California Independent
System Operator Corporation

California ISO

2007 Summer Loads and Resources Operations Assessment

March 8, 2007

Grid Assets
California ISO
Version 1.2

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I. Executive Summary

This 2007 Summer Operations Loads and Resource Assessment is designed to provide the CAISO, and interested stakeholders, an assessment of the load and resource picture for the ensuing summer season. The methodology used in developing this years' summer assessment includes the use of the California Energy Commission (CEC) Supply Adequacy Model (SAM). SAM is a forecasting tool that assesses the balance of power supply and demand for a power system. SAM was applied to determine the probability of meeting various levels of operating reserve margin during the 2007 summer peak load period for the CAISO control area, and the South of Path 26 (SP26) and North of Path 26 (NP26) sub-regions or zones. Inputs to SAM include the CAISO developed forecasts of 2007 summer peak demand, resource curtailments, and transmission limitations. Through this process a reasonable range of probable conditions are developed to help operating personnel understand and plan for a range of possible operating conditions that could occur during the upcoming 2007 summer peak demand periods.

While this report includes forecasts of 2007 peak demand levels for both 1-in-2 years and 1-in-10 years load levels, the resulting analysis does not focus on these two load conditions alone. A range of probable weather conditions are used to develop a range of load forecasts which are then combined with the range of probable resource curtailments and transmission limitations in a probabilistic approach that develops a range of operating reserve margins. The range of inputs are based on actual historic observations for the CAISO control area for daily weather conditions, weekday generator outages at time of daily peak and transmission system limitations at time of daily peak.

Available generation was developed from various sources in the CAISO to determine the actual generation capability available to the CAISO at time of system peak. A significant source was the Net Qualified Capacity (NQC) listing posted on the CAISO website. The NQC data was utilized for non-renewable resource capability. The CEC's methodology for rating wind resource capability at time of system peak loads was used for wind projects. Adjustments were made to account for expected generation additions and retirements.

Import assumptions for the CASIO, SP26 and NP26 were based on imports experienced during the 2005 and 2006 summer seasons at time of daily peak demand with particular emphasis given to import levels during the extreme weather conditions experienced during the latter part of July 2006. Import forecasts do not reflect contractual arrangements of load serving entities and suppliers within the ISO control area. The system has the capability to import more capacity if the market can provide it during times of peak. Transmission upgrades, anticipated changes in generation due to environmental issues and anticipated hydrology for 2007 impacting hydro generations within the CAISO as well as imports of surplus generation from the Pacific Northwest were also considered.

The CPUC Resource Adequacy program standards require that a 15 to 17% Planning Reserve margin be maintained based on a 1-in-2 forecast. The 15 to 17% includes the reductions in load for demand response and interruptible load programs. The demand response and interruptible program amounts are based on CPUC estimates for 2007, which include increases over 2006 amounts. The amounts have been derated to 75 percent of CPUC estimates based on observed effectiveness of programs utilized during the 2006 summer peak demand period. It is important to note that the current trigger points for invoking the demand response and interruptible load programs are Stage 1 and Stage 2 Emergencies, respectively.

The CAISO forecasts for Planning Reserve margins and the probability of entering into various staged emergencies are shown in Table 1 that follows (see Appendix G for definitions of Stages of Electrical Emergencies).

Table 1

CAISO Summer 2007 Outlook

Resource Adequacy Planning Conventions	June	July	August	September
Existing Generation	46,707	47,407	47,407	47,407
Retirements (Known)	0	0	0	0
High Probability CA Additions	700	0	0	0
Net Interchange	9,200	9,200	9,200	9,200
Total Net Supply (MW)	56,607	56,607	56,607	56,607
1-in-2 Summer Temperature Demand[2]	42,224	47,847	47,847	42,457
Demand Response (DR) (75% of CPUC 2007 estimates)	743	743	743	743
Interruptible/Curtailable Programs (75% of CPUC 2007 estimates)	1,220	1,220	1,220	1,220
Planning Reserve[1]	**38.7%**	**22.4%**	**22.4%**	**38.0%**

Supply Adequacy Model Probability Results	Summer 2007		
	Stage-1	**Stage-2**	**Stage-3**
Probability of Entering into Operating Reserve Emergencies	**20%**	**10%**	**2.9%**

SP26 Summer 2007 Outlook

Resource Adequacy Planning Conventions	June	July	August	September
Existing Generation	21,493	22,025	22,025	22,025
Retirements (Known)	0	0	0	0
High Probability CA Additions	532	0	0	0
Net Interchange	9,800	9,800	9,800	9,800
Total Net Supply (MW)	31,825	31,825	31,825	31,825
1-in-2 Summer Temperature Demand[2]	22,554	27,189	27,189	24,358
Demand Response (DR) (75% of CPUC 2007 estimates)	317	317	317	317
Interruptible/Curtailable Programs (75% of CPUC 2007 estimates)	941	941	941	941
Planning Reserve[1]	**46.7%**	**21.7%**	**21.7%**	**35.8%**

Supply Adequacy Model Probability Results	Summer 2007		
	Stage-1	**Stage-2**	**Stage-3**
Probability of Entering into Operating Reserve Emergencies	**23%**	**12%**	**3.0%**

NP26 Summer 2007 Outlook

Resource Adequacy Planning Conventions	June	July	August	September
Existing Generation	25,214	25,382	25,382	25,382
Retirements (Known)	0	0	0	0
High Probability CA Additions	168	0	0	0
Net Interchange	700	700	700	700
Total Net Supply (MW)	26,082	26,082	26,082	26,082
1-in-2 Summer Temperature Demand[2]	20,135	21,268	21,268	18,587
Demand Response (DR) (75% of CPUC 2007 estimates)	426	426	426	426
Interruptible/Curtailable Programs (75% of CPUC 2007 estimates)	279	279	279	279
Planning Reserve[1]	**33.0%**	**26.0%**	**26.0%**	**44.1%**

Supply Adequacy Model Probability Results	Summer 2007		
	Stage-1	**Stage-2**	**Stage-3**
Probability of Entering into Operating Reserve Emergencies	**16%**	**7.6%**	**3.5%**

[1] Planning Reserve calculation ((Total Generation+Demand Response+Interruptibles)/Normal Demand)-1.
[2] There is a high probability of the summer peak occurring in either July or August so for the purposes of this assessment the forecast for July & August are the same.

Table 1 shows that all three areas have risk of entering into operating reserve emergencies, the operating region where Demand Response and Interruptible programs may be utilized. The risk of having to shed firm load is a low probability event and is similar in the CAISO control area, and the SP26 & NP26 zones, under low probability, extreme demand and/or extreme adverse supply conditions.

The CAISO is counting on the continued success of the Resource Adequacy programs, generation additions to capture a moderate amount of additional supply, continuing increases in demand response and contracted interruptible programs and summer preparation efforts to manage adverse conditions that result in low operating reserves. Imports and increased ***Conservation*** will continue to be an important factor to help meet demand.

II. Review of Summer 2006 Operations

Weather

Weather conditions during the period from July 13 through July 26, 2006 were very hot, and the four-day period ending July 24 were, by all measurements, extreme. For comparison purposes Figures 1, 2 and 3 show the annual maximum Max631 temperature measurement (defined in box below) for each year from 1975 through 2006. The 2006 Max631 was the highest on record since 1975 for the region served by the CAISO as a whole as well as for the NP26 sub-region, while the 2006 Max631 for the SP26 sub-region was equaled one time, in 1990. These extreme conditions occurred through much of July and were not only noteworthy for the magnitude of the conditions, but also that they occurred throughout California (a low probability occurrence) as well as throughout the WECC Interconnection (an even lower probability occurrence).

The Max631 temperature buildup index is a weighted average of the daily maximum temperatures for a given day and the two days prior to that day. As an example, the Max631 for July 24 would be calculated as follows:

Max631 = 0.6 X (July 24th max temp) + 0.3 X (July 23rd max temp) + 0.1 X (July 22nd max temp)

Figure 1

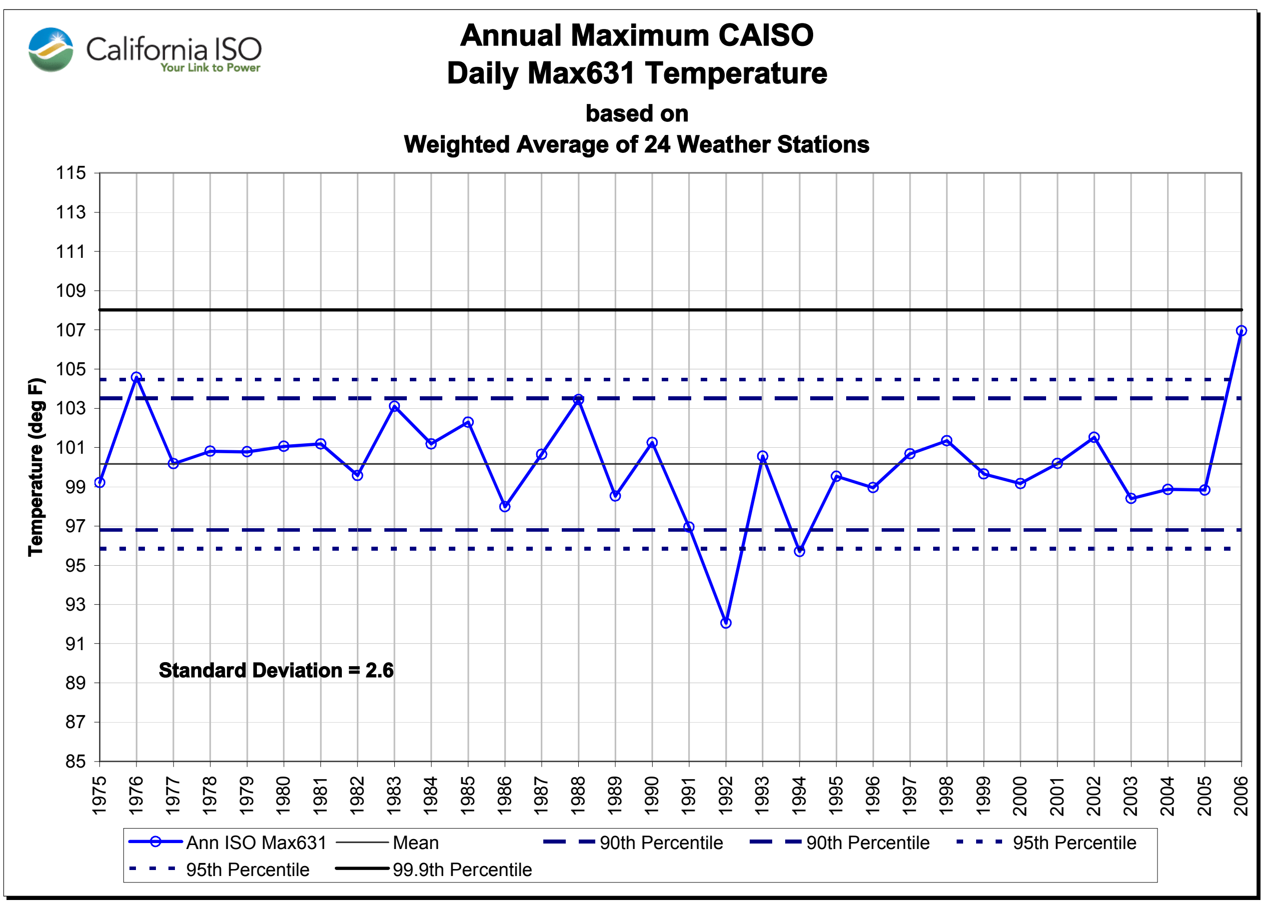


Figure 2

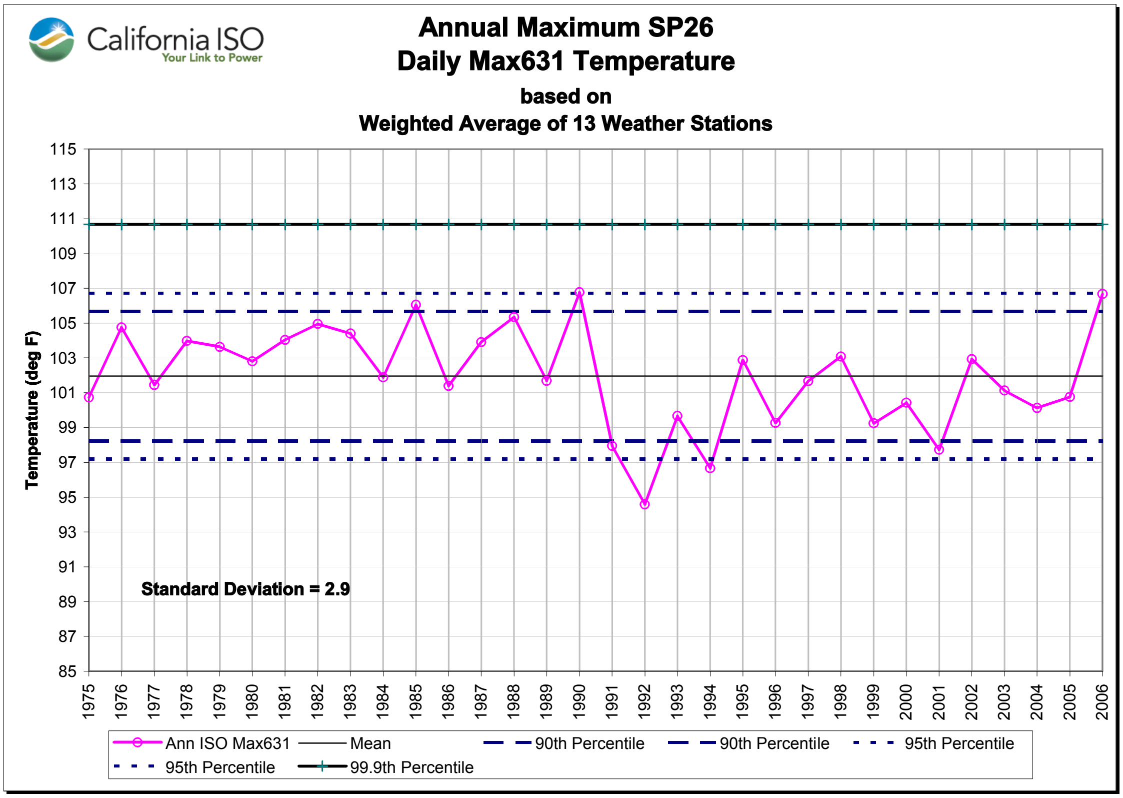
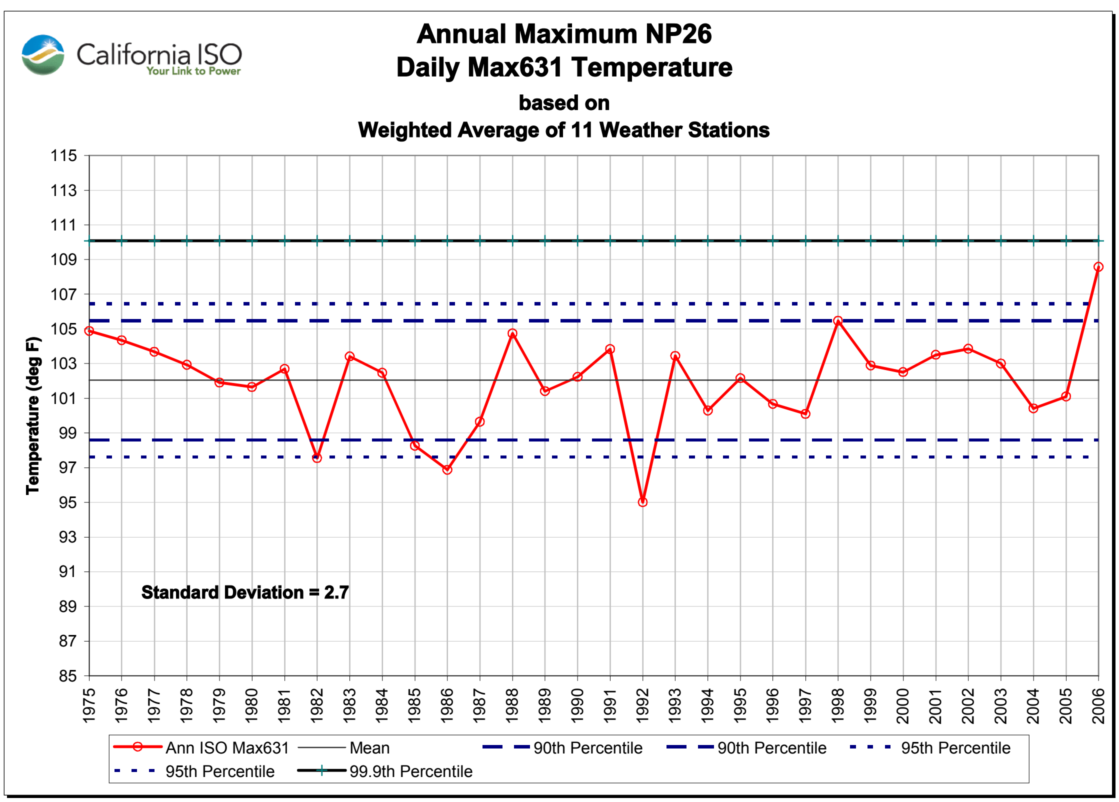


Figure 3



Demand

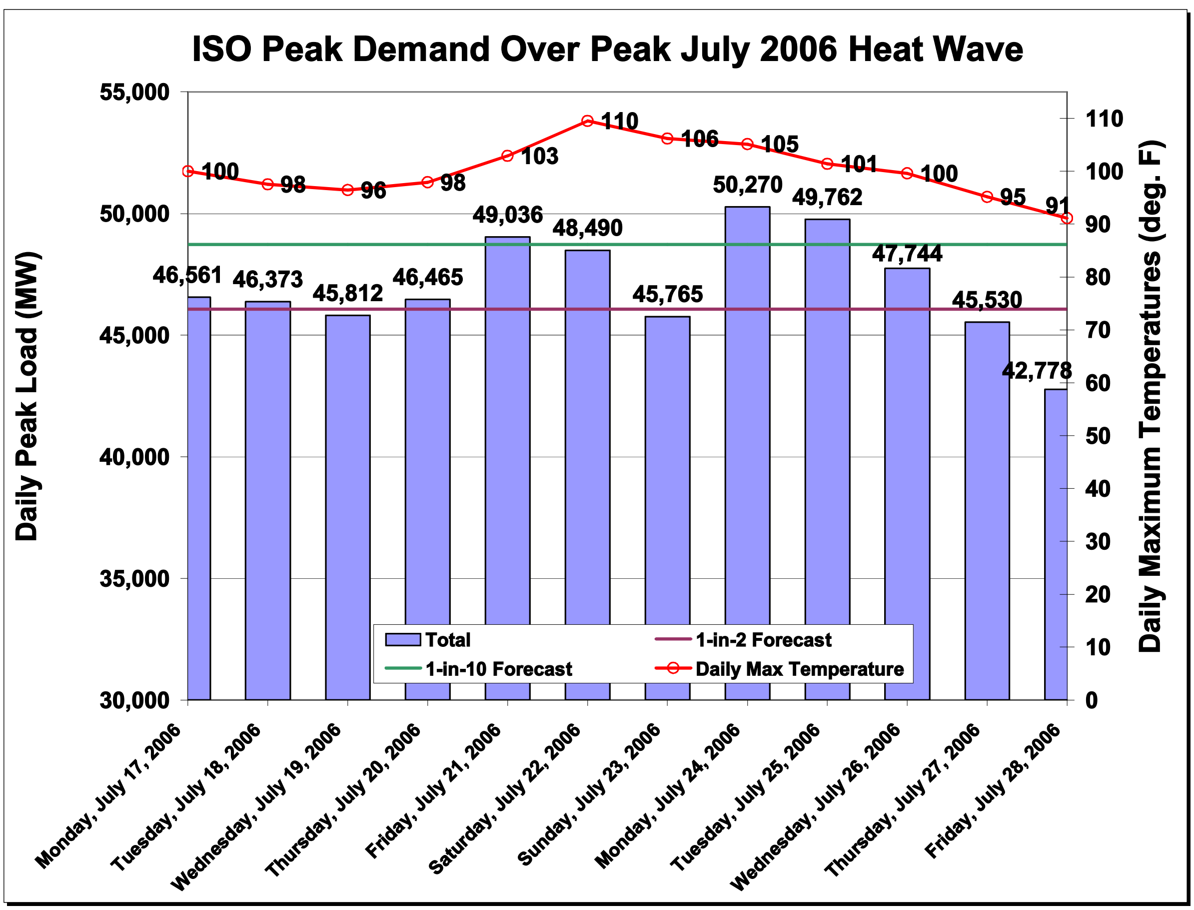
The 2006 extreme weather conditions were beyond the parameters typically used in Summer Assessments. While the loads were not outside the probable range of forecasts of the forecast models, the loads were at the extreme range of low probability. The 2006 forecast peak demands and actual peak demand levels are listed below.

Table 2
(Instantaneous Demands)

	2006 Forecast 1-in-2 Peak Demand (MW)	2006 Actual Peak Demand (MW)	Difference over 1-in-2 Forecast (MW)	Difference over 1-in-2 Forecast (%)	2006 Forecast 1-in-10 Peak Demand (MW)	Difference over 1-in-10 Forecast (MW)	Difference over 1-in-10 Forecast (%)
ISO Control Area	46,063	50,270	4,207	9.1%	48,725	1,545	3.4%
SP26	27,299	27,710	411	1.5%	29,561	-1,851	-6.8%
NP26	20,324	22,726	2,402	11.8%	21,461	1,265	6.2%

Figure 4 shows the hourly average loads during the July heat wave. The temperature is the weighted average of 24 weather stations throughout the ISO control area. The temperatures are weighted based on their contribution to the ISO peak demand.

Figure 4



Throughout the day on July 24, there were numerous distribution outages scattered throughout the Control Area. Within the SCE service areas, approximately 50 MW of distribution load tripped off-line due to the loss of approximately 1,312 pole top transformers that overheated and failed due to high loading. PG&E reported that within its service area, in excess of 2,000 distribution transformers failed during the heat wave, however on July 24, it was estimated that approximately 100 MW of load was lost due to outages on its distribution system. SDGE reported that approximately 26 MW of load was lost due to the failure of distribution transformers

Graphs of actual demand levels for the ISO control area and the SP26 region during peak operating hours for the 2006 summer season are included in Appendix A.

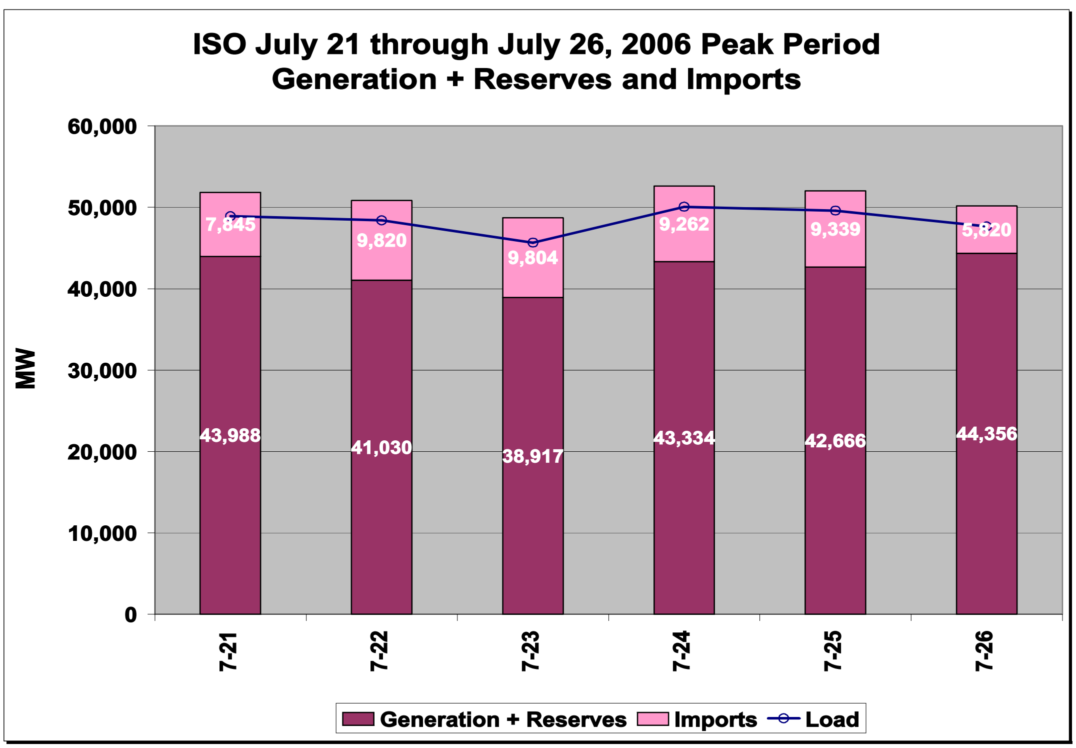
Generation

The actual amount of available generation capacity within the ISO control area can vary significantly as seen in Appendix B. The variations are primarily due to the magnitude of planned and forced outages, ambient capacity limitations, Qualifying Facility (including wind and solar) generation availability, hydro generation levels, and environmental constraints

At the time of system peak on July 24, 2006 there were 45,364 MW of generating capacity available to serve load. Actual generation at the time was 40,585 MW and an additional 2,366 MW of capacity was available as Operating Reserves (including non-spinning reserve) and was synchronized to the system. Other available unloaded generating capacity both on line and off-line (but available to serve load) is estimated at 2,413 MW. The average generation plus reserves for the weekdays surrounding the peak were similar to the 45,364 Total Available Capacity on 7/24/2006, averaging 43,586 MW.

Figure 5 shows the daily generation plus reserves and imports at time of peak for the July 21 through July 26, 2006 peak period (based on hourly average amounts).

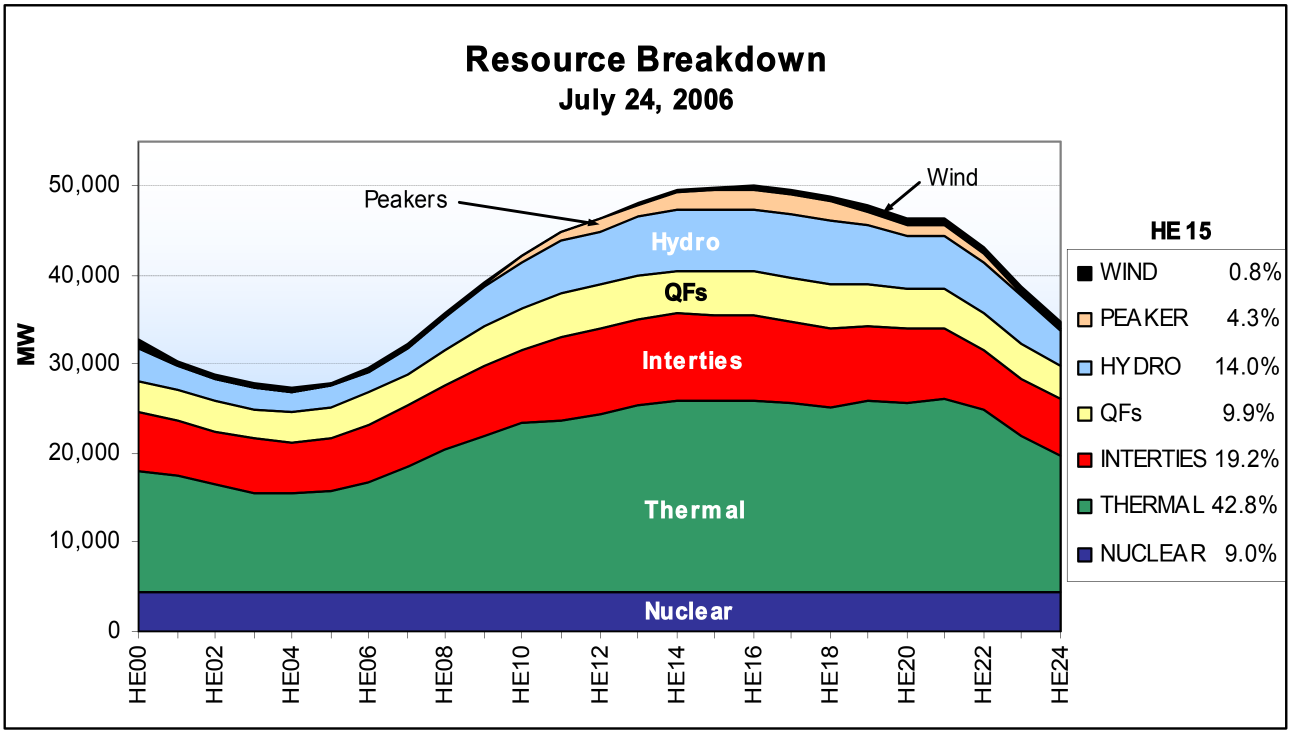
Figure 5



Resource Breakdown

During hour-ending 1500 on July 24, the CAISO had 2,136 MW of peakers on line serving load. The average wind generation during hour-ending 1500 was approximately 382 MW while QF generation averaged approximately 4,912 MW. As shown in Figure 6, thermal generators (excluding the nuclear units) accounted for the largest percentage of the resources on-line and averaged 21,348 MW. Nuclear units accounted for approximately 9%. Although, the average hydro generation for hour-ending 1500 accounted for 14% (approximately 6,970 MW) of the resources on-line, it should be noted that a substantial amount of the required Operating Reserve was procured from the hydro units.

Figure 6



Wind Generation

Wind generation is a major and quickly growing portion of the renewable resources portfolio for the LSEs. Wind resources are intermittent, and historically the output from wind generators is lowest during summer system peak hours. Typically during the summer months, the CAISO simultaneous peak demand occurs during hour-ending 1700. As shown in Figure 7, the actual wind generation for the period of the July 2006 heat wave averaged less than 200 MW during the hour of system peak demand. The actual wind generation realized at the time of system peak was 333 MW.

Figure 7

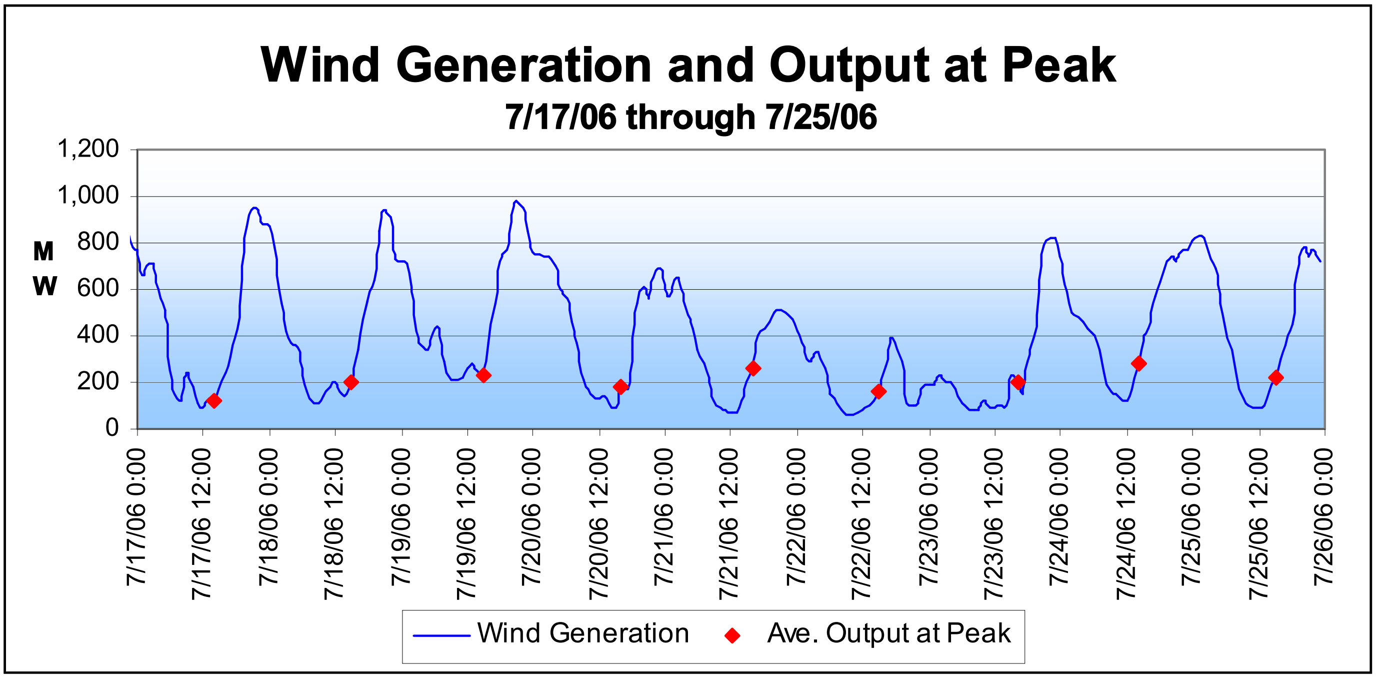


Table 3 below shows the Net Dependable Capability (NDC) and the Net Qualifying Capacity (NQC) for the largest 20 wind projects in the ISO along with the aggregated performance of these projects during hour-ending 1600 for the highest ISO peak days. The average capacity factor, based on their NDC for this one-hour period for the five days is 12 percent.

Table 3

Generation from 20 Largest Wind Units At Time of CAISO 5-Highest July 2006 Peak Days						
1 Hour Average Output for 3 - 4 PM		MW of Wind Generation at Peak	Total NDC MW Rating	Gen % of NDC	Total July NQC MW Rating	Gen % of NQC
7/21/06 15:00	7/21/06 16:00	208	2,377	9%	629	33%
7/22/06 15:00	7/22/06 16:00	154	2,377	6%	629	25%
7/24/06 15:00	7/24/06 16:00	347	2,377	15%	629	55%
7/25/06 15:00	7/25/06 16:00	213	2,377	9%	629	34%
7/26/06 15:00	7/26/06 16:00	545	2,377	23%	629	87%
		Average		12%		47%

Generation Outages

Graphs in Appendix C show the weekday hour-ending 1600 outage amounts for the 2005 and 2006 summer seasons (based on hourly averages and excluding weekends and holidays). The average of the weekday forced and planned outages at hour-ending 1600 for the June 15 through September 15 period for 2005 and 2006 are 3,108 and 2,575 respectively.

Imports

The ISO's forecast control area import level of 9,000 MW used in 2005 and 2006 was an estimate of anticipated import levels during peak load conditions. During the 2006 summer season, actual imports levels during peak load hours exceeded 9,000 MW on several days including the July 24 peak hour where the imports were 9,262 MW, and exceeded 9,800 MW on a few days.

The ISO's 2006 forecast of the import capability into the SP26 region was 10,100 MW. During the hottest days of the July heat wave the imports into SP26 at time of peak ranged from 8,211 to 8,355 MW, averaging 8,315 MW. The only other significant peak for the SP26 region was on September 5 when the imports at time of peak were 9,829 MW. There were several days were the imports were in the 10,400 MW range, but the peak load for all of these days was less than 90 percent of the summer 2006 SP26 peak load. As loads throughout the WECC Interconnect increase at times of peak the surplus generating capacity outside the CAISO control area drops, decreasing the amount of generating capacity available for import into the CAISO.

Graphs of actual import levels for the ISO control area and the SP26 region during peak operating hours are included in Appendix D.

Transmission

Within the WECC, the Operating Transfer Capability (OTC) limits are established on a seasonal basis through a process administered by the WECC OTC Policy Committee. The CAISO operated Paths subject to this process are COI (Path 66), Midway-Los Banos (Path 15), Midway-Vincent (Path 26) and SCIT. These OTC limits were not exceeded during the heat wave.

There were however, many challenges to the internal transmission grid during the heat wave. On several occasions transmission lines and transformers operated for brief periods above their normal ratings and in several cases Flow Limits were exceeded. At no time however, were there any Path rating violations. Moreover, no lines or equipment operated above their emergency limit.

III. Summer 2007 Assessment

Summer 2007 Planning Reserve & Probability Analysis Summary

CAISO Summer 2007 Outlook

Resource Adequacy Planning Conventions	June	July	August	September
Existing Generation	46,707	47,407	47,407	47,407
Retirements (Known)	0	0	0	0
High Probability CA Additions	700	0	0	0
Net Interchange	9,200	9,200	9,200	9,200
Total Net Supply (MW)	56,607	56,607	56,607	56,607
1-in-2 Summer Temperature Demand[2]	42,224	47,847	47,847	42,457
Demand Response (DR) (75% of CPUC 2007 estimates)	743	743	743	743
Interruptible/Curtailable Programs (75% of CPUC 2007 estimates)	1,220	1,220	1,220	1,220
Planning Reserve[1]	**38.7%**	**22.4%**	**22.4%**	**38.0%**

Supply Adequacy Model Probability Results	Summer 2007		
	Stage-1	Stage-2	Stage-3
Probability of Entering into Operating Reserve Emergencies	**20%**	**10%**	**2.9%**

SP26 Summer 2007 Outlook

Resource Adequacy Planning Conventions	June	July	August	September
Existing Generation	21,493	22,025	22,025	22,025
Retirements (Known)	0	0	0	0
High Probability CA Additions	532	0	0	0
Net Interchange	9,800	9,800	9,800	9,800
Total Net Supply (MW)	31,825	31,825	31,825	31,825
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Supply Adequacy Model Probability Results	Summer 2007		
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NP26 Summer 2007 Outlook

Resource Adequacy Planning Conventions	June	July	August	September
Existing Generation	25,214	25,382	25,382	25,382
Retirements (Known)	0	0	0	0
High Probability CA Additions	168	0	0	0
Net Interchange	700	700	700	700
Total Net Supply (MW)	26,082	26,082	26,082	26,082
1-in-2 Summer Temperature Demand[2]	20,135	21,268	21,268	18,587
Demand Response (DR) (75% of CPUC 2007 estimates)	426	426	426	426
Interruptible/Curtailable Programs (75% of CPUC 2007 estimates)	279	279	279	279
Planning Reserve[1]	**33.0%**	**26.0%**	**26.0%**	**44.1%**

Supply Adequacy Model Probability Results	Summer 2007		
	Stage-1	Stage-2	Stage-3
Probability of Entering into Operating Reserve Emergencies	**16%**	**7.6%**	**3.5%**

[1] Planning Reserve calculation ((Total Generation+Demand Response+Interruptibles)/Normal Demand)-1.

[2] There is a high probability of the summer peak occurring in either July or August so for the purposes of this assessment the forecast for July & August are the same.

Generation and Generation Additions & Retirements

As shown in Table 4, a total of 724 MW of additional generation capacity is expected to come on line by July 1, 2007. After accounting for the reduced capacity of wind resources available during summer peak periods the total amount equals 700 MW. The breakdown by unit type and estimated parallel date are shown in Appendix F. While it appears that these projects are on track to meet the estimated parallel date, the commercial operation date could be delayed, causing less than 700 MW of additional generation capacity to be available for the summer 2007 peak demand period. It is also worth noting that some projects have a commercial operation date beyond August 1, 2007 and may not be available to meet peak conditions and supply contingencies during July and early August. No retirements have taken place since last summer and although none are expected at this time, a generator is required to only give 90 days notice prior to retiring.

Table 4

Generation Additions Since 2006 Summer Peak Period To Beginning of 2007 Summer Peak Period

Prime Mover Type Subtotals	Capacity (MW)	Capacity (MW) Including Wind Derate
Combustion Turbine	541	541
Hydro	9	9
Reciprocating Engine	14	14
Steam turbine	135	135
Wind	24	1
Grand Total	724	700

The ISO overall generation forecast for 2007 is built off the 2007 Net Qualifying Capacity (NQC) listing as of January 29, 2007. Generators who chose not to participate in the NQC listing have been added to the list. Adjustments were made to wind generation based on the CEC methodology of using 3 percent of project nameplate rating for capability to meet annual summer peak load. This process produces the amounts of generation available to the CAISO, SP26 and NP26 for the summer peak period shown below.

	2007 Net Qualifying Capacity (MW)	Additions for 2007 (MW)	2007 Capacity (MW)
ISO Control Area	46,707	700	47,407
SP26	21,493	532	22,025
NP26	25,214	168	25,382

Hydro conditions in 2007 are expected to be normal for the Northwest Region. The early part of water year 2007 in California has been unusually dry across much of the state. While it is too soon to know how the water year will ultimately turn out, one dry year does not constitute a drought, especially when that dry year follows a very wet 2006. While energy production during the 2007 summer could be impacted by a lower than normal water year, the California hydro system will be able to generate at peak capability during system peak conditions this summer.

Environmental Issues Impacting Future Generation

Once-Through Cooling

There are several separate proceedings in California and nationally that affect existing power plants in California that utilize once through cooling technology, which represents approximately 19,000 MW of the installed capacity in California. Several state entities issued statements in 2006 that called for disallowing the ongoing use of this technology in the future. At the state level, the California State Water Resources Control Board issued a "Proposed Statewide Policy on Clean Water Act Section 316(b) Regulations" (Proposal) on July 13, 2006, which is more stringent than the federal regulations created under Clean Water Act Section 316(b). Nationally, portions of the Clean Water Act Section 316(b) regulations are being reviewed in the Federal judicial system. Power plants in California will be required, at a minimum, to reduce the impacts of once through cooling with studies due in early 2008. The CAISO does not anticipate these policies impacting the availability of generation for Summer 2007. The CAISO will continue to monitor and engage as appropriate.

Air Quality Issues

California passed several landmark Greenhouse Gas reduction pieces of legislation in 2006 that will have an impact on generation from an air quality/emissions perspective. These issues need to be followed to understand the impact on existing and future generation serving CAISO load, both internal and external to the CAISO. Issues of particular interest include emission reduction credits and greenhouse gas emissions. The CAISO does not anticipate these policies impacting the availability of generation for Summer 2007. The CAISO will continue to monitor and engage as appropriate.

Generation Outage Rates

Graphs in Appendix C show the weekday hour-ending 1600 outage amounts for the 2005 and 2006 summer seasons (based on hourly averages and excluding weekends and holidays). The graphs do not include outages for ambient outages as these amounts are accounted for in the NQC listing, based on most likely summer peak weather conditions. If the CAISO control area experiences extreme weather conditions, it is possible that not all of the capacity accounted for will be available since the unit ratings of combustion turbines and possibly other resources are impacted by high ambient temperatures.

Demand

The load forecasts were developed using Itron's MetrixND forecast model. The model utilizes linear regression with daily peak loads as the dependent variable. The independent variables used for this forecast were weather data, historical and forecast economic and population information (based on Metropolitan Statistical Areas in the CAISO control area) and CAISO system alerts, warnings and stage 1, 2 and 3 emergency data. The historical load data used was from June 1998 through September 2006.

The peak load data are based on instantaneous hourly peaks. Pumping loads were extracted from the total loads and were not included in our forecast models, as pump loads do not react to weather conditions in a similar fashion and are subject to interruption. Pump load was added back into the forecast based on typical pump loads during summer peak conditions.

The weather variables are comprised of 24 weather stations. Weather data included temperatures, cooling degree-days, heating degree-days, heat index, relative humidity, and a temperature buildup index based on a weighted average of the daily maximum temperatures for a given day and the two days prior to that day.

Calendar variables such as summer, winter, weekday, weekend, and holidays are included as well to account for the impact these events have on peak demand.

There are 3 models representing 3 distinct areas: ISO, SP26 and NP26. Each model utilizes its own set of weather, economic and demographic input variables based on its location. The model results are based on 84 sets of different annual weather patterns based on historical daily weather patterns. These are used to produce 84 different annual, daily peak demand load forecasts.

These 84 daily peak demand load forecasts are used to develop the statistically probable annual peak demand input to the SAM model. For comparative purposes, the 1-in-2 and the 1-in-10 forecasts produced by the forecasting process are given below by area.

	2006 Actual	2007 1-in-2 Forecast	2007 1-in-2 Forecast Change from 2006 Actual	2007 1-in-10 Forecast	2007 1-in-10 Forecast Change from 2006 Actual	1-in-10 Increase over 1-in-2	
	Peak Demand (MW)	Peak Demand (MW)		Peak Demand (MW)		Increase (MW)	%
ISO Control Area	50,270	47,847	-4.8%	50,609	0.7%	2,762	5.8%
SP26	27,710	27,189	-1.9%	28,783	3.9%	1,594	5.9%
NP26	22,726	21,268	-6.4%	22,661	-0.3%	1,393	6.5%

Imports

The maximum level of control area imports for the purpose of estimating control area reserve margins is difficult to forecast with the information currently available to the ISO. The ISO does not have information to estimate import levels based on contractual commitments. As a result, the estimate for control area imports is based on historical control area import levels during peak load conditions.

The CAISO forecast control area import level of 9,000 MW, used in 2005 and 2006, was an estimate of anticipated import levels during peak load conditions and was based on historical import levels during CAISO peak load conditions. It was not an estimate of the maximum import capability of the transmission system. During the 2006 summer season, actual imports levels during peak load hours exceeded 9,000 MW on several days including the July 24 peak hour where the imports were 9,262 MW. Imports exceeded 9,800 MW on a few days, but not during the highest weekday peak load periods. Based on the 2006 import levels the forecast for 2007 is increased to 9,200 MW.

There have been discussions on further restrictions on the lowest four hydro facilities of the Columbia River Power System to limit the reservoir level changes during the spring and summer months to one-foot. These discussions, however, are only in the preliminary phase and the BPA has yet to make formal comment on the impacts these restrictions would have on their integrated operations. As it currently stands, it is extremely unlikely that major operational changes of this magnitude would be implemented by the summer 2007.

The ISO's 2006 forecast of the import capability into the SP26 region was 10,100 MW. During the hottest days of the July heat wave the imports into SP26 at time of peak ranged form 8,211 to 8,355 MW, averaging 8,315 MW. The only other significant peak for the SP26 region was on September 5 when the imports at time of peak were 9,829 MW. There were several days were the imports were in the 10,400 range, but the peak for all of these days were less than 90 percent of the summer 2006 SP26 peak. While an import capability of approximately 10,400 MW has been demonstrated, the import capability of SP26 during maximum peak demand periods never exceeded 9,829 MW. For the purposes of this summer 2007 assessment, the SP26 import forecast will be 9,800 MW.

Graphs of actual import levels for the ISO control area and the SP26 region during peak operating hours are included in Appendix D.

Transmission Additions

In September 2006 WECC approved a 505 MW simultaneous capacity rating increase in the East/West-of-River import transmission capability. Since this rating increase was included in the 2006 summer assessment and the non-simultaneous rating increase was in place during the summer 2006 peak demand period, no additional import capability is included in this assessment. All other 2006 projects were completed prior to the summer 2006 peak period.

While a number of projects are expected to provide some level of either congestion relief or increased import capability during 2007, the amount of the impact of these projects have not been quantified at this time, and some of these projects are expected to be completed after the summer 2007 peak period. These projects are not anticipated to significantly impact the results of this assessment at this time.

Demand Response and Interruptible Programs

The California Public Utilities Commission (CPUC) provided a list of Demand Response (DR) and Interruptible Program amounts along with their associated trigger points (where the programs can be called on) for the three California Investor Owned Utilities (IOU). These values have been reduced to 75 percent of the CPUC values based on CAISO experience of actual load reductions when these programs were call on, typically during Stage-1 and Stage-2 emergencies. The CAISO is currently working with the CPUC to develop a readiness program where the communication and operating mechanisms utilized by these programs are tested or exercised in a "dry-run" fashion to prepare these programs for the upcoming 2007 summer season.

SAM Model Use of Generation, Imports, Generation Outages, Transmission Curtailments and Peak Demand

The amounts of generation and generation additions previously discussed are used as inputs into the SAM model. The sum of the forced and planned generation curtailments shown in graphs in Appendix C were used to develop a range of inputs of probable generation outage amounts. Also included in the outage figures were random outages for the largest generating unit hazard for each of the areas studied, based on the historical forced outage rates of those units, being sure to not double account for any actual unit outages.

Transmission curtailments used by the SAM model were developed by the CEC based on information obtained from the CAISO. The values are based on hour-ending 1200 through hour-ending 1900, May 15 thru Sep 15. For the CAISO model, the curtailments range from zero to 4,856 MW, and average 389 MW.

A string of 5,000 randomly generated values are developed for each of the independent variables; generation outage, transmission curtailment and peak demand. The SAM model uses the generation plus additions and imports and deducts generation outage and transmission curtailment values producing 5,000 supply scenarios. The 5,000 supply scenarios are used with the 5,000 peak demand scenarios to calculate 5,000 different operating reserve results.

SAM uses the DR programs that would be triggered by a Stage-1 emergency and the Interruptible programs that would be triggered by a Stage-2 emergency to calculate the new operating reserve after these additional demand-side resources have been utilized to moderate the load.

This process is used to develop the probabilities for the entire range of operating reserves based on the inputs described above. These results are then used to focus on the lower operating reserve margin range where the probability of entering into various stages of emergency conditions can be determined.

CAISO Probability Curve

Figure 7 shows the entire the range of probabilities for all of the operating reserve outcomes of the SAM model for the CAISO. Figure 8 zooms in on the more critical information of the probability curve, the probabilities of entering into various stages of emergency conditions for the CAISO control area.

Figure 7

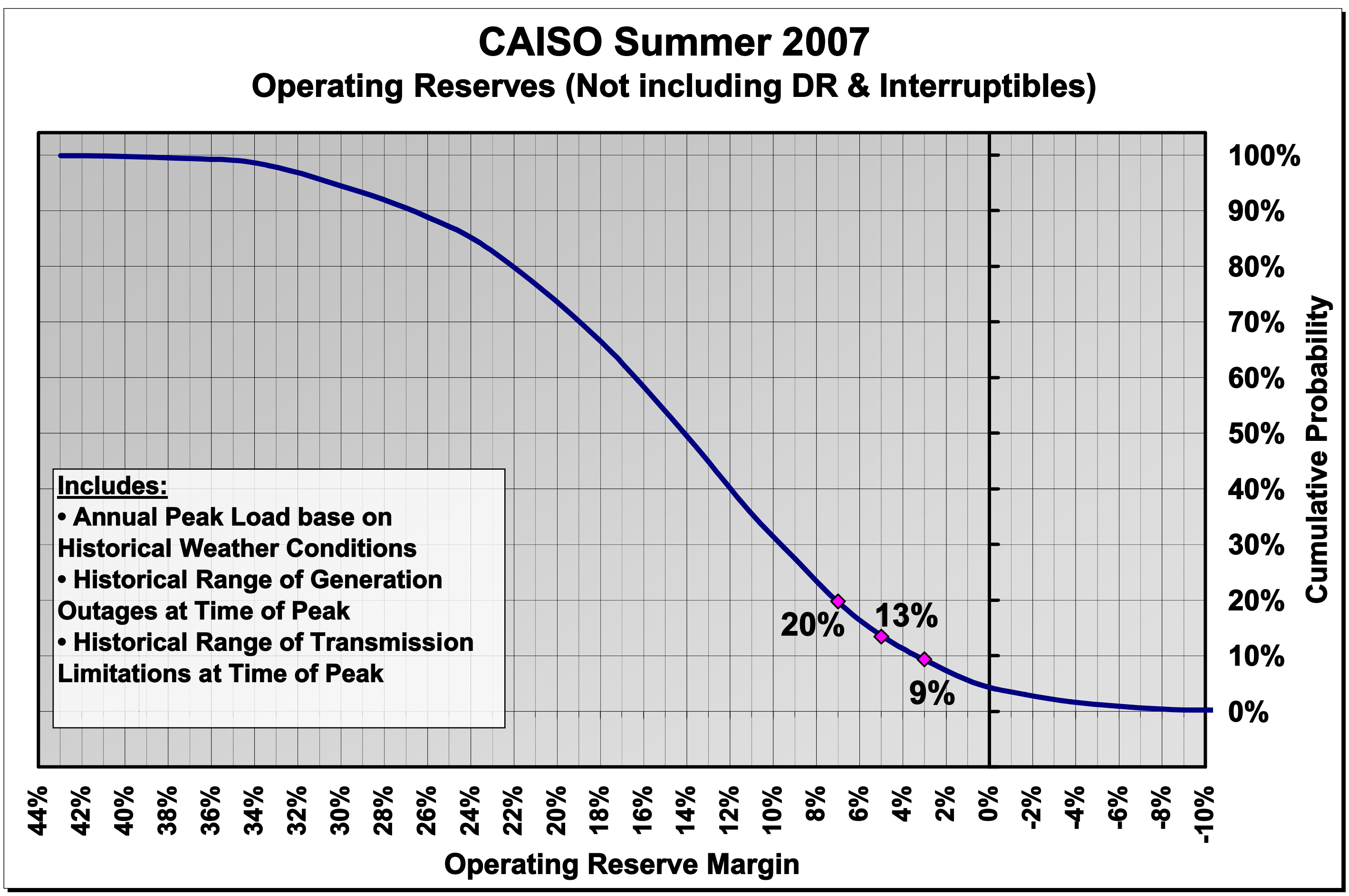


Figure 8

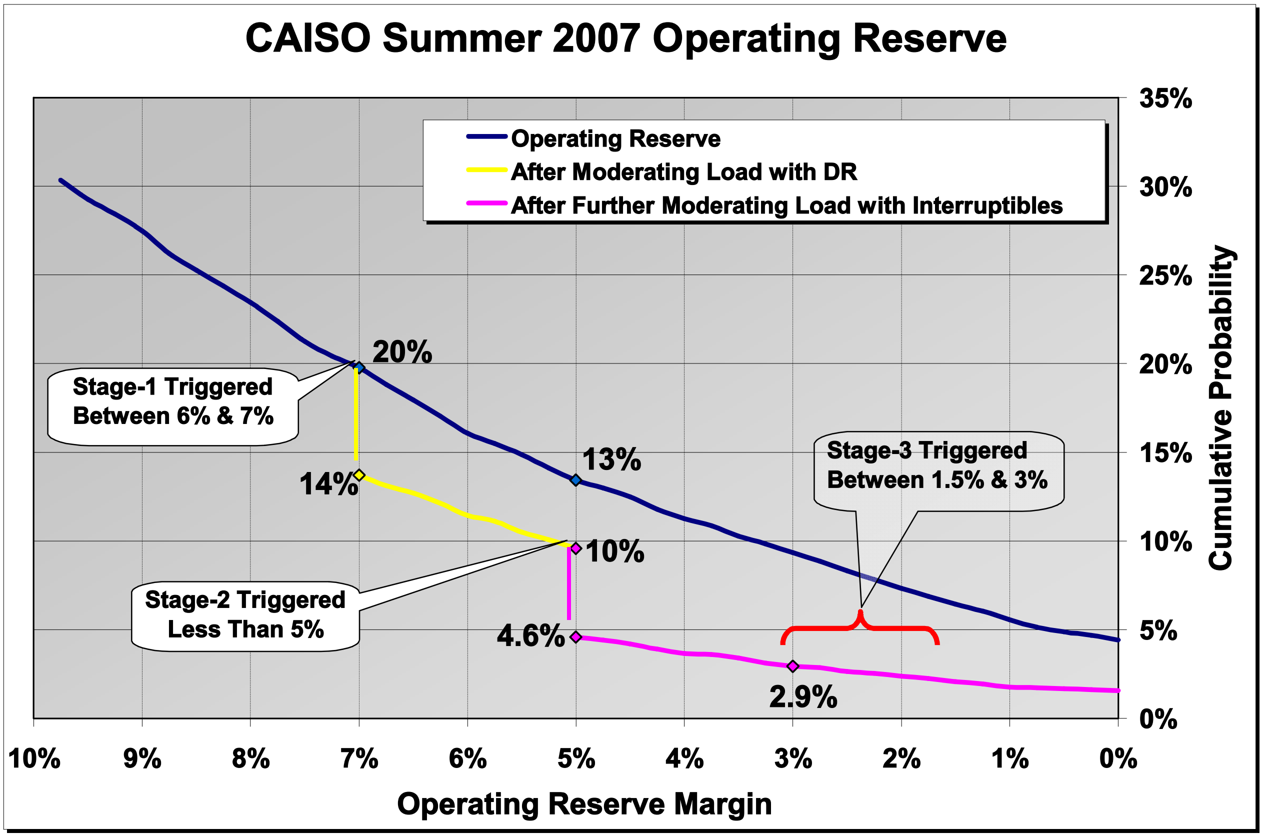


Figure 8 goes through the progression of diminishing operating reserve margins (ORM) and shows there is a 20 percent probability of having the ORM reach 7 percent, the point where a Stage-1 Emergency may be called. Assuming at that point that all available DR programs are called on, the SAM model calculates the new probability curve for ORM which now includes these additional demand-side resources that have been utilized to moderate the load. The beginning of this new declining probability curve for ORM is 14 percent.

The next point of interest is at a 10 percent probability of reaching an ORM of 5 percent, the point where a Stage-2 Emergency is called. Assuming at that point that all available Interruptible programs are called on, the SAM model calculates the new probability curve for ORM which now includes these additional demand-side resources that have been utilized to moderate the load. The beginning of this new declining probability curve for ORM is 4.6 percent.

Moving further down the new curve from the 4.6 percent probability at a 5 percent ORM, the point is reached where a Stage-3 Emergency can be called at a 3 percent ORM. At a Stage-3 Emergency firm load may be shed. The probability of this occurrence is 2.9 percent, assuming all DR and Interruptible programs have been utilized.

SP26 Probability Curve

Next, Figures 9 shows the entire the range of probabilities for all of the operating reserve outcomes of the SAM model for SP26. Figure 10 zooms in on the more critical information of the probability curve, the probabilities of entering into various stages of emergency conditions for the SP26 zone.

Figure 9

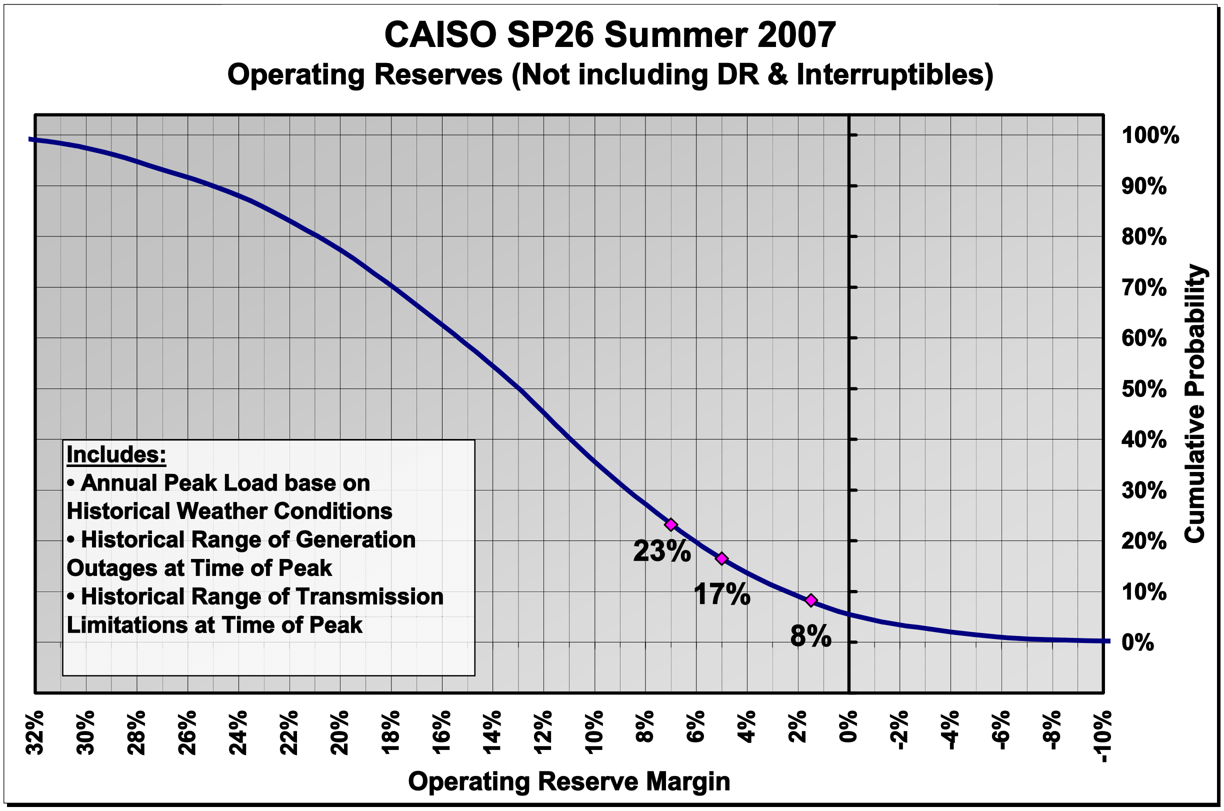


Figure 10

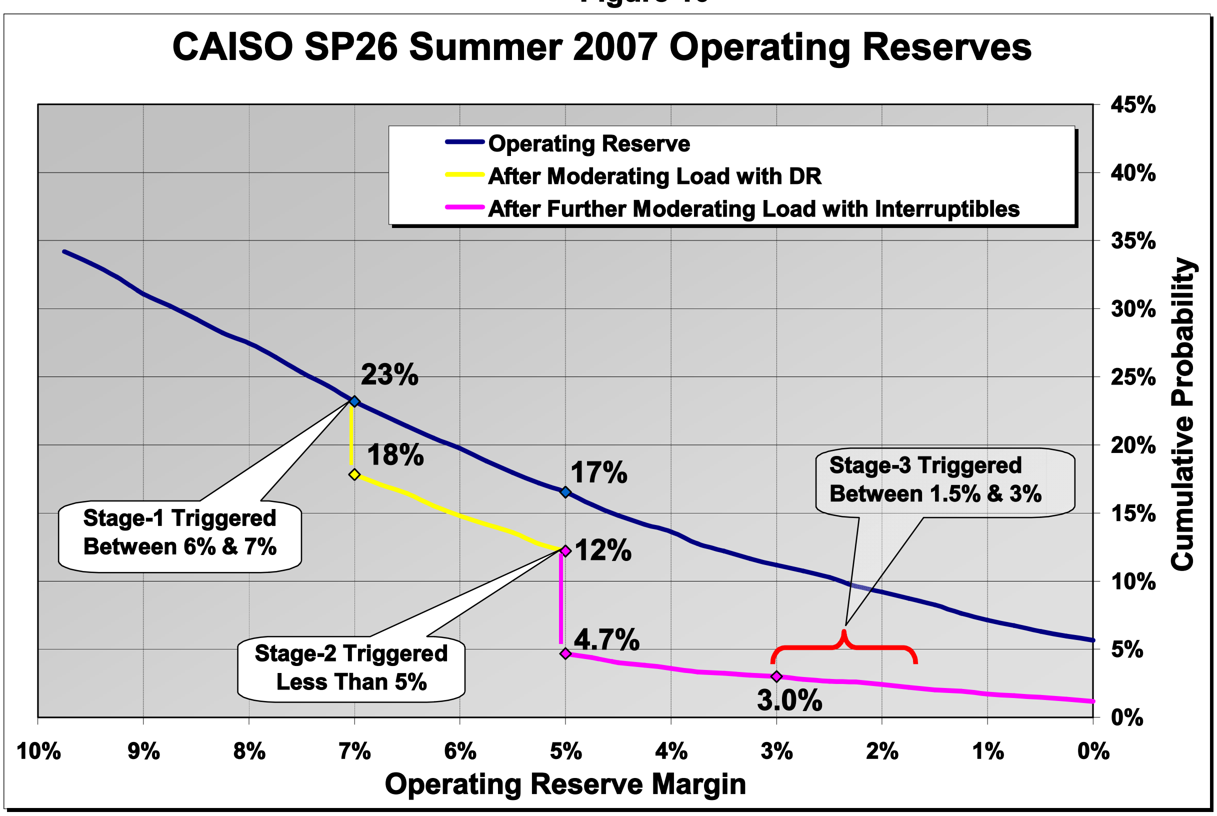


Figure 10 goes through the progression of diminishing ORMs for SP26 and shows there is a 23 percent probability of having the ORM reach 7 percent, the point where a Stage-1 Emergency may be called. As with the CAISO control area, assuming at that point that all available DR programs are called on, the SAM model calculates the new probability curve for ORM which now includes these additional demand-side resources that have been utilized to moderate the load. The beginning of this new declining probability curve for ORM is 18 percent.

The next point of interest is at a 12 percent probability of reaching an ORM of 5 percent, the point where a Stage-2 Emergency is called. Assuming at that point that all available Interruptible programs are called on, the SAM model calculates the new probability curve for ORM which now includes these additional demand-side resources that have been utilized to moderate the load. The beginning of this new declining probability curve for ORM is 4.7 percent.

Moving further down the new curve from the 4.7 percent probability at a 5 percent ORM, the point is reached where a Stage-3 Emergency can be called at a 3 percent ORM. At a Stage-3 Emergency firm load may be shed. The probability of this occurrence in SP26 is 3.0 percent, assuming all DR and Interruptible programs have been utilized.

NP26 Probability Curve

Finally, Figures 11 shows the entire the range of probabilities for all of the operating reserve outcomes of the SAM model for NP26. Figure 12 zooms in on the more critical information of the probability curve, the probabilities of entering into various stages of emergency conditions for the NP26 zone.

Figure 11

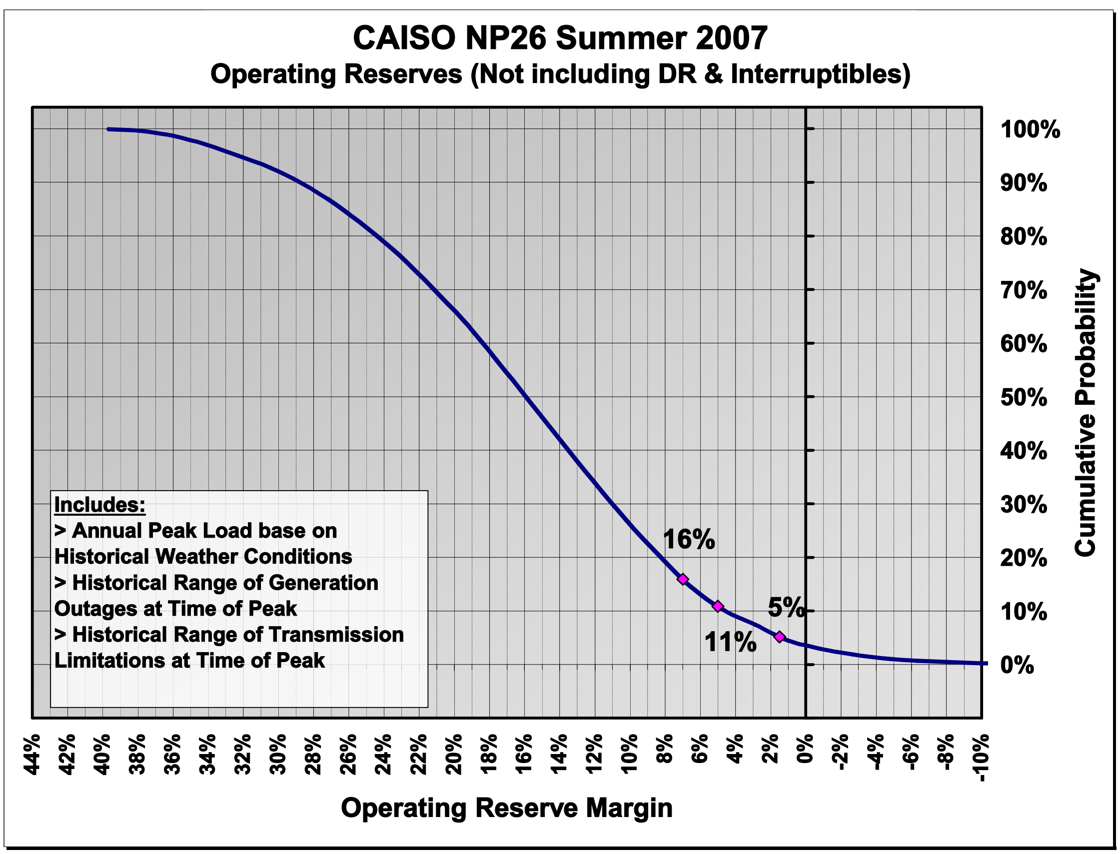


Figure 12

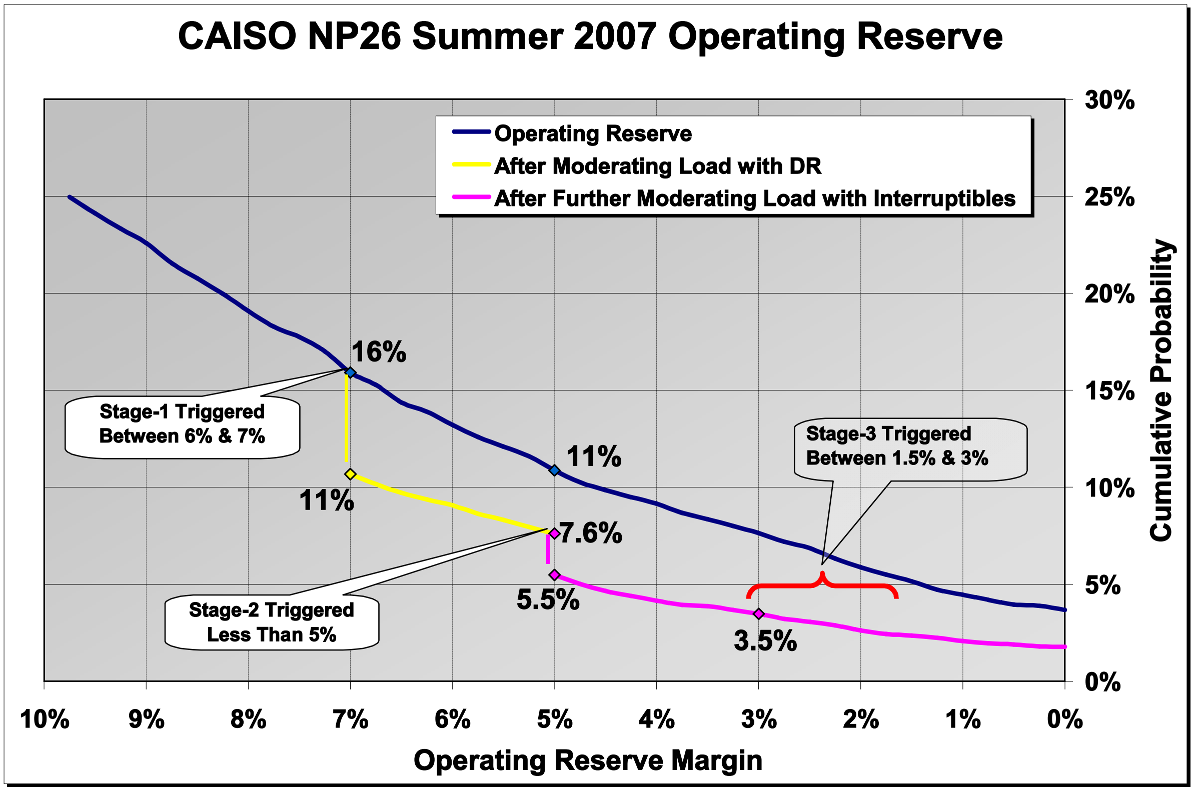


Figure 12 goes through the progression of diminishing ORMs for NP26 and shows there is a 16 percent probability of having the ORM reach 7 percent, the point where a Stage-1 Emergency may be called. As with the other cases, assuming at that point that all available DR programs are called on, the SAM model calculates the new probability curve for ORM which now includes these additional demand-side resources that have been utilized to moderate the load. The beginning of this new declining probability curve for ORM is 11 percent.

The next point of interest is at a 7.6 percent probability of reaching an ORM of 5 percent, the point where a Stage-2 Emergency is called. Assuming at that point that all available Interruptible programs are called on, the SAM model calculates the new probability curve for ORM which now includes these additional demand-side resources that have been utilized to moderate the load. The beginning of this new declining probability curve for ORM is 5.5 percent.

Moving further down the new curve from the 5.5 percent probability at a 5 percent ORM, the point is reached where a Stage-3 Emergency can be called at a 3 percent ORM. At a Stage-3 Emergency firm load may be shed. The probability of this occurrence in SP26 is 3.5 percent, assuming all DR and Interruptible programs have been utilized.

These graphs show that the SP26 zone is the area with the highest probability of entering into various stages of emergencies, and the area of greatest risk for having to shed firm load.

In developing load and resource forecasts, the ISO relies heavily on historical information including, import levels, outage rates, and transmission loading conditions during peak load periods during the prior year in estimating available supply. The 2006 and previous Summer Operations Assessments should be used as a reference to support this report.

IV. Appendices

A. 2005 Peak Load Summary Graphs

B. 2005 Generation Summary Graphs

C. Outage Data

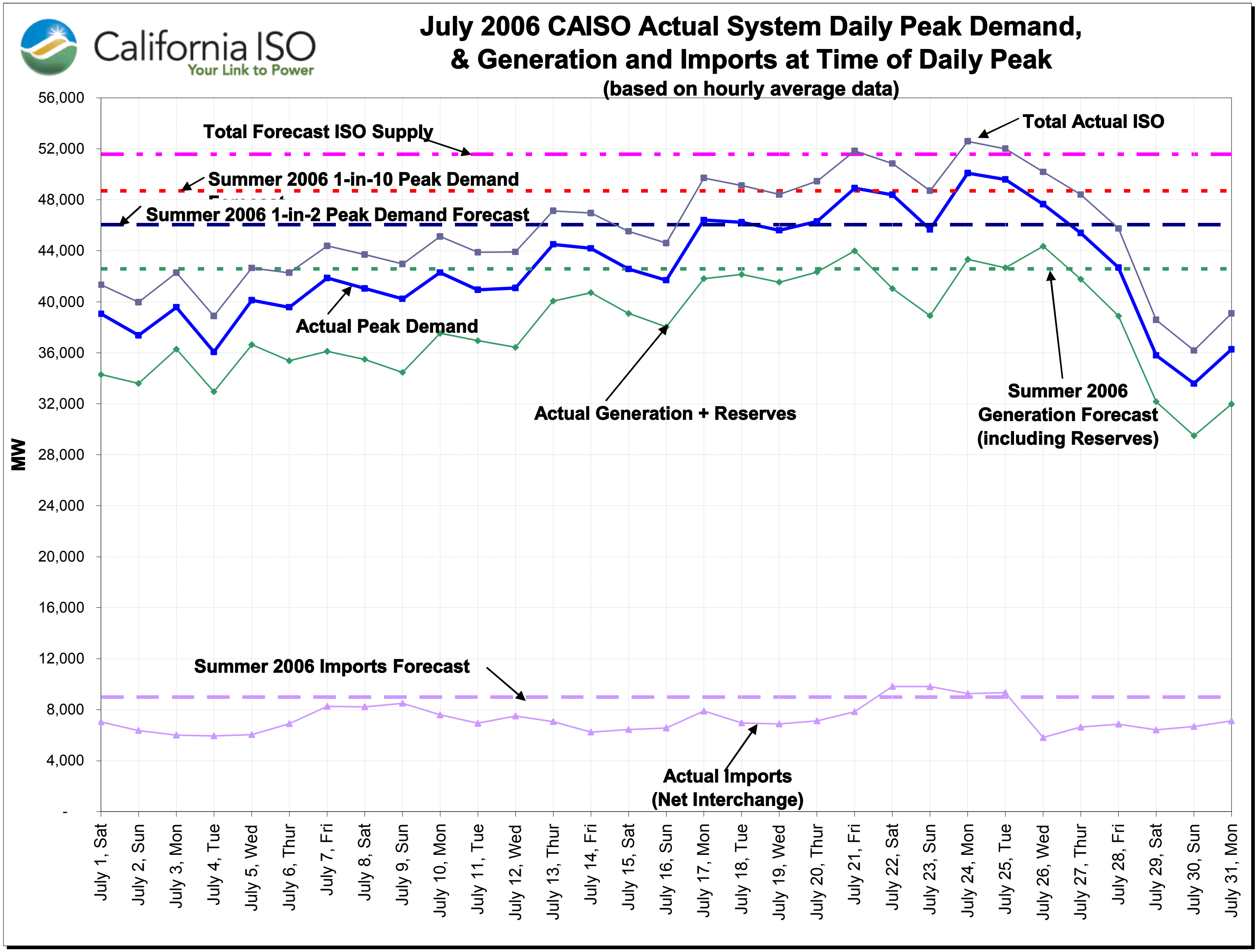
D. 2005 Imports Summary Graphs

E. SAM Model Results

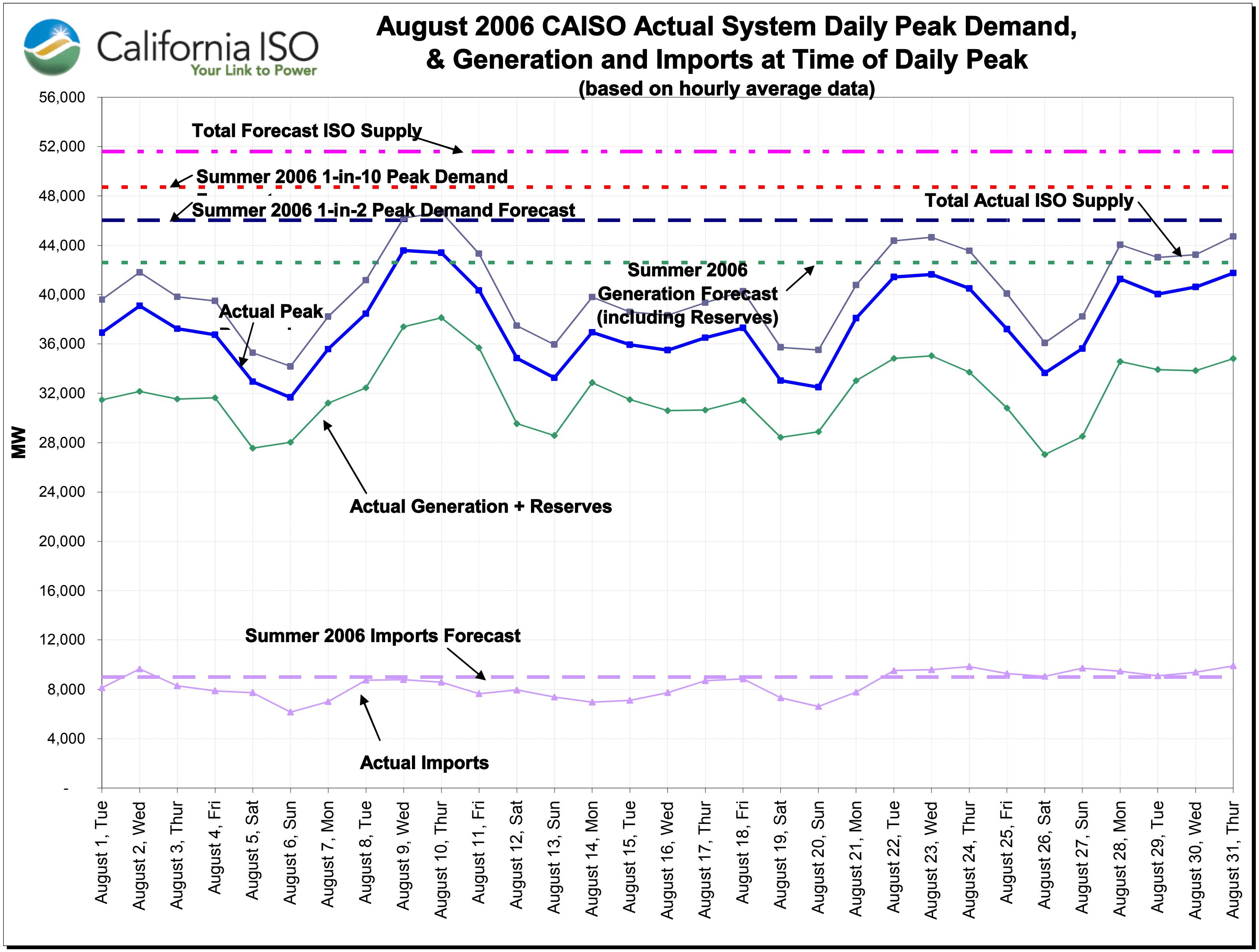
F. Generation Additions

G. Stages of Electrical Emergencies

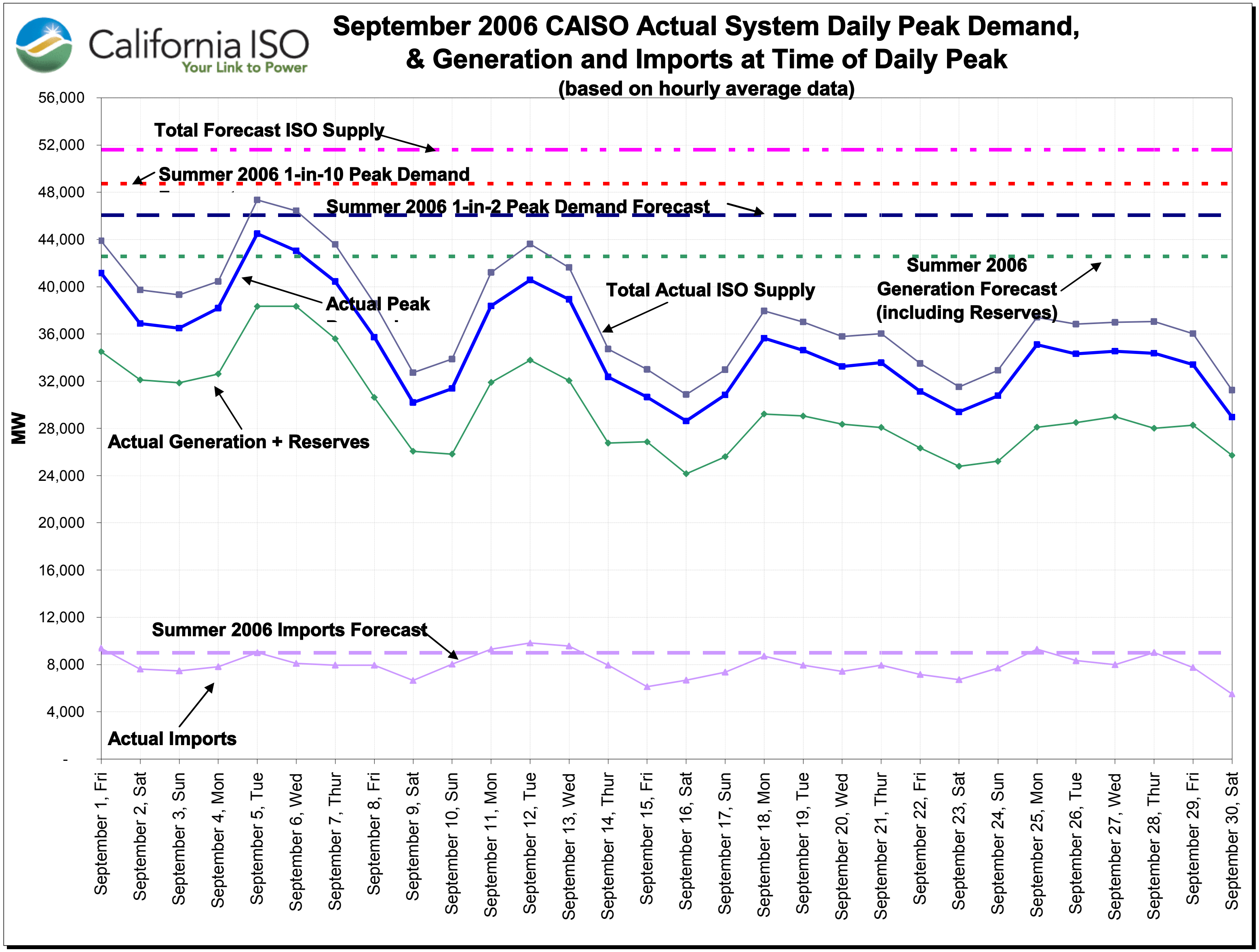
Appendix A - 2006 Peak Load Summary Graphs



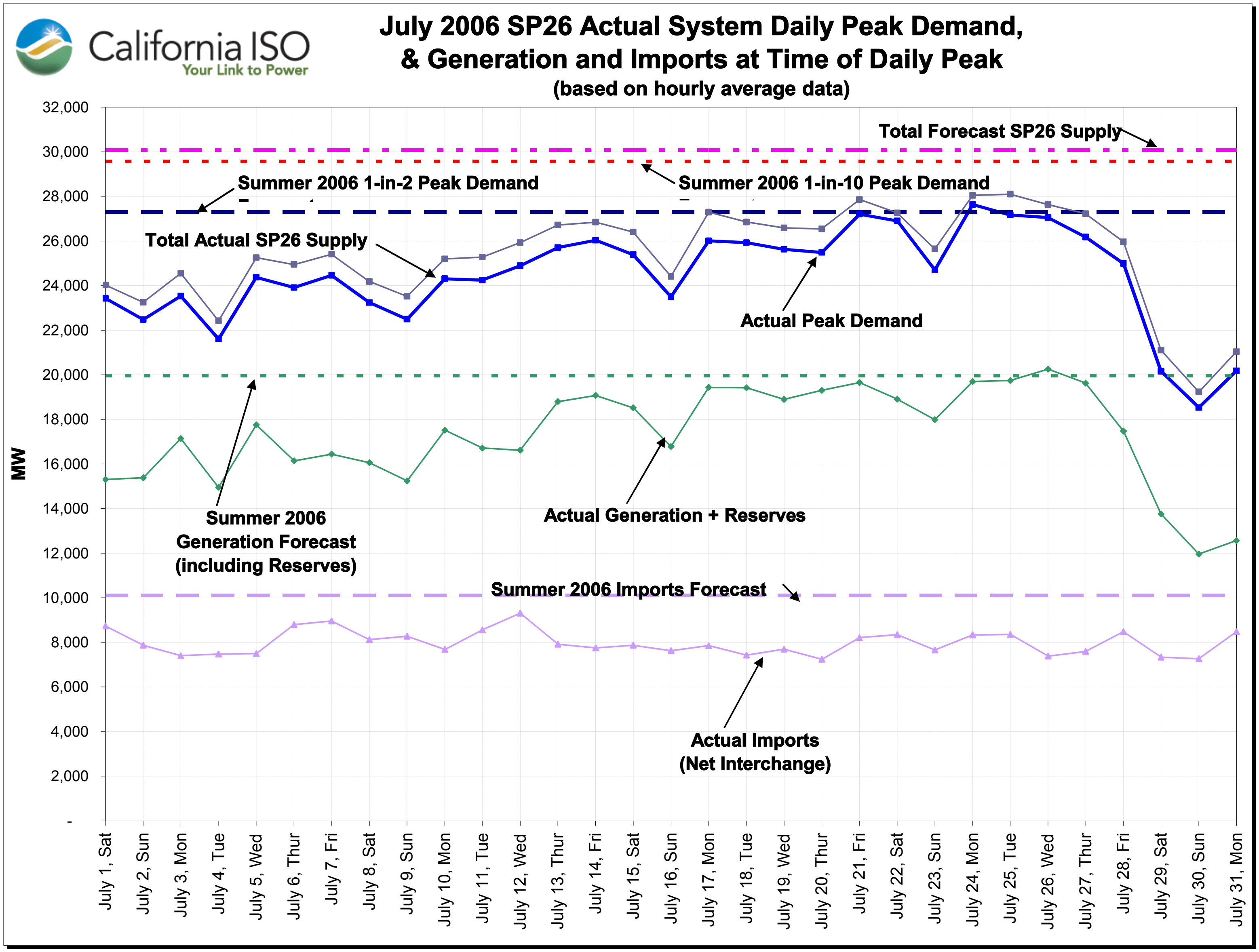
Appendix A – Continued



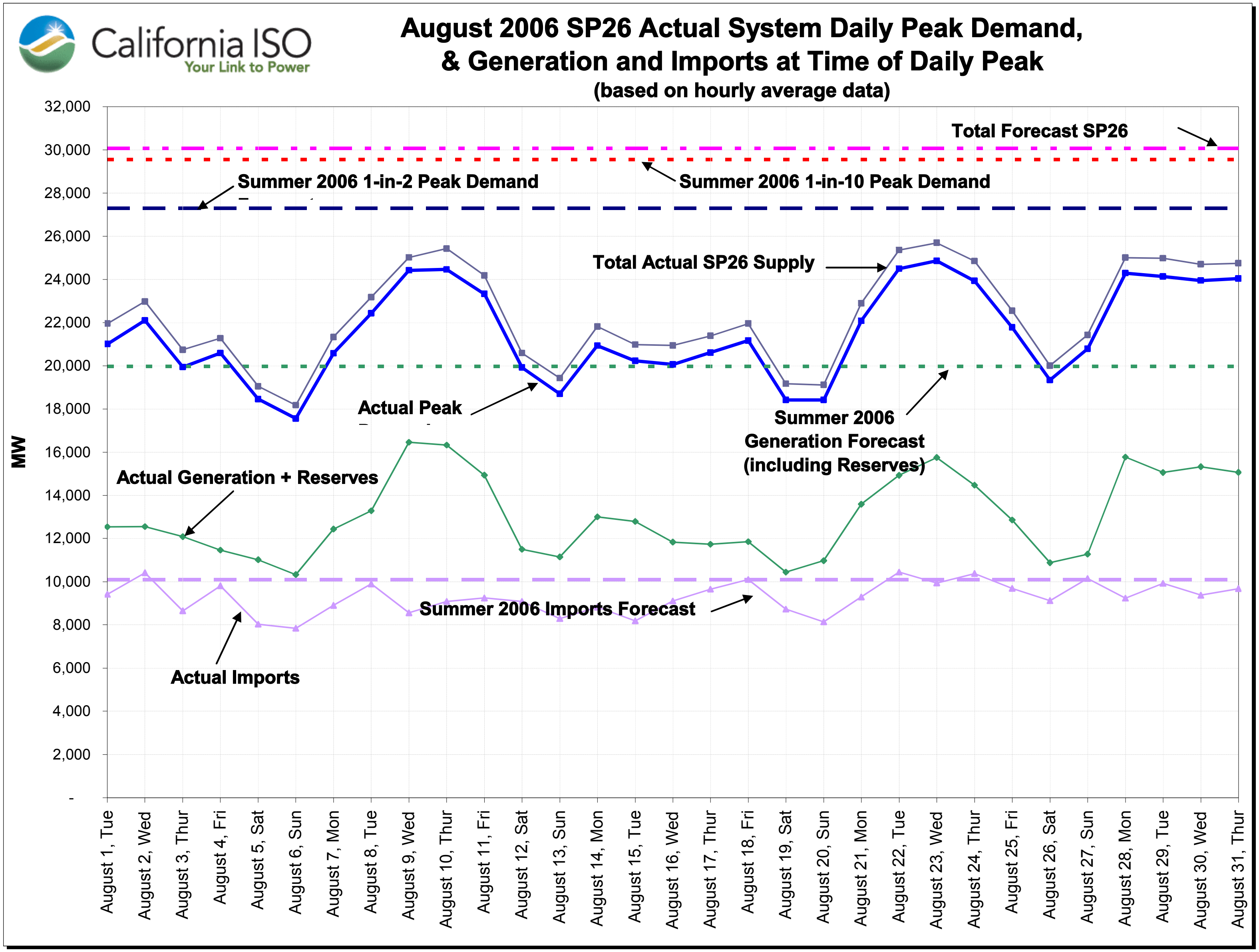
Appendix A – Continued



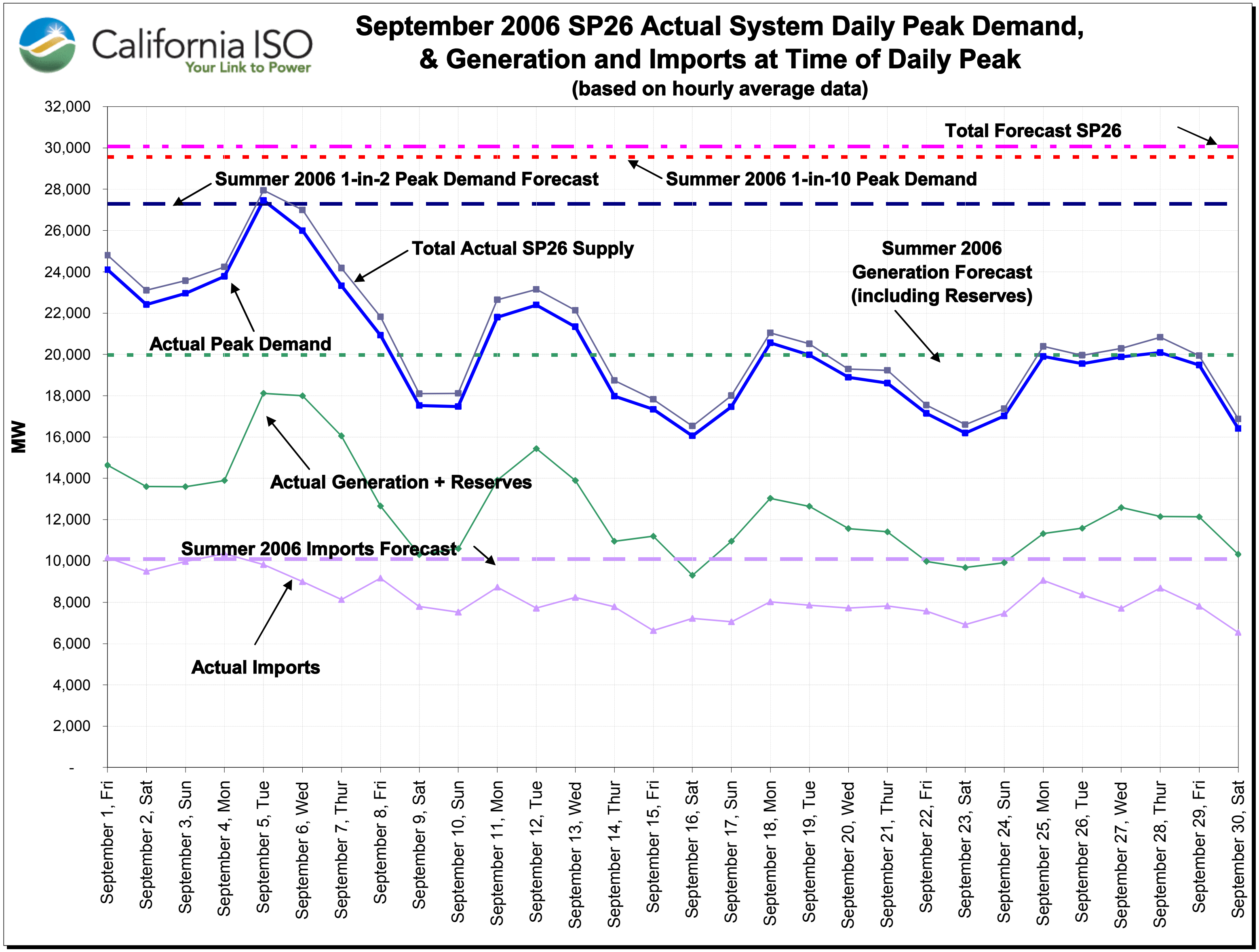
Appendix A – Continued



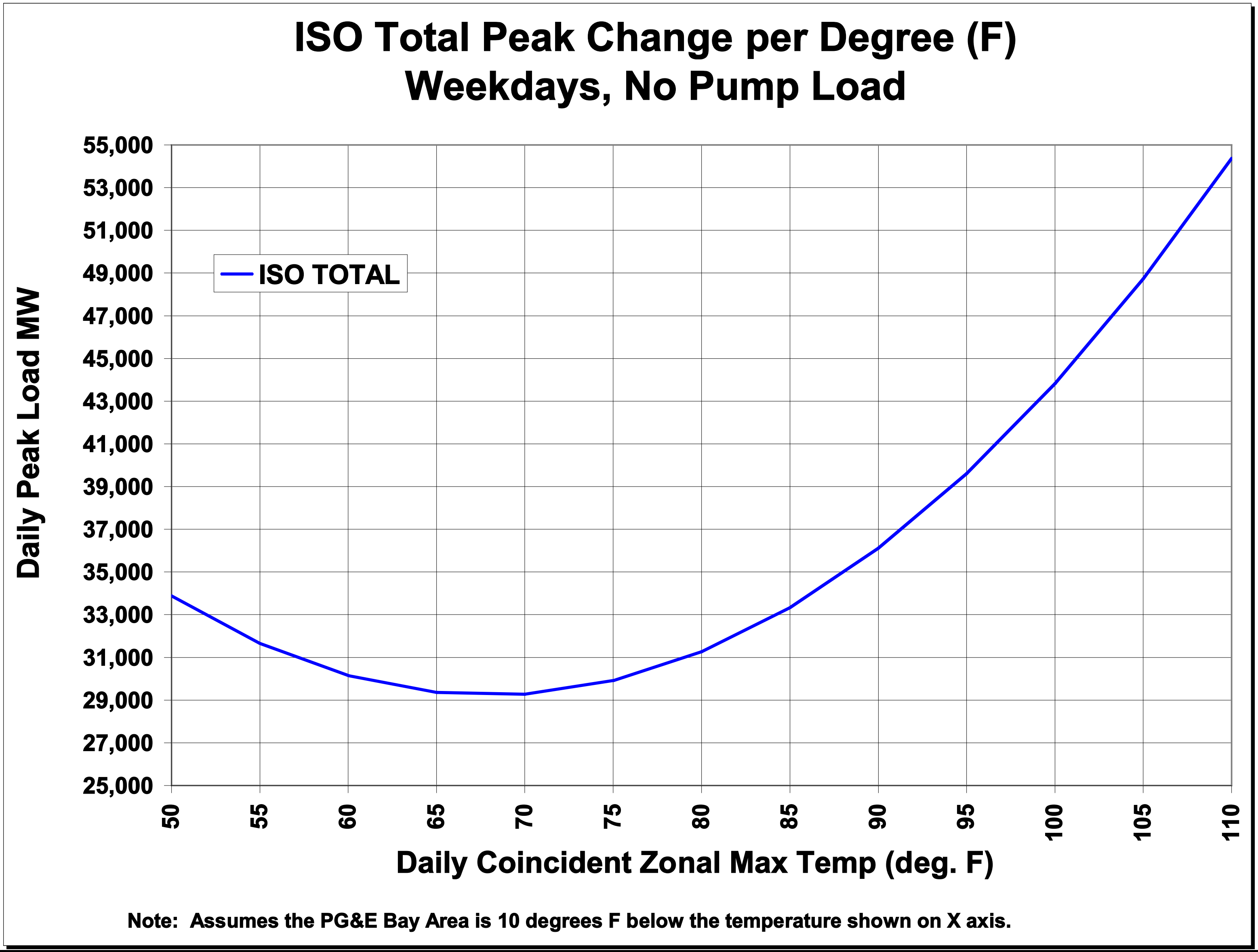
Appendix A – Continued



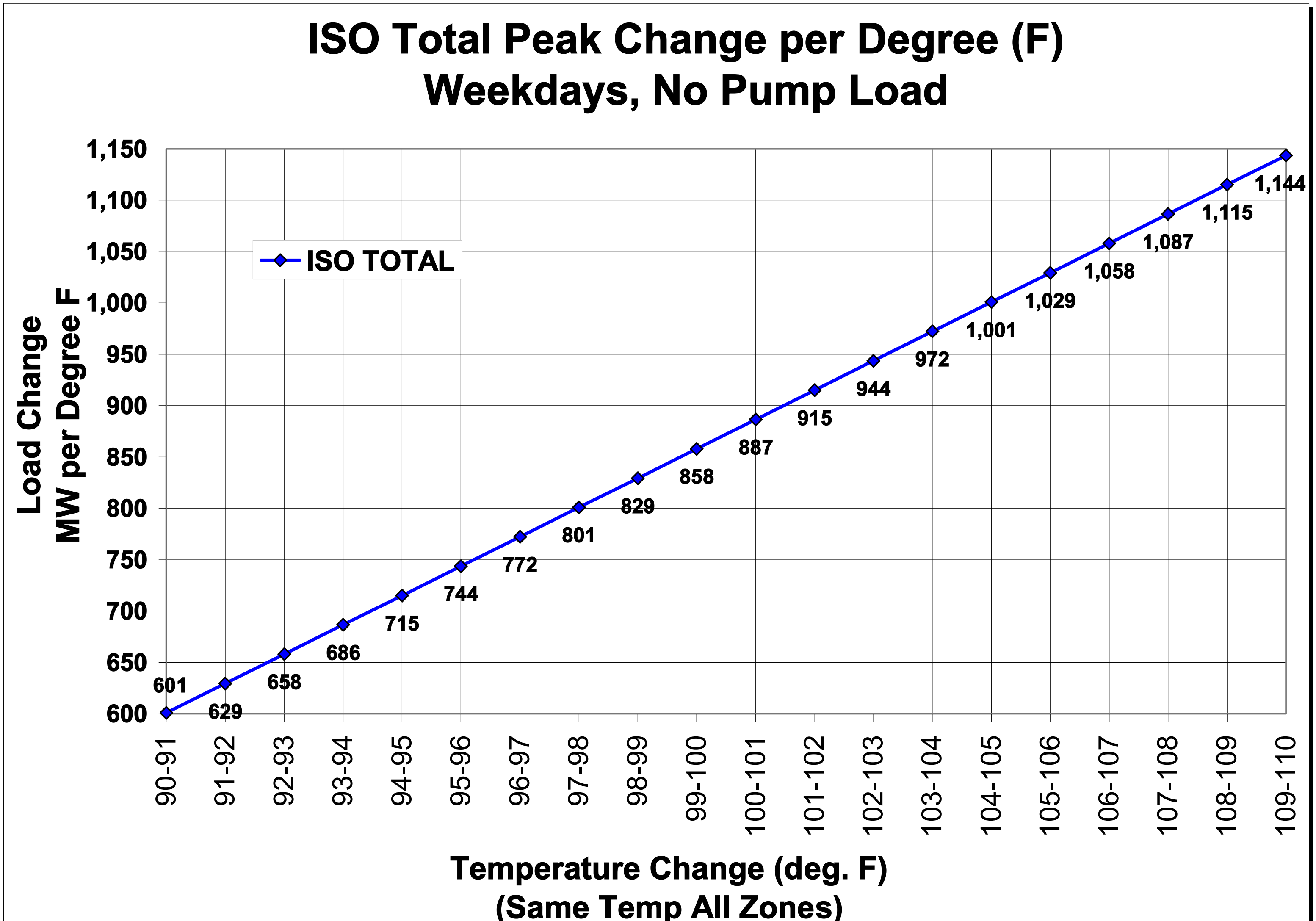
Appendix A – Continued



Appendix A – Continued

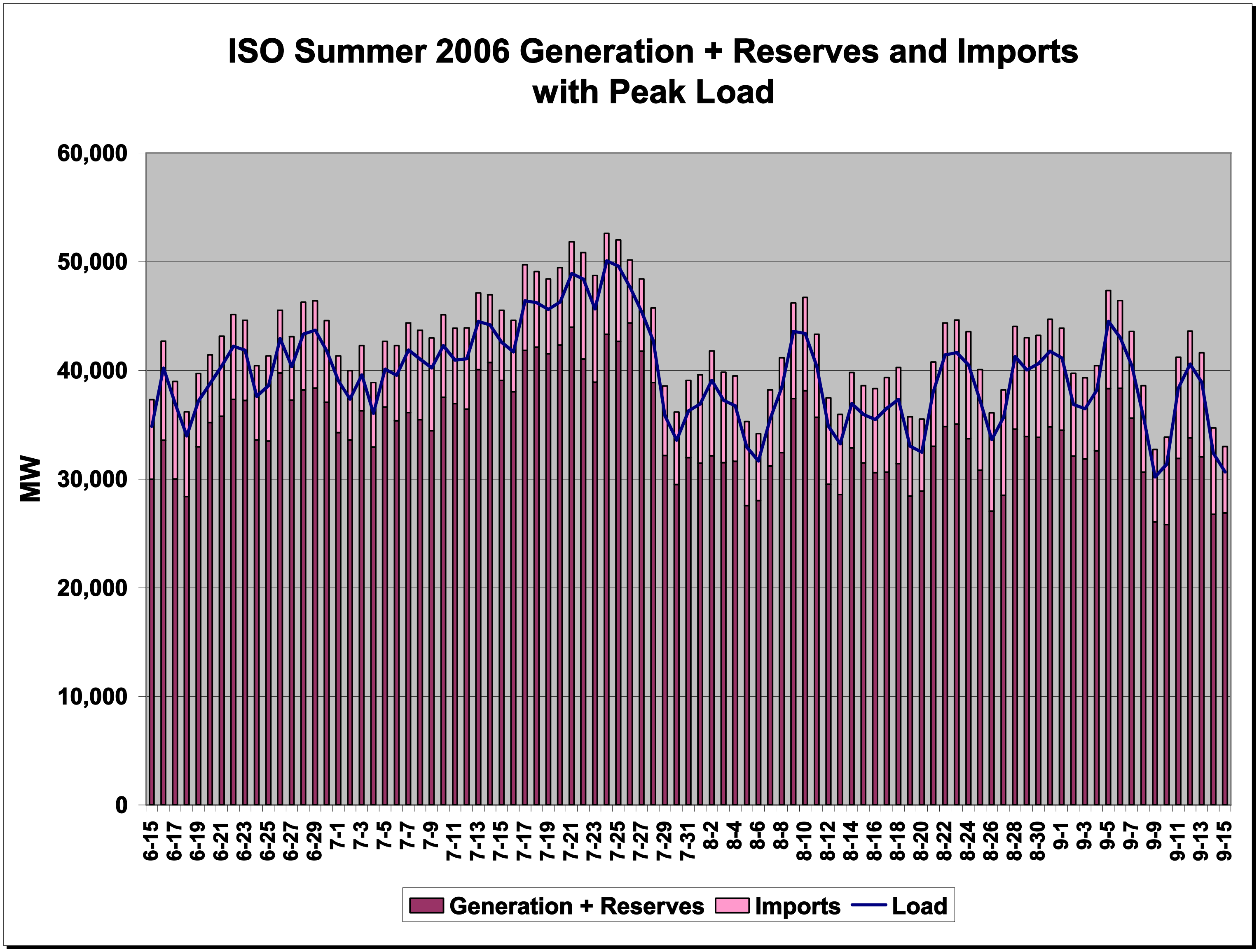


Appendix A – Continued



Note: Assumes the PG&E Bay Area is 10 degrees F below the temperature shown on X axis.

Appendix B - 2006 Generation Summary Graphs



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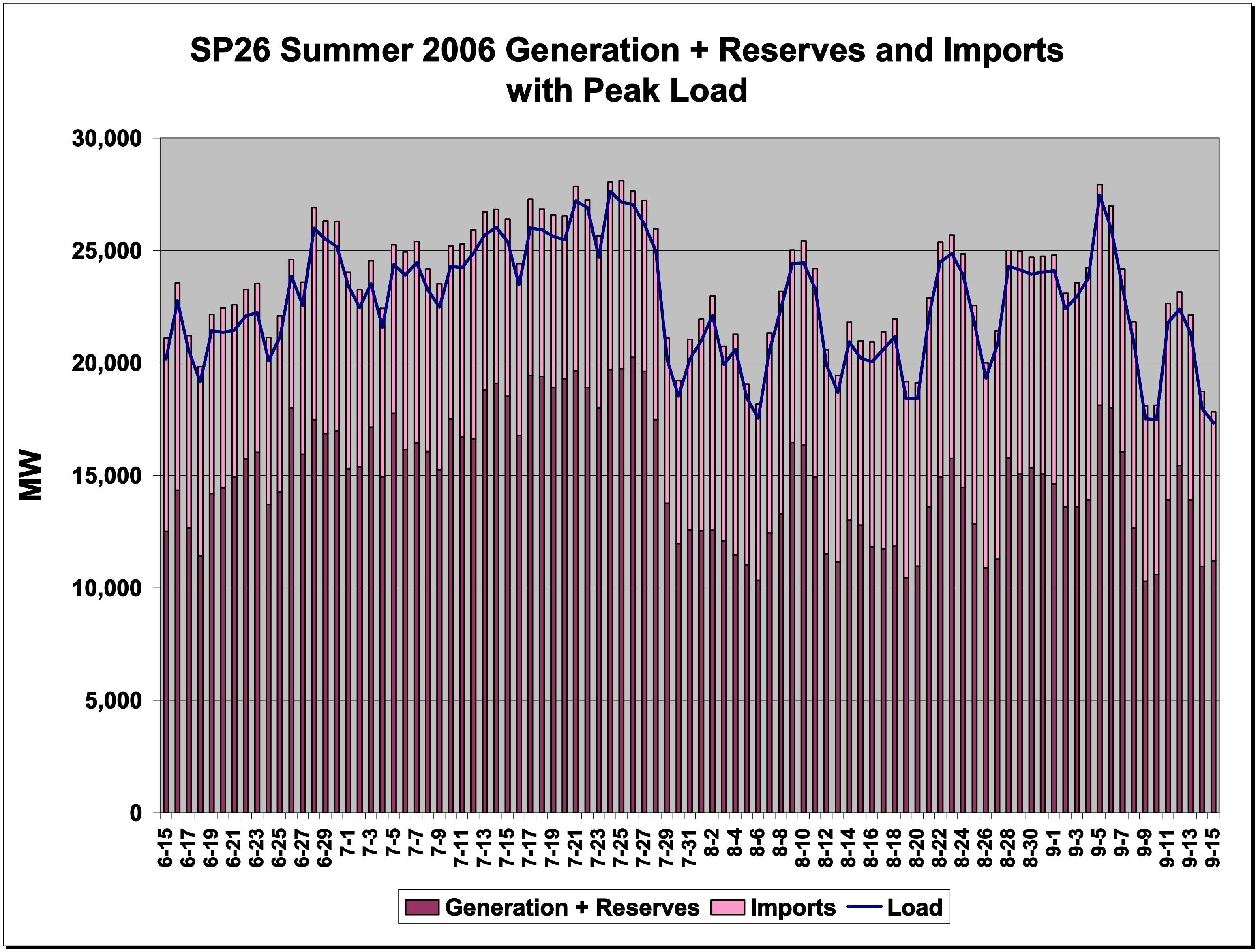
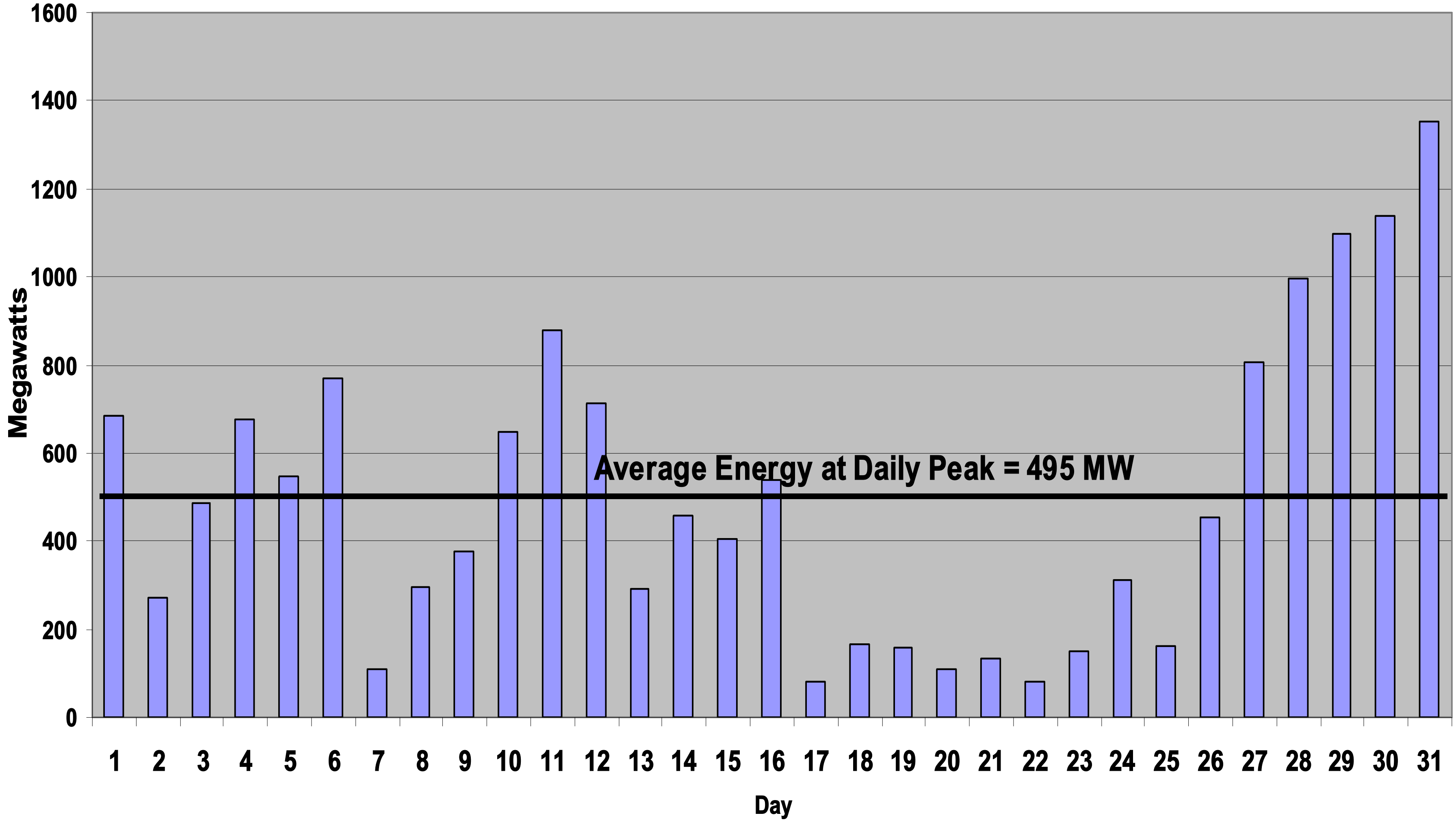


Appendix B – Continued

July - Wind Energy Production at Time of Daily Peak Load



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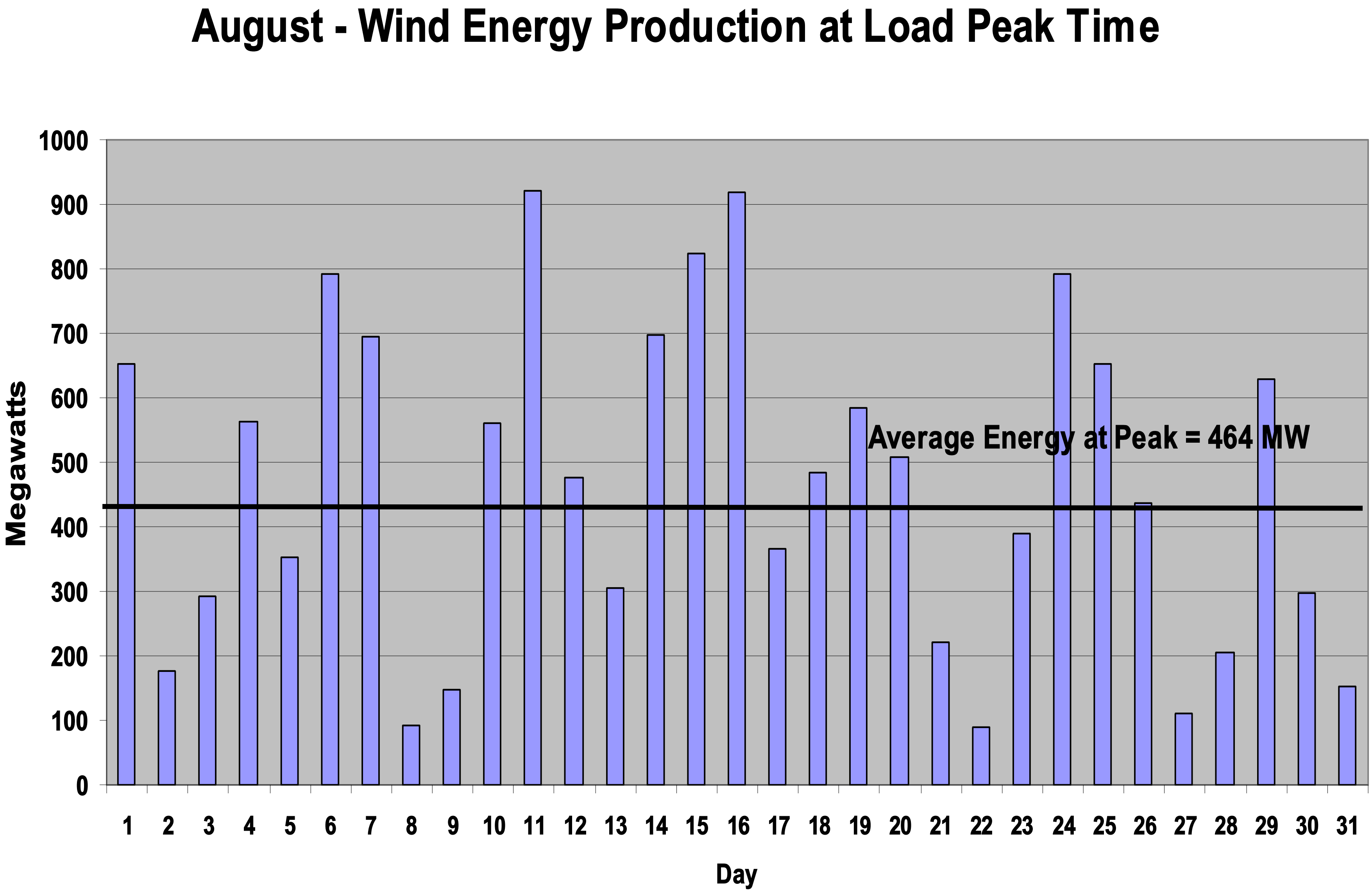
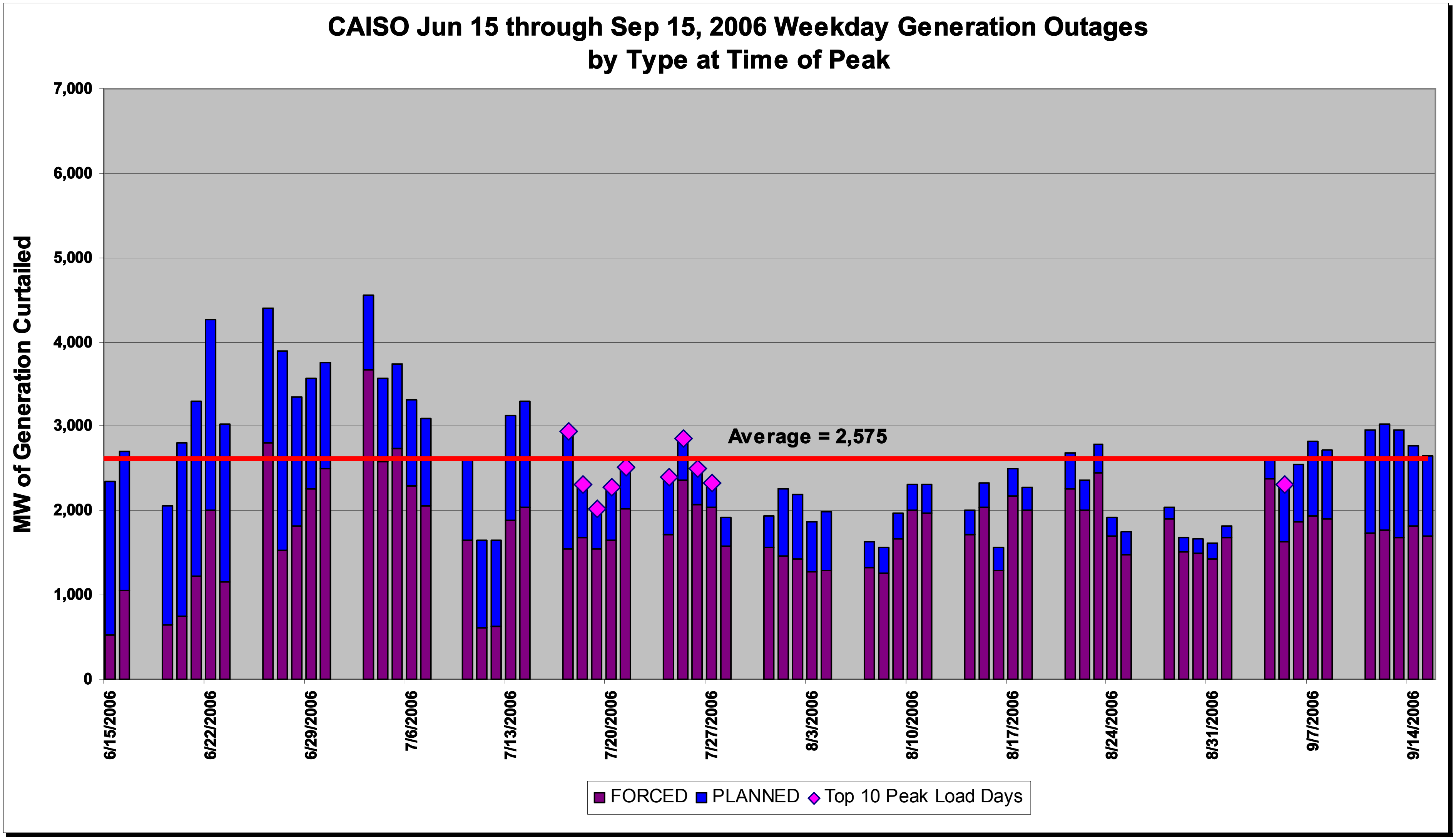


Appendix C – Outage Graphs



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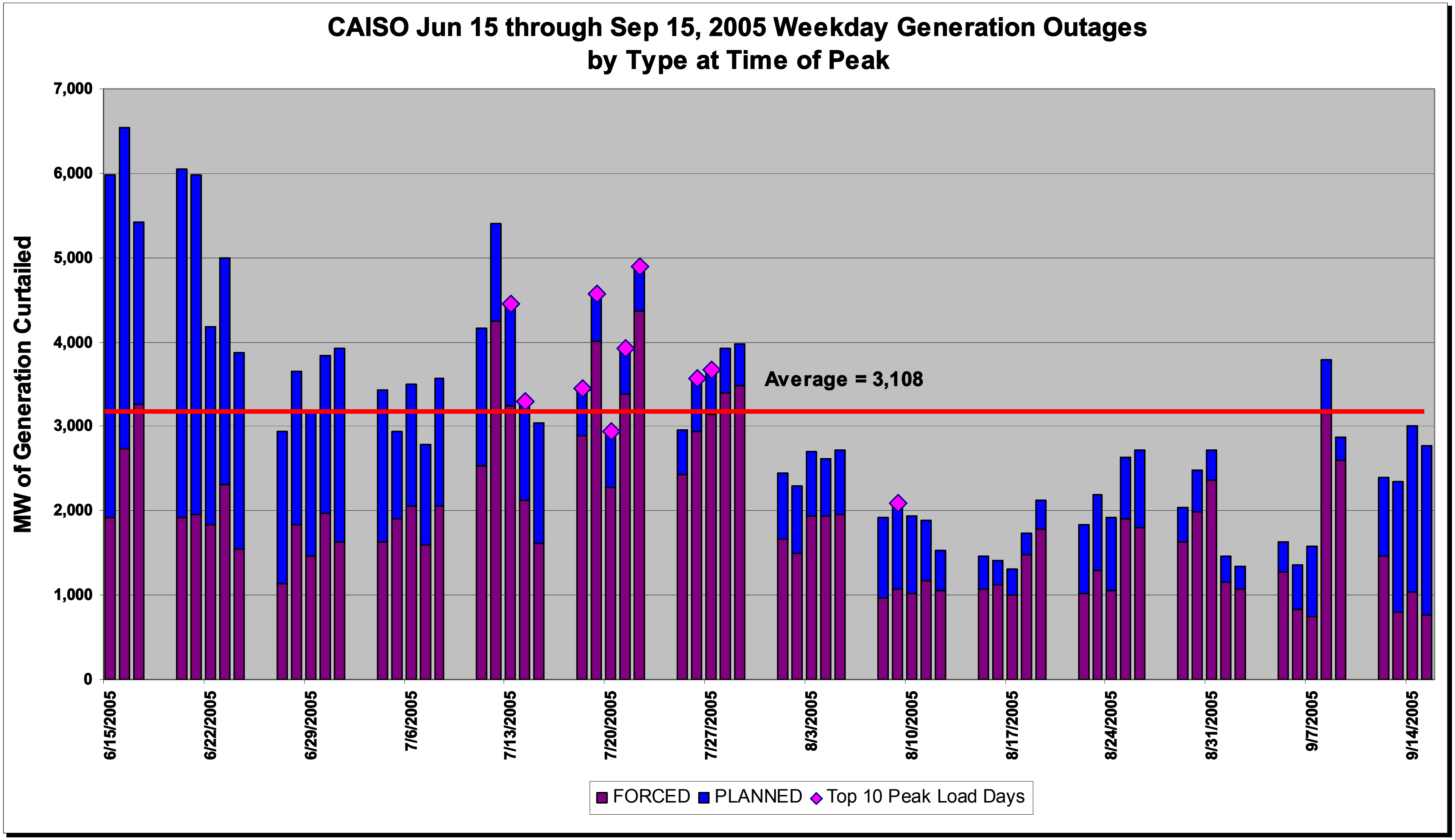
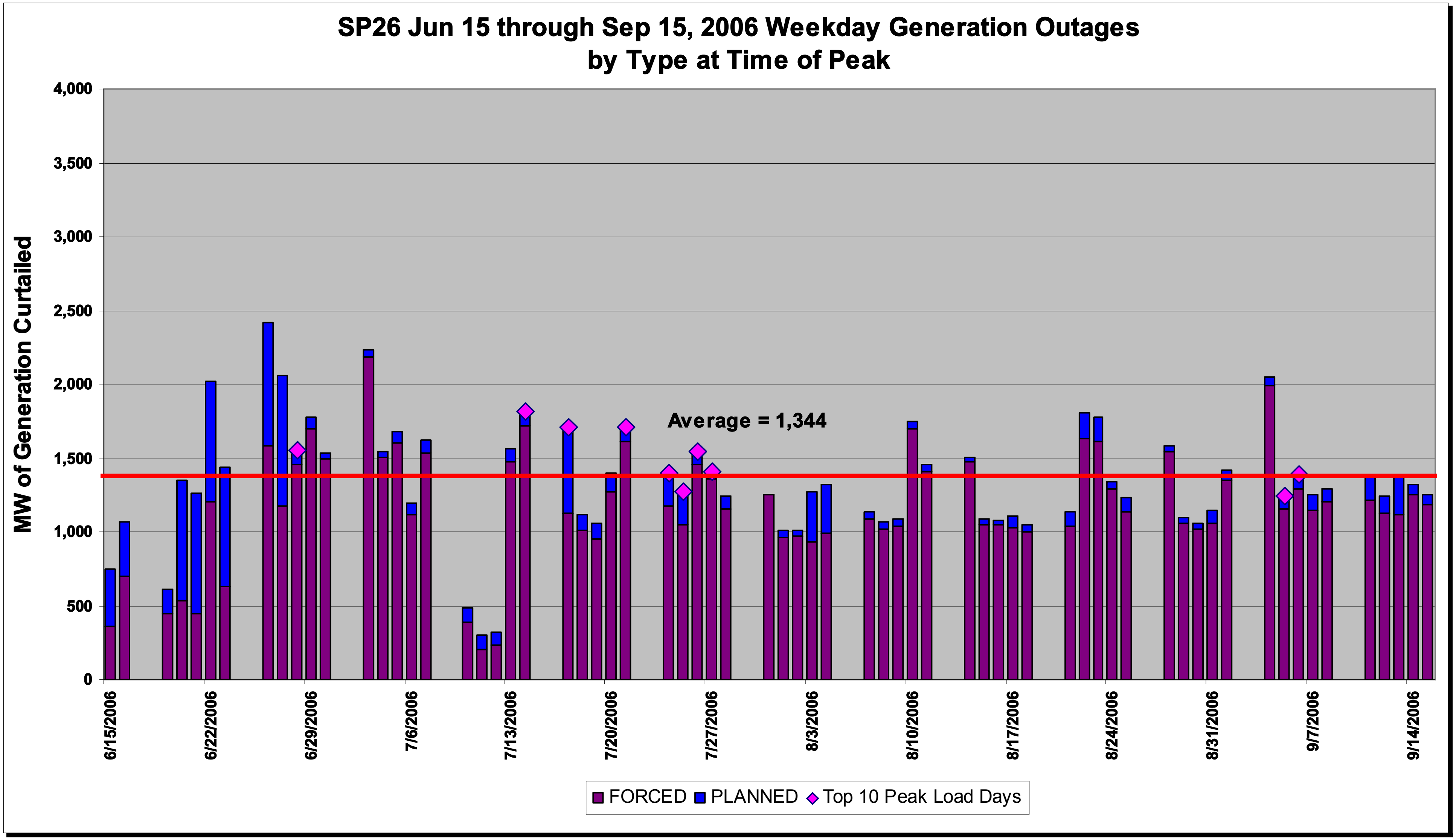
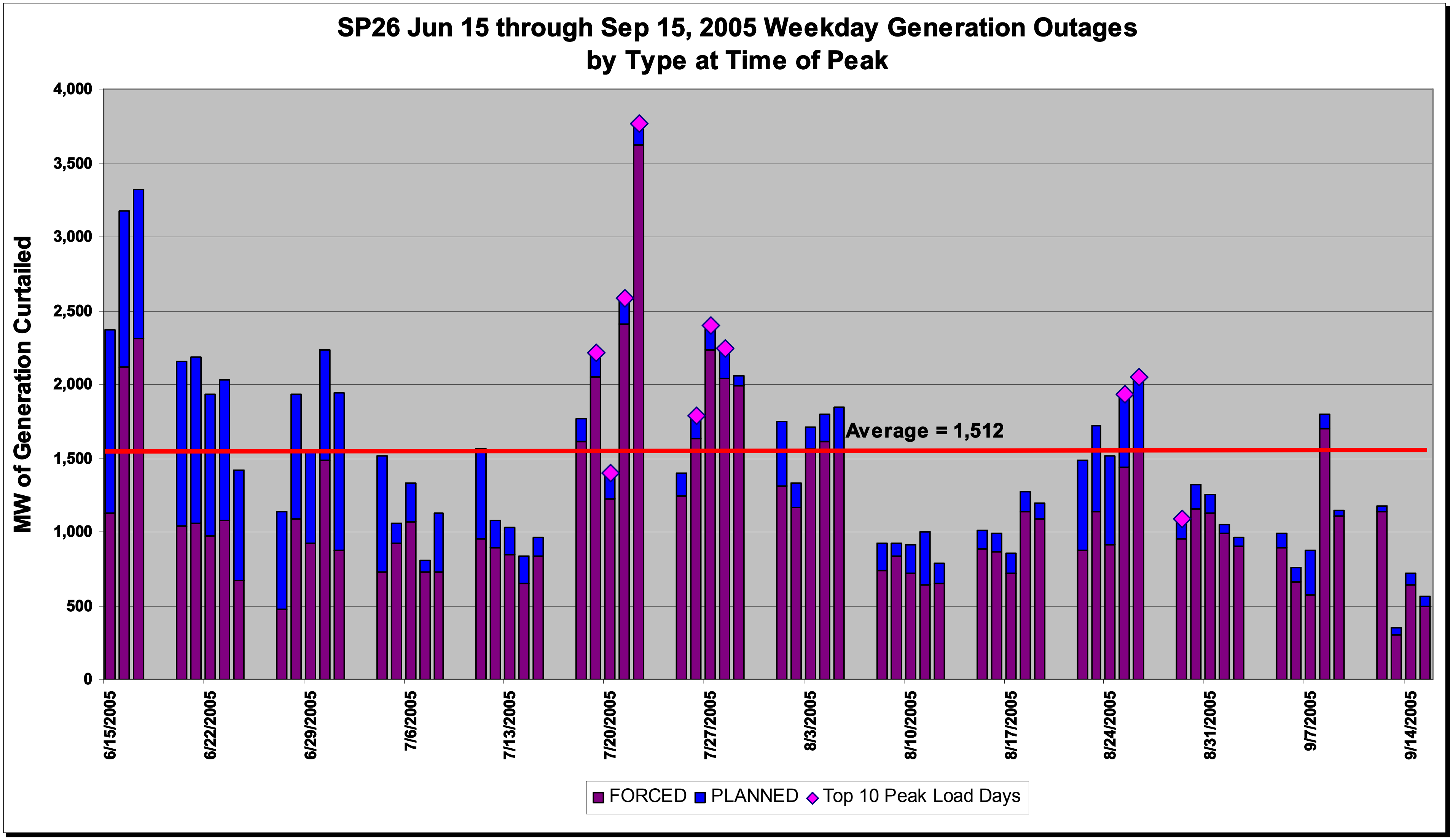


Appendix C – Continued



Appendix C – Continued



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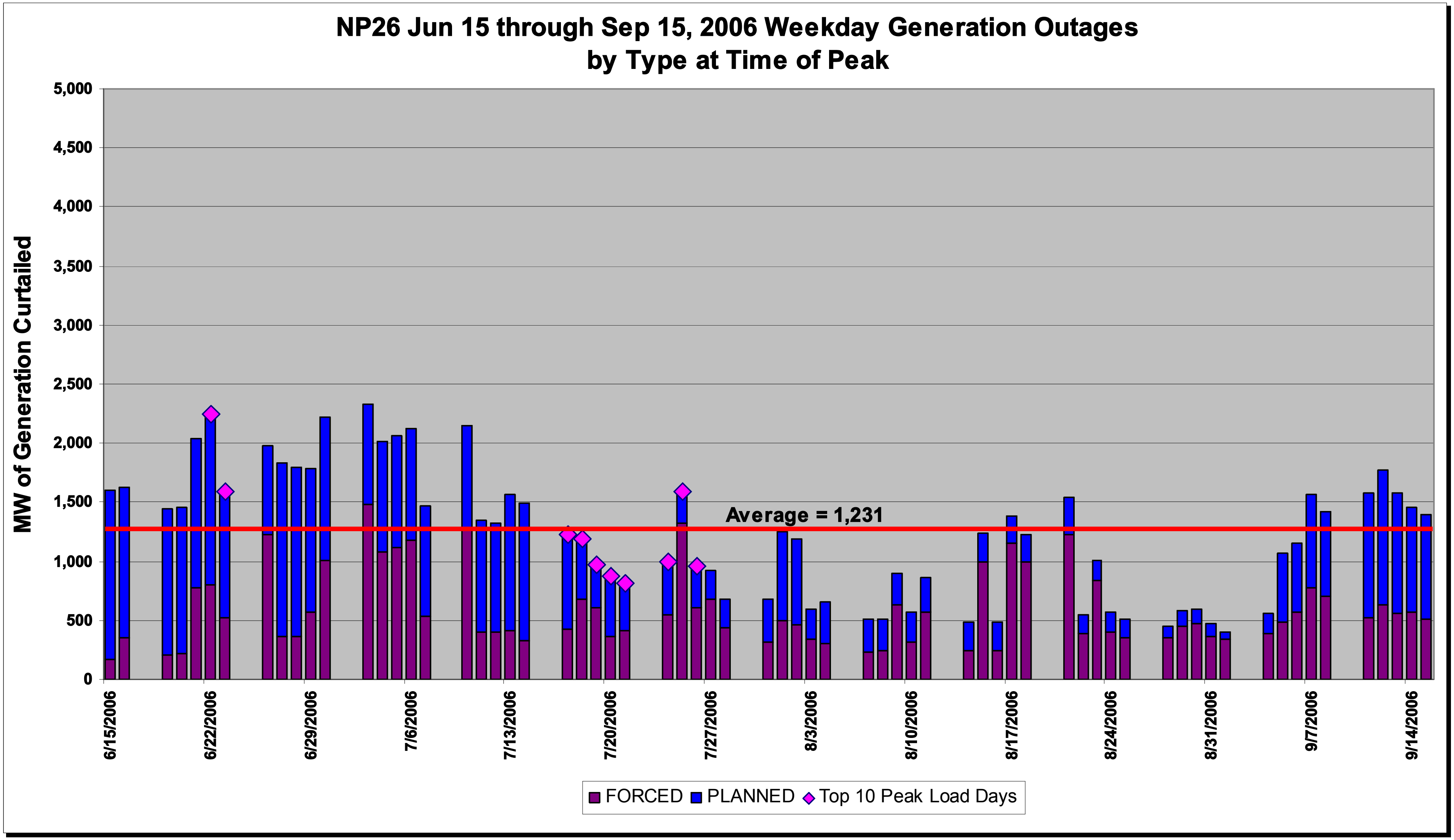

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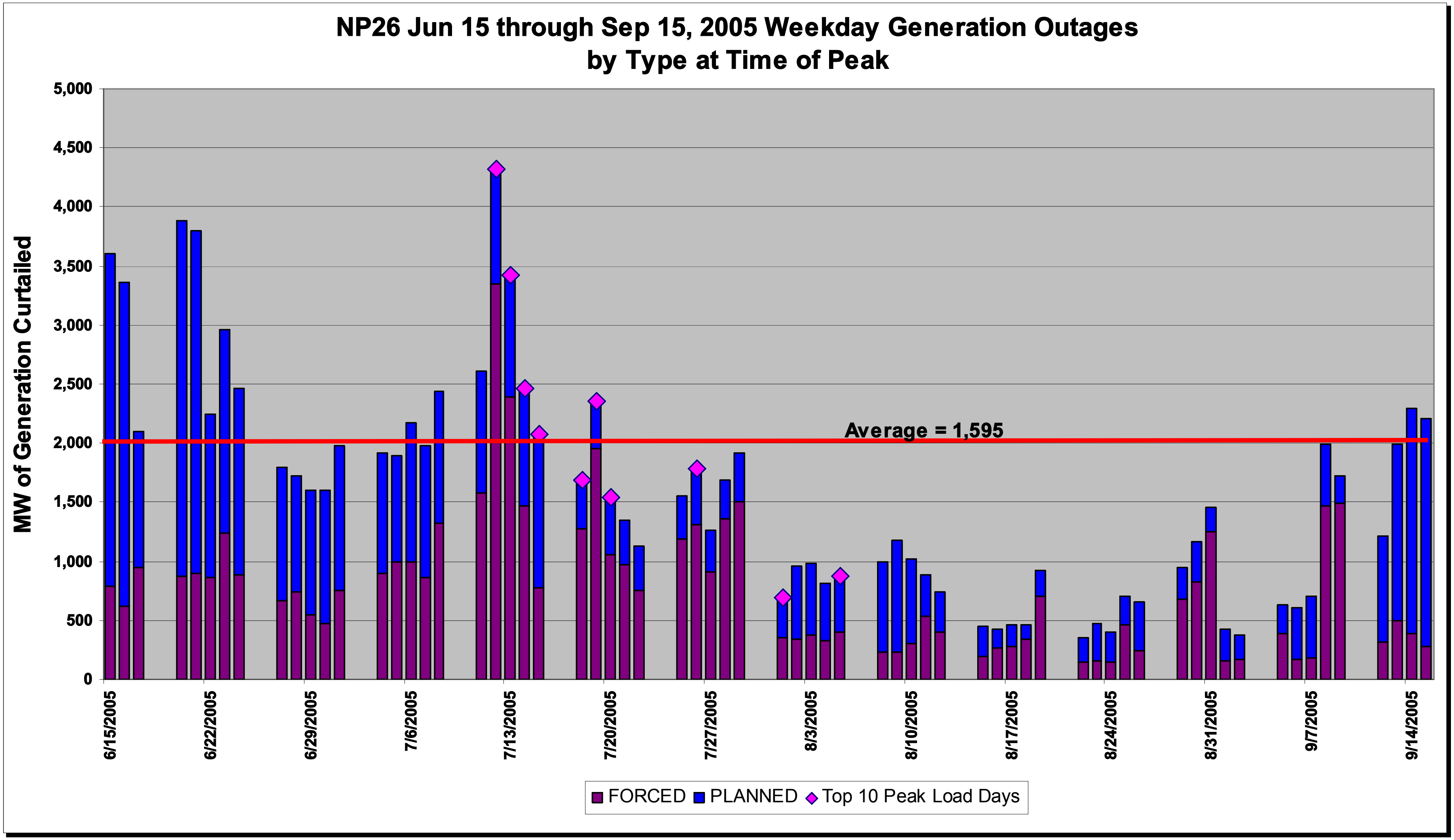
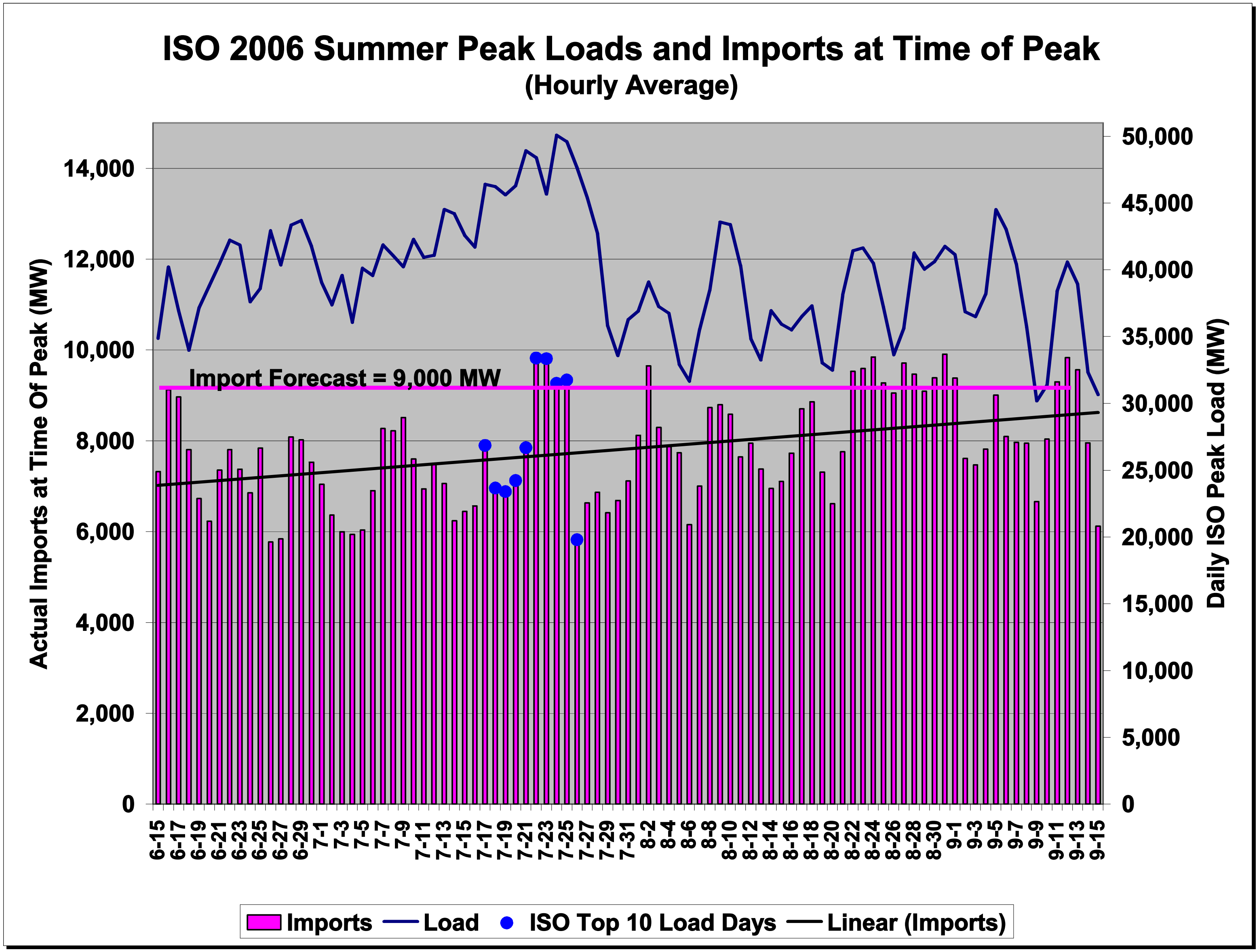
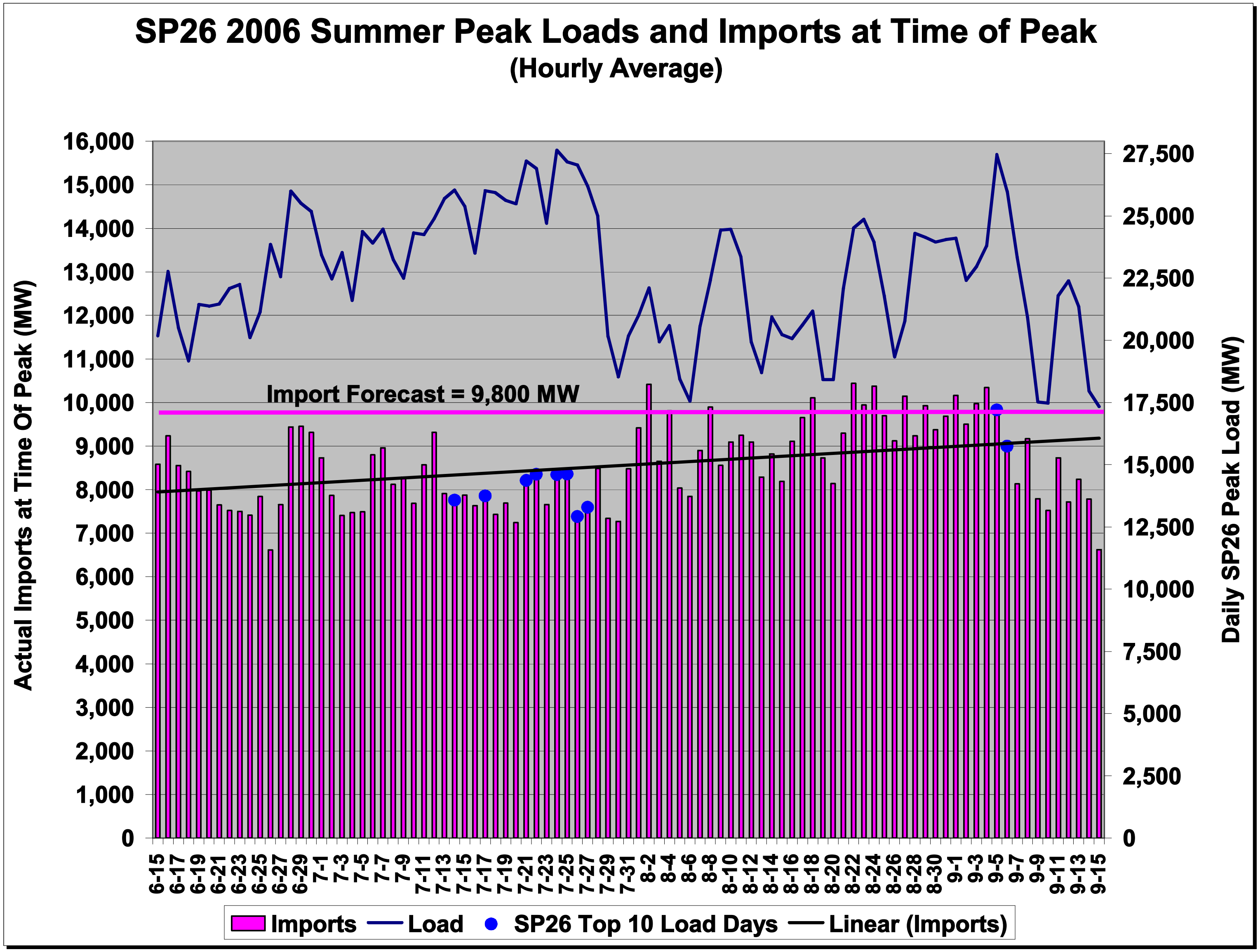


Appendix D - 2006 Imports Summary Graphs



Appendix D – Continued



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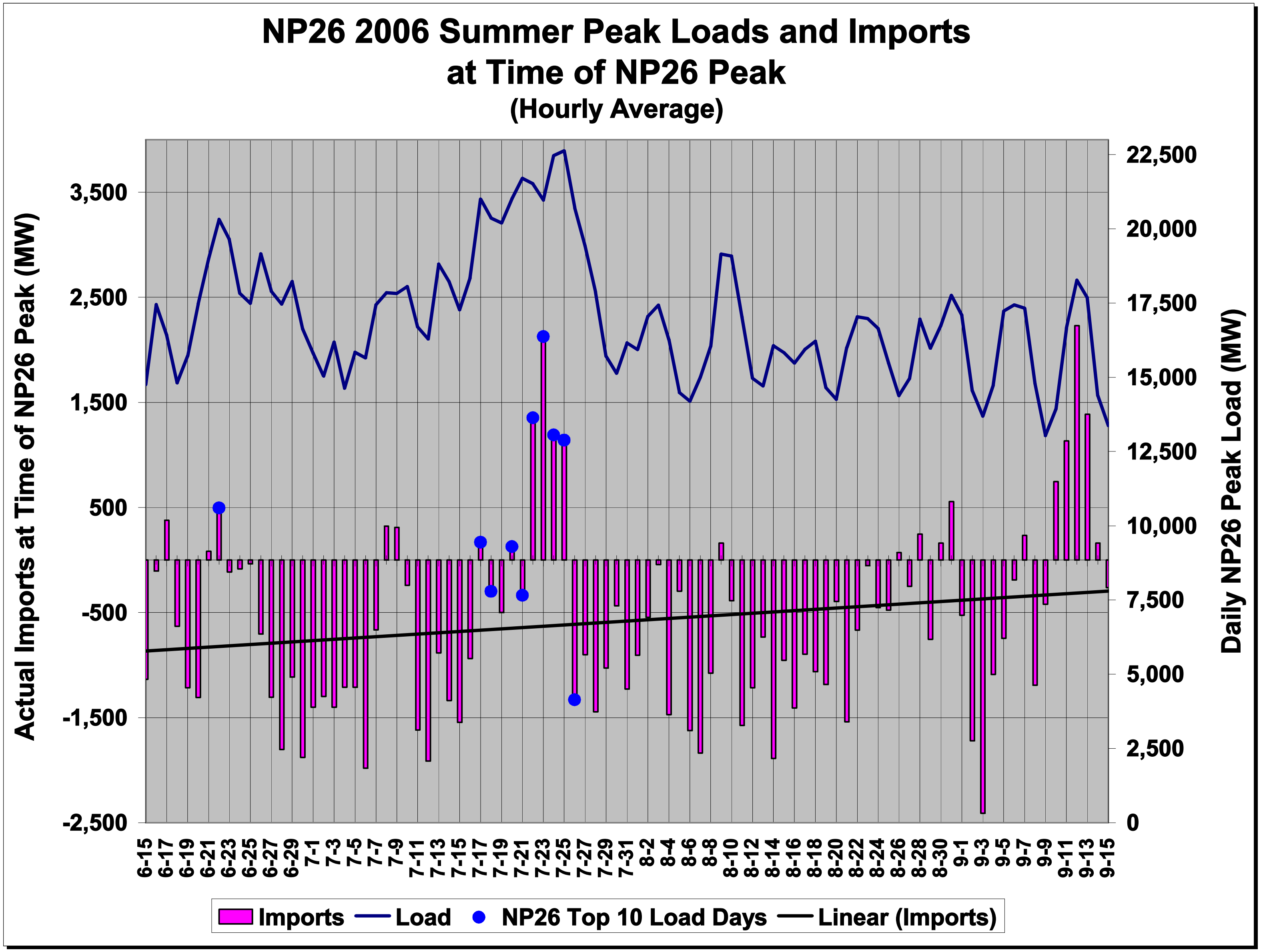
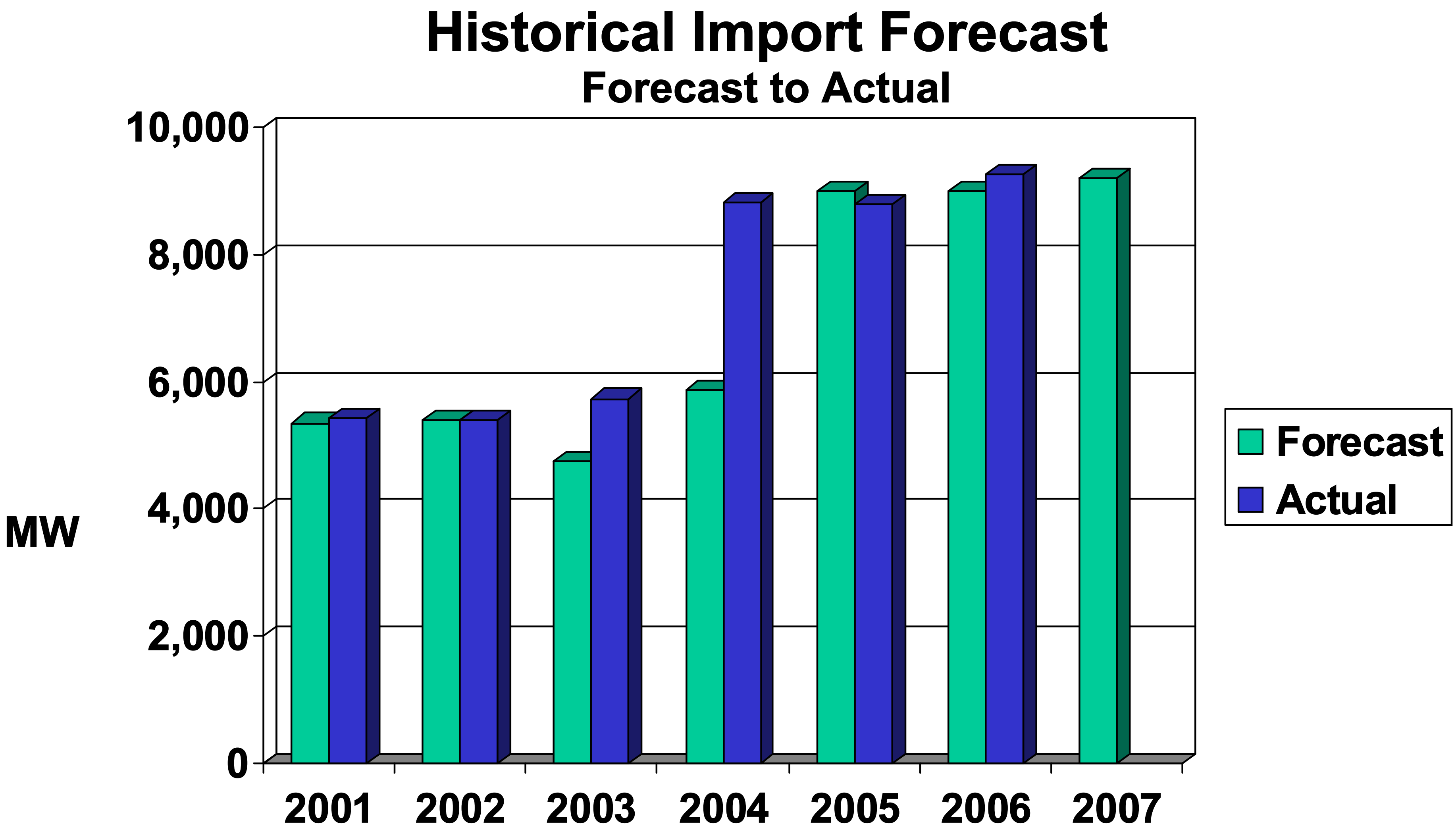
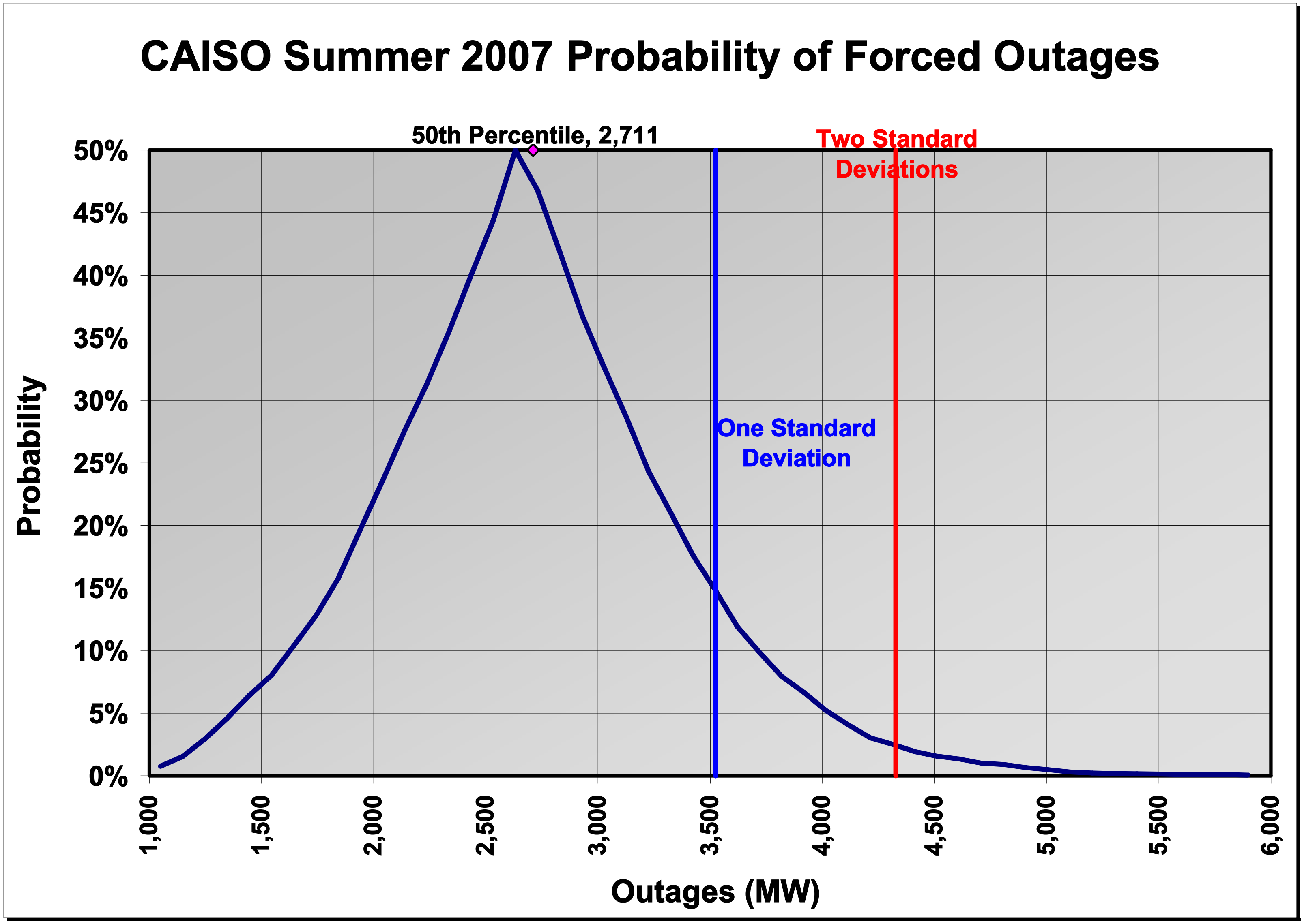


Appendix D – Continued



Appendix E – SAM Model Results



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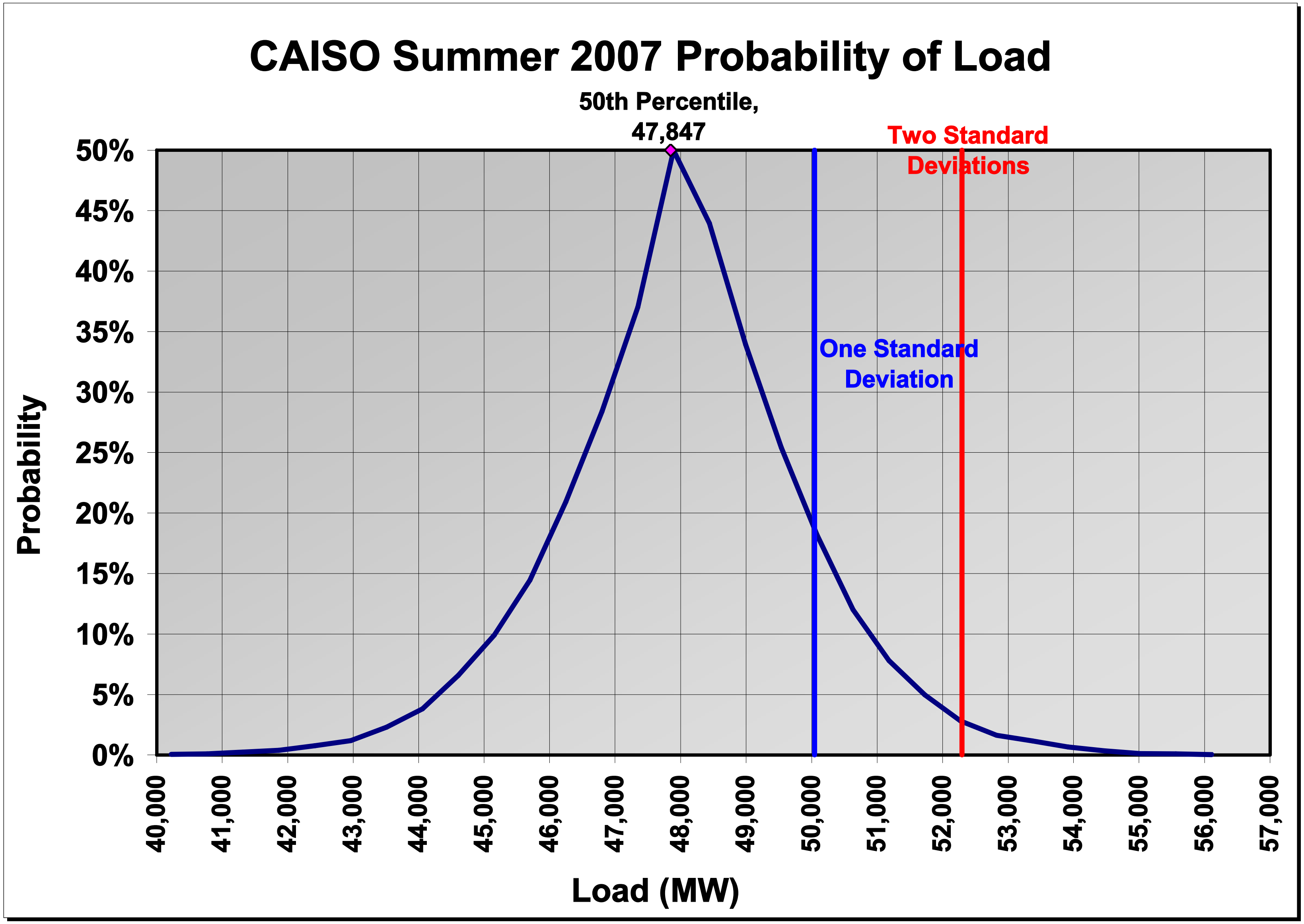

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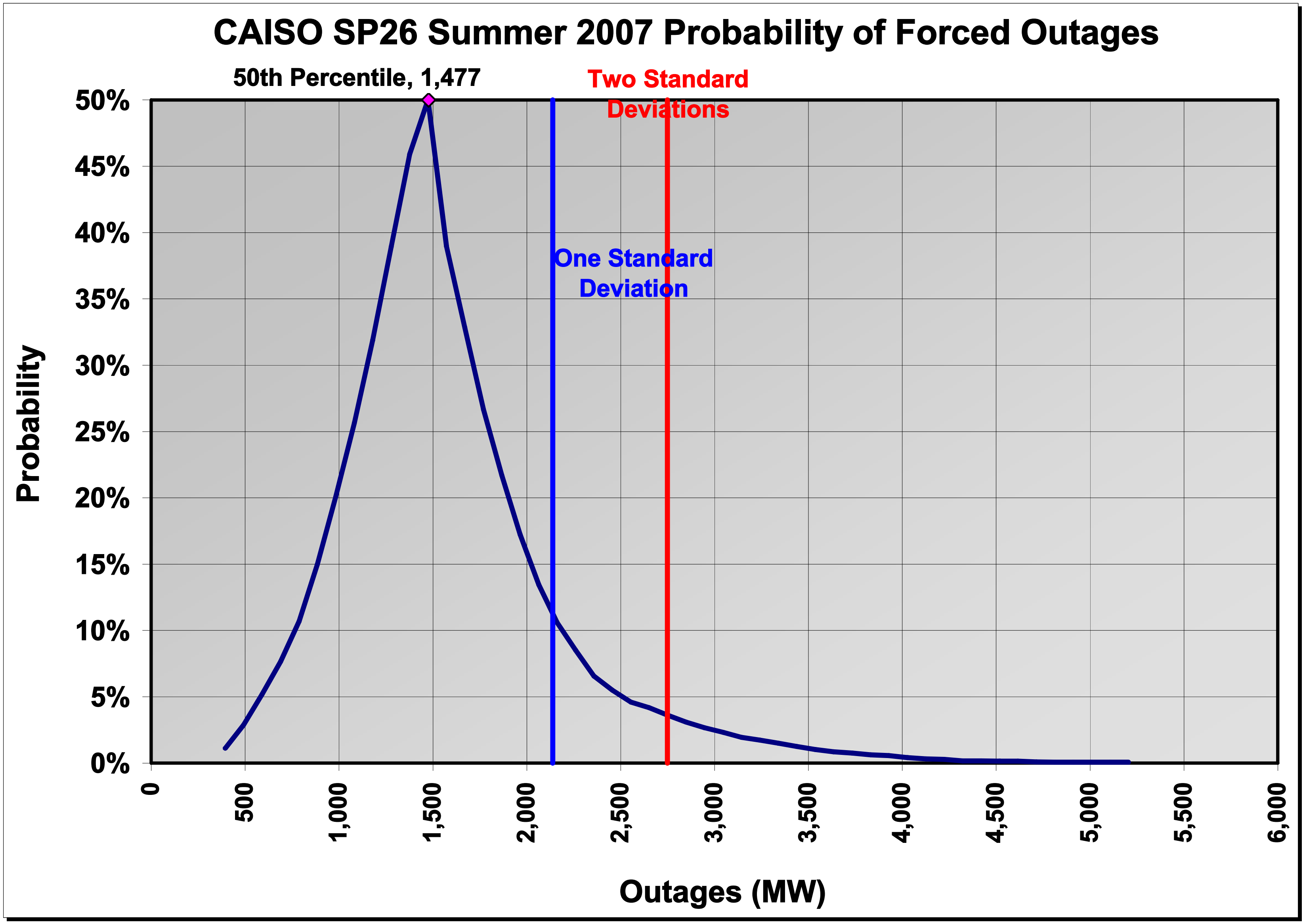

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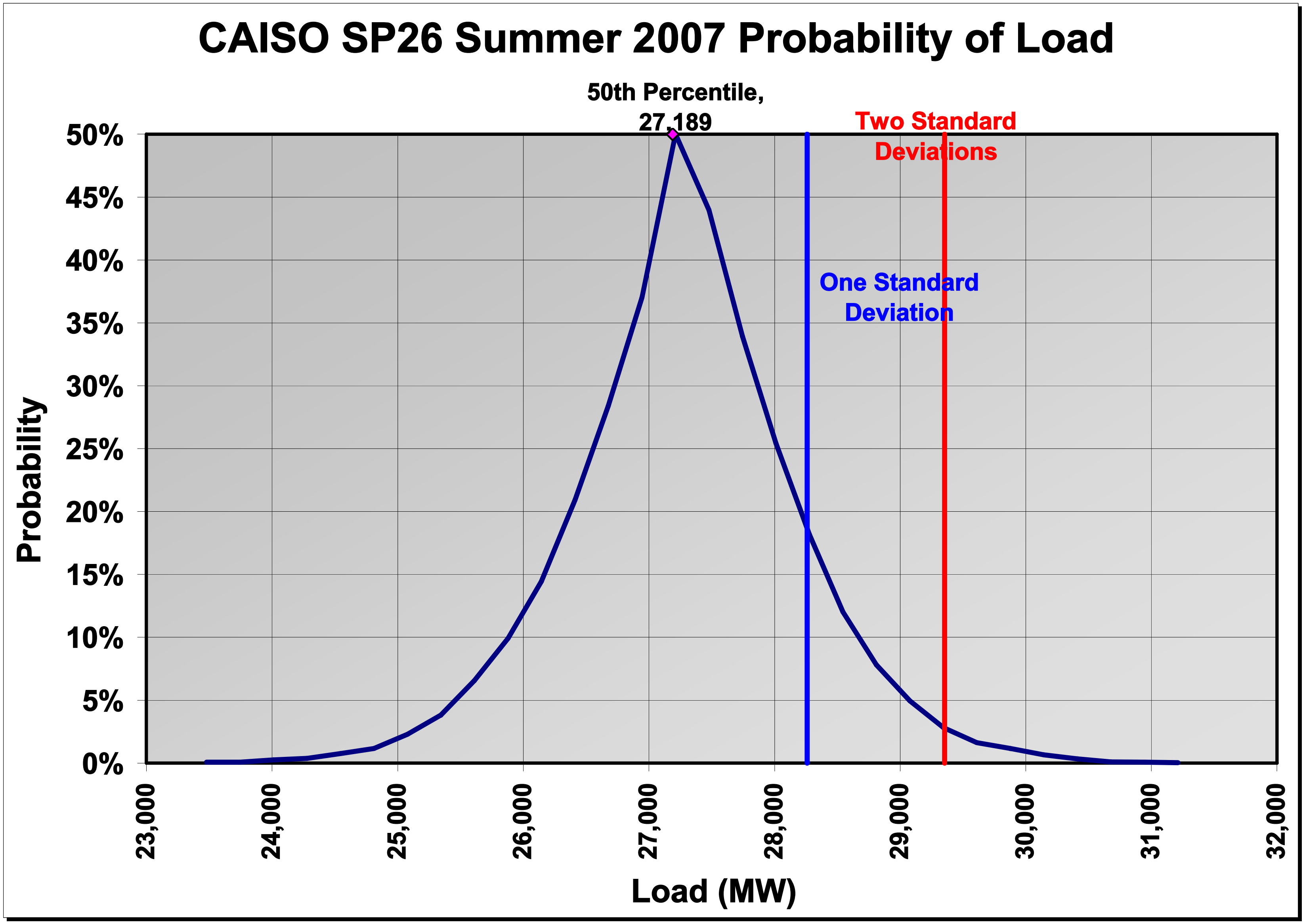

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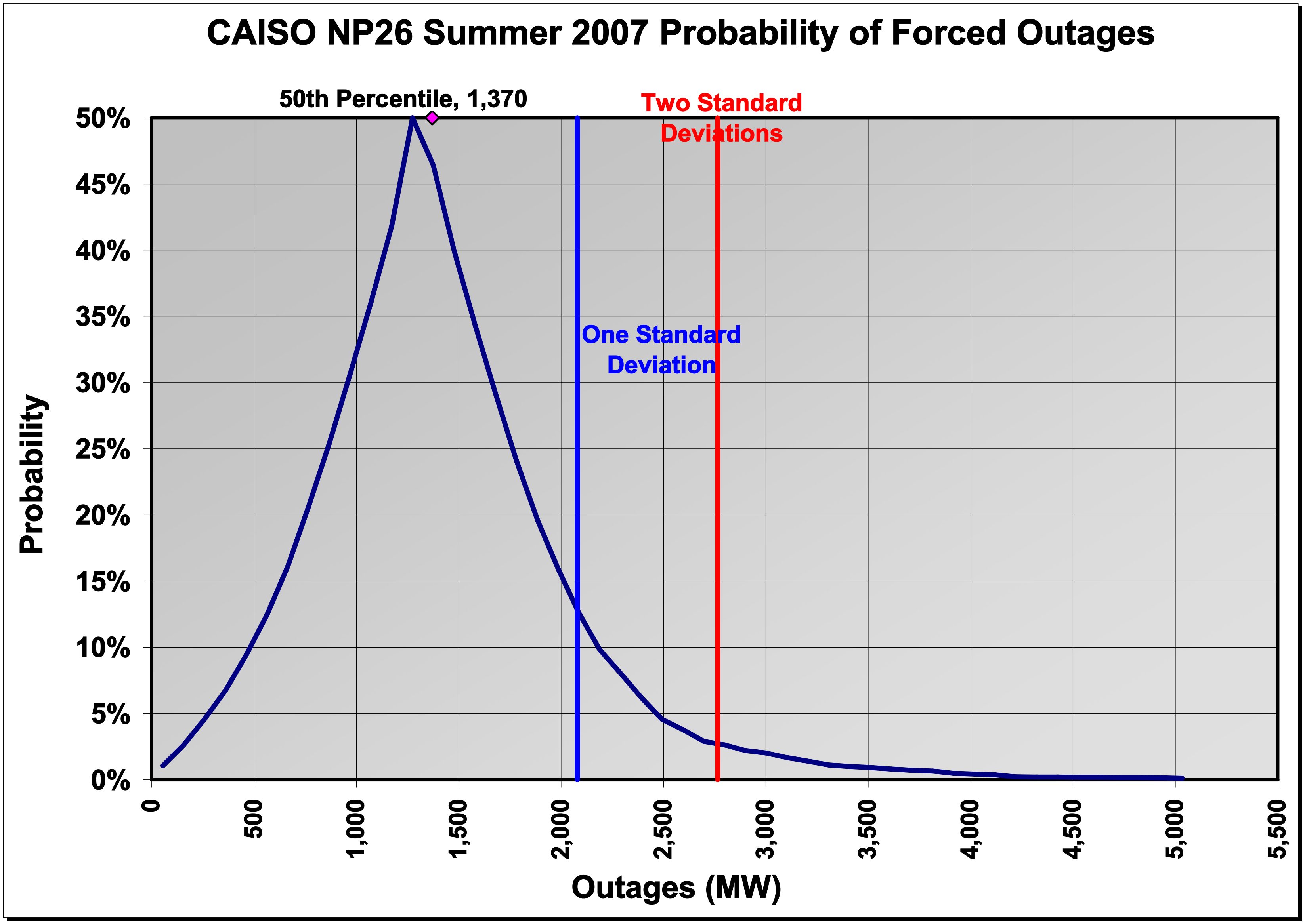

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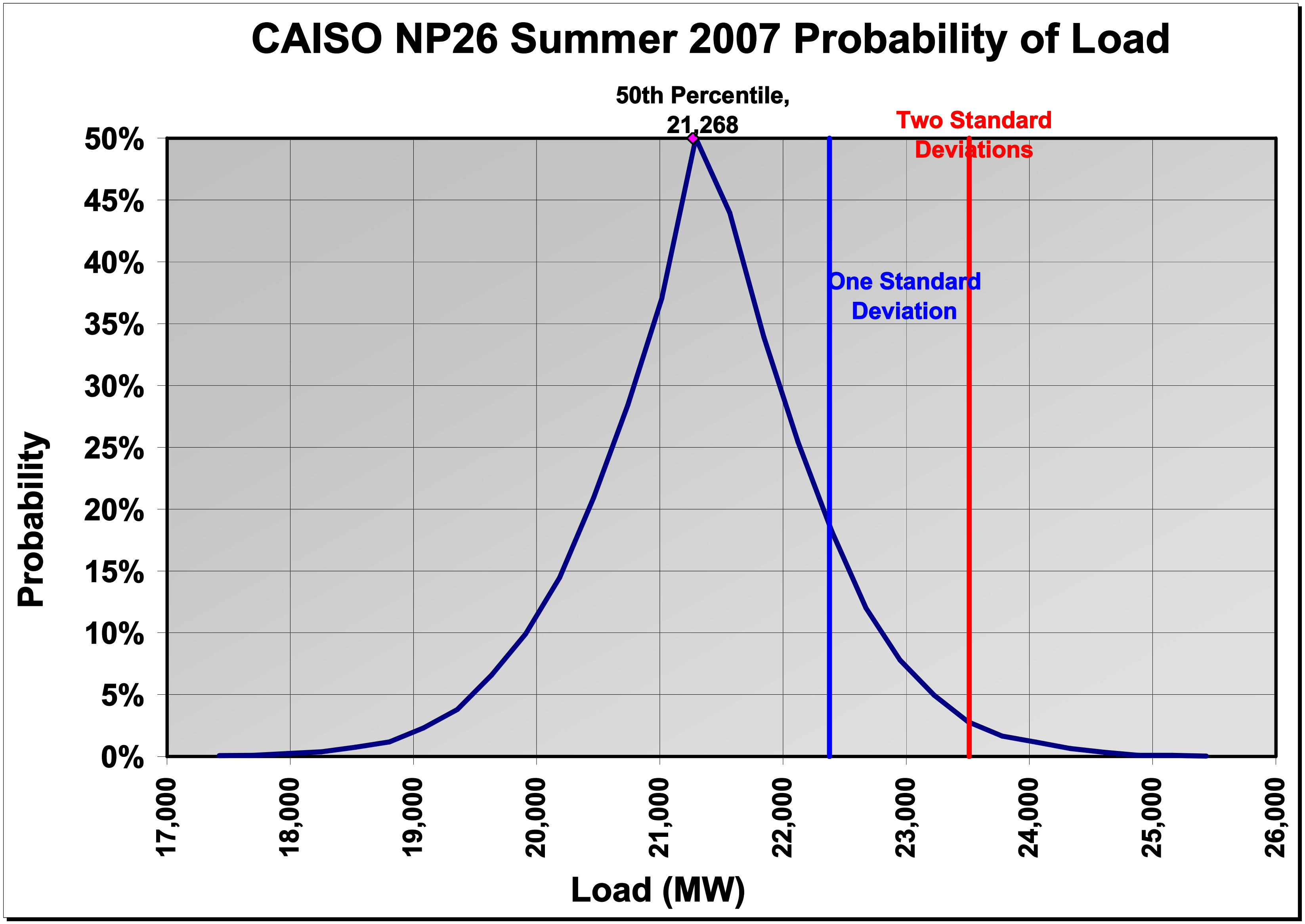


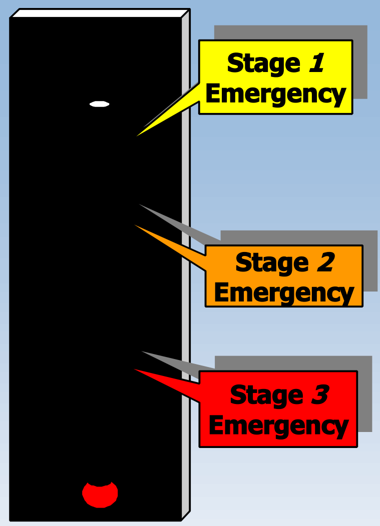
Appendix F – Generation Additions

Generation Additions Since 2006 Summer Peak Period To Beginning of 2007 Summer Peak Period							
CAISO Project Name	**Capacity (MW)**	**Derated Capacity (MW)**	**Fuel Type**	**Capacity Change Type**	**Prime Mover Type**	**Transmission Owner**	**Estimated Parallel Date**
Bottle Rock Power	55	55	Geothermal	Re-power	Steam turbine	PGE	2/22/2007
Marina-LFG2	2.6	2.6	Landfill Gas	New	Reciprocating Engine	PGE	3/1/2007
Midsun Generation Facility Repower	22.5	22.5	Natural Gas	Re-power	Combustion Turbine	PGE	1/1/2007
Santa Maria Cogen	10.2	10.2	Natural Gas	QF Conversion	Combustion Turbine	PGE	1/1/2007
Fresno Cogeneration Expansion Project	73.3	73.3	Natural Gas	Re-power	Steam turbine	PGE	4/1/2007
Lake Mendocino Hydro	3.5	3.5	Water	Re-power	Hydro	PGE	3/30/2007
Santa Clara Wind Project	24.1	0.7	Wind	QF Conversion	Wind	PGE	2/21/2007
	191.2	**167.8**				**PGE Total**	
MM Tajiguas Energy, LLC	3.1	3.1	Landfill Gas	QF Conversion	Reciprocating Engine	SCE	3/1/2007
MM Tulare Energy, LLC	1.5	1.5	Landfill Gas	QF Conversion	Reciprocating Engine	SCE	1/1/2007
West Covina 1	3.3	3.3	Landfill Gas	QF Conversion	Combustion Turbine	SCE	1/1/2007
West Covina 2	6.5	6.5	Landfill Gas	QF Conversion	Steam turbine	SCE	1/1/2007
MM Yolo Power LLC	3.6	3.6	Municipal Waste	QF Conversion	Reciprocating Engine	SCE	1/1/2007
Long Beach Repower - Unit 1	65	65	Natural Gas	Re-power	Combustion Turbine	SCE	6/1/2007
Long Beach Repower - Unit 2	65	65	Natural Gas	Re-power	Combustion Turbine	SCE	6/1/2007
Long Beach Repower - Unit 3	65	65	Natural Gas	Re-power	Combustion Turbine	SCE	6/1/2007
Long Beach Repower - Unit 4	65	65	Natural Gas	Re-power	Combustion Turbine	SCE	6/1/2007
McGrath Beach Peaker	49	49	Natural Gas	New	Combustion Turbine	SCE	8/3/2007
Barre Peaker	49	49	Natural Gas	New	Combustion Turbine	SCE	7/20/2007
Center Peaker	49	49	Natural Gas	New	Combustion Turbine	SCE	7/20/2007
Grapeland Peaker	49	49	Natural Gas	New	Combustion Turbine	SCE	7/11/2007
Mira Loma Peaker	49	49	Natural Gas	New	Combustion Turbine	SCE	7/13/2007
San Dimas Wash Hydro	1.1	1.1	Water	QF Conversion	Hydro	SCE	3/1/2007
	523.9	**523.9**				**SCE Total**	
Otay 3	3.8	3.8	Landfill Gas	New	Reciprocating Engine	SDGE	2/21/2007
Rancho Penasquitos Hydro Facility	4.7	4.7	Water	New	Hydro	SDGE	11/9/2006
	8.5	**8.5**				**SDGE Total**	
	723.6	**700.2**				**Grand Total**	
ISO Total	**724**	**700**					
NP26 Total	**191**	**168**					
SP26 Total	**532**	**532**					

Appendix G – Stages of Electrical Emergencies

California ISO
Your Link to Power

Stages of Electrical Emergencies



Operating Reserves less than WECC/NERC *requirements*

(Continuously recalculated. Between 6.0% & 7.0%)

- ✓ **Issue *Flex Your Power Now Power Watch***
- ✓ **Public requests for conservation**
- ✓ **Coordinate with public safety agencies**
- ✓ **Initiate CAISO Voluntary Load Reduction Program**

Operating Reserves less than *5.0%*

- ✓ **Invoke Utility load reduction programs**

Spinning Reserves less than *WECC MORC requirements*

(Continuously recalculated. Between 1.5% & 3.0%)

- ✓ **Issue *Notice of Load Interruptions***
- ✓ **Instruct utilities to implement load interruptions**