CALIFORNIA ISO

CAISO 2001 Summer Assessment

Version 1.0

Operations Engineering
California ISO

March 22, 2001

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Operations Engineering

Executive Summary

California is facing an electricity shortage of unprecedented proportions. This report provides a detailed analysis of historical and forecasted near-term peak electricity supply and demand levels for the California Independent System Operator (CAISO) Control Area. The trends of historic data contained in this report indicate a significant supply shortage for Summer 2001. This forecast deficiency suggests that California will experience rotating blackouts for periods this summer.

Two points to note about the CAISO's Peak forecast:

- It focuses on peak levels in order to identify periods during which supply deficiencies will require electricity demand to be curtailed (rotating blackouts) and
- It is conservative, in that potential demand reductions and possible new supply resources are not considered. The CAISO forecasts of supply and demand levels reflect observed demand and proven resources. As an operating organization, these forecasts are used by the CAISO to guide preparations for future operating periods (months away) and must therefore, not count on demand or supply measures that have no track record or that do not have a high probability of materializing.

The following table summarizes forecasted supply and demand conditions that result in a resource deficiency for June through September ranging from 600MW to nearly 3,700 MW. (See Section 1 for a detailed explanation of each line of this table.)

	CONTROL AREA PEAK DEMAND [MW]	SUMMER 2001			
		JUNE	JULY	AUGUST	SEPT.
1	Forecast Summer Season Peak Load	47,703	47,703	47,703	47,703
2	Operating Reserve Requirements	2,600	2,600	2,600	2,600
3	Estimated Total Control Area Capacity Requirement	50,303	50,303	50,303	50,303
	CONTROL AREA GENERATION RESOURCES [MW]				
4	Maximum Net Dependable Capacity of CAISO Control Area Resources (as of February 2001)	42,113	42,113	42,113	42,113
5	Dynamic Schedules into CAISO	1,857	1,857	1,857	1,857
6	Expected New Generation [Cumulative Totals]	390	2,593	2,789	3,371
7	Scheduled Outages	0	0	0	0
8	Estimated Forced Outages/Capacity Limitations	-2,500	-2,500	-2,500	-2,500
9	Estimated Hydro Capacity Limitations	-1,000	-1,000	-1,000	-1,000
10	Estimated Control Area Resource Capacity (at peak)	40,860	43,063	43,259	43,841
	GENERATION IMPORTS [MW]				
11	Required Net Imports [Line 3 - Line 10]	9,443	7,240	7,044	6,462
12	Forecast Net Imports at Peak	3,500	3,500	3,500	3,500
13	Estimated Resource Deficiency Before Mitigation Measures	-5,943	-3,740	-3,544	-2,962
	DEFINITIVE MITIGATION MEASURES [MW]				
14	UDC Interruptible Load Curtailments	400	400	400	400
15	Demand Relief Programs	596	596	596	596
16	Conversion of Non-Spinning Reserve to Energy	1,300	1,300	1,300	1,300
17	**RESOURCE DEFICIENCY AT PEAK [MW] after definitive mitigation measures**	-3,647	-1,444	-1,248	-666

The trends that underlie the anticipated deficiencies are described below:

CAISO Control Area Peak Demand

The needs for electricity (MWh) and generation capacity (MW) have steadily increased over the last decade, in the CAISO control area, in California as a whole, and throughout the Western Interconnection.

- In the CAISO Control Area, the number of days that demand exceeded 35,000 MW increased from 51 in 1998 to 84 in 2000.
- Since the CAISO cannot accurately forecast when the system summer peak will occur; the estimated 2001 summer maximum peak load is applied to every month. It is this peak demand against which the adequacy of generation resources is evaluated.

CAISO Control Area Generation Resources

Generation capacity additions throughout the Western Interconnection have not kept pace with increases in demand. In California, this is particularly true: no new major generation has been built within the state of California during the last decade.

- In fact, much of the CAISO Control Area generation has already exceeded its useful life, and its maximum generating capability has been degraded due to age.
- Similarly, declining steam field pressure has affected the power output of geothermal units within the CAISO Control Area, thereby reducing the overall maximum "dependable" generating capability.

In addition to existing CAISO Control Area generation capacity, this forecast anticipates new CAISO Control Area generation to come on-line this summer. New generation is essential for minimizing resource deficiencies this summer.

- The new generation anticipated to be on-line this summer includes large thermal plants, peaking plants (Summer Reliability Generation), and renewable energy projects (including biomass restart projects).

Downward adjustments must also be made to *existing* dependable Control Area capacity in order to account for the capacity *expected* to be unavailable to serve the peak demand this summer due to unplanned or forced outages. Forecasted forced outages included here amount to 2,500 MW, the value that the CAISO has historically used to approximate forced outages. That number could vary depending on any number of unforeseen factors.

- CAISO Control Area generation resources have been used more intensively, and therefore experienced more wear, in recent years: total annual energy production from resources located within the CAISO Control Area increased by 14% between 1999 and 2000. Forced outages have also increased recently: Experience in December 2000, where generation had been heavily used during the previous summer, showed the average forced outage rate was over 5,000 MW, with outages exceeding 6,000 MW on 6 individual days.

- Better planned outage coordination (pending approval of legislation and/or proposed tariff amendments) could not only minimize outages during both summer and winter peaking periods, but may also allow some flexibility to soften otherwise unmitigated spikes in forced outages as well. Moreover, as greater emphasis (through incentives or penalties) is placed on providing and adhering to maintenance plans, as well as maximizing availability, scheduled and forced outages may become more predictable.[1]

- Similarly, outages due to generators exceeding air emissions limits are expected to decline this summer: collaborative effort is under way between the California Independent System

[1] This level of forced outages also assumes that Control Area generation capacity is not forced-out due to lack of payment.

Operator, California Energy Commission, California Air Resource Board, local Air Pollution Control Districts, and the owners of California power plants to develop mechanisms, interim rules and regulations that will relax/remove some of the current emissions and other environmental restrictions from these power plants.

Imports Into the CAISO Control Area

Historically, the CAISO Control Area is a net importer in most hours. California's current energy crisis is partly a function of declining imports.

- CAISO annual average net import levels declined by 28% between 1999 and 2000.
- Imports have declined because electricity producers outside of California have had less electricity to export to California for two main reasons: increasing electricity demand in the Western Interconnection (causing utilities to sell more to native loads rather than export to CA) and decreasing supplies from hydropower resources in the Pacific Northwest as annual precipitation levels drop.

Definitive Mitigation Measures

Prior to the CAISO curtailing load, the CAISO relies on voluntary demand curtailment and the conversion of non-spin reserves to energy. These two measures are accounted for in the CAISO's forecast of resource deficiency.

- The established demand reduction programs (existing CAISO's Demand Relief Program and the UDCs' Interruptible Load Curtailment program) can offset some of the anticipated supply. Other conservation efforts by the State may further reduce demand but, because their effects cannot be dependably forecast, they are not included in these estimates of demand reduction.
- Similarly, converting of non-spinning reserves (CAISO Control Area generation and/or imports) to energy and utilizing CAISO control area firm load to meet contingency reserve requirements will help lessen demand while maintaining service reliability by adhering to the Western Systems Coordinating Council's (WSCC) Minimum Operating Reliability Criteria (MORC).

Resource Deficiency (after definitive mitigation measures)

For the months of June through September, the CAISO forecasts a peak demand resource deficiency ranging from 600MW to nearly 3,700 MW. Given this forecast, the CAISO expects that load curtailments (blackouts) will occur this summer. The CAISO will revise this forecast as conditions change. The CAISO is committed to working with governmental and private entities, and consumers, to provide the reliable electric service for Summer 2001 and beyond. Minimizing blackouts will require significant and sustained conservation efforts by Californians, careful coordination and conservation of hydroelectric imports from the drought-ridden Pacific Northwest, accelerated construction of new generation, good maintenance and coordination of Control Area generation, and a bit luck.

I. Peak Load & Resource Forecast Summary for 2001

Table I-2 provides an itemized breakdown of the CAISO Peak Load and Resource Forecast Summary for 2001 with a brief commentary regarding each line item. This forecast is based on actual historic generation, net interchange, and load levels.

	IN-AREA DEMAND [MW]	SUMMER 2001			
		JUNE	JULY	AUGUST	SEPT.
1	Forecast Summer Season Peak Load	47,703	47,703	47,703	47,703
2	Operating Reserve Requirements	2,600	2,600	2,600	2,600
3	Estimated Total Control Area Capacity Requirement	50,303	50,303	50,303	50,303
	INTERNAL GENERATION RESOURCES [MW]				
4	Maximum Net Dependable Capacity of CAISO Control Area Resources (as of February 2001)	42,113	42,113	42,113	42,113
5	Dynamic Schedules into CAISO	1,857	1,857	1,857	1,857
6	Expected New Generation [Cumulative Totals]	390	2,593	2,789	3,371
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10	Estimated Control Area Resource Capacity (at peak)	40,860	43,063	43,259	43,841
	IMPORTS [MW]				
11	Required Net Imports [Line 3 - Line 10]	9,443	7,240	7,044	6,462
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	DEFINITIVE MITIGATION MEASURES [MW]				
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16	Conversion of Non-Spinning Reserve to Energy	1,300	1,300	1,300	1,300
17	**RESOURCE DEFICIENCY AFTER DEFINITIVE MITIGATION MEASURES [MW]**	-3,647	-1,444	-1,248	-666

Table I-2

1. **Forecast Summer Season Peak Load** – Estimated summer season peak demand (including transmission losses) based on historical load levels, economy data and weather data. This estimate does not include adjustments for proposed demand relief programs/products or other conservation effects being developed as a result of the widely publicized energy crisis. The CAISO cannot accurately forecast when the system summer peak will occur; therefore, the estimated 2001 summer maximum peak load is applied to every month in Table I-2.

2. **Operating Reserve Requirements** – Estimated minimum WSCC Operating Reserve requirement based on the current WSCC criteria. WSCC is currently reevaluating minimum Operating Reserve criteria. The current proposal is to reduce minimum Operating Reserve requirement to the Control Area's most severe single contingency. Under the newly proposed criteria, the CAISO minimum Operating Reserve requirement could be reduced to a level of 1,200 - 2,000 MW (depending on transmission loading levels). It is not anticipated that WSCC Operating Reserve requirements will change before the summer 2001 season.

3. **Estimated Total Control Area Capacity Requirement** – Sum of demand and operating reserve requirements.

4. **Maximum Net Dependable Capacity of CAISO Control Area Resources** – Estimated maximum "net" generation capacity of resources located within the CAISO Control Area

excluding capacity of resources dynamically scheduled out of the CAISO Control Area (e.g. it only includes SCE's share of the Mohave Powerplant). It does not include contractual or ownership rights in resources located outside the CAISO Control Area.

The Net Dependable Capacity is the estimated maximum generation capacity derived as delineated in Section II of this report entitled Resources (Existing Generation). Net Dependable Capacity differs from the summation of each resource's nameplate capacity. It accounts for load netted against generation (QF's and Municipal resources, station service load, etc.), lack of EMS visibility on smaller resources, retired or de-rated unit capabilities, capacity factor of wind generation and reduced capacity levels of geothermal resources.

The maximum net dependable capacity was not adjusted to account for reduced energy production as a result of generators not receiving payments for supplied energy, environmental restrictions or reduced hydro levels.

5. **Dynamic Schedules into CAISO** – Estimated maximum dynamic schedule capacity into the CAISO Control Area from Investor Owned Utility (IOU) generation geographically located outside the CAISO Control Area. The Dynamic Schedules include both IOU and Municipal shares of Palo Verde, Four Corners, and Hoover.

6. **Expected New Generation** – Estimated new generation in the CAISO Control Area includes large capacity generation plants and Summer Reliability Generation plants. A list of new generation resources, plant capacity, and projected in-service dates are included in Section II of this report entitled Resources (New Generation).

7. **Scheduled Outages** – Planned outages scheduled through the CAISO Outage Coordination Department. CAISO will not approve scheduled outages during the summer peak load periods.

8. **Estimated Forced Outages/Capacity Limitations** – Estimated unplanned unit outages and capacity limitations. Forecasts based on historic outage information are questionable. Until recently, generation owners were not required to provide detailed information of outages. Consequently, documentation of historic forced outage rates for the CAISO Control Area resources are poor. Furthermore, generation units in the CAISO Control Area have experienced unprecedented operating duration periods and output levels, implying that future outage rates may increase.

9. **Estimated Hydro Capacity Limitations** – Adjustment accounting for forecast hydro capacity limitations. The hydro capacity limitations delineated in table I-2 are based on hydro capacity limitations previously experienced on summer peaks. During the summer peak periods in 2000, the average hydro capacity limitations observed in the CAISO control area were at or above the capacity limitation shown in table I-2 above.

   In addition to hydro capacity limitations, hydro resources are energy limited. Only a finite amount of water storage (energy) is available during any given day for hydro resources. Figure I-A below illustrates generation capacity by technology throughout the summer peak day occurring on August 16, 2000. The hydro energy produced on August 16, 2000 is also indicated on Figure I-A as the royal blue area between the peaker and import chart bands. Essentially, Figure I-A indicates water or energy is stored during off peak hours and used during peak hours.

   Energy available for hydro resources throughout the summer of 2001 is directly related to the reservoir levels and snow pack conditions in California and in the northwest states. A summary of the current reservoir levels and snow pack conditions is shown in Table I-3

below. The current snow pack conditions and reservoir levels in California and the northwest states are notably less than normal. Given the current hydro reservoir levels and the snow pack conditions, hydro resources will be more energy constrained than the previous summer. Therefore, energy limitations may play a more limiting role than hydro capacity. If the generation technology profiles for the 2001 summer peak matched the 2000 summer peak as illustrated in Figure I-A, energy would probably be a limiting factor. At some point through the day, possibly during peak, reservoir storage would reach low levels and force curtailment of hydro capacity.

GEOGRAPHIC AREA		DESCRIPTION
California	1.	Reservoir storage is approximately 93% to 102% of normal while last year in February the reservoir storage was approximately 109% to 119% of normal.
	2.	The statewide Snow Water Equivalent (SWEQ) average is approximately 18" which equates to approximately 75% of normal.
Northwest States	3.	In the Northwest states, the aggregated reservoir storage is approximately 73% to 83% of normal while last year in February the aggregated reservoir storage was approximately 102% to 112% of normal.
	4.	Reservoir storage in Washington state is approximately 46% to 56% of normal while last year in February the reservoir storage was approximately 110% to 120% of normal.
	5.	Reservoir storage in Oregon state is approximately 61% to 71% of normal while last year in February the reservoir storage was approximately 90% to 100% of normal.
	6.	Snow pack conditions range between states in the Northwest and between basins within each individual state as summarized below: • SWEQ in Oregon basins range between 22% and 78% of average; • SWEQ in Washington basins range between 49% and 66% of average; • SWEQ in Idaho basins range between 44% and 78% of average; • SWEQ in Montana basins range between 49% and 69% of average.

Table I-3

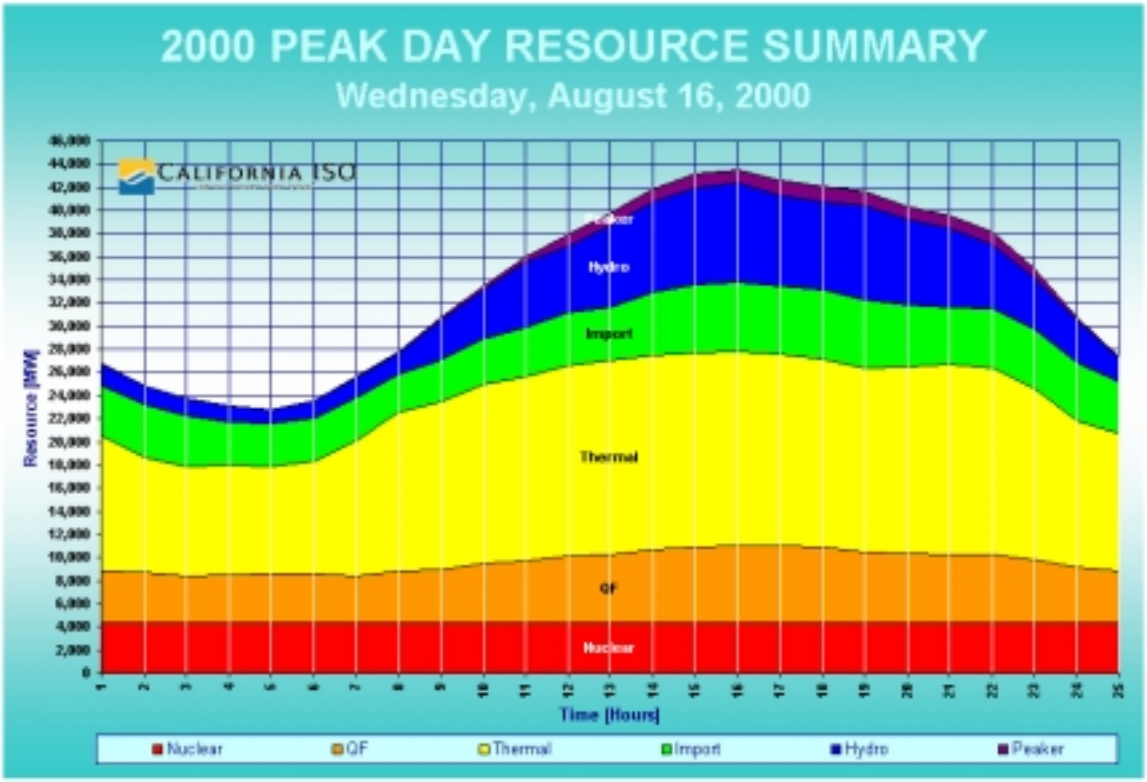

Figure I-A

10. **Estimated Control Area Resource Capacity (at peak)** – The forecasted total available generation capacity of resources located within the CAISO Control Area (including dynamic schedules) after adjusting for estimated outages and other capacity limitations.

11. **Required Net Imports** – The level of CAISO net capacity imports (excluding dynamic schedules) required to meet the estimated total Control Area demand and meet WSCC minimum operating reserve requirements.

12. **Forecast Net Imports at Peak** – Estimated net import level (excluding dynamic schedules) based on actual net imports observed during the summer 2000 season. In 2000, net imports during the August 16, 2000 summer peak were 4,675 MW. For the summer 2001 season, net import levels are anticipated to be less than the amount available during the 2000 summer season due to low forecasted hydro conditions in the Northwest and increased load growth in other regions. The CAISO does not have information detailing firm bi-lateral contracts between entities in the CAISO Control Area and entities outside the CAISO Control Area to accurately predict net import levels during peak load periods.

13. **Estimated Resource Deficiency Before Mitigation Measures** - Represents total estimated capacity deficiency before load conservation, demand relief measures, and operating reserve reductions.

14. **UDC Interruptible Load Curtailments** – Interruptible Load Curtailments associated with SCE's air conditioner cycling and agricultural pump load programs. There was approximately 2,800 MW of interruptible service available for use from the utility distribution companies (UDCs) for mitigation of emergencies; however, only 400 MW is available currently because of the following: 1) PG&E has exhausted their 500 MW curtailment of industrial load earlier this year; and 2) penalties can not be administered to 1,940 MW of contracted load in SCE's and SDG&E's industrial load programs due to CPUC's decision 01-01-056 dated 01/26/01.

15. **Demand Relief Program –** The CAISO Demand Relief Program operates June through September and serves as a curtailment option that can be used after interruption of non-firm loads and before moving into Stage III rotating blackouts.

16. **Conversion of Non-Spinning Reserve to Energy** – Corresponds to the converting of non-spinning reserves (CAISO Control Area generation and/or imports) to energy and utilizing CAISO control area firm load to meet contingency reserve requirements.

17. **Resource Deficiency After Definitive Mitigation Measures** – Represents total estimated capacity deficiency after definitive mitigation measures are taken without compromising the WSCC's Minimum Operating Reliability Criteria (MORC). This deficient capacity will need to be rectified with public conservation, CAISO's Discretionary Load Curtailment Program, CAISO's Participating Ancillary Services Load Program, net import capacity increases and lastly firm load curtailments.

II. Resources

Historical Generation

The power generated from resources in the CAISO Control Area for the year 2000 increased when compared to the previous two years. Fifty percent of the time, CAISO Control Area generation exceeded 21,697 MW in 2000. In 1999, 50% of the time, CAISO Control Area generation exceeded 19,296 MW. See figures II-A and II-B titled “Hourly Average Generation Duration Curves” and “Monthly Average Generation." The figures II-A and II-B, derived from historical revenue metering data, graphically represent the CAISO Control Area total generation for 1998, 1999, and 2000.

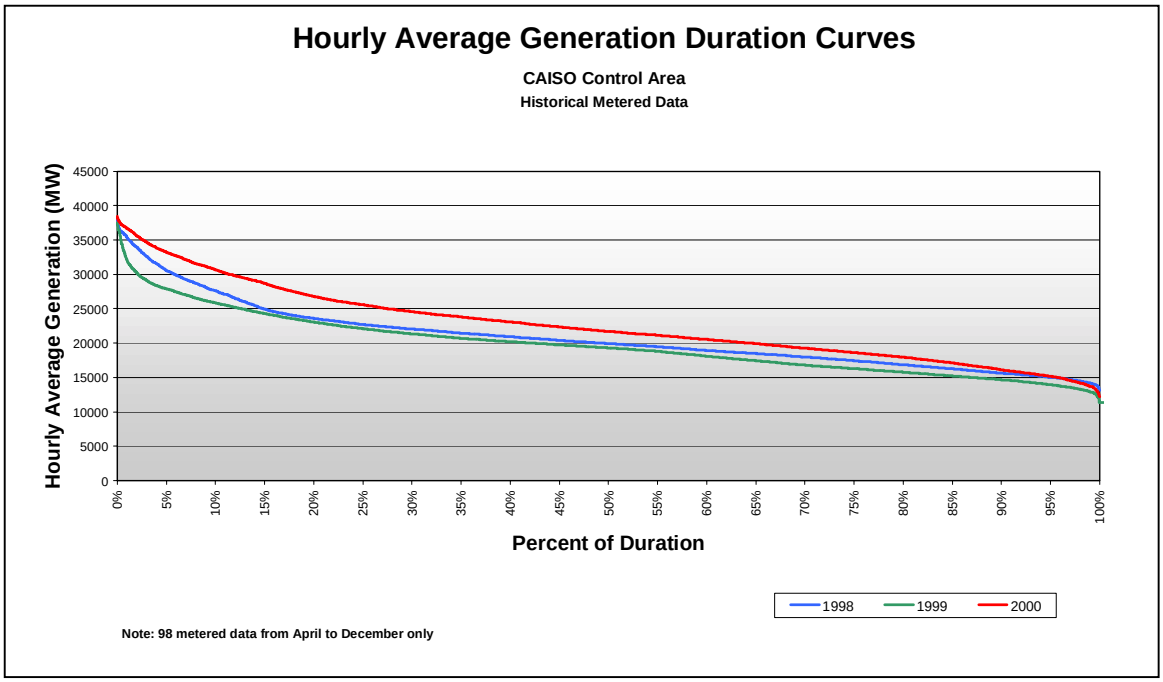

Figure II-A

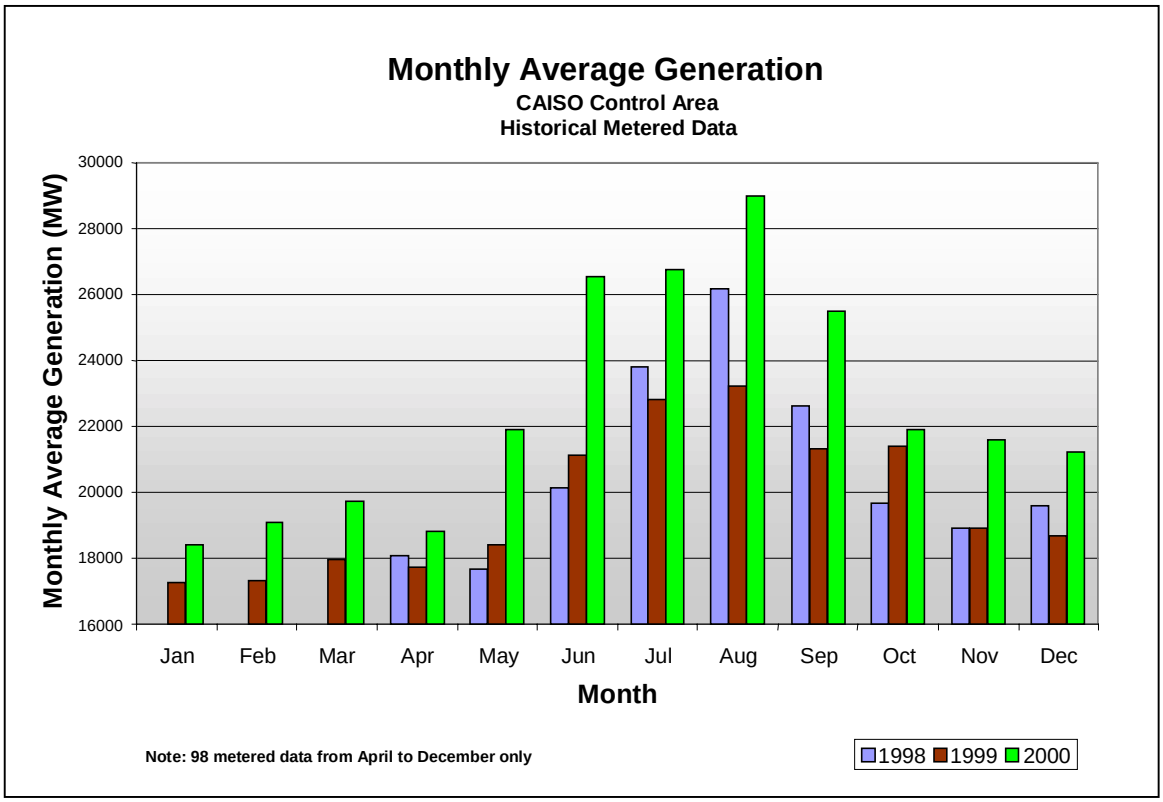

Figure II-B

Existing Generation

This section of the CAISO 2001 Summer Assessment Report is dedicated to the discussion of existing generation in the CAISO Control Area.

It is projected that the CAISO will have a maximum of 42,113 MW of "dependable" generating capability during 2001. This estimation of dependable generating capability is limited to the existing system and does not include planned generating capacity due to be added during 2001 (Refer to Section II of this report entitled Resources (New Generation) for a summary and discussion of new generation capacity). It also does not take into account expected curtailments and/or capacity limitations due to forced & scheduled maintenance of the major or agency unit categories. Table II-1 provides an itemized breakdown of the estimation of "dependable" generating capability for 2001 with a brief commentary regarding each line item.

EXPECTED AVAILABLE RESOURCES FOR 2001 [NOT INCLUDING PLANNED FACILITIES]	
ITEMIZED DESCRIPTION	**AMOUNT [MW]**
1. Maximum CAISO Control Area Generating Capability	46,612
2. Expected Unavailability from Qualifying Facilities (QF) Generation (Excluding Wind)	- 2,999
3. Expected Unavailability from Wind Resources	- 1,500
Maximum "Dependable" Generating Capability	**42,113**

Table II-1

1. **Maximum CAISO Control Area Generating Capability** - The derivation of maximum generating capability is a makeup of various data sources. These include:

   - The Ancillary Services (AS) Certification Database
   - The CAISO Masterfile
   - The California Energy Commission database entitled "California Power Plant Data Information"
   - WSCC power flow model generation capacity limits (P-max values)
   - Statistical analysis of EMS/PI data

   Different data sources were utilized to calculate the maximum generating capability depending on the generation categories. Data sources used for the major unit, agency and QF categories are as follows:

   - A large percentage of the generation capability of major units in the CAISO Control Area was derived from values reflected in the AS Certification database - approximately 72% (or 20,573 MW of 28,490 MW). The remaining generation capability of the major units (approximately 28%) was obtained from either the WSCC's power flow model, which is currently being used by the three IOUs and CAISO, or derived from statistical analysis of generation output observed by CAISO's Energy Management System (EMS).
   - The maximum agency generation capability of 7,809 MW was acquired from either the WSCC's power flow model or derived from statistical analysis of EMS data.
   - The maximum QF generating capability of 10,313 MW was obtained from various sources.

   The maximum generating capability does not include the dynamically scheduled export portion of the Mohave generating plant. However, approximately 56% (790 MW) of Mohave's generation capacity was included in the maximum generation capability.

2. **Expected Unavailability from Qualifying Facilities (QF) Generation (Excluding Wind)** –

   - The expected unavailability from QF Generation (excluding wind) is 2,999 MW (4,499 MW - 1,500 MW).
   - The expected QF generation availability of 5,814 MW was determined by analyzing aggregated QF totals submitted by each IOU on an hourly basis for every day of 2000. Therefore, the expected unavailability of QF generation, based on historical EMS/PI readings, is approximately 4,499 MW. This yields a substantially smaller component of QF generating capability than compared to the total QF rated capability of 10,313 MW. The reduction is primarily due to netted load behind the metering point, generation outages and generation curtailments. At present, QF facilities are not required to submit their (netted) load information to the CAISO, nor are they required to inform the CAISO of their maintenance schedules. This makes the amount of dependable QF Generation capability difficult to estimate with great certainty. A summary of actual QF Generation output for August 2000 is shown in Figure II-C.
   - The expected unavailability of wind resources, as detailed in paragraph 3 below, is 1,500 MW.

3. **Expected Unavailability from Wind Resources** – Based on the Histogram and duration curves illustrated below in Figures II-D through II-F, it can be seen that wind generation resources are below 376 MW 50% of the time. With a maximum generating capability of 1,876 MW, an expected unavailability factor of 80% [or 1,500 MW] is applied due to wind generation's relatively low availability.

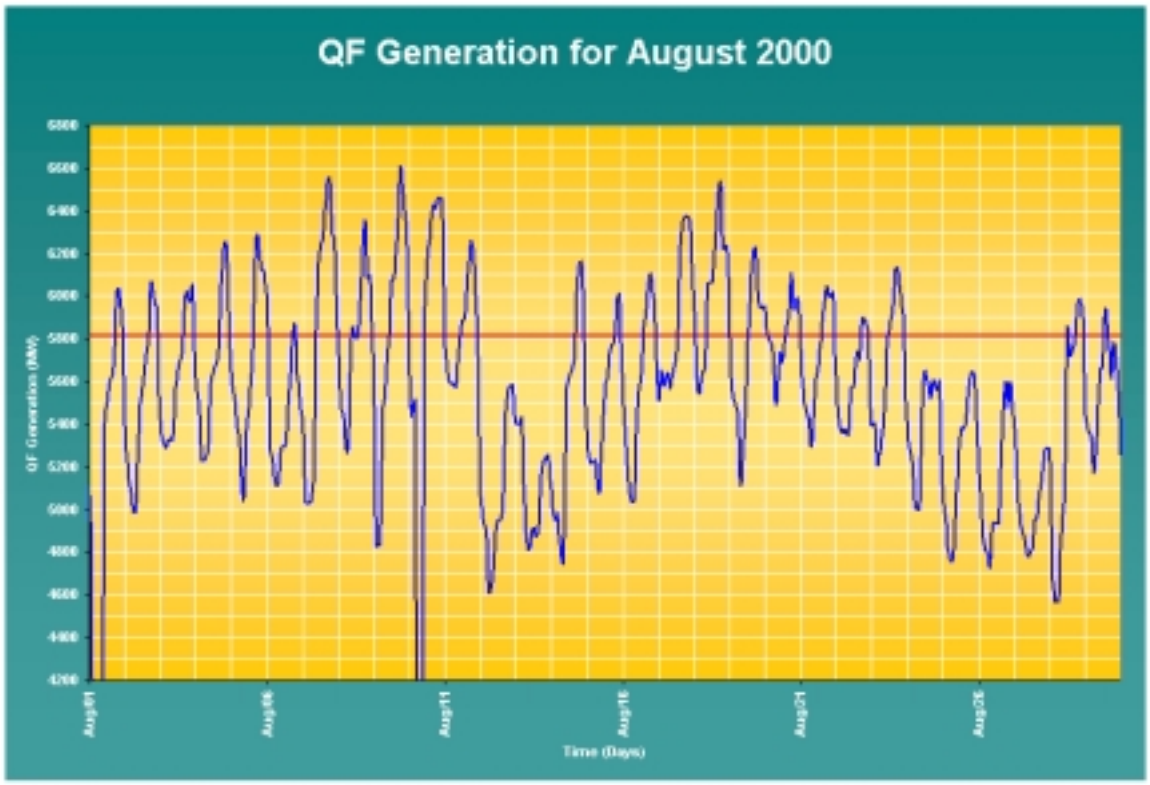

Figure II-C

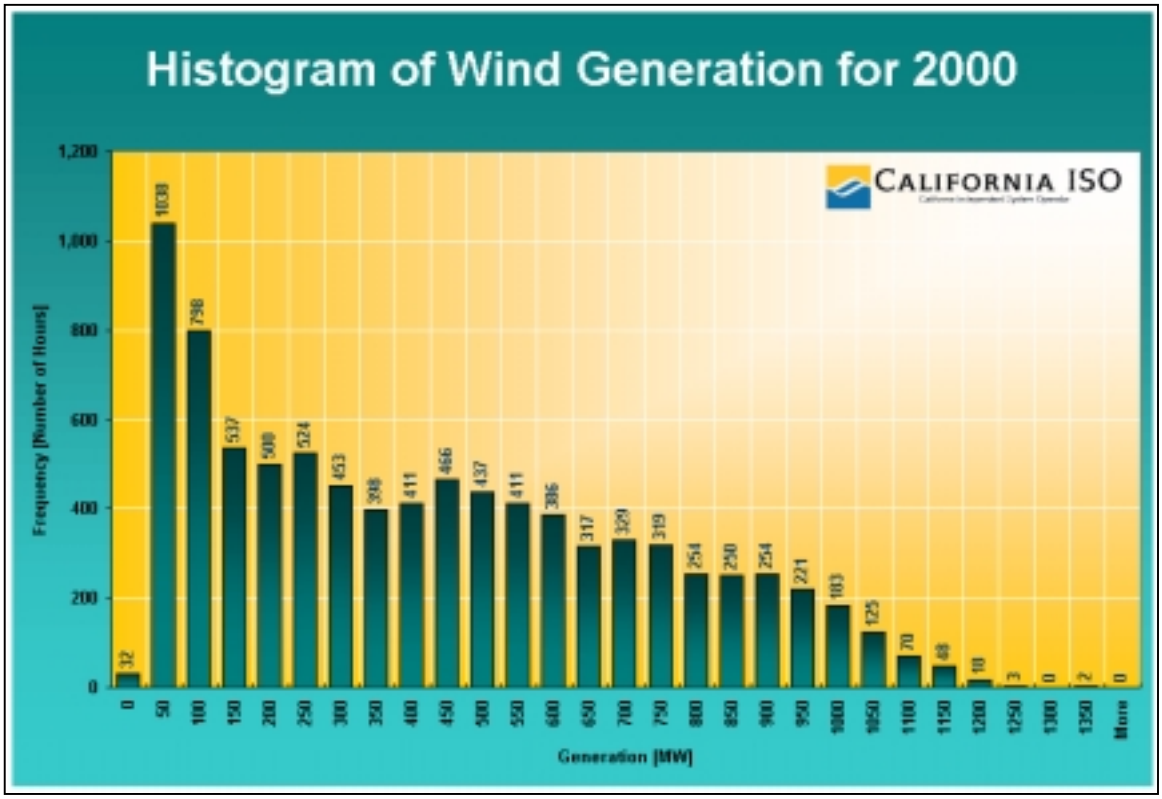

Figure II-D

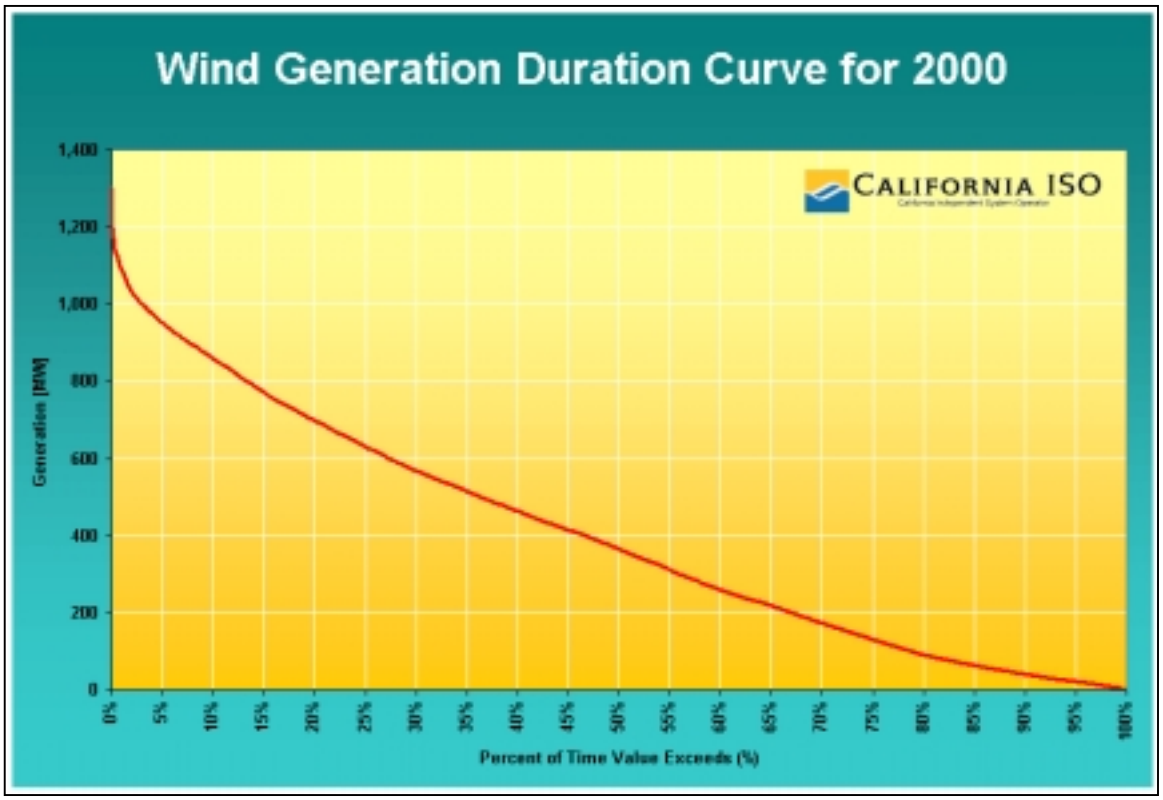

Figure II-E

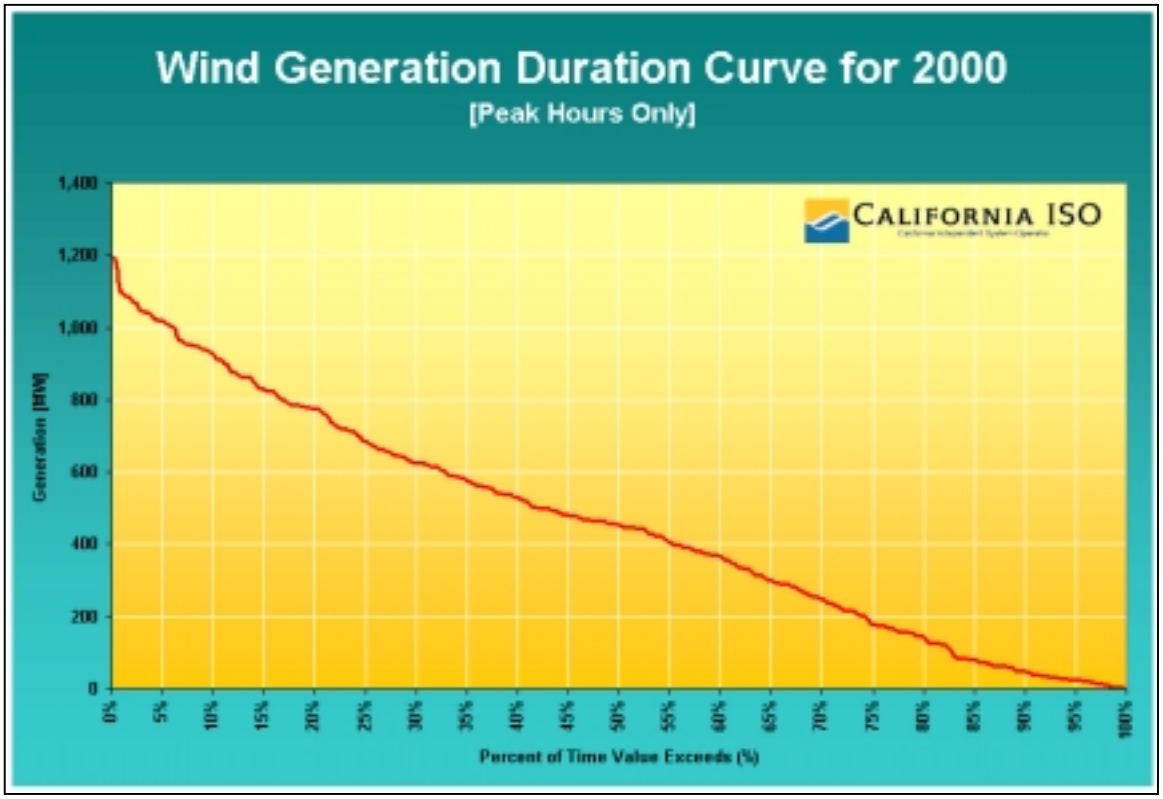

Figure II-F

No new major generation has been built within the state of California during the last decade. However, based on this statement, it should not be construed that the total generating capacity within the CAISO Control Area has remained constant. Much of the CAISO Control Area generation has already exceeded its useful life, and its maximum generating capability has been degraded due to age. Alternatively, depleting steam field pressure has affected the power output of geothermal units within the CAISO Control Area, thereby reducing the overall maximum "dependable" generating capability. Furthermore, it may also be concluded that some QF generating facilities, producing electric power a decade ago, are no longer operational today.

This section of the report does not attempt to quantify the change in the generating resources in the CAISO Control Area, but attempts to take a snapshot of the existing capability as of the writing of this report. For the purpose of discussion, generation facilities have been broken into the three following major categories:

- Major Units
- Agency Units
- QF Generation

Major Units are defined as the generating facilities within the CAISO's Control Area that were once owned by the three major IOUs (Pacific Gas & Electric, Southern California Edison, and San Diego Gas & Electric). The Major Units category consists mostly of base-load large thermal, hydroelectric, nuclear, and "peaking" generation.

Generation facilities that are currently owned by federal, state and municipal agencies such as the Sacramento Municipal Utility District, Western Area Power Administration, Northern California Power Agency, and the California Department of Water Resources, are classified as "agency units." The generation that makes up the Agency Units category includes various technologies - geothermal, small thermal, hydro, wind and "peakers."

Finally, the QF Generation category is comprised of the "qualifying facilities" that are essentially "independent" generator owners. Much of the technology that makes up QF Generation is industrial co-generation. Industrial co-generation can be described as a host process that generates a byproduct (e.g., gas), which in turn, is used to fuel a generator to create two or more forms of energy including electricity for the power grid and a second energy form like steam for its own process. In recent years, some of the QF units have left their long-term power purchase contracts with utilities and made other arrangements for the purchase of their excess energy.

Figure II-G provides a graphical breakdown of the maximum CAISO Control Area generating capability by the major categories defined above. An overall summary of the generation technology mix within the CAISO Control Area is illustrated in Figure II-H.

Figure II-J provides a graphical depiction of the maximum CAISO Control Area generating capability by locale. In this instance, the generating capability is categorized by its location within each of the Participating Transmission Owner's (PTO's) service territory.

A variation of Figure II-J, which breaks down the locality even further, is shown in Figure II-K. In this illustration, generation capability is parsed by CAISO Demand Zone. A map outlining the CAISO's demand zones can be found on the CAISO Internet web site at the following address: http://www.caiso.com/marketops/technical/index.html.

Finally, Figure II-L dissects the CAISO Control Area generating capability by congestion zone location (e.g., North or South of Path 15).

Figures II-G through II-L are merely a sample of the variations and varieties that can be graphed from a master CAISO Control Area generating capability list. For the convenience of the reader, an electronic copy of the master CAISO Control Area generating capability list in MS Excel 97 format will be posted on the CAISO Internet web site under http://www.caiso.com/thegrid/operations/.

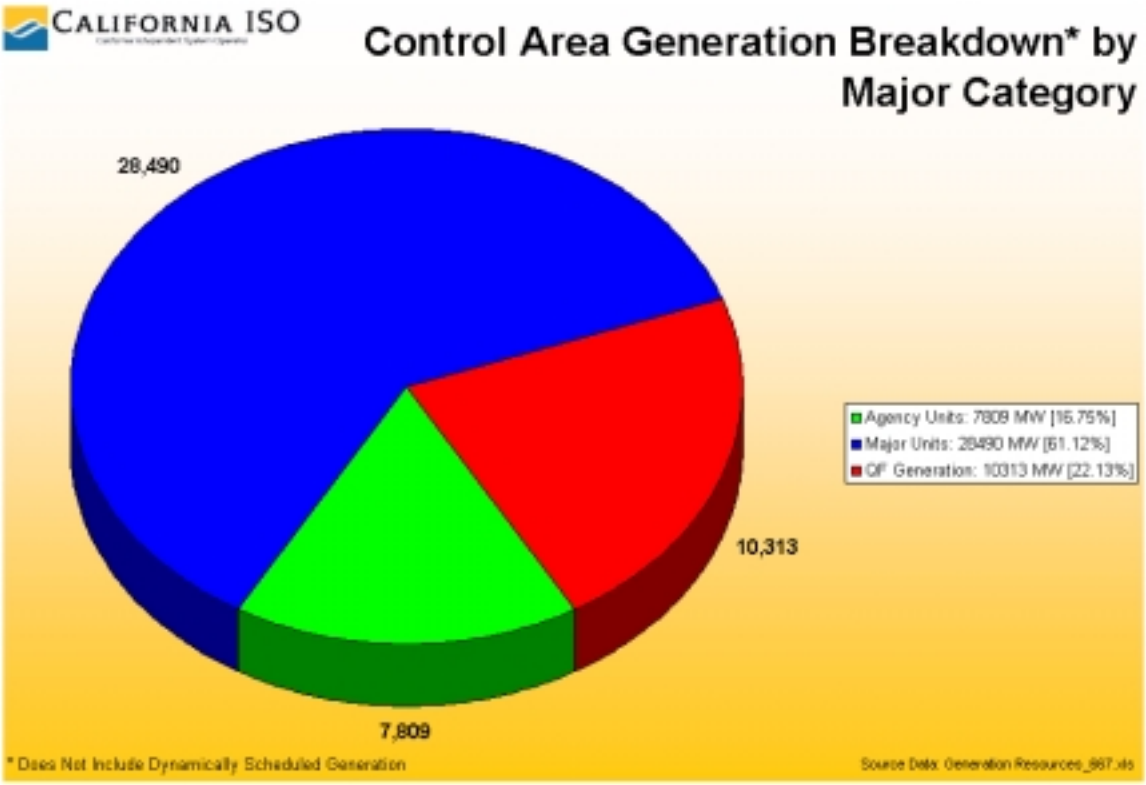

Figure II-G

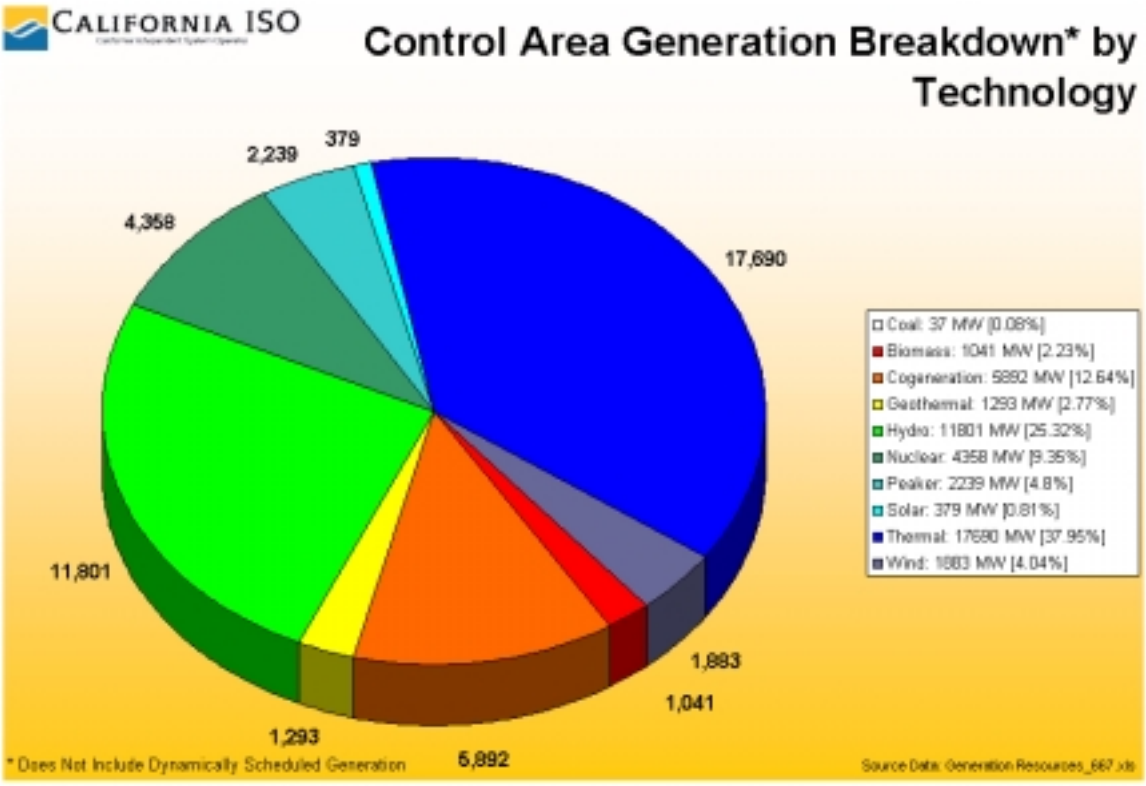

Figure II-H

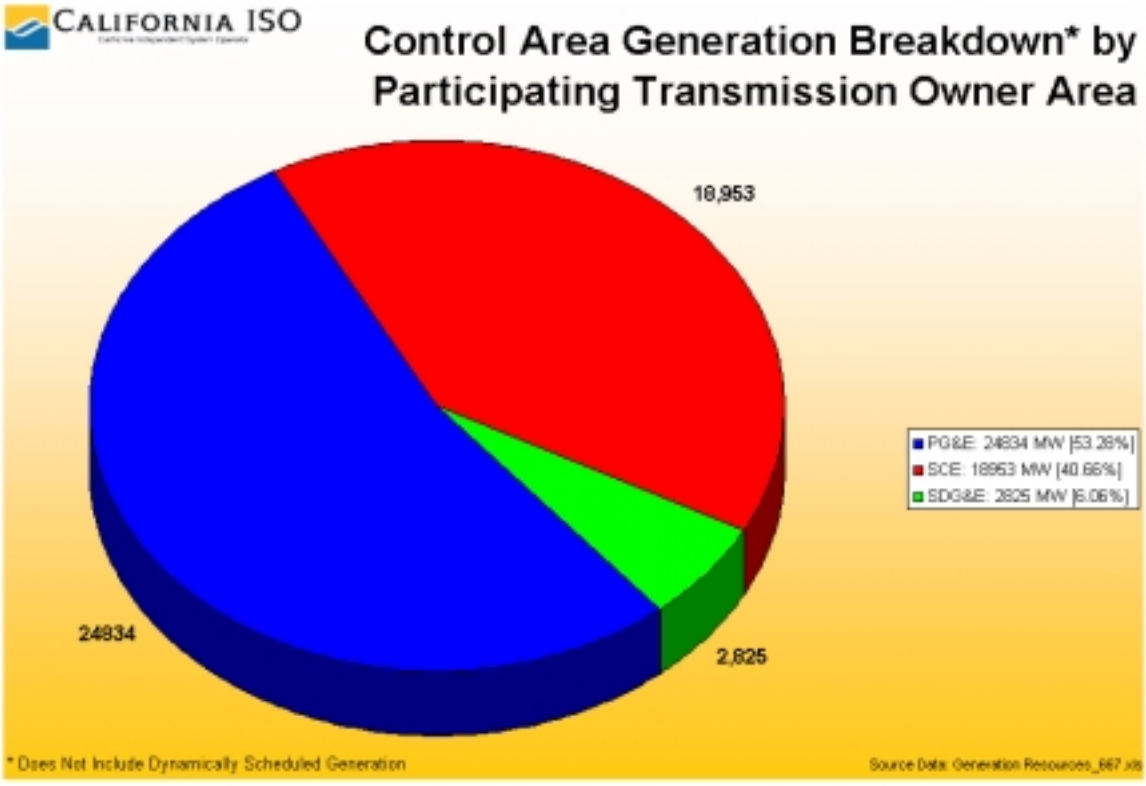

Figure II-J

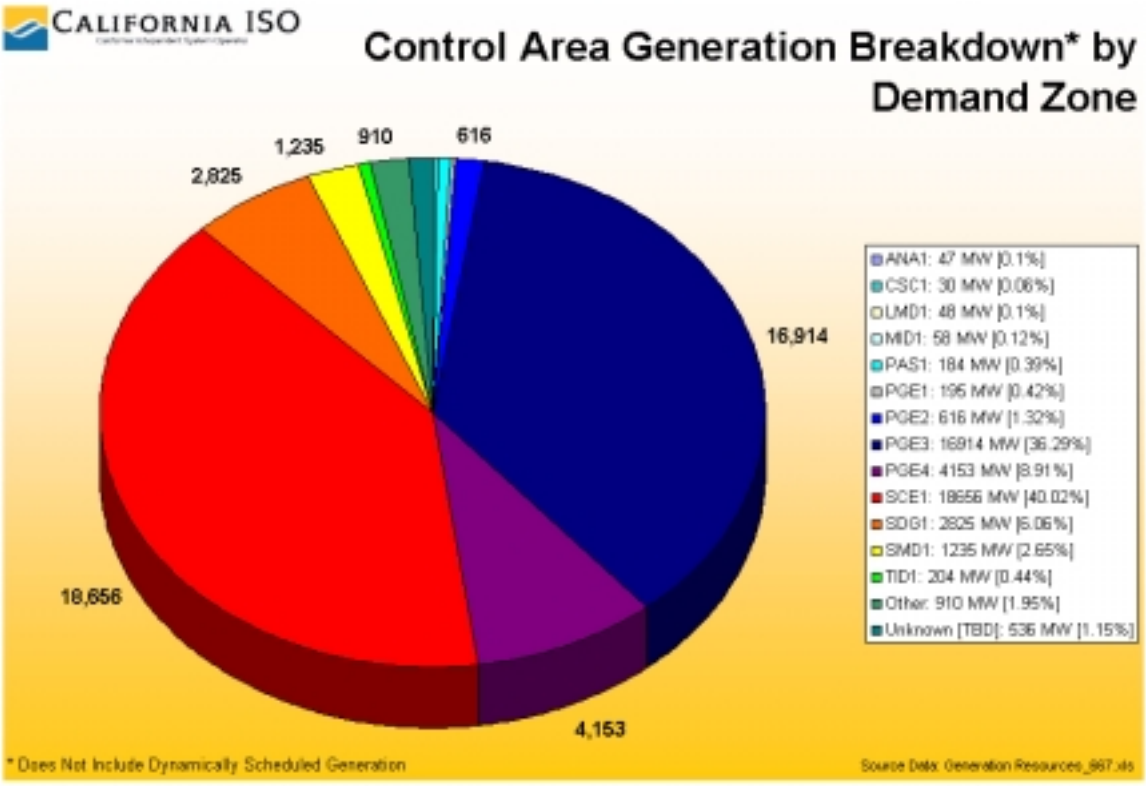

Figure II-K

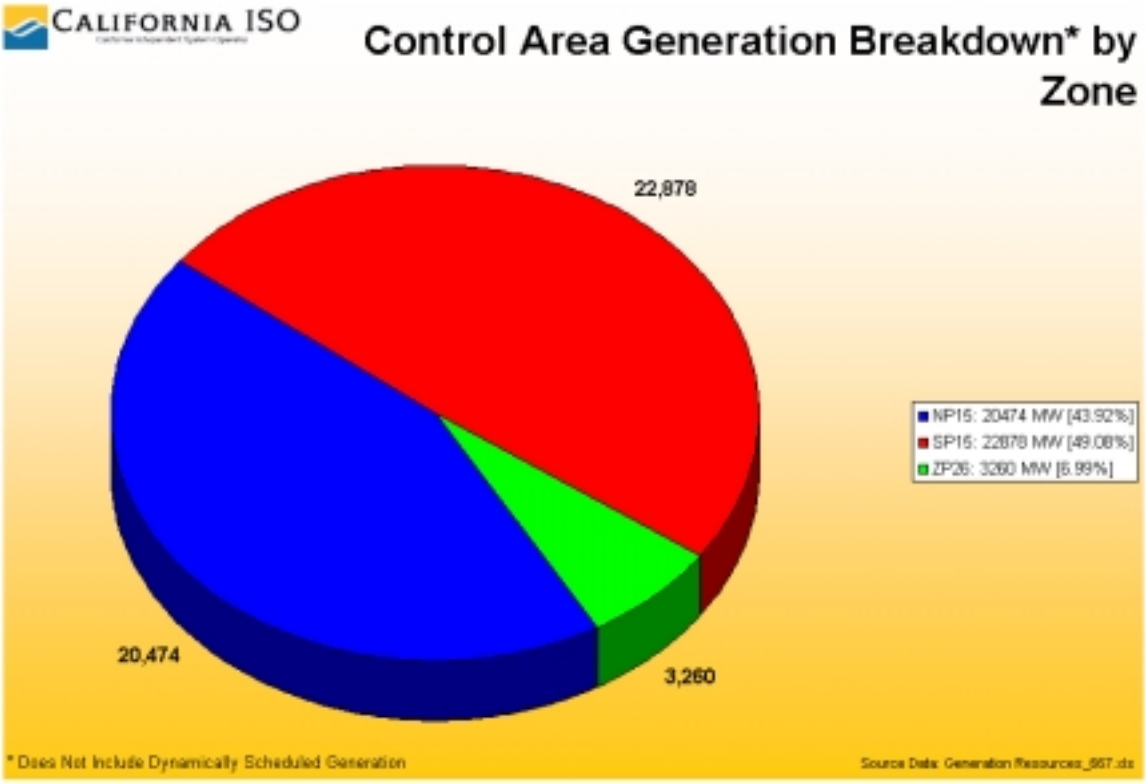

Figure II-L

New Generation

New Generation for Summer of 2001

Detailed below is the expected generation for the summer of 2001 within the CAISO Control Area, which includes large capacity generation plants, Summer Reliability Generation plants and renewable energy generation plants.

Large Capacity Generation Plants

The total generation capacity of the larger generation plants scheduled to be in service this summer is approximately 1,904 MW as shown in Table II-2.

PLANT NAME	OWNER	GENERATION CAPABILITY	EXPECTED ON-LINE MONTH
Los Medanos Energy Center	Calpine	540	July, 2001
Sutter Energy Center	Calpine	500	July, 2001
Sunrise Plant	Edison International	320	July, 2001
Huntington Beach 3 & 4	Williams/AES	450	July, 2001
United Golden Gate	El Paso Merchant	50	August, 2001
Proctor & Gamble Cogen	SMUD	44	June, 2001
	TOTAL CAPACITY	**1,904**	

Table II-2

Summer Reliable Generation Plants

The total generation capacity of the Summer Reliable Generation plants (Peaker Plants) scheduled to be in service at various dates during the summer of 2001 is 1,244.1 MW for the CAISO and 80 MW for the California Energy Resources Center as shown in Table II-3 and II-4, respectively. It should be noted that these are generation "nameplate" capacities. Actual capacities available at peak load periods may be less due to transmission constraints.

CAISO SUMMER RELIABILITY GENERATION					
DEVELOPER	**SITE**	**SUBSTATION**	**ELECTRIC INTERCONNECT SYSTEM**	**TOTAL MW**	**ANTICIPATED IN SERVICE DATE**
DG	Border	Border	SDG&E	49	9/1/01
DG	El Cajon	El Cajon	SDG&E	49	9/1/01
DG	Escondido	Escondido	SDG&E	49	8/15/01
DG	Midway	Midway	PG&E	49	9/1/01
DG	Mission	Mission	SDG&E	49	9/1/01
DG	Panoche	Panoche	PG&E	49	9/1/01
DG	Vaca-Dixon	Vaca-Dixon	PG&E	49	9/1/01
Harbor Cogen	Harbor Cogen	Harbor Gen Switchyard	SCE	30	6/1/01
NEO	Red Bluff	Rawson Jct Sub	PG&E	48.6	7/31/01
NEO	Chowchilla II	Certainteed Tap - Chowchilla Sub	PG&E	48.6	6/30/01
NRG	Round Mtn.	Springfield-Magunden Transmission Line	SCE	43	10/1/01
PandaWest 1	Susuin City	Contra Costa	PG&E	49	9/1/01
PandaWest 2	Susuin City	Contra Costa	PG&E	49	9/1/01
PandaWest 3	Susuin City	Contra Costa	PG&E	49	9/1/01
RAMCO	Chula Vista	Otay	SDG&E	44	5/15/01
RAMCO	East Livermore	Los Positas Sub	PG&E	49.5	9/1/01
RAMCO	East Livermore	Las Positas Sub	PG&E	49.5	9/1/01
RAMCO	Escondido	Escondido	SDG&E	44	7/1/01
Tejas # 1	Border	Border	SDG&E	43	7/31/01
Tejas # 2	San Ysidro	San Ysidro	SDG&E	43	9/15/01
Tejas # 3	Border	Border	SDG&E	43	6/30/01
Tejas # 4	Palm Springs 1	Devers	SCE	43	7/31/01
Tejas #5	Palm Springs 2	Devers	SCE	45	7/31/01
Tenaska	Vaca-Dixon	Vaca-Dixon	PG&E	49.9	7/31/01
Wellhead	Fresno	Helm/Kerman Tap	PG&E	18	6/15/01
Wellhead	Gates	Gates	PG&E	45	7/15/01
Wellhead	Los Banos	Los Banos	PG&E	45	7/15/01
Wellhead	Stockton	Webster Radial Tap	PG&E	22	6/15/01
			TOTAL CAPACITY	**1,244.1**	

Table II-3

CALIFORNIA ENERGY RESOURCES CENTER SUMMER RELIABILITY GENERATION					
DEVELOPER	**SITE**	**SUBSTATION**	**ELECTRIC INTERCONNECT SYSTEM**	**TOTAL MW**	**ANTICIPATED IN SERVICE DATE**
Alliance	Colton	Drews	SCE/Colton	40	8/1/01
Alliance	Colton	Century	SCE/Colton	40	8/1/01
			TOTAL CAPACITY	**80**	

Table II-4

Table II-5 outlines peaker plant capacity by the in service month and by location in reference to Path 15. The layout of the data in this table essentially delineates how much peaker generation will be available during summer months to meet the 2001 summer peak demand requirement.

DEVELOPER	SITE	NP15 / SP15	MAY	JUNE	JULY	AUG	SEPT	OCT
DG	Panoche	NP15					49	
DG	Vaca-Dixon	NP15					49	
NEO	Red Bluff	NP15			48.6			
NEO	Chowchilla II	NP15		48.6				
PandaWest 1	Susuin City	NP15					49	
PandaWest 2	Susuin City	NP15					49	
PandaWest 3	Susuin City	NP15					49	
RAMCO	East Livermore	NP15					49.5	
RAMCO	East Livermore	NP15					49.5	
Tenaska	Vaca-Dixon	NP15			49.9			
Wellhead	Fresno	NP15		18				
Wellhead	Los Banos	NP15			45			
Wellhead	Stockton	NP15		22				
Alliance	Colton	SP15				40		
Alliance	Colton	SP15				40		
DG	Border	SP15					49	
DG	El Cajon	SP15					49	
DG	Escondido	SP15				49		
DG	Midway	SP15					49	
DG	Mission	SP15					49	
Harbor Cogen	Harbor Cogen	SP15		30				
NRG	Round Mtn.	SP15						43
RAMCO	Chula Vista	SP15	44					
RAMCO	Escondido	SP15			44			
Tejas # 1	Border	SP15			43			
Tejas # 2	San Ysidro	SP15					43	
Tejas # 3	Border	SP15		43				
Tejas # 4	Palm Springs 1	SP15			43			
Tejas #5	Palm Springs 2	SP15			45			
Wellhead	Gates	SP15			45			
	NP15 Subtotal		0	88.6	143.5	0	344	0
	SP15 Subtotal		44	73	220	129	239	43
	Total Capacity		44	161.6	363.5	129	583	43

Table II-5

Renewable Energy Generation Plants

Based on information provided by the California Energy Commission (CEC), various renewable energy generation plants are coming on-line before the end of the 2001 summer season. The net dependable capacity of all these plants is approximately 71.3 MW. Table II-6 indicates the total net dependable capacity by technology for renewable energy generation plants available by the end of the summer. All generation technologies are forecasted to be available 100% of the time except for the wind technology. As described in Section II of this report entitled Resources (Existing Generation), the wind technology has an expected unavailability factor of 80%; therefore, only 31.25 MW of the total 156.25 MW for the wind technology are counted as net dependable capacity.

RENEWABLE ENERGY GENERATION CAPACITY BY TECHNOLOGY			
GENERATION TECHNOLOGY	**NAMEPLATE CAPACITY**	**AVAILABILITY FACTOR**	**DEPENDABLE CAPACITY (MW)**
Biomass	11.3	1	11.3
Landfill Gas	17.475	1	17.475
Small Hydro	11.25	1	11.25
Wind	156.25	0.2	31.25
		TOTAL DEPENDABLE CAPACITY	71.275

Table II-6

In the summer of 2001, the renewable energy generation capacities on-line by month shall be as follows: 42.8 MW by June, 54.8 MW by July and 71.3 MW by August

Existing Biomass Restart Projects

Based on information provided by the California Energy Commission (CEC), various existing biomes restart generation plants are coming on-line before the end of the 2001 summer season. The net dependable capacity of all these plants is approximately 115 MW. Table II-7 indicates the total net dependable capacity for the restart generation plants available by the end of the summer.

EXISTING BIOMASS RESTART GENERATION PLANTS		
GENERATION PLANTS	**ON-LINE DATES**	**NAMEPLATE CAPACITY (MW)**
Sierra Forest Products	March 2001	7
Dinuba	March 2001	12
Soledad	May 2001	13
Madera	May 2001	25
Honey Lake	June 2001	30
Jackson Valley	July 2001	18
Blue Lake	30-60 day lead time *	10
	TOTAL CAPACITY	115

* Plant assumed to-be on-line by June 2001

Table II-7

New Generation Forecast for 2002 through 2006

Table II-8 below forecasts all new generation projects in the CAISO Control Area for 2002 through 2006. The number of projects and the corresponding aggregated capacities are delineated below by Investor Owned Utility (IOU) area or Municipal Utility District area. Approximately 54 generation projects, totaling 29,888 MW of capacity, are forecasted to be brought on line between 2002 and 2006. Of the 29,888 MW, only 3,600 MW is CEC approved.

YEAR	NO OF GEN PRJ.	MW	PG&E AREA		SCE AREA		SDG&E AREA		MUNI AREA		CEC APPROVED PROJECTS	
			No	Capacity (MW)	No	Capacity (MW)	No	Capacity (MW)	No	Capacity (MW)	No	Capacity (MW)
2002	11	4,686	5	3,440	1	89.4	3	713.4	2	443.5	2	1,630
2003	19	9,915	6	3,393	8	4,962	5	1,560	0	0	3	1,970
2004	16	10,913	5	2,490	9	7,287	2	1,136	0	0	0	0
2005	7	4,374	3	2,005	2	1,309	0	0	2	1,060	0	0
2006	1	0	0	0	0	0	0	0	1	0	0	0
Total	54	29,888	19	11,328	20	13,647.4	10	3,409.4	5	1,503.5	5	3,600

Table II-8

Outage Rates

Historically, the CAISO has used approximately 2,500 MW as an estimate of generation that can be expected to be out of service (e.g., either off-line or curtailed) because of some sort of forced (e.g., unplanned) outage. This is generally less during the summer months because of the concerted effort to prepare generation for the peak period. However, considering higher run times (both to serve load in the CAISO Control Area and for exports due to an expanded market) coupled with the average age of generating units, this value can be expected to increase over time. Experience in December 2000, where generation was heavily utilized over the previous summer, showed the average forced outage rate was over 5,000 MW, with outages exceeding 6,000 MW on 6 individual days. An estimated average forced outage range is between of 3,000 MW to 6,000 MW.

Scheduled outages can be expected to be better coordinated (pending approval of proposed tariff amendments) not only to minimize outages during both summer and winter peaking periods, but to allow some flexibility to soften otherwise unmitigated spikes in forced outages as well.

Moreover, as greater emphasis (through incentives or penalties) is placed on providing and adhering to maintenance plans, as well as maximizing availability, scheduled and forced outages may become more predictable.

Air Quality Issues

Summary

All California power plants are required to operate in accordance with strict environmental regulations. The CAISO projects that in 2001 the in-area plants will be operated for unprecedented duration, and a majority of these facilities will exhaust their allowed operational hours or consume their allowed Nitrogen Oxide (NOx) emission credits prior to the end of summer of 2001, if not earlier.

The CAISO, in cooperation with the California Air Resource Board (CARB) and the California Energy Commission (CEC), have actively worked with the plant owners, local Air Pollution Control Districts (APCDs) and Environmental Protection Agency (EPA) Region 9 to individually address the environmental restrictions at each power plant in the CAISO Control Area. This CAISO 2001 Summer Assessment report provides a brief summary of the environmental issues surrounding the major power plants in the CAISO Control Area, the actions taken thus far, and the CAISO's view of the steps required to remove the environmental restrictions that potentially restrict the availability of CAISO Control Area power plants.

Conclusion

The majority of the CAISO Control Area generators operate under strict environmental, air quality and air emission regulations that set a ceiling on the total annual operational hours and/or output of these facilities. During the severe energy shortage in 2001, the CAISO has been forced to utilize all available in-area generators to prevent curtailing firm load. The emergency operation, essential to minimize the immediate problem of rolling blackouts, has caused the power plants in the CAISO Control Area to exhaust their allowable air emission credits and has jeopardized future operation of these plants.

A collaborative effort is under way between the California Independent System Operator, California Energy Commission, California Air Resource Board, local Air Pollution Control Districts, and the owners of California power plants to develop mechanisms, interim rules and regulations that will relax/remove some of the current emissions and other environmental restrictions from these power plants. The objective of this effort is to permit maximum availability of these resources during this period of electric supply deficiency in the state. The executive orders from the Governor of California pave the way for an expedited increase in power plant availability and use. Efforts are required at the federal level to ensure EPA Region 9 fully endorses this concept of temporary relaxation of the environmental regulations that, in some cases, are in violation of the federal Clean Air Act.

III. Load Forecast

Introduction

The estimated 2001 summer peak load for the CAISO's Control Area is expected to fall within a range of 46,388 MW and 47,703 MW. The peak temperatures were weighted across major load centers under the base case forecasting model. Various assumptions of weather conditions, economic and demographic growths were made to develop Artificial Neural Network forecasting models. Range forecasts were developed using simulation techniques. A range analysis is desirable to mitigate any uncertainty that could not be captured by any one given statistical estimation technique. Should the weather conditions deviate by more than 12% from the base case level along with the higher than expected economic growth, a summer peak load may reach to 48,895 MW. If the economy slows significantly and the summer weather conditions are below the expected weather of the last three years, the summer peak load could be as low as 44,996 MW.

Historical Load

Monthly averages of daily peak load levels including load interruptions for 1998, 1999, and 2000 are shown in Table III-1 below.

HISTORICAL MONTHLY AVERAGE PEAK LOADS (MW)												
CAISO CONTROL AREA												
Year	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**August**	**Sept**	**Oct**	**Nov**	**Dec**
1998	NA	NA	NA	NA	NA	29,264	36,099	38,824	34,402	28,827	28,841	30,330
1999	29,356	29,276	29,112	28,268	28,621	32,145	35,325	35,722	34,100	32,491	30,619	31,853
2000	31,082	30,600	30,498	29,909	31,689	36,896	36,460	37,658	34,602	30,666	30,838	31,072

Table III-1

Table III-2 shows the actual monthly peak loads with load interruptions. Historical peak loads illustrate an upward trend consistent with the economic growth of the state. As shown in Table III-2 below, the 2000 summer instantaneous peak load in the CAISO Control Area was 45,494 MW. Control Area load duration curves are shown below in Figure III-A. Figure III-B indicates the number of days out of a year the daily peak has exceeded the threshold of 35,000 MW and critical resource level of 40,000 MW respectively.

ACTUAL MONTHLY INSTANTANEOUS PEAK LOADS (MW)												
CAISO CONTROL AREA												
Year	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**August**	**Sept**	**Oct**	**Nov**	**Dec**
1998	NA	NA	NA	NA	NA	33,688	43,394	45,811	44,442	31,208	30,846	33,264
1999	31,419	31,532	31,146	31,174	34,698	40,937	45,884	44,006	40,188	36,772	32,860	34,432
2000	32,744	32,394	32,552	33,911	39,808	43,630	45,245	45,494	43,740	33,181	33,338	34,115

Table III-2

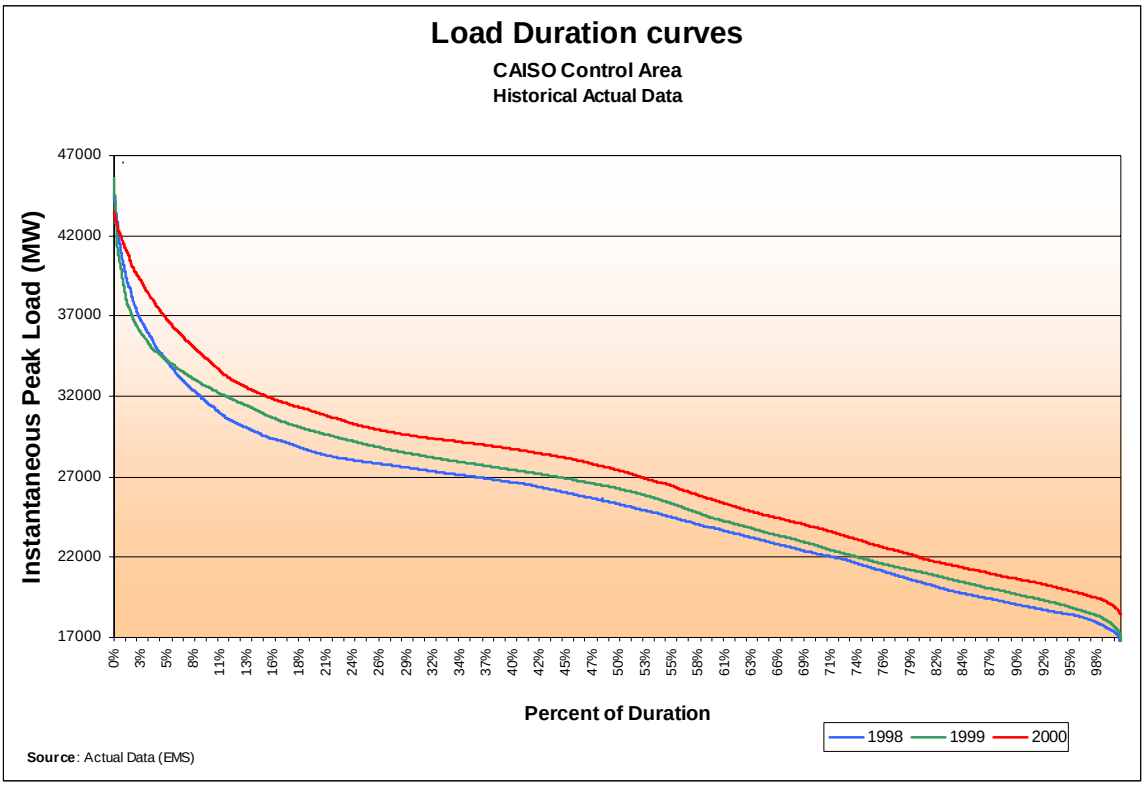

Figure III-A

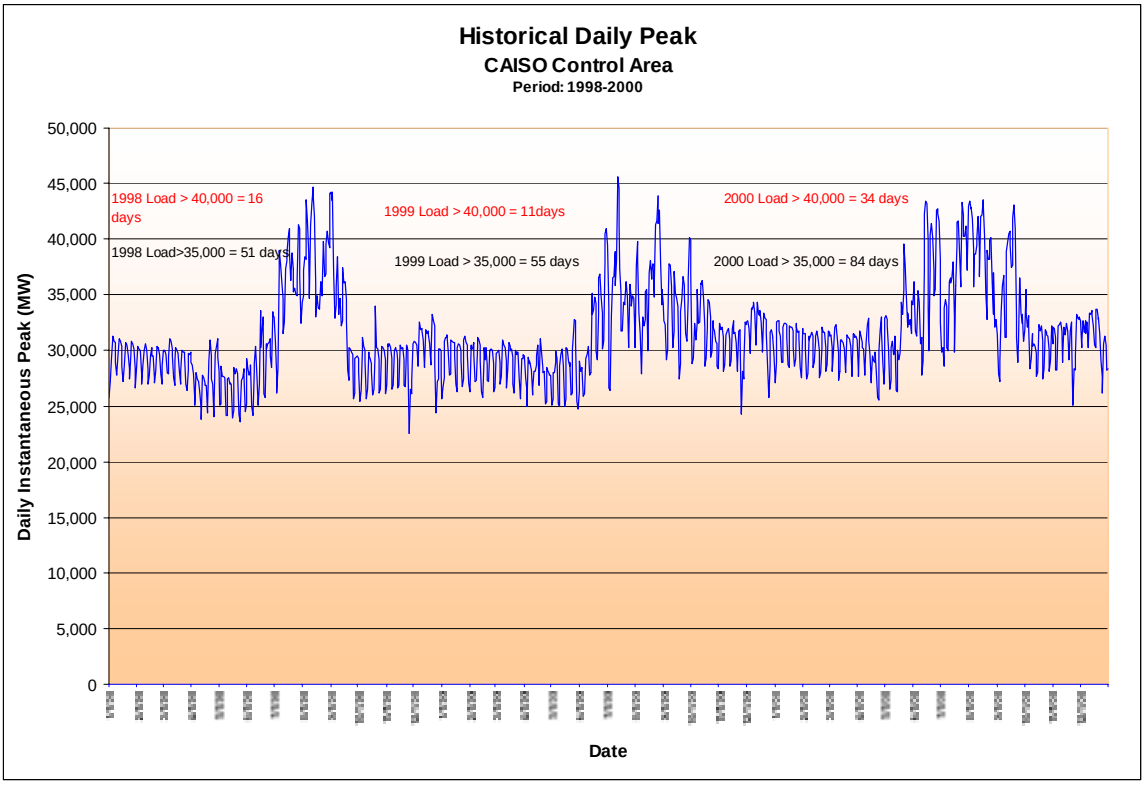

Figure III-B

Load Forecast

10 Year Forecast

A 10-year forecast of peak load per month is show in Table III-3. Figure III-C represents summer and winter peak load per year for the next 10 years. The load-forecast methodology, used to forecast the peak load demand by month, employs assumptions for the weather, economy, etc. and predicts a 10-year long-range forecast.

MONTHLY INSTANTANEOUS PEAK LOAD (MW) FORECAST												
CAISO CONTROL AREA												
Year	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**August**	**Sept**	**Oct**	**Nov**	**Dec**
2001	32,187	32,842	32,203	37,977	41,977	46,488	45,798	47,703	44,231	36,501	33,247	34,605
2002	32,783	33,450	32,799	38,680	42,754	47,348	46,645	48,586	45,049	37,176	33,862	35,245
2003	33,389	34,068	33,406	39,395	43,545	48,224	47,508	49,484	45,883	37,864	34,489	35,897
2004	34,007	34,699	34,024	40,124	44,350	49,116	48,387	50,400	46,732	38,565	35,127	36,561
2005	34,636	35,341	34,653	40,866	45,171	50,025	49,282	51,332	47,596	39,278	35,776	37,238
2006	35,277	35,994	35,294	41,622	46,006	50,950	50,194	52,282	48,477	40,005	36,438	37,927
2007	35,930	36,660	35,947	42,392	46,857	51,893	51,123	53,249	49,373	40,745	37,112	38,628
2008	36,594	37,338	36,612	43,177	47,724	52,853	52,068	54,234	50,287	41,498	37,799	39,343
2009	37,271	38,029	37,289	43,975	48,607	53,831	53,032	55,237	51,217	42,266	38,498	40,071
2010	37,961	38,733	37,979	44,789	49,506	54,826	54,013	56,259	52,165	43,048	39,210	40,812

Table III-3

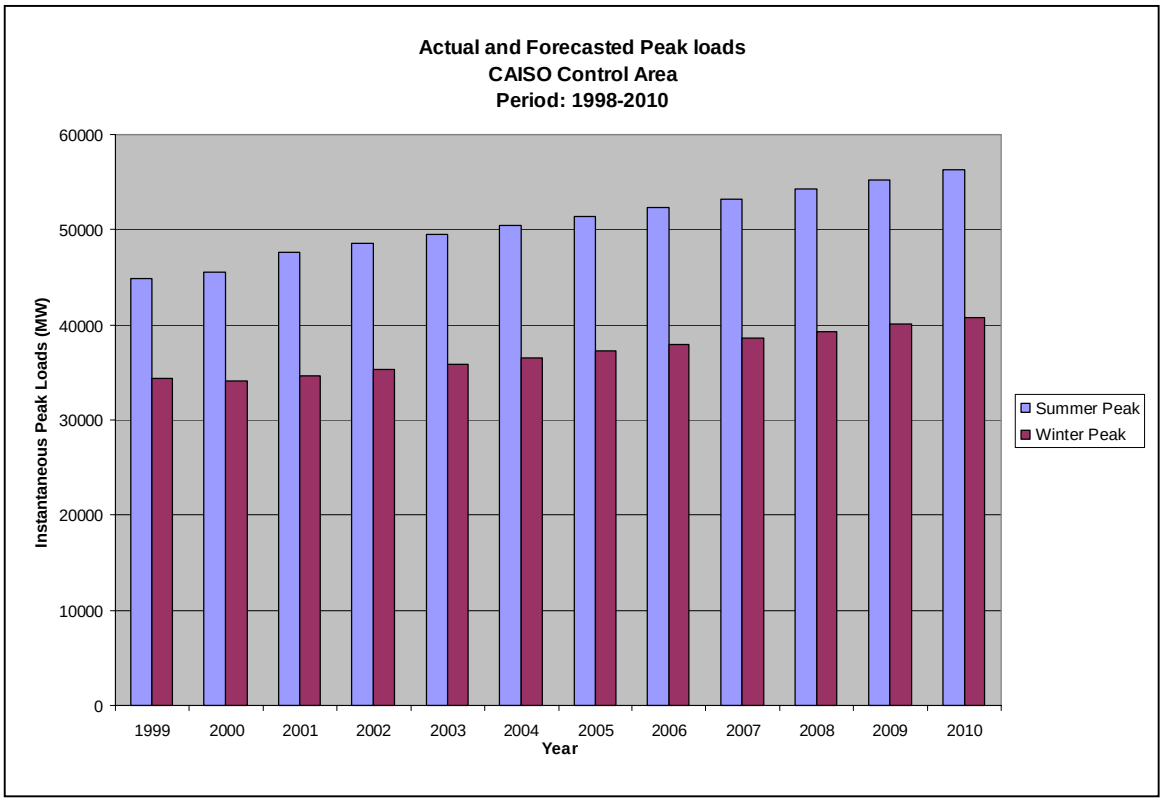

Figure III-C

Table III-4 delineates actual and forecasted monthly energy data. Figure III-D represents actual energy usage from 1998 to 2000 and forecasted energy usage for the next 10 years without conservation efforts. The energy-forecast methodology, used to forecast the energy by month, employs assumptions for the weather, economy, etc. and predicts a 10-year long-range forecast.

ACTUAL AND FORECASTED MONTHLY ENERGY (GWH) CAISO CONTROL AREA												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**July**	**Aug**	**Sept.**	**Oct.**	**Nov.**	**Dec.**
1998	18,057	16,992	18,207	16,790	17,150	17,993	21,332	22,538	19,591	17,927	17,006	18,316
1999	17,867	16,871	18,216	17,281	18,129	19,309	21,330	21,697	20,138	19,885	18,104	19,283
2000	18,984	17,807	18,990	18,210	19,997	21,603	21,935	23,141	20,620	19,437	18,656	19,412
2001	19,720	18,498	19,726	18,917	20,773	22,441	22,786	24,039	21,420	20,191	19,380	20,165
2002	20,231	18,977	20,237	19,407	21,311	23,022	23,376	24,662	21,975	20,714	19,882	20,687
2003	20,755	19,468	20,762	19,910	21,863	23,619	23,982	25,300	22,544	21,250	20,397	21,223
2004	21,293	19,973	21,299	20,425	22,430	24,230	24,603	25,956	23,128	21,801	20,925	21,773
2005	21,844	20,490	21,851	20,954	23,011	24,858	25,240	26,628	23,727	22,365	21,467	22,337
2006	22,410	21,021	22,417	21,497	23,607	25,502	25,894	27,318	24,342	22,945	22,023	22,915
2007	22,990	21,565	22,997	22,054	24,218	26,162	26,564	28,025	24,972	23,539	22,594	23,509
2008	23,586	22,123	23,593	22,625	24,845	26,840	27,252	28,751	25,619	24,149	23,179	24,118
2009	24,197	22,696	24,204	23,211	25,489	27,535	27,958	29,496	26,283	24,774	23,779	24,742
2010	24,823	23,284	24,831	23,812	26,149	28,248	28,682	30,260	26,963	25,416	24,395	25,383

Table III-4

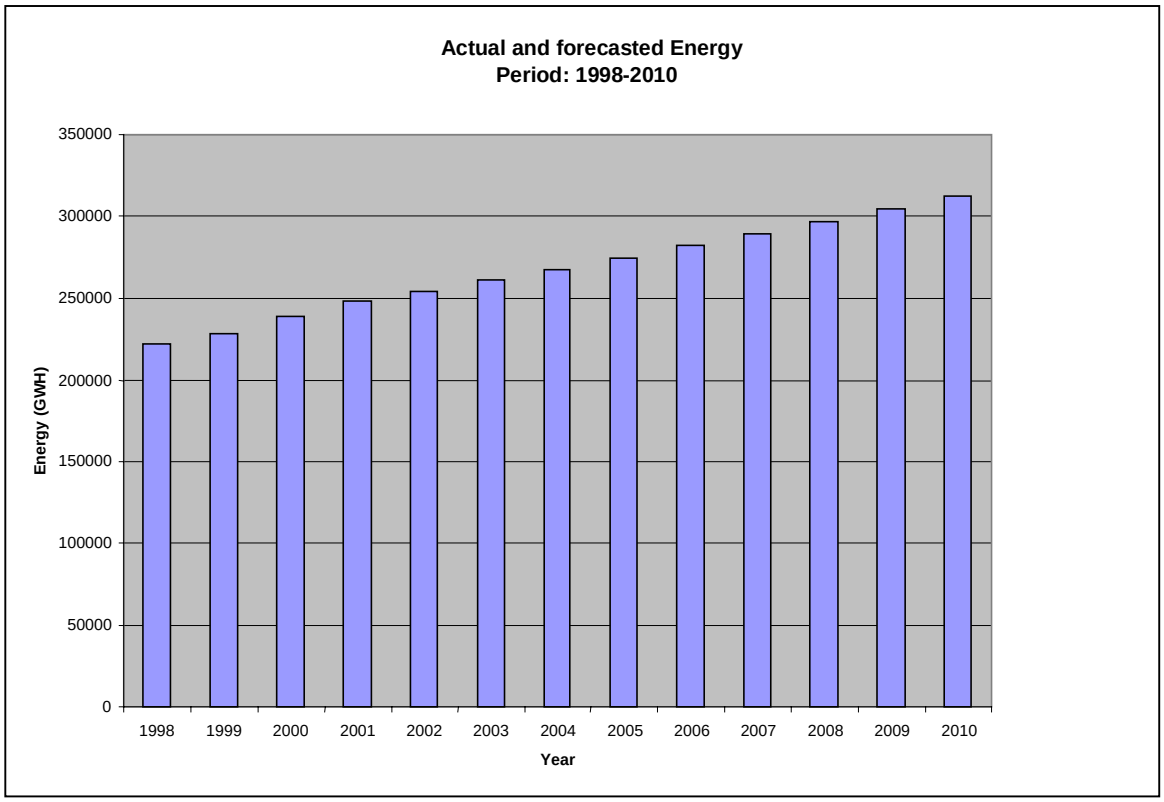

Figure III-D

Demand Relief

The CAISO has been working with its Board of Governors and market participants on several fronts to improve demand response programs for 2001. This activity accelerated recently to help address concerns with interruptible tariffs. This section of the CAISO 2001 Summer Assessment is an update on several items of interest regarding the three CAISO Demand Response Programs.

Demand Relief Program

The Demand Relief Program operates June through September and serves as a curtailment option that can be used after interruption of non-firm loads (interruptible tariffs) and before moving into Stage III rotating blackouts.

The ISO issued an RFB for the Demand Relief Program in December, 2000. Based on bids received, 596 MW have been approved for final contract execution and implementation, for the summer of 2001.

The CAISO is considering issuing a separate request for bids for the Demand Relief Program with bids due in the April timeframe, possibly with a July 1 start date. This second RFB is intended to attract (1) Loads on PG&E interruptible tariffs that have exhausted their 2001 allocation, (2) Loads associated with military complexes in the state, (2) unsuccessful DRP bidders from the first round that can modify their offerings, (3) Back-up generators that can accommodate the new program structure, (4) Loads that may elect to participate in new state-sponsored programs to install interval meters on smaller loads, and (5) other new load entrants. A decision on this matter should be reached by March 16, 2001.

Discretionary Load Curtailment Program

Principles of this new program were posted on the CAISO web page in early January of 2001. Based on the Board of Governors' feedback and CAISO review of programs elsewhere, the CAISO is nearing completion of the final design of this program and posted the program design on March 6, 2001. The program was modified to coordinate with various proposals that have been developed as part of the CPUC Rulemaking on Interruptible Tariffs. Final approval for this program and pricing is expected by mid-March. This program will operate year-round, and encourages participation by smaller loads by giving them total discretion whether to curtail or not, without penalty. The Discretionary Load Curtailment Program could be another vehicle to allow additional demand participation from loads on interruptible tariffs that have exhausted their yearly curtailment allotment.

Participating AS Load Program

The CAISO has removed the telemetry requirement for loads making Supplemental Energy bids into the market. This will apply to all loads signing a Participating Load agreement for participation in the Supplemental Energy market. The telemetry requirements as defined in the technical standards still apply for bids in the Non-Spinning Reserve and Replacement Reserve markets.

Energy bids from loads, whether for supplemental energy, or the energy portion of the A/S bids, are now subject to the pricing provisions of the December 15th FERC order, providing for a $150 soft price-cap, and payment as bid for bids above the soft price-cap that are dispatched.

Figure III-E illustrates how Demand Response Programs are implemented relative to Alerts, Warnings and Emergencies (AWE).

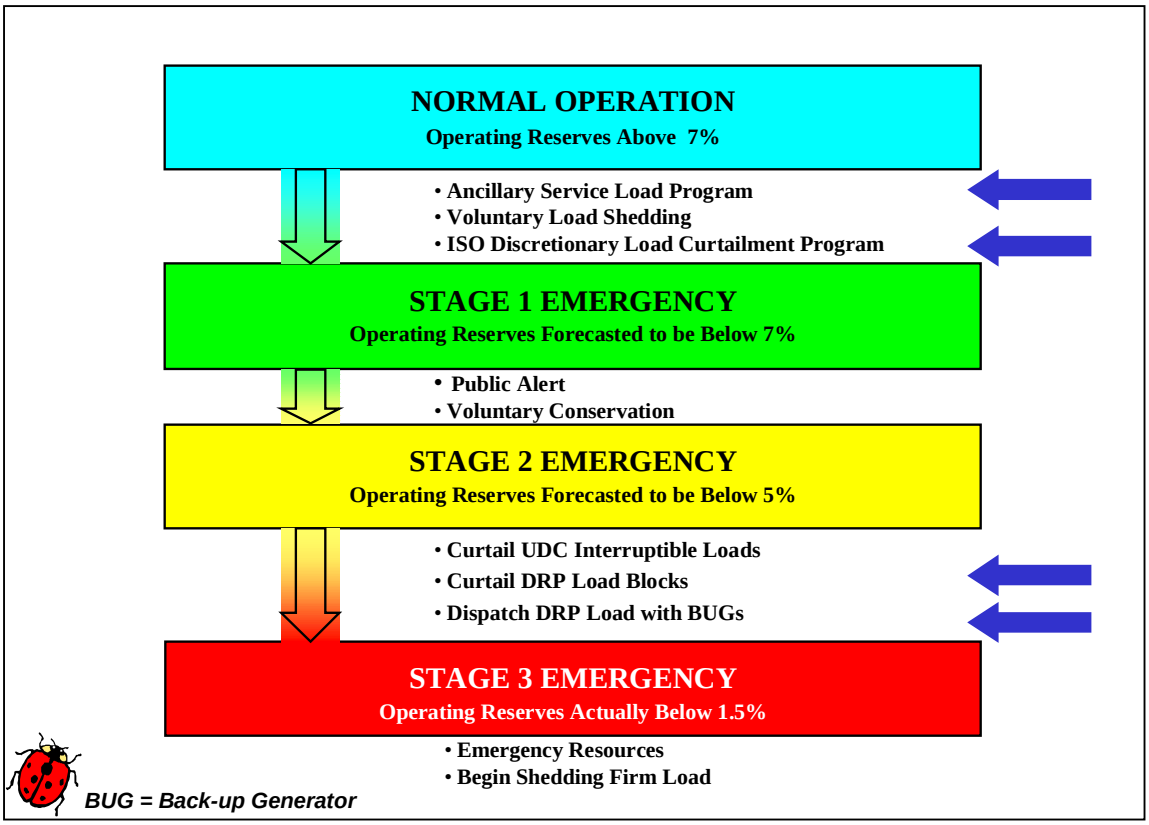

Figure III-E

IV. Interchange and Dynamics

Interchange

The net interchange is generally calculated by subtracting the total export from the total import for the ties connected to the CAISO Control Area. The majority of the time the CAISO Control Area has net imports. California's current energy crisis can be partly tied to the reduction of imports. See figures IV-A, IV-B and IV-C titled "Hourly Average Net Interchange Duration Curves," "Monthly Average Net Interchange" and "Daily Average Net Interchange," respectively shown below. The figures IV-A, IV-B and IV-C, derived from historical revenue metering data, graphically represent the CAISO Control Area net interchange for 1998, 1999 and 2000 and include dynamically scheduled generation. A comparison of the yearly data shows a significant reduction in imports through the interchange for year 2000 when compared to year 1999.

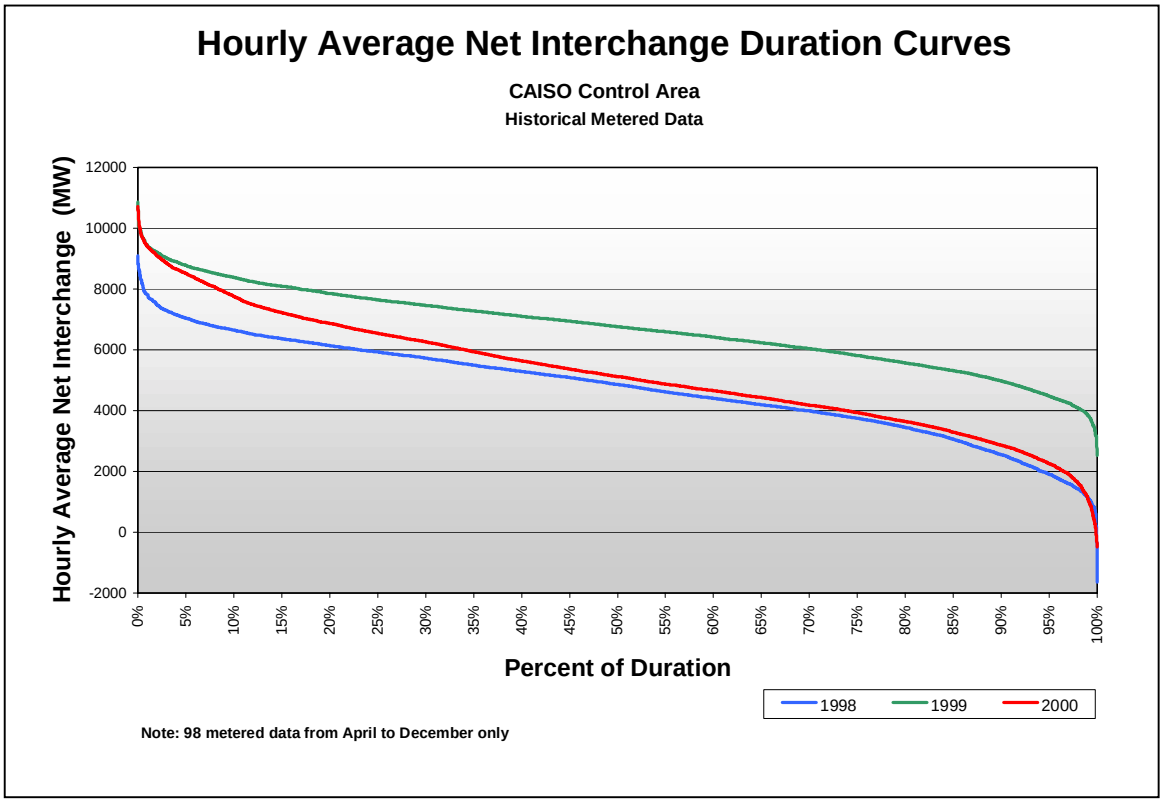

Figure IV-A

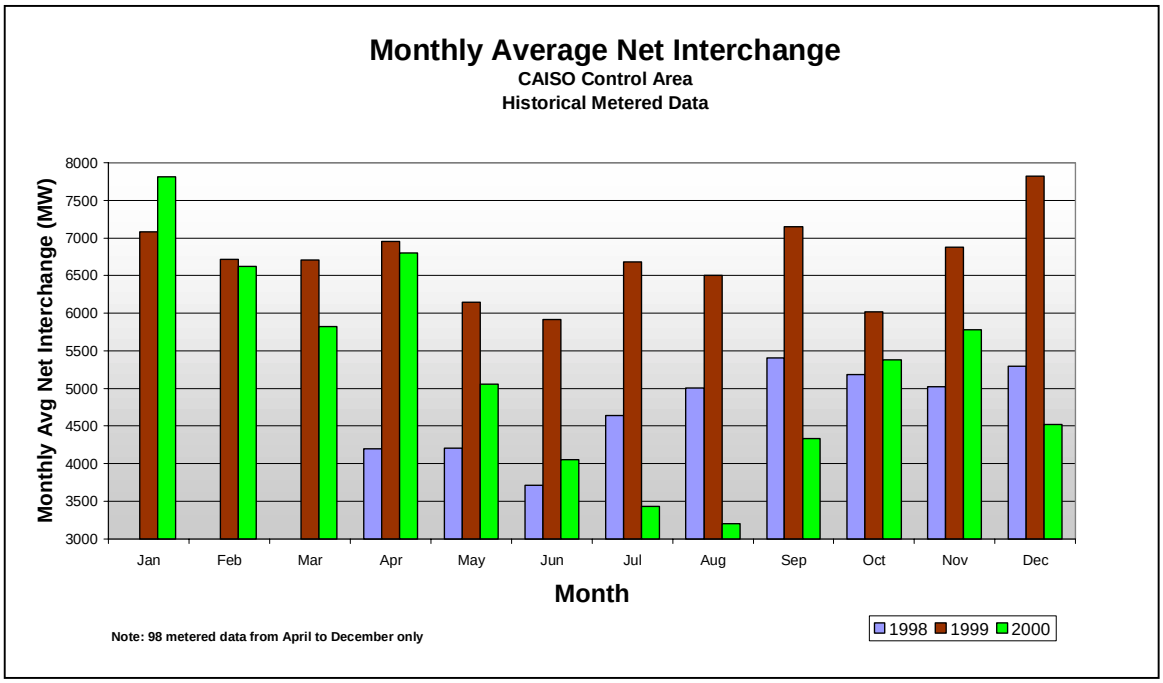

Figure IV-B

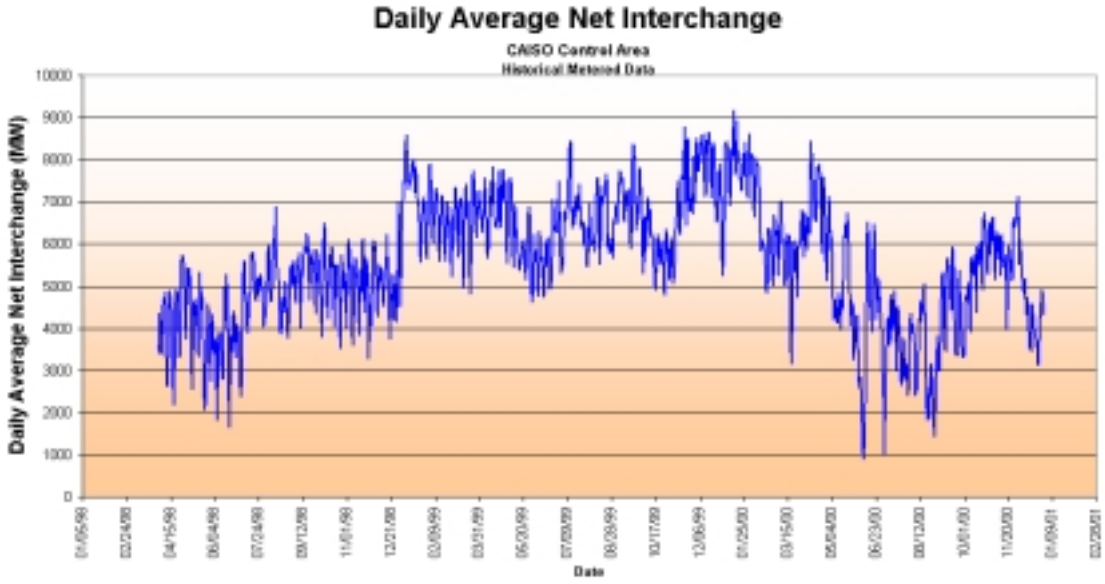

Figure IV-C

Dynamics

Dynamics generally refers to generation resources geographically located in a control area, which are dynamically scheduled by a second and separate control area.

The dynamic schedules into the CAISO Control Area are a combination of the following units:

- SCE's share of Hoover (14.2%) 277 MW
- SCE's share of Four Corners 4 & 5 (48%) 753 MW
- SCE's share of Palo Verde (15.8%) 579 MW
- Metropolitan Water District's share of Hoover (12.7%) 248 MW

This yields a combined maximum total of 1857 MW of dynamically scheduled resources available to the CAISO.

It should be noted that SCE's share of Mohave (56%) has been included as part of the Maximum CAISO Control Area Generating Capability computation in Section II above entitled Resources (Existing Generation). The other 44% of Mohave's generating capability is dynamically scheduled out of the CAISO Control Area to three other control areas including LDWP, SRP and NEVP.

V. Operating Reserves

To achieve a high degree of service reliability, the CAISO adheres to the Western Systems Coordinating Council's (WSCC) Minimum Operating Reliability Criteria (MORC). According to MORC, adequate minimum generation capacity needs to be available 24 hours a day in the CAISO's Control Area. This generation capacity, otherwise known as Operating Reserve, is necessary to maintain frequency and to avoid loss of firm load following the loss of generation resources or transmission system components.

Current Operating Reserve Requirements

The current Operating Reserve maintained in the CAISO's Control Area is defined as the summation of Regulating Reserve, Contingency Reserve, Reserve for Interruptible Imports and Reserve for On-Demand Obligations.

Regulating Reserve

Regulating Reserve is generally defined as adequate generator spinning reserve under the CAISO's Automatic Generation Control (AGC) to provide regulation according to the Northern American Electric Reliability Council's (NERC) criteria.

Contingency Reserve

Contingency Reserve is generally defined as spinning and non-spinning reserve necessary to reduce the CAISO's area control error (ACE) to pre-contingency levels within 10 minutes. In the CAISO's Control Area, Contingency Reserve is equal to 5% of the load served by hydro generation and 7% of the load served by thermal generation. At least half of the Contingency Reserve must be generation spinning reserve.

Reserve for Interruptible Imports

Reserve for Interruptible Imports is generally described as spinning or non-spinning reserve which can be up and running in 10 minutes equal to the imports into the CAISO's Control Area that can be interrupted.

Reserve for On-Demand Obligations

Reserve for On-Demand Obligations is generally described as spinning or non-spinning reserve which can be up and running in 10 minutes equal to the on demand obligations to other entities or control areas.

Operating Reserve Deficiencies

CAISO's ability to maintain minimum operating reserve requirements has consistently decreased since 1998. When the operating reserve requirements of the CAISO Control Area are compromised, the CAISO provides notification to market participants, utility distribution companies (UDCs), the public, etc. via CAISO's Alerts, Warnings and Emergencies (AWE) protocol. As a result, the number of Alerts, Warnings and Emergency occurrences from year to year is an indicator of CAISO's ability to uphold required operating reserves.

Alerts, Warnings and Emergencies (AWE) Protocol

A simplified summary comparison of Alerts, Warnings, and Emergencies may be characterized as follows:

- **Alert:** Notice to all Market Participants advising of marginal conditions (usually relative to Operating Reserve) and requesting market response for resolution;
- **Warning:** Notice to all Market Participants advising of marginal conditions (usually relative to Operating Reserve) and requesting market response for resolution, and additionally advising Market Participants that the ISO may seek resolution by acquisition of resources through non-competitive means.
- **Emergency:** Notice to all Market Participants and/or to the public of conditions threatening electric system reliability (e.g., Operating Reserve and/or other system concerns) enabling out of market acquisition of resources and obligating response from all Market Participants as directed by the ISO. That response may include as appropriate, changes in generating resources and/or the curtailment of UDC demand (voluntary and/or involuntary load reduction).

Emergencies can further be divided into Stage 1, Stage 2 and Stage 3 Emergencies which are issued based on the level of severity. A simplified summary comparison of Stage 1, Stage 2 and Stage 3 Emergencies may be characterized as follows:

- **Stage 1:** Actual or anticipated Operating Reserves are less than WSCC Minimum Operating Reserve Criteria;
- **Stage 2:** Actual or anticipated Operating Reserves are less than or equal to five percent (5%);
- **Stage 3:** Actual or anticipated Operating Reserves are less than or equal to one and one half percent (1.5%).

CAISO's capability of maintaining the required Operating Reserves has significantly diminished since 1999 as shown in Table V-1 below which indicates the number of Alerts, Warnings and Emergency occurrences per year.

DECLARATION	1998	1999	2000	2001	TOTAL
Alert	7	2	34	75	118
Warning	8	6	85	75	174
Stage 1 Emergency	7	4	55	49	115
Stage 2 Emergency	5	1	36	46	88
Stage 3 Emergency	0	0	1	34	35

Table V-1

VI. Transmission Assessment

Introduction

In general, the transmission system is expected to demonstrate adequate operating margins for Summer 2001. Use of the transmission system is directly related to load conditions, net import levels, and the availability of significant resources. If CAISO has sufficient resources to meet its peak load and maintain minimum reserve requirements, then the transmission system could experience record use. However if a resource shortage occurs, load curtailments may be used to alleviate demand on the transmission system. The following sections provide a brief assessment of the transmission system in CAISO's Control Area for the summer of 2001.

Significant Transmission System Additions

Various changes and additions are expected by Summer 2001 for the CAISO Control Area. Many of these changes (in both transmission and generation) will significantly change the behavior and power flows previously experienced by the transmission system. Table VI-1 below lists the expected transmission changes. Tables II-2, II-3 and II-4 in Section II of this report entitled Resources (New Generation) delineate planned new generation additions for the 2001 operating season.

SUMMER 2001 TRANSMISSION CHANGES					
FACILITY	**AREA / LOCATION**	**LENGTH (MILES)**	**CAPACITY**	**VOLTAGE**	**EXPECTED OPERATING DATE**
O'Banion-Sutter Line	Sacramento	5	530 MVA	230 kV	December 2000
Martin Shunt Capacitors	San Francisco	-	150 MVAR	230 kV	April 2001
Hunters Point #2 & #3 Synchronous Condensers	San Francisco	-	80 MVAR (each)	115 kV	April/May 2001
Tesla Transformer	Bay Area	-	1122 MVA	500/230 kV	May 2001
Tesla-Newark #2 Line	Bay Area	28	637 MVA	230 kV	May 2001
Ravenswood Sub: Loop-in Newark-San Mateo Line	Bay Area	.2	N/A	230 kV	May 2001
Metcalf Shunt Capacitor	Bay Area	-	350 MVAR	500 kV	June 2001
Wavetrap upgrades on the Midway-Vincent 500 kV lines	Southern California	N/A	N/A	500 kV	April 2001
Wavetrap upgrades on the Alamitos-Lighthipe/Barre #2-230 kV lines	Southern California	N/A	N/A	230 kV	June 2001
Installation of a Remedial Action Scheme (RAS) on the Midway-Vincent 500 kV lines (Path 26)	Southern California	N/A	N/A	500 kV	June 2001
Modification of "North of Lugo" RAS	Southern California	N/A	N/A	230 kV	June 2001
Modification of "South of Lugo" RAS	Southern California	N/A	N/A	500 kV	June 2001 (possible on-line delays)
New 230/69 kV Transformer Bank at Escondido substation	San Diego	N/A	To be determined	230/69 kV	August 2001

Table VI-1

Forecasted Local Area Grid Conditions

California Imports, WSCC Paths

The following sections describe the conditions and constraints expected for the (bulk) 500 kV transmission system in California. Paths and 500 kV constraints for Northern California are described first, followed by Southern California. Northern California is comprised of the Pacific Gas & Electric service territory, including several Municipal utilities. Southern California consists of the service areas for Southern California Edison (SCE), San Diego Gas & Electric (SDG&E), and Los Angeles Department of Water and Power (LADWP).

Northern California Imports

The total import into Northern California is defined by two major paths: the California–Oregon Intertie (COI, Path 66), and the connection between Northern–Southern California (Midway-Vincent, Path 26). In addition, there is a key internal path within Northern California, known as Midway–Los Banos (Path 15) which transfers energy to the major load centers in Northern California. The limits on Path 66, Path 26, and Path 15 are not expected to significantly change from last summer.

Under most summer conditions, Northern California load is met by internal generation and imports from Path 66 and Path 26. During most of the summer peak periods of 2000, Path 66 was loaded near or at it's operating limit, importing power from the Pacific Northwest. However, Path 26 was generally not at it's limit during peak load periods in Northern California; rather, south-to-north imports were limited by the internal Path 15 constraint.

As mentioned, the limits on Path 66, Path 26, and Path 15 are not expected to significantly change from last summer. For Summer 2001, one possible operating condition is that Path 66 may experience flow levels well below its limits, due to near-drought conditions in the Pacific Northwest; as a result, heavier south-to-north loading on Paths 15 and 26 may occur more often. If 2001 summer peak loads exceed last summer's loads, or if internal generation is unavailable/curtailed in Northern California, then there may be load curtailments in the northern area of the PG&E system bounded by Path 66 and Path 15 due to the transmission constraints.

Path 15 Discussion

During the Winter months of 2000-2001, resource shortages in Northern California and the Pacific Northwest caused increased south-to-north flows across Path 15. Path 15 reached its operating limit numerous times; this led to the extended declarations of Stage 2 and Stage 3 Emergencies, and ultimately, manual load curtailments to both interruptible customers and to firm customers in the north of Path 15 area. For example on January 17, 2001, excessive Path 15 loading resulted in the shedding of 500 MW of firm load for 2 hours. Similarly on January 18, 2001, excessive Path 15 flows caused 1000 MW of firm load to be shed for 1 hour, and 500 MW of firm load to be shed for another 1 hour.

From April 1, 1998 to January 15, 2001, there were 226 incidents where the flow on Path 15 exceeded the south-to-north stability limit. Of these 226 overloads, 51 were for a period longer than 10 minutes. WSCC RMS sanctions occur when flows exceed the stability limit for 10 minutes or longer. The estimated sanctions paid to the WSCC for the period above is $132,600 for Path 15.

Southern California Imports

The total import into Southern California is defined by several transmission paths, including the connection between Northern-Southern California ("Midway-Vincent," Path 26), the Pacific DC Intertie, and eastern-connecting paths such as the Intermountain Power Plant (IPP) DC line, "North of Lugo," and "West of (Colorado) River." Collectively, the imports into Southern California are limited by the Southern California Import Transmission (SCIT) Nomogram.

Last year, SCIT flows reached the import limit on a few occasions, but not during the summer peak periods. Furthermore, in the instances when the SCIT limit was reached, additional southern area generation was available to operate within the limits established by the SCIT Nomogram.

During some peak periods last summer, significant amounts of non-firm load (interruptible customers) were curtailed in the SCE and SDG&E service areas, due to operating reserve/resource shortages throughout the ISO and/or WSCC systems. If Summer 2001 loads for Southern California reach last year's levels, and less generation is available within the southern region, the SCIT import limit could be reached under peak conditions, requiring load to be interrupted.

Northern California 500/230 kV Transformers

During past Summers' peak conditions, the 500/230 kV transformers in Northern California have been heavily loaded. In particular, emergency overload concerns have been noted for the transformers at Tracy, Vaca Dixon, Tesla, and Metcalf substations. To help mitigate these overloads, transformer ratings have been increased, and procedures have been created for coordinating overload relief of these transformers. These procedures also included the possibility of load curtailment to reduce transformer overloads.

In May of 2001, a new 500/230 kV transformer bank is expected to come on-line at the Tesla substation. This transformer bank is a much needed addition to help serve the rapidly-growing San Francisco Bay Area. Installation of this transformer (along with a new dedicated 230 kV transmission line) reduces the normal demand on the other 500/230 kV transformers at Tracy, Vaca Dixon, Tesla, and Metcalf. However, it is expected that some procedures will still be required to help mitigate some emergency/contingency transformer overload conditions.

Additional reinforcements could be available as early as 2002 to address these transformer loading issues.

Sacramento Valley Area

During summer peak load conditions, the Sacramento Valley Area can experience low voltage conditions, and is subject to voltage collapse for various double line outages. To protect against voltage collapse, an undervoltage load shedding scheme was put in place in 1996. The amount of load armed to protect against voltage collapse is re-evaluated annually, but is generally in the range of 400 MW. CAISO is working closely with the Sacramento Valley Study Group (SVSG) to assess the performance of the local area system, reevaluate the undervoltage load shedding parameters, and develop procedures to mitigate voltage problems in the area for the upcoming summer season.

For this Summer, one significant change is the July 2001 addition of the Sutter Power Plant. This new 500 MW generator connects to the 230 kV on the periphery of the Sacramento Valley transmission system, and is expected to change the voltage performance of the Sacramento Area.

San Francisco Bay Area

During Summer 2000, record high temperatures coupled with multiple simultaneous generator outages led to localized firm load-shedding within the Bay Area on June 14, 2000. For Summer 2001, the Greater San Francisco Bay Area ("the Bay Area") and the San Francisco Sub-Area are expected to undergo radical changes. Substantial transmission reinforcements have been added in anticipation of meeting the Summer 2001 demand for this area. These reinforcements, along with the July addition of the new Los Medanos 500 MW power plant, are expected to significantly change the power flows typically experienced by the Bay Area's internal network.

Major transmission system changes expected in 2001 for the Bay Area include:

- Martin 230 kV Shunt Capacitors (150 MVAR) in April 2001,
- Conversion of Hunters Point units #2 and #3 to synchronous condensers (80 MVAR each) in April/May 2001,
- Tesla 500/230 kV, 1122 MVA Transformer in May 2001,
- Tesla-Newark #2-230 kV Transmission Line (28 miles, 637 MVA) in May 2001,
- Ravenswood substation upgrade: Loop-in Newark-San Mateo 230 kV Line in May 2001,
- Metcalf 500 kV Shunt Capacitor (350 MVAR) in June 2001,
- Los Medanos Energy Center (540 MW Power Plant) on-line July 2001.

Initial analysis indicates that even without the addition of the Los Medanos power plant, these projects produce a markedly improved performance in the Bay Area transmission system. However, under a few select contingencies, the Bay Area could still experience local transmission line and transformer bank overloads, and/or low local area voltages.

Fresno Area

The installation of 150 MVAR of 230 kV shunt capacitors at Gregg Substation in 2000 greatly improved the voltage profiles for the Fresno Area. In addition, the expected availability of all the synchronous condensers in this area should prevent any low voltage problems during the 2001 summer months.

Furthermore, four Summer Reliability Generators (SRG) with a capacity of 156.6 MW are expected to be in-service in the Fresno Area by the end of July. These SRG units will increase the load serving capability in the greater Fresno area, and will help mitigate overload and potential low voltage problems following N-1 contingencies.

For summer 2001, the forecasted load for the Fresno Area is 2,900 MW, which could be a challenge for system operators should hydro resources be restricted. The primary concerns are utilizing the Kings River generating resources to meet system demand, maintaining operating reserve and not being able to pump with Helms. These conditions could deplete the Kings River resource by mid-August, 2001, which could result in load curtailment in the Fresno Area.

Southern California Edison (SCE) Area

SCE added significant transmission upgrades in 1999 and 2000, to reduce the local Reliability Must Run (RMR) generation requirement for this area. With these transmission upgrades, there is adequate reactive (MVAR) margin during major disturbances with minimum amount of RMR generation requirement. Also, under expected peak conditions there is sufficient transfer capability to import power from external resources.

A number of new transmission upgrades are scheduled for completion by June 1, 2001. The purpose of these projects is to mitigate local constraints based on the forecasted load. These projects include:

- Wavetrap upgrades on the Midway-Vincent 500 kV and Alamitos-Lighthipe/Barre #2-230 kV lines,
- Installation of a Remedial Action Scheme (RAS) on the Midway-Vincent 500 kV lines (Path 26) (project under review),
- Tehachapi area 66 kV upgrades,
- Modification of “North of Lugo” and “South of Lugo” RAS,
- 115 kV shunt capacitor installations at Devers and Santa Rosa substations.

San Diego Gas and Electric (SDG&E) Area

SDG&E receives its transmission imports from two primary sources: 1) 230 kV lines emanating southward from San Onofre Nuclear Generating Station (collectively known as Path 44, “South of SONGS”), and 2) a single 500 kV transmission line known as the SouthWest Power Link (SWPL). Import limits into the SDG&E Area are defined by the availability of all these circuits, and limited by loss (N-1) of the SWPL source.

Significant transmission upgrades were implemented in 2000 to raise the SDG&E Simultaneous Import Limit to 2,750 MW and the Non-Simultaneous Import Limit (Path 44, South-of-Songs) to 2,200/2,400 MW. With these higher simultaneous and non-simultaneous import capabilities, adequate imports can be handled during the projected peak for this area.

Two more transmission upgrades are scheduled for completion by August, 2001. These two projects are designed to mitigate local SDG&E constraints based on the forecasted load. These two projects are:

- New 230/69 kV Transformer Bank at Escondido substation,
- Reconductor Rancho Santa Fe Tap-Bernardo 69 kV line.

VII. Description of CAISO Control Area

A control area is defined as a geographic area which regulates its generation in order to balance load and maintain planned interchange schedules with other control areas and assists in controlling the frequency of the interconnected system in accordance with WSCC and NERC criteria. The CAISO Control Area, shown in figure VII-1 below, geographically includes most, but not all, of California. Three previous control areas: PG&E's, SCE's and SDG&E's now comprise the CAISO Control Area. Municipalities like Sacramento Municipal Utility District (SMUD), Modesto Irrigation District (MID), Turlock Irrigation District (TID), etc., which were within the three previous IOU control areas, are also within the CAISO Control Area. Utilities including, but not limited to, Los Angeles Department of Water and Power (LDWP), Pacificorp (PAC), Imperial Irrigation District (IID), and Sierra Pacific Power (SPP) have their own control areas within California and are shaded in black in Figure VII-1 below.

Figure VII-1