplus / Deficiency (Before Imports)	(2,246)	4,956	(1,380)	4,046	(3,002)	3,317	(3,355)	3,123	(4,342)	2,295
25	Expected Existing Net Imports (Excluding Dynamics)	5,000	6,000	5,000	6,000	5,000	6,000	5,000	6,000	5,000	6,000
26	Accumulative New Imports from increased Generation and Tie Line Capacity	-	-	-	-	811	811	811	811	811	811
27	Surplus / Deficiency (After Imports)	2,754	10,956	3,620	10,046	2,809	10,128	2,456	9,934	1,469	9,106
28	Demand Response Programs used to meet Non-spinning Reserve	180	-	180	-	180	-	180	-	180	
29	Surplus / Deficiency Contingency Planning Reserve	2,934	10,956	3,800	10,046	2,989	10,128	2,636	9,934	1,649	9,106
30	*High Forecast*	*46,573*	*33,979*	*47,447*	*34,706*	*48,337*	*35,448*	*49,246*	*36,208*	*50,172*	*36,983*
31	*Capacity Requirement to meet High Forecast Minimum Operating Reserves*	*2,744*	*1,847*	*2,802*	*1,895*	*2,807*	*1,890*	*2,867*	*1,940*	*2,928*	*1,991*
32	Total Additional High Forecast Capacity Requirement	2,140	655	2,141	655	2,140	654	2,141	655	2,141	654
33	**% Projected Reserve (Base Forecast)**	**12.9%**	**39.0%**	**14.7%**	**35.6%**	**12.7%**	**35.1%**	**11.8%**	**33.9%**	**9.7%**	**31.1%**
34	**% Projected Reserve (High Forecast)**	**7.6%**	**35.8%**	**9.4%**	**32.5%**	**7.6%**	**32.1%**	**6.8%**	**31.0%**	**4.9%**	**28.2%**

The following is a brief explanation for Forecast Demand Requirement and Capacity shown in Table 1.

ISO Control Area Forecasted Peak Demand and Reserves

Peak Demand Forecast Range
(Table 1, line item 1)
Demand for electricity is influenced by various economic and non-economic factors. The methodology used to forecast seasonal peak loads is based on multiple statistical simulation models that consider the economic, demographic, and weather assumptions for the forecasting horizon. Due to the uncertainty in predicting the demand-determining factors used in the model (energy prices, level of conservation efforts, weather conditions, and economic outlooks, etc.) a Base, High, and Low range is forecasted within which actual peak demand is anticipated to fall.

The Load Forecast is determined using local and statewide demographics, and energy prices. It is anticipated that the electricity demand will grow at a rate of 1.97% for the base scenario after the year 2004. The forecast has a 95% confidence interval whereas the following assumptions are used to determine the risk variance and uncertainty under High Case, Base Case, and Low Case scenarios:

- The **High Case** load forecast assumes that the California economy will grow at a rate of 2.20% annually, and the weighted average peak hour temperature in the ISO Control Area will reach its most extreme[3] experienced over the last five years.

- The **Base Case** (most likely) load forecast assumes that the California economy will grow at a rate of 1.50% annually, and the temperature will be at the weighted average peak hour temperature in the ISO Control Area over the last five years.

- The **Low Case** load forecast assumes that the California economy will grow less than one percent (0.95%), and the temperatures will vary 10% from the weighted average peak hour temperature in the ISO Control Area over the last five years.

Table 2 represents the ISO demand forecast for the three scenarios.

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[3] The most extreme temperature is the coldest temperatures reached during winter months (October through April) and the warmest temperatures reached during summer months (May – September).

Table 2
ISO Control Area Capacity Outlook
2004 to 2008 Summer and Winter Peak Demand Forecast

Year (MW)	***Summer***			***Winter***		
	Low Case	***Base Case***	***High Case***	***Low Case***	***Base Case***	***High Case***
2004	*42,535*	*44,380*	*46,573*	*32,515*	*33,179*	*33,979*
2005	*43,408*	*45,253*	*47,447*	*33,242*	*33,906*	*34,706*
2006	*44,299*	*46,144*	*48,337*	*33,984*	*34,649*	*35,448*
2007	*45,207*	*47,052*	*49,246*	*34,744*	*35,408*	*36,208*
2008	*46,133*	*47,978*	*50,172*	*35,519*	*36,184*	*36,983*

Operating Reserves
(Table 1, line item 2)
In addition to dispatching capacity to meet the peak demand, the ISO must also have capacity available to meet the minimum operating reserve requirement established by the Western Electricity Coordinating Council (WECC) Minimum Operating Reliability Criteria (MORC). The minimum operating reserve is estimated as 6.6% of the generation capacity within the ISO Control Area including net dynamically scheduled generation, and net unit contingent imports[4] used to meet the ISO system wide Peak Demand Forecast. It is assumed that all available net imports, including Net Unit Contingent imports will be used to meet peak demand with the remaining capacity coming from ISO Control Area generation, and Dynamic Schedules. Net Unit Contingent imports are at times as high as 3,000 MW.

ISO Control Area Generation Resources

Existing Resources
The reported capacity of all Generating Units located within the ISO Control Area as of October 1, 2003 is shown in Figure 2. The capacity that the ISO expects to have available during summer and winter peaks is adjusted to account for scheduled and forced outages, hydro limitations, wind, solar, geothermal steam fields, environmental conditions, and transmission limitations that restrict the full available capacity of the generating resources. The reported capacity of Generating Units located within the ISO Control Area is comprised of:

- **Participating Thermal Generating Units** *(Table 1, line item 4)*– Thermal generating facilities within the ISO's Control Area that have signed a Participating Generator Agreement or a Metered Subsystem Agreement. The

[4] Unit contingent transactions are imports and exports whose energy sold is contingent on a specific generator being operational.

thermal category is comprised of nuclear, base load thermal, peaking, geothermal, cogeneration, and biomass generators.

- **Non-Participating Thermal Generating Units** *(Table 1, line item 5)* – Thermal Generating Units that generate in the ISO Control Area whose owners have not signed an agreement with the ISO and are not obligated to operate under the requirements established by the ISO Tariff. These units are comprised of Non-Participating Municipal units, Qualifying Facilities, and two merchant units.

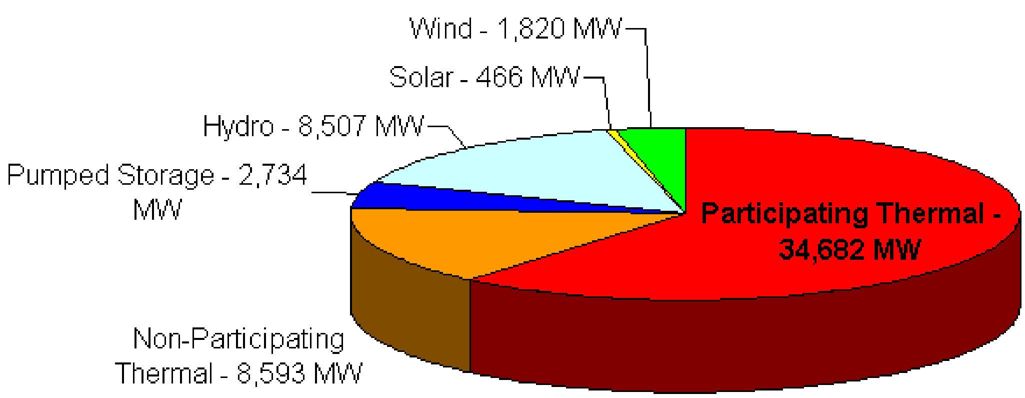
- **Solar Units** *(Table 1, line item 6)*

- **Pumped Storage Units** *(Table 1, line item 7)*

- **Hydro Units** *(Table 1, line item 8)*– Run-of-river, and pond storage hydro generation.

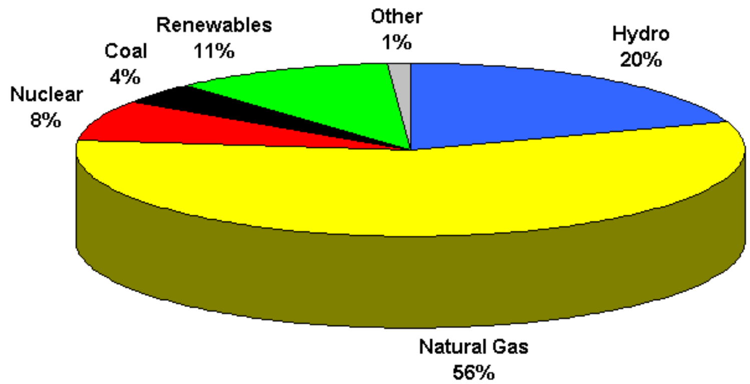
- **Wind Units** *(Table 1, line item 9)*

Figure 2
ISO Control Area Generation Capacity
(As of August 29, 2003 before de-rates for availability)



Resource Fuel Diversity
The Generation in the ISO Control Area is made up of Natural Gas, Hydro, Renewables, Nuclear, and Coal (See Figure 3). Diversity in fuel improves reliability and helps control prices when fuel shortages occur. Two fuel sources (natural gas, and hydro generation) make up 76% of the capacity in the ISO Control Area, leaving the ISO and California a large exposure to natural gas interruptions, and/or low hydro conditions.

Figure 3
ISO Control Area Generation Capacity by Fuel Type
(As of August 29, 2003 before de-rates for availability)



Generation that runs on natural gas has two potential exposures over the next five years: fuel shortages, and pipeline outages.

California is located at the end of the gas pipeline system in the United States, and is a storage balancing system. [Gas shortages have previously occurred when loads were high, hydro conditions were low, and gas storage was minimal.]

Federal Bill HR3609 may also affect natural gas fired Generating Units while exposing them to potential gas line outages. Federal Bill HR 3609 requires gas utilities (over the next 10 years) to inspect all fuel transmission pipelines that come within 650 ft. of any inhabitants or meeting place. This will impact most of the gas-fired generating facilities in the state of California; very few have either dual fuel capabilities or a second fuel gas line serving the station. Most facilities will require two outages. The first outage will be to modify the gas transmission line to enable inserting of the test equipment, and will last approximately one week. The second outage for the actual inspection will last around ten days. Additional or extended outages lasting several weeks could be required if the gas pipeline does not pass the inspection and repairs are required.

Generation running on hydro is the second largest fuel source in the ISO Control Area. Hydro availability may vary depending on how late in the summer season the summer peaks occur. Variations in hydro conditions are further discussed on page 14 of this document and are accounted for in the Base and Adverse Capacity Outlook scenarios.

Expected Additional Generation Capacity *(Table 1, line item 10)*
Table 3 lists all planned generation projects expected to be commercially available within the next five years. All of the projects listed have started construction.

Table 3
Planned Commercial Generation Capacity Additions for 2003 to 2008
COD = Commercial Operation Date

Developer	Generation Project	PTO Area	COD Estimated as of October 1, 2003	Unit/Fuel Type	ISO Net Dependable Capacity
Waste Management Energy Solutions	El Sobrante	SCE	10/15/2003	Landfill Gas	2.7
El Dorado Irrigation District	El Dorado Power House Unit 1	PGAE	10/30/2003	Hydro	10.0
El Dorado Irrigation District	El Dorado Power House Unit 2	PGAE	10/30/2003	Hydro	10.0
City of Pasadena	Glenarm Unit 3	SCE	10/30/2003	CT - Nat. Gas	43.7
City of Pasadena	Glenarm Unit 4	SCE	10/30/2003	CT - Nat. Gas	43.7
Calpine	Pastoria Project	SCE	8/1/2004	ST - Nat. Gas	750.0
Silicon Valley Power	Pico Power Plant	PGAE	12/5/2004	CC - Nat. Gas	147.0
Calpine	Metcalf Energy Center	PGAE	2/1/2005	ST - Nat. Gas	600.0
Calpine	Otay Mesa	SDGE	3/1/2007	ST - Nat. Gas	615.0

Net Dynamic Schedules

(Table 1, line 12)

Dynamic schedules are generation resources geographically located within one control area, which are owned, operated, and scheduled with a Load Serving Entity in a second and separate control area on a real-time basis. The combined maximum net capacity of dynamically scheduled resources available to the ISO is 1,312 MW.

It should be noted that the total capacity of Mohave has been included as part of the ISO Control Area Net Dependable Generating Capacity. 44% of Mohave's generating capability is dynamically scheduled out of the ISO Control Area to three other control areas: Los Angeles Department of Water and Power (LADWP), Salt River Project (SRP), and Nevada Power Company (NEVP). Mohave is scheduled to retire at the end of 2005. This retirement is noted in Table 1, line 20, and the export of dynamically scheduled generation is similarly ended in Table 1, line 12.

ISO Control Area Generation De-rates

The capacity that the ISO expects to have available in the five year planning horizon is based on historical scheduled and forced outages, and past observed generation levels for non-participating, hydro, and intermittent resources.

Scheduled and Forced Outages of Participating Thermal, Pumped Storage, and Dynamically Scheduled Generation
(Table 1, line 14)

Base Scenario

The ISO Tariff requires generators who have signed a Participating Generator Agreement to report all outages and de-rates to the ISO. The available capacity in real time for Participating Generators is the reported Net Dependable Capacity (NDC)[5] less scheduled outages approved by the ISO. During summer months the ISO only approves outages that are deemed necessary and cannot be delayed until the winter months. Scheduled and forced outages for participating thermal, pumped storage, and dynamically scheduled generation are estimated based on historical generation levels. Forced outages average approximately 3,000 MW in the ISO Control Area and are often as high as 4,000 to 5,000 MW.

Adverse Scenario

The Adverse scenario assumes forced and scheduled outages are 1,000 MW greater than the Base scenario.

Non-Participating Thermal Unit Limitations
(Table 1, line 15)

Base Scenario

The Non-Participating Thermal units are not required to report outages to the ISO; thus the future Net Dependable Capacity (NDC) is estimated based on historical operating levels recorded through the ISO Energy Management System (EMS). The NDC of these units is the difference between the Maximum Capacity of Non-Participating units and limitations such as: load netted behind metering, station service load, lack of EMS visibility on smaller resources, retired or de-rated unit capabilities, maintenance, and reduced capacity levels of steam for geothermal resources. Figures 4 and 5 show the forecast, minimum, maximum, and average capacity from the Non-Participating Thermal Generation since 1999 for the Summer and Winter seasons.

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[5] NDC – defined as the power level that a Generating Unit can sustain, on average, measured at or compensated to the point of delivery to the electric grid by both telemetry and ISO revenue metering systems if there are no equipment, operating or regulatory restrictions. It is mathematically equal to Gross Dependable Capacity minus any capacity utilized for the unit's auxiliary load, on-site load if applicable, and step-up transformer and project transmission losses. If the Generating Unit provides Ancillary Services, the NDC must be tested and certified by the ISO.

Adverse Scenario

Capacity variation in Non-Participating Thermal units is not considered in the Adverse Scenario. The Adverse Scenario is assumed to be the same as the Base Scenario.

Note: In 2003 the ISO gained EMS visibility previously not available on some units. Thus, the levels of generation experienced in 2003 appear higher than previous years. This additional visibility has been considered when determining the forecast for future years.

Figure 4
Non-Participating Thermal Generation at Time of Daily Peak for Summer 1999 to 2003

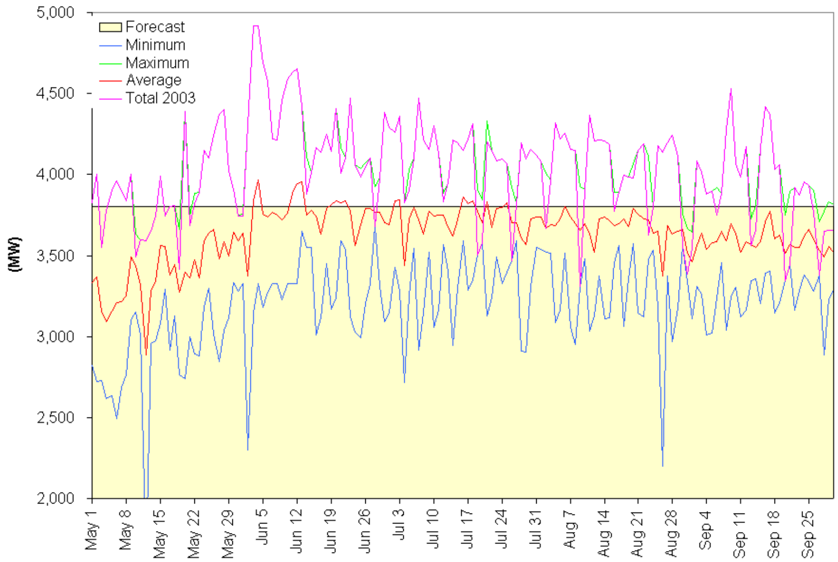
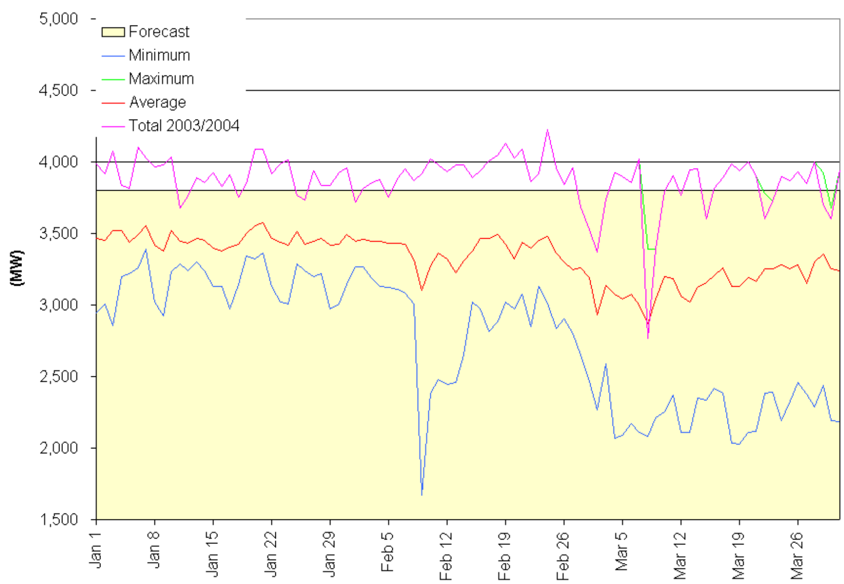


Figure 5
Non-Participating Thermal Generation at Time of Daily Peak for Winter 1999 to 2003



Solar Limitations
(Table 1, line 16)

Base Scenario

There is 466 MW of Solar Capacity in the ISO Control Area. However, the ISO has EMS visibility of only 406 MW. Figures 6 and 7 show the forecast, maximum, average, and minimum capacity available from that 406 MW at the time of daily peaks for summer and winter days, 1999-2003.

Adverse Scenario

Capacity variation in Solar generation is not considered in the Adverse Scenario. The Adverse Scenario is assumed to be the same as the Base Scenario.

Figure 6
Solar Generation at
Time of Daily Peak for Summer 1999 to 2003

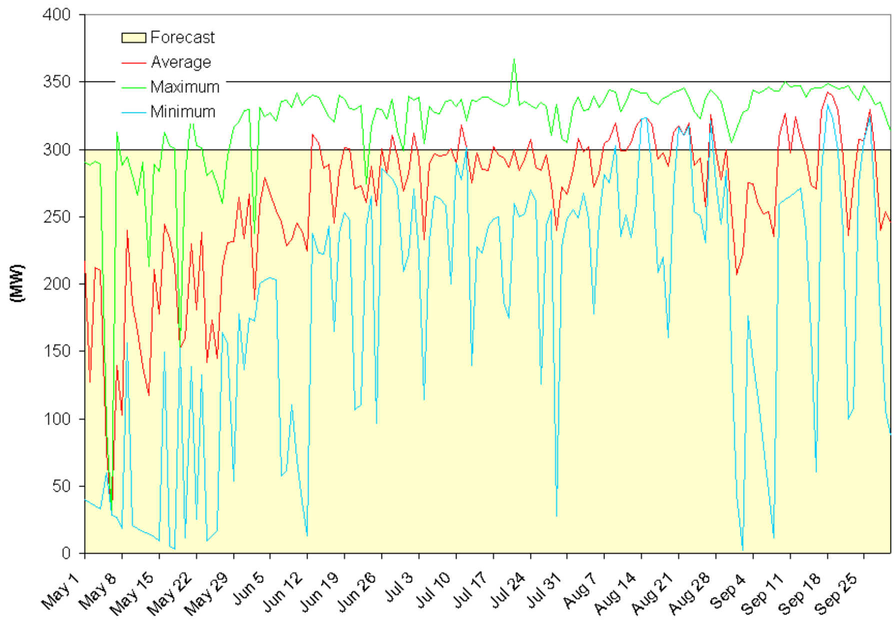
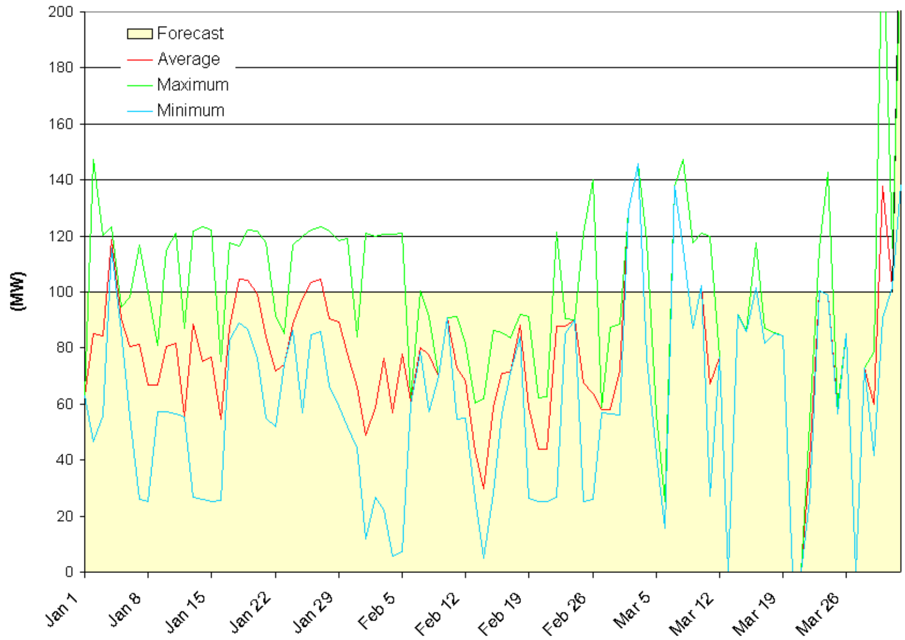


Figure 7
Solar Generation at
Time of Daily Peak for Winter 1999 to 2003



Hydro Limitations

(Table 1, line 17)

The derate/limitation applied in forecasting total hydro output is based on historical hydro operating levels and scheduled reserves previously experienced during similar months for the year 2001 through September 30, 2003. Hydro is energy limited and during a dry year, the ISO is more reliant on thermal generation during non-peak hours. As the season moves into mid August some of the reservoirs are not able to release water because the reservoir levels are low and are environmentally constrained. Figures 8 and 9 are graphs of total hydro at the time of Daily Peak.

Base Scenario

Under the Base scenario, the seasonal peak demand for electricity occurs while there is still spring runoff and the reservoirs are full (prior to mid August). The ISO forecasts that there would be 6,507 MW of capacity available to serve load if the summer peak occurs prior to mid August.

Adverse Scenario

Under the Adverse scenario, the seasonal peak occurs when spring runoff is over and after the reservoirs begin to become environmentally constrained. The ISO forecasts that there would be 6,007 MW of capacity available to serve load if the summer peak occurs after mid August.

Figure 8
Hydro Generation at
Time of Daily Peak for Summer 2001 to 2003
(Does not include Hoover or Pumped Storage Units)

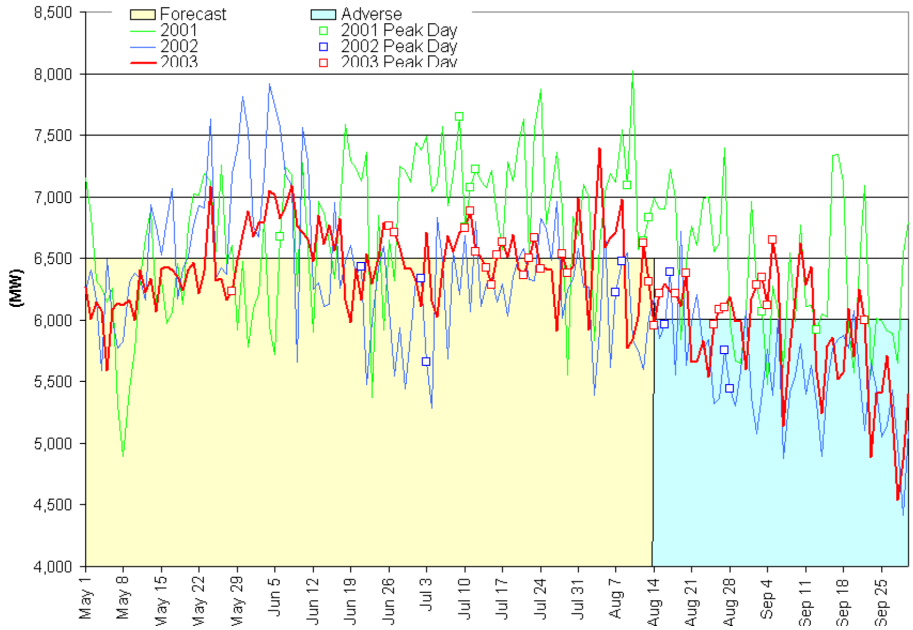
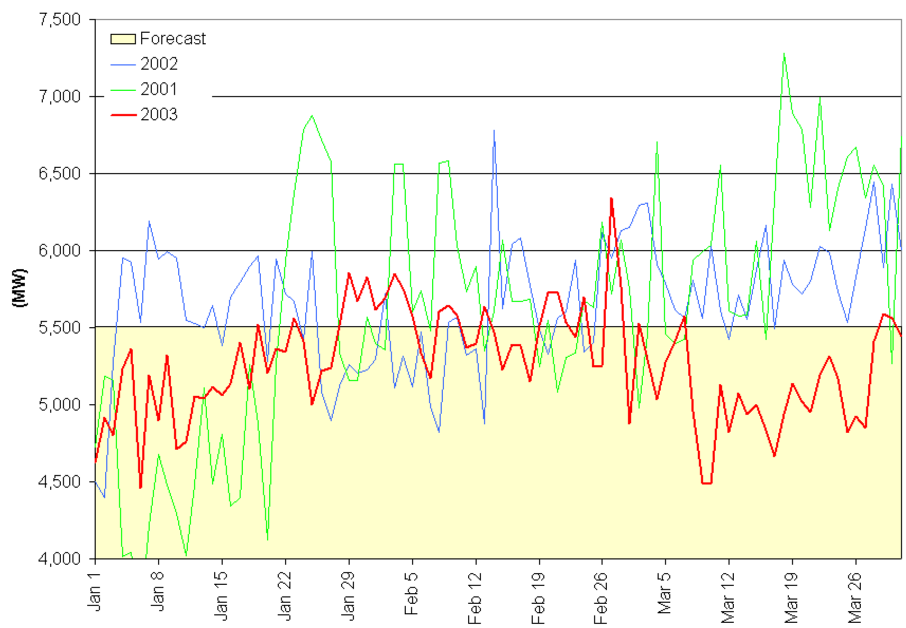


Figure 9
Hydro Generation at
Time of Daily Peak for Winter 2001 to 2003
(Does not include Hoover or Pumped Storage Units)



Wind Limitations

(Table 1, line 18)

Wind capacity is an important resource to serve load in the ISO Control Area, and it is anticipated that the amount of wind generation will continue to increase to meet the requirements of the IOUs' recent Renewables Portfolio Standard. Because wind units are intermittent resources, it is difficult for these generators to participate in the ISO energy market. The ISO has recently introduced an elective program for intermittent resources that assists the ISO in real time dispatch and also protects wind generators from uninstructed deviation charges that can occur due to sporadic wind conditions. More information on the ISO Participating Intermittent Resource Program can be found at www.caiso.com under Market Services.

Base Scenario

Summer: The forecast of the wind capacity attainable at peak is based on historical output during times of daily peak. Historically, wind speeds and wind generation output are lowest during the peak hours on hot summer days while almost all the wind units are inactive. Wind capacity is fully de-rated during the summer months because it is not dependable during the summer peak.

Winter: There is little relationship between wind capacity and winter peak demand, thus the winter wind capacity forecast is based on average wind generation experienced during winter peaks (shown in Figure 10). The base forecast for wind generation during the winter months is 200 MW, which represents the level of wind generation that is available fifty percent of the time (shown in Figure 11).

Adverse Scenario

Wind is an intermittent resource during winter peaks with no relationship to peak day loads. At anytime wind speeds and wind generation output could be inactive. The Adverse scenario forecast during both summer and winter months is 0 MW.

Figure 10
Wind Generation at
Time of Daily Peak for Winter 1999 to 2003

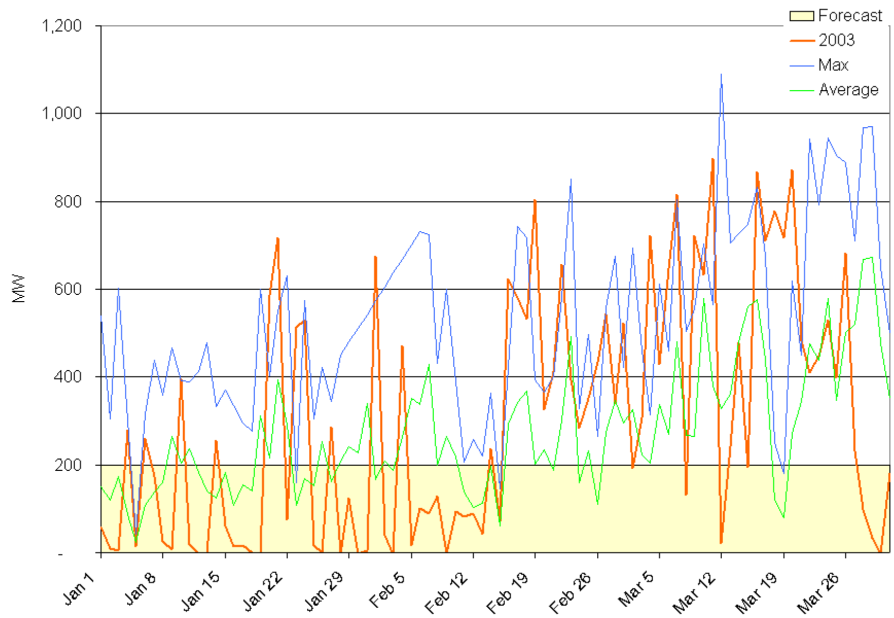
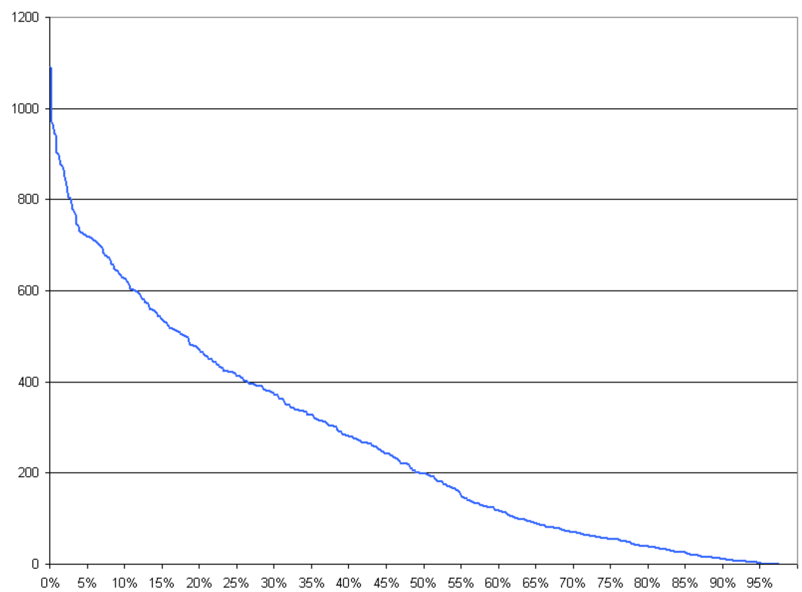


Figure 11
Duration Curve of Wind Generation at
Time of Daily Peak for Winter 1999 to 2003



Transmission Constrained Generation

(Table 1, line 19)

Transmission Constrained Generation reflects the estimated capacity of generation that is restricted from running due to transmission constraints. Constraints currently exist for generation connected near the Imperial Valley and Miguel substations (Mexican

Generation). The maximum simultaneous transfer capability for power flowing out of the Miguel substation into San Diego is rated at 1,100 MW. Actual transfer capability will vary as low as 500 MW due to the restrictions represented in the Miguel Import Nomogram.

Two transmission projects are planned and approved to alleviate the constraints on the Mexican Generation. A new 500/230 kV transformer bank at Miguel Substation projected to be complete by January 2005 will mitigate the majority of transmission-constrains on the Mexican Generation. It is estimated that the new 500/230 kV transformer bank at Miguel Substation will increase transfer capabilities by approximately 300 MW. The second project, a new SDG&E 230 kV line between Miguel and Mission substations projected to be complete prior to Summer 2006, will alleviate the remaining transmission constraints on this generation, and in addition, will improve import capabilities for other generation located in Mexico. The new SDG&E 230 kV line between Miguel and Mission substations is estimated to increase the simultaneous import capabilities by an additional 260 MW.

Base Scenario
It is anticipated that 309 MW of the new generation at Miguel will be constrained when the actual simultaneous transfer capability is rated at 1,100 MW.

Adverse Scenario
It is anticipated that 909 MW of the new generation at Miguel will be constrained when the actual simultaneous transfer capability is rated at 500 MW.

Accumulative Retirements
(Table 1, line 20)
Base Scenario
In the Base Scenario, the ISO includes only those retirements that have been reported to the ISO or have been made public. The following is a list of Generating Units that have retired in the year 2003 and are not included in future estimates of Maximum Net Dependable Capacity:

Jefferson Smurfit Corporation	29 MW	Mothballed 2/28/03
Sunlaw Energy – Federal	28 MW	Retired 4/16/03
Sunlaw Energy – Growers	28 MW	Retired 4/16/03
Alamitos Unit 7	134 MW	Retired 6/7/03

The following units presently included in the Net Dependable Capacity (Table 1, line 4) are expected to retire during the next five years:

Pittsburg Units 1-4	625 MW	Scheduled Retirement 10/1/03
Etiwanda Unit 5	120 MW	Scheduled Retirement 1/1/04
Glenarm Units 1 & 2	46 MW	Scheduled Retirement 1/1/04
Mohave	1,580 MW	Scheduled Retirement 1/1/06

Because Mohave is dynamically scheduled out of the ISO Control Area, the retirement of Mohave will increase the Net Dynamic Schedules into the ISO Control Area (reflected in Table 1, line 12).

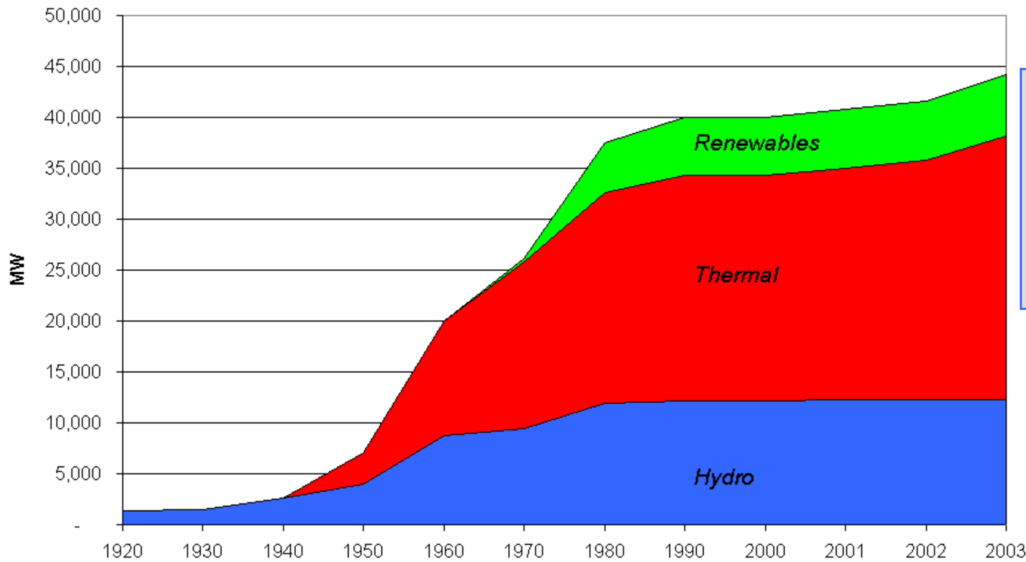
Adverse Scenario

There is 1,037 MW of capacity built in the 1960's and 1970's that may retire prior to January 1, 2005 if the cost of NOx retrofits cannot be justified. The Adverse Scenario assumes the retirements of these units.

Additional Generation Retirement Risk

Figure 12 depicts a historical record of new generation built in the ISO Control Area. In addition to the retirement of generation listed above, there is a potential risk that over 3,870 MW of thermal generation built in the 1950's and 1960's will retire in the next several years. These Generating Units have high heat rates and are costly to maintain. It is assumed that Generating Units that have an RMR contract or run more than 60% of the time are less likely to retire. The potential loss of this generation is not reflected in the Base or Adverse scenario; however, it does remain an exposure to resource shortages in the ISO Control Area.

Figure 12
Generation "Name Plate" Capacity in ISO Control Area by Decade Built



Note: Capacity includes some self-generation capacity that is not considered in Table 1.

Decade (MW)	**'20**	**'30**	**'40**	**'50**	**'60**	**'70**	**'80**	**'90**	**'00**	**'01**	**'02**	**'03**
Hydro	1,374	1,486	2,632	3,939	8,777	9,486	11,899	12,206	12,206	12,249	12,249	12,249
Thermal	-	-	-	3,089	11,253	16,365	20,677	22,082	22,082	22,747	23,495	25,885
Renewables	-	-	-	-	-	283	4,890	5,668	5,671	5,785	5,891	6,043

Environmental Constraints

(Table 1, line21)

This line item represents limitations to a Generating Unit's maximum capacity due to environmental factors. For example, during hot days, there are may be opacity limitations, and/or NOx limitations. It is anticipated that environmental limitations will be minimal after generators complete their currently projected emission work. These scheduled emissions projects will bring the Generator Units into compliance with more stringent air quality standards in 2004 and 2005. Some environmental constraints are duration-based, limiting generation from running for a number of hours per day, month, year, etc.; while others limit the units' maximum output capacity. For the next five years, the only limitation that is forecast to affect peak hours is the opacity and thermal limitations of Mohave. Mohave is forecast to retire prior to January 1, 2006.

Net Imports

Expected Existing Net Imports
(Table 1, line25)
Net Imports is the sum of imports from existing generation located outside the ISO Control Area and generation located within the ISO Control Area that is sold to other Control Areas. The Net Interchange Capacity available to serve load in the ISO Control Area may vary with economic conditions, transmission transfer capability, neighboring Control Areas load requirements, and snow-pack conditions in the Northwest and throughout the WECC region.

The forecast for Existing Net Imports is based on the past level of net imports during the time of daily peak for 1999 through September 30, 2003. Import levels were lowest in 2001 when much of the Northwest was in a drought year. The Northwest also had "below normal" snow pack conditions in the Winter 2002 – 2003; however, new generation in the Southwest helped increase overall import levels.

There is very little new generation development planned in future years to assist in meeting the WECC regional load growth[6]. Without any further development, gains in imports levels may soon diminish.

Base Scenario
The ISO anticipates that for future years net import levels for the Base Scenario will be more similar to medium imports experienced thus far in 2003 (See Figures 13 and 14).

Adverse Scenario
During summer months imports available to the ISO compete with neighboring Control Area loads. The Adverse Scenario assumes import levels during the summer peaks will be at the lower levels experienced in 2003.

[6] The July 2003 publication of the Western Electricity Coordinating Council Information Summary report provides a forecast of reserves for the year 2003 through 2012.

Figure 13
Net Imports at
Time of Daily Peak for Summer 1999 to 2003

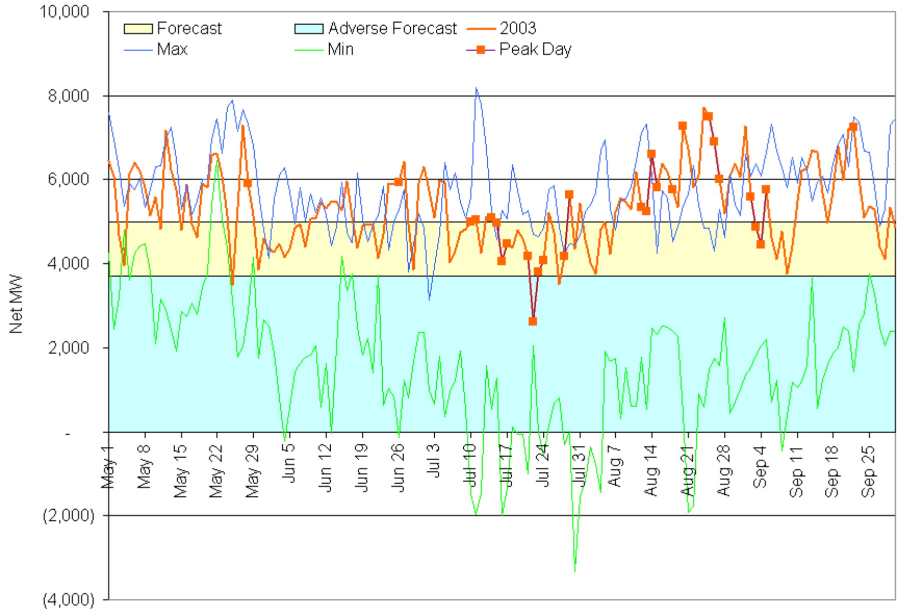
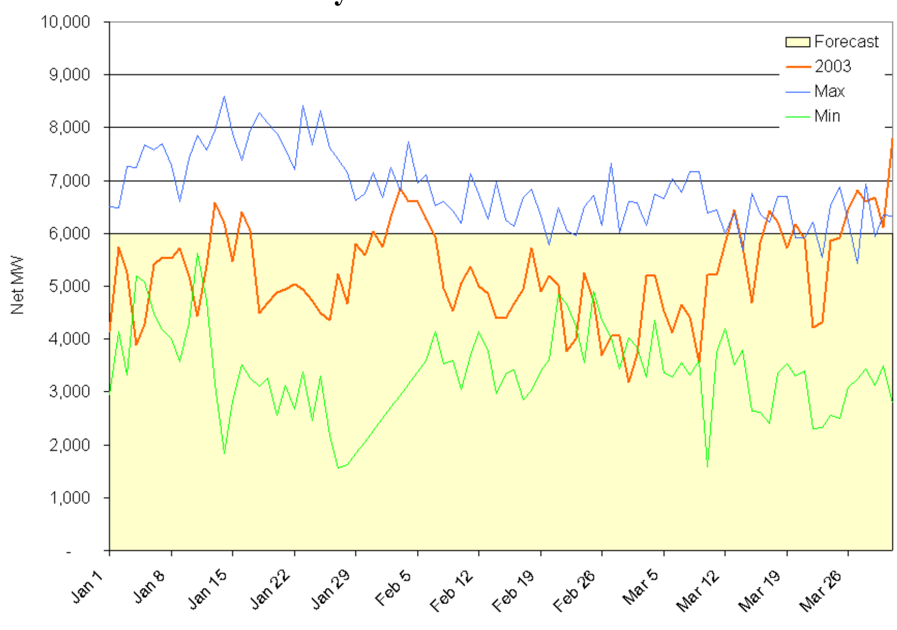


Figure 14
Net Imports at
Time of Daily Peak for Winter 1999 to 2003



Accumulative New Imports from increased Generation and Tie Line Capacity *(Table 1, line26)*

Transmission projects discussed on page 17 will alleviate congestion on Mexican Generation located in the ISO Control area and further improve import capabilities into the ISO Control Area from Mexico. In addition, imports coming from the Southwest are presently limited by transmission constraints, including limitations associated with the Southwest Power Link (SWPL). Plans to expand the transmission system in the Southwest have been approved and are underway that will allow for an additional 560 MW of capacity by the summer of 2006.

Demand Response Programs used to meet Non-Spinning Reserve

(Table 1, line28)

Base Scenario

Load in the ISO Control Area has the opportunity (through the Participating Load Agreement) to participate in the ISO's Markets by providing Non-Spinning Reserve. At this time, the only loads that participate in this program are pumps. These loads must be running and have bid into the market in order to be available as a resource to the ISO. In the past summers, typically there has been up to 180 MW of load participation available during peak times (See Figure 15). The ISO has maintained an assumption that 180 MW will be available during summer months in future years based on indications from the Investor Owned Utilities (IOU) that they will increase their participation in this program.

Adverse Scenario

Participating Loads are not required to participate in the ISO's Markets. An adverse scenario assumes there is 0 MW available from loads participating in the ISO's Markets.

Figure 15
Participating Load
Time of Daily Peak for Summer 2002 and 2003