California Independent
System Operator Corporation

California ISO

2009 Summer Loads and Resources Operations Preparedness Assessment

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Grid Assets
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I. EXECUTIVE SUMMARY

This *2009 Summer Loads and Resource Operations Preparedness Assessment* (Assessment) is designed to provide the California Independent System Operator Corporation (the ISO) and interested parties an assessment of the supply and demand picture for the ensuing summer season. The continuing drought conditions and its impact on hydroelectric (hydro) generated capacity and energy as well as the impact that the current recession is having on peak demand loads are of particular interest this year and are addressed in this Assessment.

This Assessment uses deterministic and probabilistic methodologies to characterize the current state of the 2009 summer supply and demand situation to help the ISO and the electricity industry prepare for contingencies that may arise. The deterministic approach helps to frame the issues and circumstances that can lead to conditions where operating reserves are low and the ISO needs to take action to mitigate the risk of having to shed firm load. The deterministic approach also provides a reference to the amount of a reserve shortfall in cases that show a reserve deficiency. The probabilistic approach describes how likely it is that events leading to low operating reserves may occur.

The analyses were performed based on forecasts of various categories that impact the supply and demand situation expected during the 2009 summer peak load period for the ISO system, and the South of Path 26 (SP26) and North of Path 26 (NP26) zones. This Assessment describes the inputs used in the analyses, such as 2009 summer peak demand, forecast planned generation resources, imports, generation outages and transmission limitations. Through this process, a 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 2009 summer peak demand periods.

Findings

Supply for the summer 2009 is adequate to handle a broad range of operating conditions but system operations will be challenging at the extremes. The need to maximize imports into southern California, under a variety of conditions, is essential to maintaining adequate supplies during high demand and/or high outage conditions. This applies to northern California as well this year as a result of adverse hydro supply conditions. Conservation through the Flex Your Power program and utility demand response programs continue to be important this summer and will play an increasingly important role in years to come.

The ISO will continue its summer preparation efforts, which include working with generators, transmission owners, and other balancing authorities in the west to prepare for adverse conditions that result in low operating reserves. While electrical peak demand is likely to decrease due to the current recession, concerted efforts are needed to ensure that generation is added to replace generation under pressure to retire as well as to meet future load growth that will take place as the economy returns to more normal conditions.

California is transitioning to a vastly different electricity system in response to renewable, greenhouse gas, and water quality goals. As the ISO generating fleet transitions into a lower carbon and higher renewable hybrid system, the ISO will be managing this transition by continuing to develop tools and procedures for operating the system in a safe and reliable manner. This transition requires both careful management and greater public understanding of the benefits and challenges ahead.

The ISO is counting on the continued success and further refinement of the resource adequacy (RA) program. The California Public Utilities Commission (CPUC) RA program requires load-serving entities to contract in advance with generators and demonstrate that contracts are in place to meet a 15 to 17% planning reserve margin, based on a 1-in-2 peak demand forecast. The 15 to 17% planning reserve margin includes demand response and interruptible load programs. The demand response and interruptible program amounts are based on the CPUC amounts allowed for RA for the 2009 summer months. The RA program requires load-serving entities to show that they have 90% of the total RA obligation under contract a year in advance and 100% of the RA obligation under contract one month in advance. This process is designed to ensure that enough capacity is under contract prior to the summer peak period to meet a 15% planning reserve margin.

This Assessment looks at all capacity within the ISO regardless of contractual arrangements to better understand how the system will respond under contingencies when all resources within the ISO could be called on to perform. Although there may be some resources within the ISO that do not receive a contract under the RA program and contract with entities outside the ISO, those arrangements tend to be short-term, and such units continue to provide system stability to the ISO even if their generation is scheduled for export.

Imports are a key assumption in both the deterministic and probabilistic analyses. The amount of imports into the ISO on any given day depends on a number of factors and it is difficult to predict the level of imports that will occur or even be available during a given set of contingencies. Modeling the complex dynamics that lead to a given import level on any given day are beyond the scope of this Assessment. This Assessment is primarily concerned with the imports that come to bear to meet the highest peak demands during the summer season or during moderate loads coupled with losses of high amounts of generation and/or transmission. Since there is no single import amount that can be used to represent every scenario, the Assessment examines high, moderate and low import levels. These scenarios represent import levels associated with a variety of circumstances and are used in the supply adequacy analyses contained in this Assessment.

Table 1 is the supply and demand outlook for the 2009 summer based on a planning perspective. This table shows the planning reserve based on the 1-in-2 peak demand forecast prior to accounting for any generation outages or transmission curtailments. The import amounts are based on moderate import levels experienced at time of peak demand for each area represented during the 2008 summer season. The import levels experienced during the 2008 summer peak loads are expected to be representative of 2009 import levels.

Table 1 shows 1,476 MW of new generation coming on-line between the end of the summer of 2008 and by the beginning of the summer of 2009. Hydro derates of 1,000 MW are shown for the ISO and these derates are used in the analysis presented in this Assessment. The high, moderate and low import scenarios have increased over last year's Assessment based on observed import levels during the 2008 summer peak demand periods (discussed in more detail later in this Assessment and shown in *Table 12*).

Table 1

Summer 2009 Outlook			
Resource Adequacy Planning Conventions	**CAISO**	**SP26**	**NP26**
Existing Generation	47,500	22,558	24,929
Retirements (Known)	22	0	22
High Probability CA Additions	1,476	378	1,098
Hydro Derates	-1,000	-208	-792
Net Interchange (Moderate)	10,100	9,200	2,050
Total Net Supply (MW)	58,098	31,929	27,306
Demand (1-in-2 Summer Temperature)	45,379	25,412	21,370
DR & Interruptible Programs	2,090	1,496	593
Planning Reserve[1]	**32.6%**	**31.5%**	**30.6%**

[1] Planning Reserve calculation (Total Net Supply + Demand Response + Interruptibles)/1-in-2 Demand)-1.

Figures 1, 2 and *3* are graphical representations of the deterministic analysis results, including 1-in-2, 1-in-5 and 1-in-10 generation and transmission outages/curtailments, and 1-in-2, 1-in-5 and 1-in-10 peak demand scenarios for the ISO, NP26 and SP26. The assessment of the more extreme conditions allows the ISO to frame the electric system challenges and focus management effort on measures that will minimize possible impacts.

Nine deterministic scenarios are presented in each of the following *Figures 1, 2* and *3.* These figures show that no firm load shedding would be needed in the ISO, NP26 or SP26 under any of the nine scenarios. Only in one NP26 scenario (1-in-10 demand & outage scenario with low imports) does the operating reserve margin drop significantly below 7 percent (3.6 percent).

Figure 1

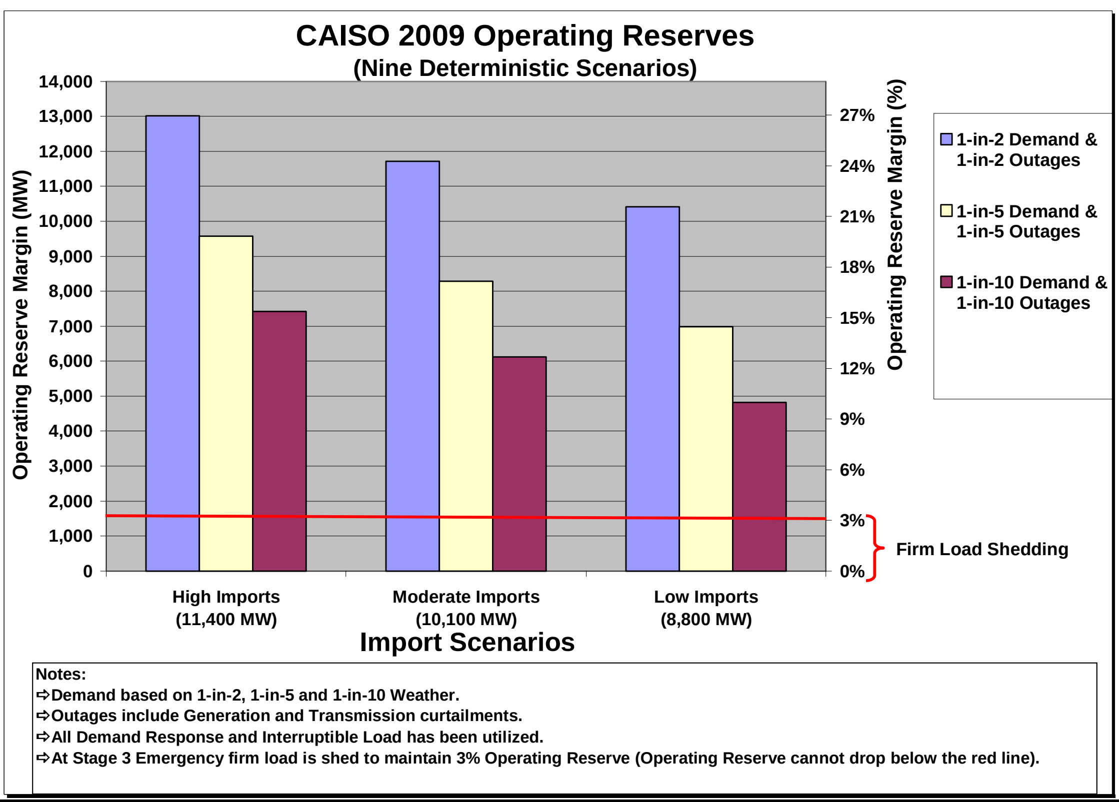


Figure 2

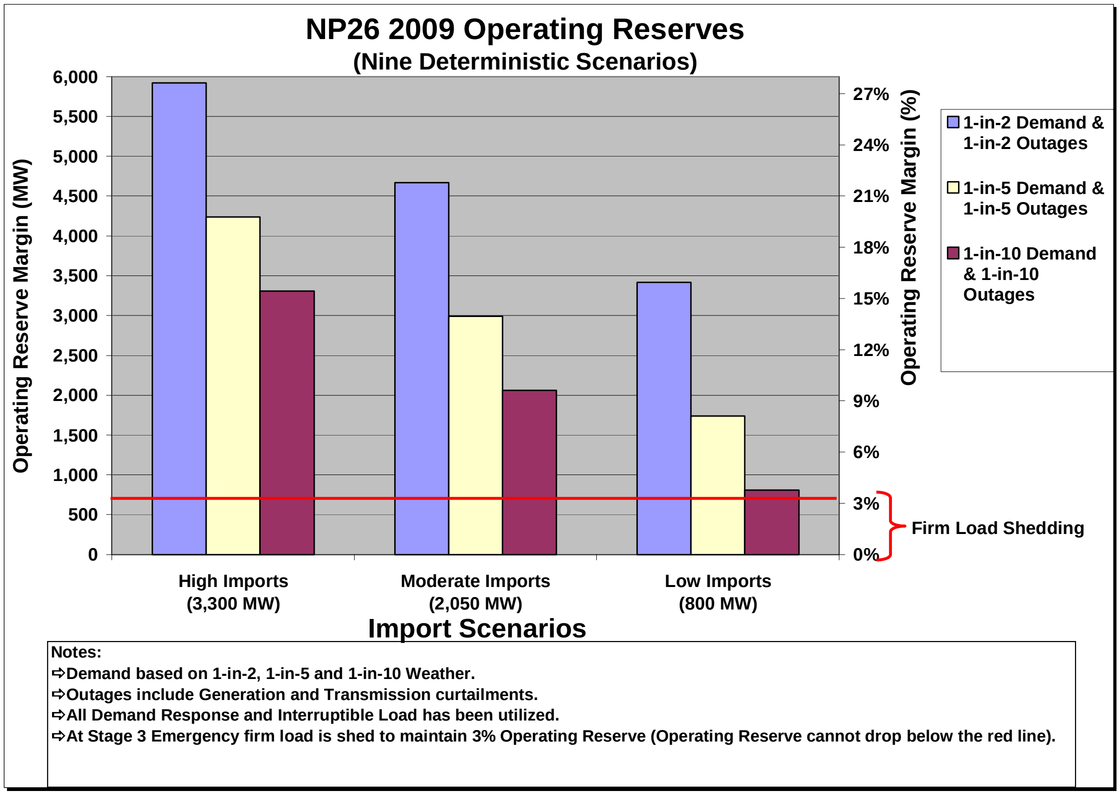
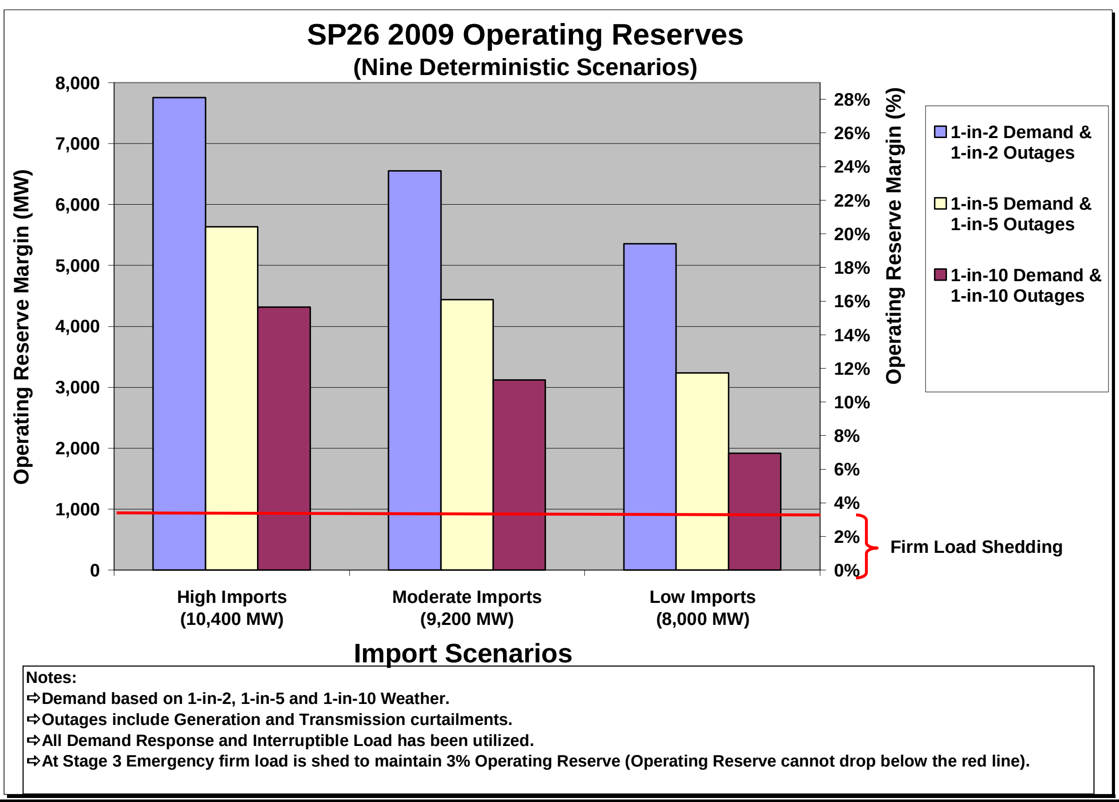


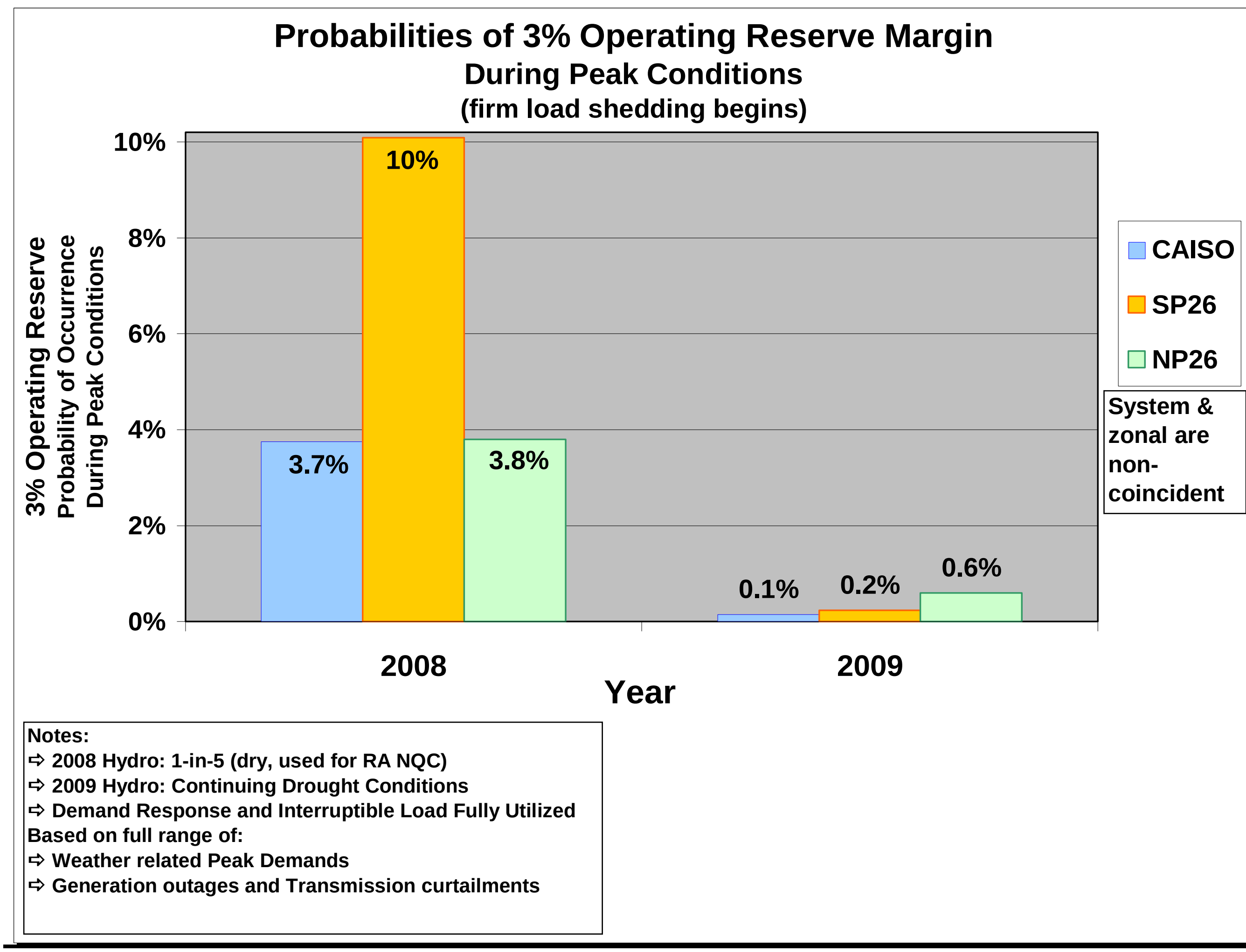
Figure 3



The assessment of these conditions (normal to extreme) allows the ISO to frame the electric system challenges and focus management efforts on measures that will minimize possible impacts. Since these various scenarios show the operating reserve margin after using all demand response (DR) programs it, is critical that these programs operate as expected and to the levels expected when called on. This highlights one of the main purposes of this Assessment, which is to focus the ISO's summer preparations on the conditions and contingencies that pose the greatest reliability risk. As a result of this analysis, the ISO will be better prepared, and can prepare others, to manage the system under identified conditions and minimize the chance of load shedding.

Figure 4 represents probabilities for having the operating reserve margin fall to 3 percent or less, where firm load shedding begins, for the ISO as a whole and for the SP26 and NP26 zones. The probabilities projected for 2008 are shown for reference purposes. Although resources will be tight this summer under the more extreme circumstances if low hydro conditions persist, the 1,476 MW of new generation, the increased import projections and the reduced peak demand load due to the recession result in greater positive impacts to system reliability than the negative impacts from the adverse hydro conditions. The ISO will continue to manage the risks associated with extreme weather or other conditions, as was done successfully during the extreme heat wave of July 2006 and other extreme conditions.

Figure 4



Once-Through cooling

The State Water Resources Control Board (SWRCB) continues to work on a proposal that would require units that use once-through-cooling (OTC) technology, which utilizes large amounts of ocean or estuarial water for cooling, to greatly reduce these amounts in order to minimize the intake and mortality of marine life. Further, the CEC and the CPUC have recommended that a significant number of aged generating units (greater than 30 years old) be retired or repowered, essentially within the same timeframe. *Table 2* shows the amount of capacity that could be affected.

Considering these issues from the perspective of the interconnected electrical grid in California, there are reliability and market implications in the ISO balancing area of removing these units from service, even assuming different levels of offsetting generation additions and/or repowering. The ISO continues to participate in the Inter Agency Working Group which is providing input to the SWRCB as it works to develop the OTC policy. The SWRCB expects to release a draft policy by July 1, 2009 and expect to adopt the policy by the end of 2009. There are no expected impacts on summer 2009 reliability from the OTC policy process, but impacts could be seen in 2010

Table 2

Once-Through Cooled and Aged Units Slated for Retirement/Repowering	
Coastal Units Using Once Through Cooling	
Breakdown of O-T-C Units by Type and Location	**NQC[1] MW**
CAISO Fossil Units	14,151
Nuclear Units	4,530
LADWP Units	2,391
Units in CAISO NP26	7,813
Units in CAISO SP26	10,868
Total Units in CAISO	18,681
Total Units in California	21,072
Aged Non-O-T-C Units Slated to be Retired/Repowered	
Breakdown of Units by Location	**NQC[1] MW**
Units in CAISO SP26	1,276
Total Generation At Risk of Retirement	
Breakdown of Units by Location	**NQC[1] MW**
NP26 Total At Risk Generation	7,813
SP26 Total At Risk Generation	12,143
Total CAISO At Risk Generation	19,956
Total California At Risk Generation	22,347
1) Net Qualifying Capacity	

South Coast Air Quality Management District priority reserve issue

A recent court ruling limiting the supply of air emissions credits in the South Coast Air Quality Management District (SCAQMD) has resulted in a new challenge for adding new generation in the SCAQMD, impacting local area reliability and potentially system reliability. If new gas-fired power plants cannot be licensed in the Los Angeles basin because air emission credits from the SCAQMD priority reserve process are not available, new generation will not be built in the Los Angeles basin. Consequently, aging, less efficient generating facilities that have been slated for retirement will continue to operate to maintain local and system reliability. This could have a negative impact on Southern California's ability to meet summer peak and local capacity requirements in the next few years and conflicts with some of the possible solutions to the OTC issue discussed above.

The ISO is working closely with the CPUC, CEC, and other agencies related to these issues. The ISO does not anticipate these policies impacting the availability of generation for summer 2009. Nevertheless, these new and important environmental policies are impacting the addition of new generation.

As with all forward looking supply and demand evaluations, this Assessment is based on engineering judgments that rely heavily on historical information and economic and other forecasts in estimating available future supply and demand. The ISO will continue to monitor the supply and demand situation for changes and make adjustments to these results as necessary.

II. REVIEW AND ANALYSIS OF SUMMER 2008 OPERATIONS

Demand

Figure 5 shows the daily peak demand for the ISO system, and the two zones NP26 and SP26. The system peaked on June 20, 2008, coincident with the SP26 peak. NP26 peaked on July 8, 2008 essentially at the 2008 NP26 forecast level.

Figure 5

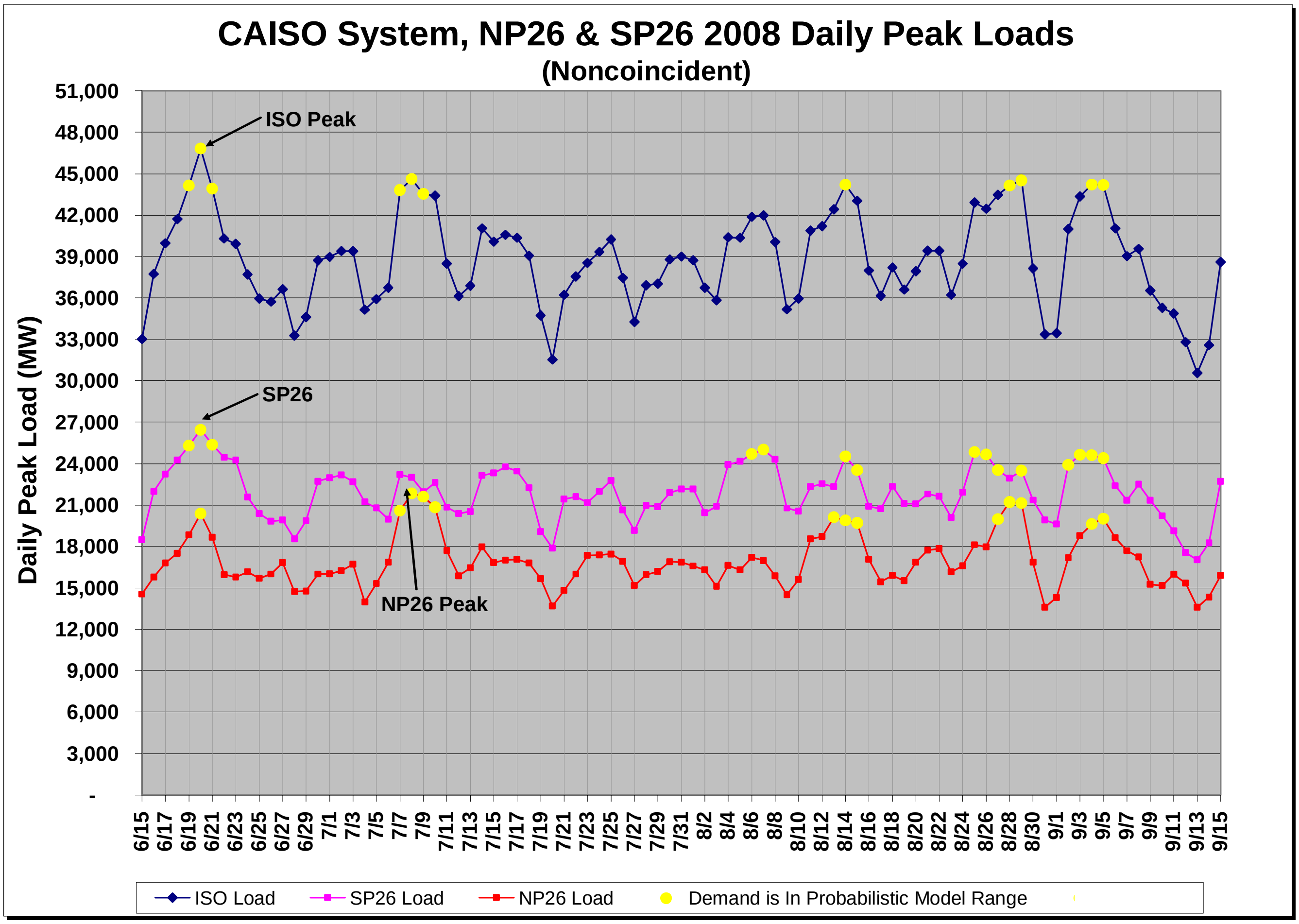


Table 3 shows the difference between actual 2008 peak loads and the 2008 1-in-2 peak demand forecast.

Table 3
(Hourly Average Demand)

CAISO Actual Peak Demand vs. Forecast				
	2008 1-in-2 Forecast	2008 Actual	Difference from 1-in-2 Forecast	
	MW	MW	MW	%
ISO Control Area	48,900	46,814	-2,085	-4.3%
SP26	28,331	26,446	-1,885	-6.7%
NP26	21,969	21,833	-136	-0.6%

Figure 6 shows the daily maximum heat index 631 heat buildup measured for each day from June 1 through September 7 for the past 3-years. Since the 2008 hottest period occurred during June the peak was not as high as it typically would be had it occurred in July or August. Overall, the weather during the 2008 summer period was the hottest for the last three years. However, the 2008 August peak demand was roughly 4,000 MW below 2007 August peak demand with similar weather conditions.

Figure 6

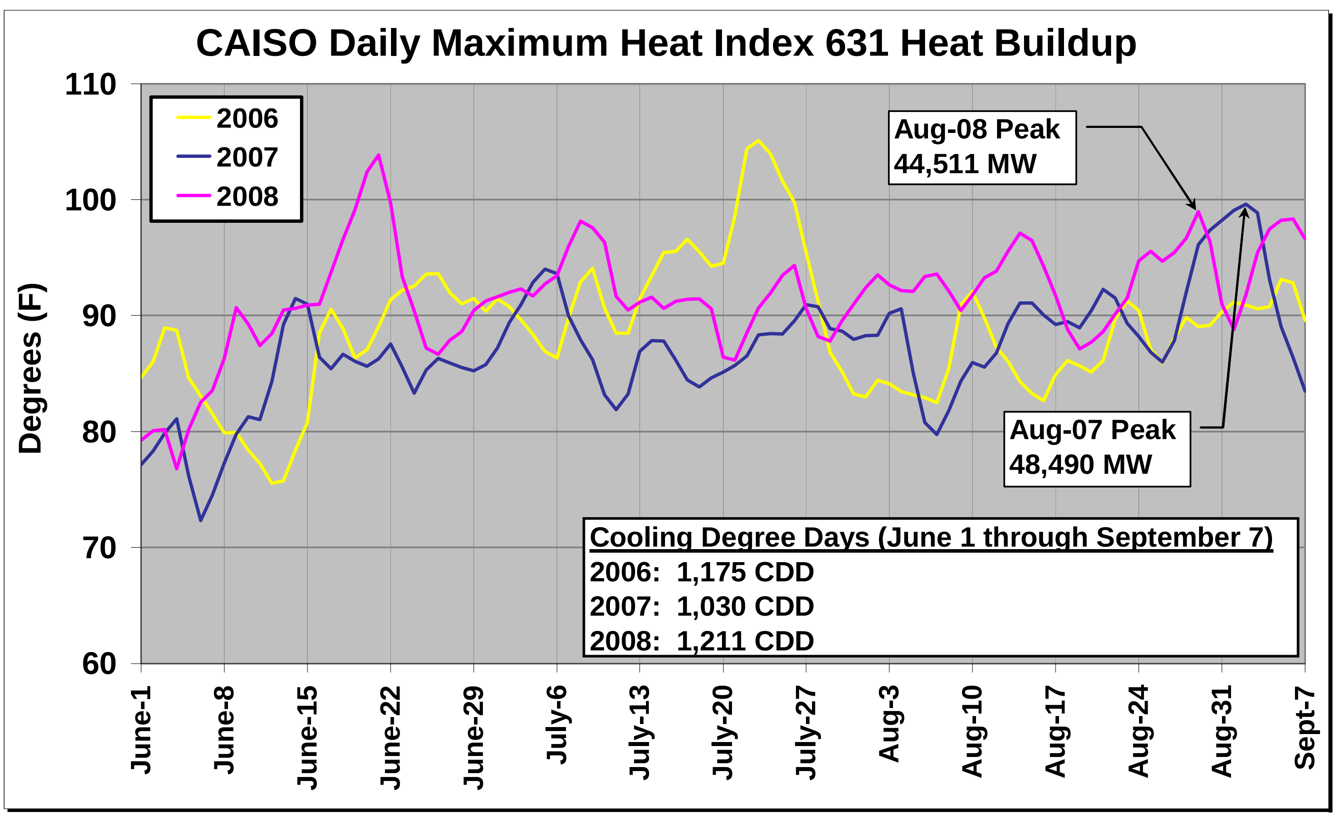


Table 3 shows the actual 2008 peak demand for the ISO and for SP26 were significantly below the 2008 forecast. *Table 4* shows that the average summer daily maximum 631heat-index amounts experienced during the last four summers, which indicates that overall 2008 was the hottest of the four years (the July 2006 heat wave remains the strongest heat wave during the period). The average demand based on the daily maximum 631heat-index for the ISO shows that on average the amount of load increase for a one-degree increase of the daily maximum 631heat-index declined in 2008 about 5 percent from the previous two years.

Table 4

CAISO Weather Comparison				
	2005	2006	2007	2008
Summer Average 631MaxHeat-Index (Deg F)	86.1	88.8	87.1	91.6
Percent of 2005 - 2008 Average	97%	100%	99%	104%
Zonal Weather Comparison				
NP26	2005	2006	2007	2008
Summer Average 631MaxHeat-Index (Deg F)	88.6	90.1	88.7	90.9
Percent of 2005 - 2008 Average	99%	101%	99%	101%
SP26	2005	2006	2007	2008
Summer Average 631MaxHeat-Index (Deg F)	84.0	87.8	85.8	92.2
Percent of 2005 - 2008 Average	96%	100%	98%	105%
CAISO Load per Heat Index Degree				
	2005	2006	2007	2008
Average Summer MW per 631MaxHeat-Index (Deg-F)	430.2	439.0	438.9	416.7
Change from Prior Year		**2.04%**	**-0.03%**	**-5.06%**

The pattern is also being seen in the 2008-2009 daily winter and spring loads, where the short-term load forecast models required correction factors to compensate for both on-peak and off-peak load reductions. It is believed that these load reductions are due to the recession the state of California and the nation are experiencing. This will be discussed further in the *Demand* section of Section III.

Generation outages

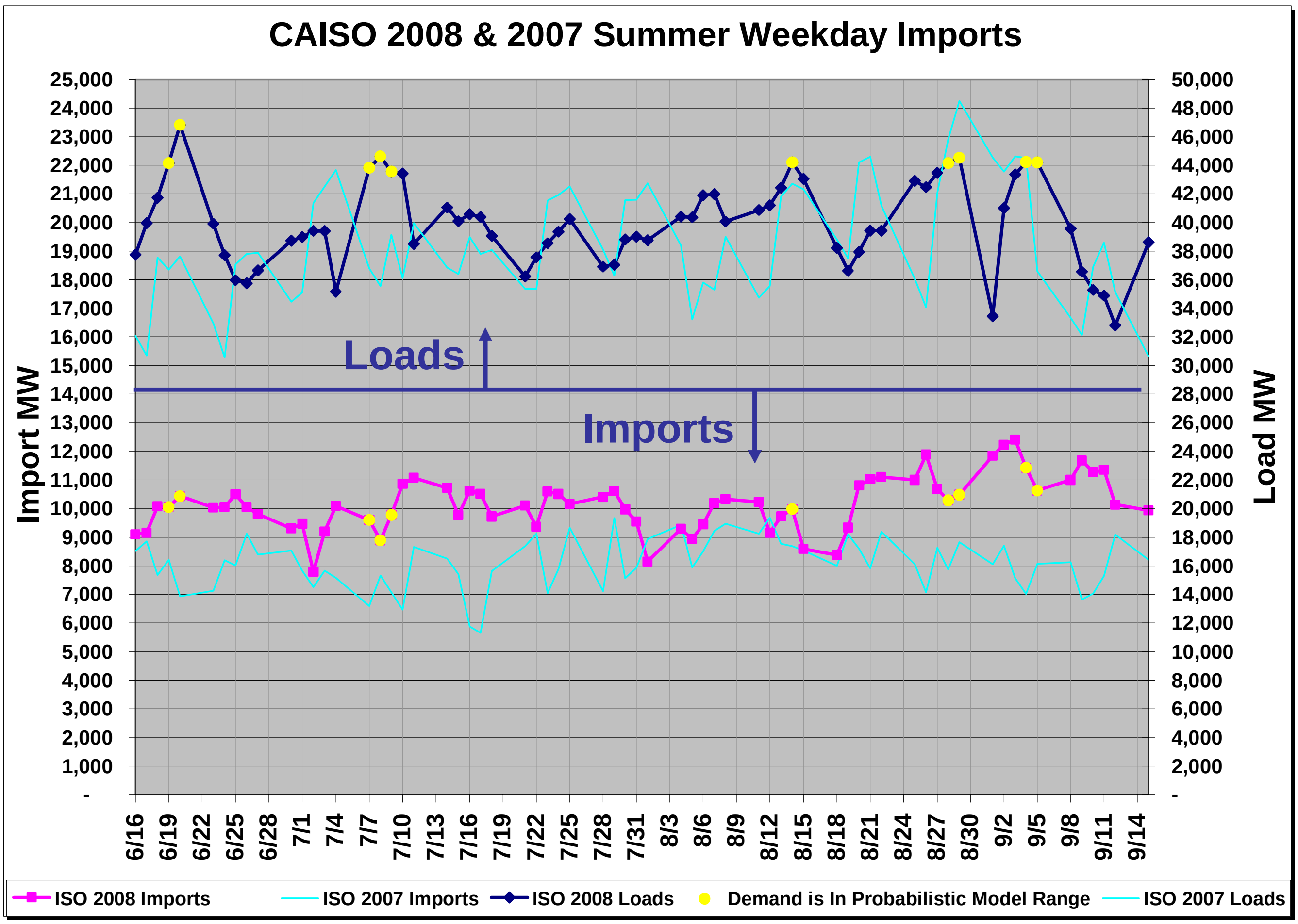
The primary noteworthy generation outages during the 2008 summer were a nuclear unit that experienced a forced outage late in the day of August 16 that remained out of service through the study period, followed by another nuclear unit at a different facility that experienced a forced outage on September 1 that also remained out of service through the study period. Graphs in Appendix C show the hour-ending 1600 outage amounts for the 2006 through 2008 summer seasons (excluding weekends and holidays).

Net interchange/imports

Figure 7 shows the 2008 and the 2007 peak hour loads and the net interchange over the weekday peak hour during the summer peak load period. There are numerous factors that contribute to the level of interchange between the ISO and other balancing authorities at any given point in time. *Figure 7* makes no attempt to portray the various factors that lead to a given import level.

Figure 7 does show significant increases in imports during the 2008 summer period versus the 2007 summer period. The increased level of imports over the summer will need to be repeated during the 2009 summer due to the current drought's continuing impact on hydro capacity and energy generation. With near normal hydro forecast for the Pacific Northwest, these import levels should be able to be met during 2009 to help alleviate any low hydro generation. *Appendix B* contains graphs of daily peak demand and import levels at time of peak for the ISO, SP26 and NP26.

Figure 7



III. SUMMER 2009 ASSESSMENT

Generation additions & retirements

As shown in *Table 5*, a total of 1,476 MW of additional generation capacity is expected to come on line by July 1, 2009 in the ISO, with 1,098 MW in NP26 and 378 MW in SP26.

Table 5

PGA Name/PGA Holder	Est. Initial Sync	Actual Initial Sync	Est. COD	Actual COD	NP (MW)	Prime Mover Type	Project Type	Contract Type	PTO Area	Renewable	NQC (est)	CAISO Accum NQC	NP26 Accum NQC	SP26 Accum NQC
(1) Inland Empire Energy Center Unit 1	5/30/08	5/30/08	10/1/09		405	Combined Cycle	New	PGA	SCE		376	376		376
Fontana RT Solar	9/22/08	11/27/08	5/1/09		2	Photovoltaic	New	PGA	SCE	1.7	1.7	378		378
Garnet Energy Center	5/15/09		5/15/09		3	Wind Turbine	New	PGA	SCE	0.5	0.5	378		378
Gateway Generating Station	11/10/08	11/10/08		1/4/09	619	Combined Cycle	New	PGA	PGE		590	968	590	378
Shiloh Wind Farm II	11/13/08	11/20/08		2/1/09	150	Wind Turbine	New	PGA	PGE	11.1	11.1	979	601	378
Ox Mountain Landfill Gas Generation	1/15/09		4/1/09	4/1/09	11.4	Recip. Engine	New	PGA	PGE		10.6	990	612	378
G2 Energy, Ostrom Road LLC	1/15/09			1/28/09	1.6	Recip. Engine	New	PGA	PGE		1.5	992	613	378
Starwood Power Midway	4/15/09	4/16/09	6/1/09	5/4/09	120	Gas Turbine	New	PGA	PGE		112.0	1,104	725	378
Panoche Energy Center	4/15/09	4/15/09	6/1/09		401	Gas Turbine	New	PGA	PGE		373	**1,476**	**1,098**	**378**

(1) Inland Empire Energy Center Unit 1 while not commercial has been providing consistent test energy

There are 22 MW of installed capacity that is planning to retire prior to summer, however, a participating generator is only required to give a 90 day notice prior to retiring.

The ISO overall generation forecast for 2009 is built off the final net qualifying capacity (NQC) list for compliance year 2009, posted on October 29, 2008. Generators who chose not to participate in the NQC process have been added to the list. This process produces the amounts of generation available to the ISO, SP26 and NP26 for the summer peak period shown in *Table 6*. The NQC values for the wind generation portion of *Table 6* have been adjusted based on actual output at time of peak over a three-year period. Since the evaluation for wind at time of peak for NP26 and SP26 were not performed on a coincident basis, the sum of the total generation for NP26 and SP26 do not match the ISO total. If the ISO balancing area experiences extreme weather conditions beyond what is taken into account by the NQC calculation process, it is possible that not all of the capacity accounted for will be available since the unit ratings of combustion turbines and some other resources are impacted by high ambient temperatures. While these amounts of generation are within the ISO, it is possible that a small number of units could have contractual arrangements to deliver their production to an entity outside the ISO.

Table 6

Total Generation In the ISO for Summer 2009				
	NQC (MW)	**Additions by Summer 2009 (MW)**	**Retirements prior to Summer 2009 (MW)**	**Total Expected Capacity for Summer 2009 (MW)**
ISO Control Area	47,500	1,476	22	48,954
SP26	22,542	378	0	22,921
NP26	24,967	1098	22	26,044

Generation outage rates

Graphs in Appendix C show the weekday hour-ending 1600 outage amounts during the summer peak days from June 15 through September 15 for the 2006, 2007, and 2008 summer peak load periods (excluding weekends and holidays). The graphs do not include reductions for ambient derates as these amounts are accounted for in the NQC listing, based on most likely summer peak weather conditions. The data behind these graphs were used to develop a range of outages for the probabilistic analysis and to determine the 1-in-2 and 1-in-10 outage levels for the deterministic analysis.

Current hydro conditions

As of April 1, 2009, statewide hydrologic conditions were as follows: precipitation, 80 percent of average to date; runoff, 55 percent of average to date; and reservoir storage, 80 percent of average for the date. Sacramento River unimpaired runoff observed through March 31, 2009 was about 7.1 million acre-feet (MAF), which is about 63 percent of average which compares to 52 percent of average on March 31, 2008. As of April 1, 2009, both the Sacramento and San Joaquin water year types have moved from “critical” to “dry.”

Table 7 shows the reservoir storage amounts in selected large reservoirs in California as of April 17, 2009. Storage levels at these key reservoirs remain below last year’s level. While being a strong indicator of water delivery potential, reservoir storage amounts is a moderate indicator of hydro generation potential as only a portion of the California hydro generation comes from generating facilities fed by large storage reservoirs that are impacted by and year-to-year carryover.

Figure 8 shows the California snow water content as of May 4, 2009 and indicates that snowpack was 70 percent of average for this date for the Northern Sierras, 70 percent of average for this date for the Central Sierras, 55 percent of average for this date for the Southern Sierras, and 65 percent of average for this date State wide. As of May 4, 2009 snowpack is slightly below last year’s levels in the Northern Sierras, slightly above in the Central Sierras and about the same in the Southern Sierras.

Snowpack is a better indicator of hydro conditions for a large portion of the hydro generation within the ISO, which are fed from snowmelt rather than large reservoir storage. The amount of runoff available for hydro generation from these units during July, August, and early September, the typical peak load months, will depend on weather between now and then. There is always the risk that the weather conditions could produce accelerated snowpack melting resulting in decreased runoff during the mid to late summer peak demand periods. Charts are provided in *Appendix D* showing the year-to-date precipitation and snowpack, which include references to key historical annual trends.

Table 7

California Reservoir Storage Summary

Ending at midnight - 05/06/2009

For selected reservoirs in Northern and Southern California

Water Storage

Reservoir Name	StaID	Reservoir Capacity (AF)	Current Storage (AF)	Current % of Capacity	Historical Average Storage	Current % of Average	Storage Last Year This Date	Current % of 2008
TRINITY RIVER								
TRINITY LAKE	CLE	2,447,700	1,272,713	52%	2,075,209	61%	1,677,290	76%
SACRAMENTO RIVER								
SHASTA	SHA	4,552,000	3,133,631	69%	3,986,116	79%	2,927,318	107%
FEATHER RIVER								
OROVILLE	ORO	3,537,600	2,173,298	61%	2,968,240	73%	1,716,577	127%
STANISLAUS RIVER								
NEW MELONES	NML	2,420,000	1,290,220	53%	1,484,467	87%	1,402,934	92%
TUOLUMNE RIVER								
DON PEDRO	DNP	2,030,000	1,370,301	68%	1,479,485	93%	1,384,142	99%
SAN LUIS CREEK								
SAN LUIS	SNL	2,039,000	925,750	45%	1,833,859	50%	1,399,592	66%
Total Storage (AF)		17,026,300	10,165,913	**60%**	13,827,376	**74%**	10,507,853	**97%**

AF - Acre Feet

http://cdec.water.ca.gov/cgi-progs/reservoirs/RES

Figure 8

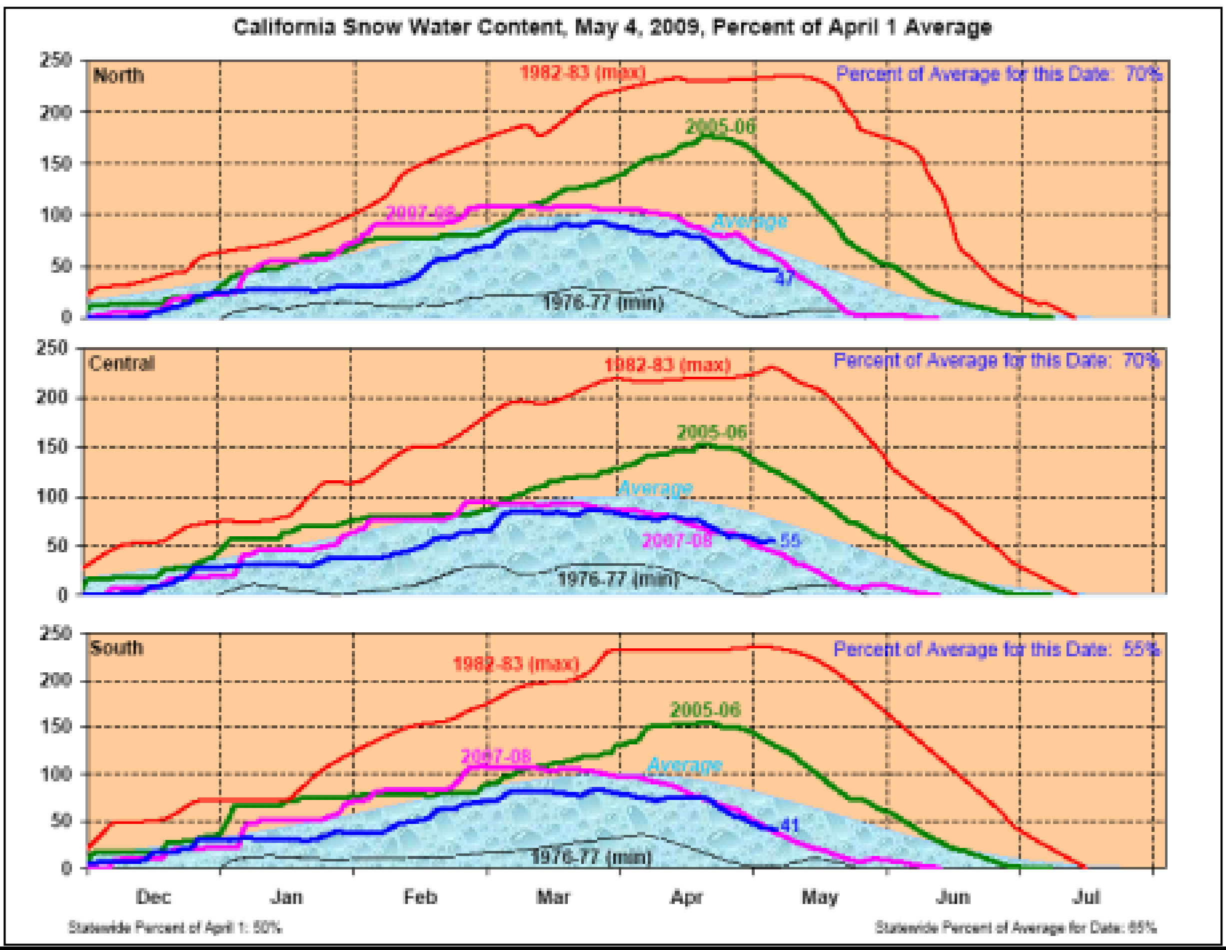
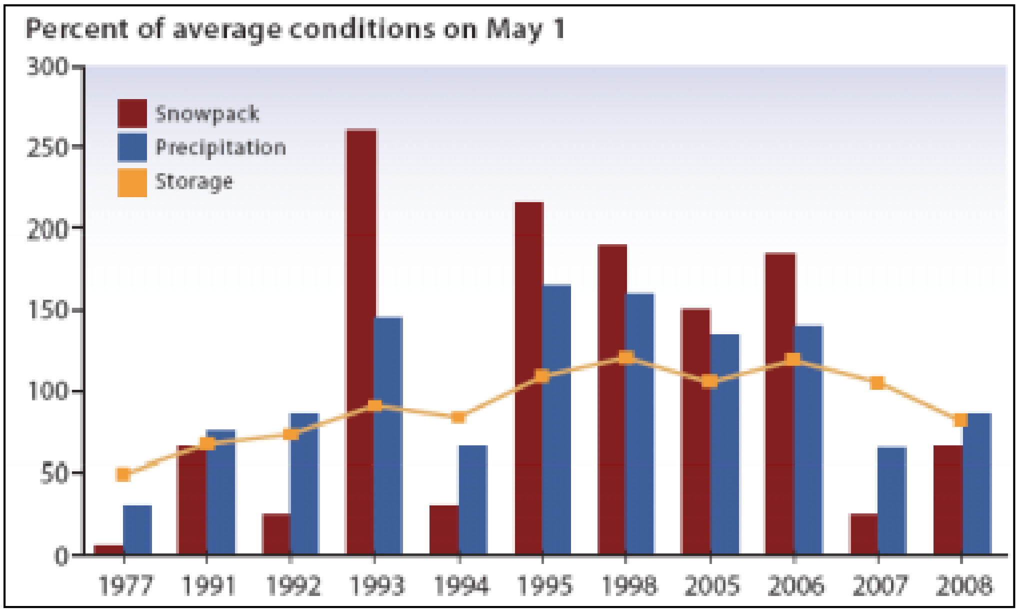


Figure 9 shows historical water conditions based on May 1 measurements. While 2009 had greater precipitation than 2008, 2009 snowpack and storage are less than 2008.

Figure 9



Additional information on current California hydro conditions is provided in Appendix D.

2009 hydro scenario

One of the objectives of this Assessment was to quantify the risk of continuing drought conditions on hydro production and its result on system reliability. The ISO performed analysis of potential hydro conditions for a preliminary assessment of 2009 summer loads and resources outlook that was discussed in the ISO February 2009 Board of Governors CEO report. In that report, an ISO hydro capacity derate of 3,025 MW was reported as a possible scenario based on the hydro conditions at that point in time. Since then, hydro conditions have improved and the ISO has revised its hydro generation scenario for this Assessment to the following.

NP26 hydro capacity derate	792 MW
SP26 hydro capacity derate	208 MW
ISO hydro capacity derate	1,000 MW

For this scenario the ISO is assuming that hydro units that are fed directly from show melt and are not dependent on large reservoir storage and year-to-year carryover will be able to generate at their NQC levels at time of peak throughout the summer. The 1,000 MW derate for the ISO is based on the lower reservoir levels at hydro facilities that are tied to large reservoirs that depend on year-to-year carryover as well as annual precipitation.

It is recognized that hydro capacity is not stagnant over the course of a summer and there are numerous scenarios that could be used to portray the hydro conditions during the various peak periods throughout the summer season. Within the limitations of this Assessment, this hydro derate scenario provides a projected impact of the current drought that can be analyzed, discussed and communicated to interested parties. Hydro conditions in the Pacific Northwest for 2009 were assumed to be near normal for the purposes of this Assessment.

Demand forecast

The economic recession is expected to have a significant impact on the forecast for peak demand this summer. After examining five different scenarios described on the next page, the ISO estimates that the forecast peak demand will be approximately 3 percent below the 2008 actual summer peak demand and 7 percent below the forecast for summer 2008.

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 are weather data, historical and forecast economic and population information (based on metropolitan statistical areas in the ISO balancing area) and the ISO system alerts, warnings and stage 1, 2 and 3 emergency data. 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. The historical load data used was from October 2003 through March 2009.

The peak load data are based on 30-minute average peak demands. Pump loads were extracted from the total loads and were not included in the forecast models, as pump loads do not react to weather conditions in a similar fashion and are subject to interruption. Pump load is added back into the forecast based on a range of typical pump loads during summer peak conditions.

The weather variables are comprised of 24 weather stations located throughout the large population centers within the ISO. Weather data used in the model includes various temperature data, cooling degree-days, heating degree-days, heat index, relative humidity, solar radiation and temperature buildup indexes. Buildup variables are based on a weighted average of a weather variable for a given day and the two days prior to that day (60% of forecast day, 30% of prior day and 10% of 2-days prior).

The forecast process involves developing seven different weather scenarios for each year of weather history so that each historical year has a scenario that starts on each of the seven days of the week. The model results for forecasting peak demand, particularly the highest of the peak load days, are significantly improved using parameters such as humidity that were not available for most stations prior to 1995. Consequently, 1995 through 2008 historical weather were used which produces 98 weather scenarios. The 98 different weather scenarios were used to develop a range of load forecast for the probability analysis using a normal distribution random number generation process. This distribution is used to develop the 1-in-2, 1-in-5 and 1-in-10 peak demand forecasts.

There are three main models representing three distinct areas; the ISO, SP26 and NP26, as well as models that forecast various sub-regions within the ISO that have similar weather characteristics. Each model utilizes its own set of weather, economic and demographic input variables.

Each time a new forecast is made the model is updated by adding in the latest historical load, weather, economic, and operational variables. The model is then tuned with this new data. For this forecast the model was tuned with baseline economic forecast data to develop the base case forecast. Four load forecast scenarios were developed by substituting the scenario's economic forecast in place of the baseline economic forecast. A discussion of the economic scenarios is provided below.

As discussed in the *Demand* section of Section II, the 2008 summer loads were below forecast and the 2008-2009 winter loads and 2009 spring loads were as well. It is believed that the majority of these load reductions are due to the recession and the home mortgage crisis the state of California and the nation are experiencing. The ISO mid-term forecast models use historical and forecasts of gross domestic product (GDP) and population as independent variable inputs for growth trends and for base load levels. The models also use GDP as an indicator of weather driven cooling load levels. *Figure 10* shows the historical and forecast GDPs of metropolitan statistical areas with the ISO, developed by Moody's Economy.com (Moody's). There are five GDP forecasts that represent five different projections for how the current recession will play out. It is very difficult to accurately forecast the depth and duration of a recession. These five forecasts represent a baseline and four different scenarios to capture the range of possible outcomes of how the recession will play out. *Figure 10* also shows the 2008 GDP forecast that was used in the *2008 Summer Assessment* load forecast process for reference purposes.

The baseline forecast is designed so that there is a 50% probability that the economy will perform better and a 50% probability that the economy will perform worse. The four scenarios described below are relative to the baseline forecast. The baseline and the four scenarios were all developed by Moody's.

- *Scenario 1* is a shallower recession where housing stabilizes. It is an above-baseline scenario, designed so that there is a 10% probability that the economy will perform better than in this scenario, broadly speaking, and a 90% probability that it will perform worse.[1]
- *Scenario 2* is a weaker recovery in which the downturn is somewhat deeper than the baseline. It is designed so that there is a 75% probability that economic conditions will be better, broadly speaking, and a 25% probability that conditions will be worse.[1]
- *Scenario 3* is a very severe recession scenario. It is designed to portray a prolonged credit squeeze where there is a 90% probability that the economy will perform better, broadly speaking, and a 10% probability that it will perform worse.[1]
- *Scenario 4* is a depression scenario, there is a 96% probability that the economy will perform better, broadly speaking, and a 4% probability that it will perform worse.[1]

[1] This information has been reprinted and reproduced with permission from Moody's Economy.com. Source: Macroeconomic Outlook Alternative Scenarios – February 2009.

Figure 10

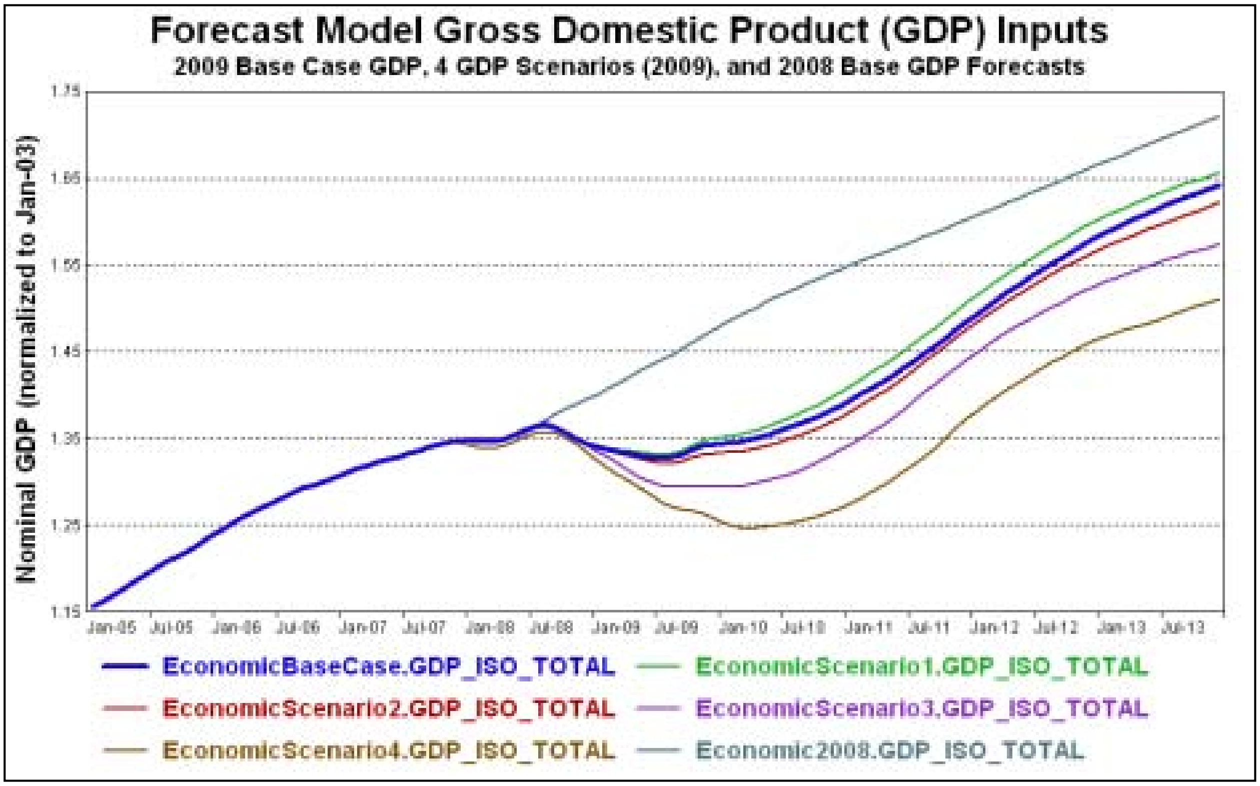


Figure 11 shows the results of the forecast process for the ISO through 2011. These peak demand amounts are prior to adding in the pumping loads. It is important to note that these forecasts are based on the Moody's GDP forecasts released in March 2009. Moody's GDP forecasts are updated monthly and will change as this recession plays out over the months ahead, and new information becomes available. Currently the Moody's GDP data reflects actual historical data through 2007 with 2008 monthly data scheduled to be incorporated into their data in June 2009. Also, this forecast was made prior to the 2009 summer weather related cooling load season. Consequently, this forecast is based on what is known at the date of its release.

Figure 11

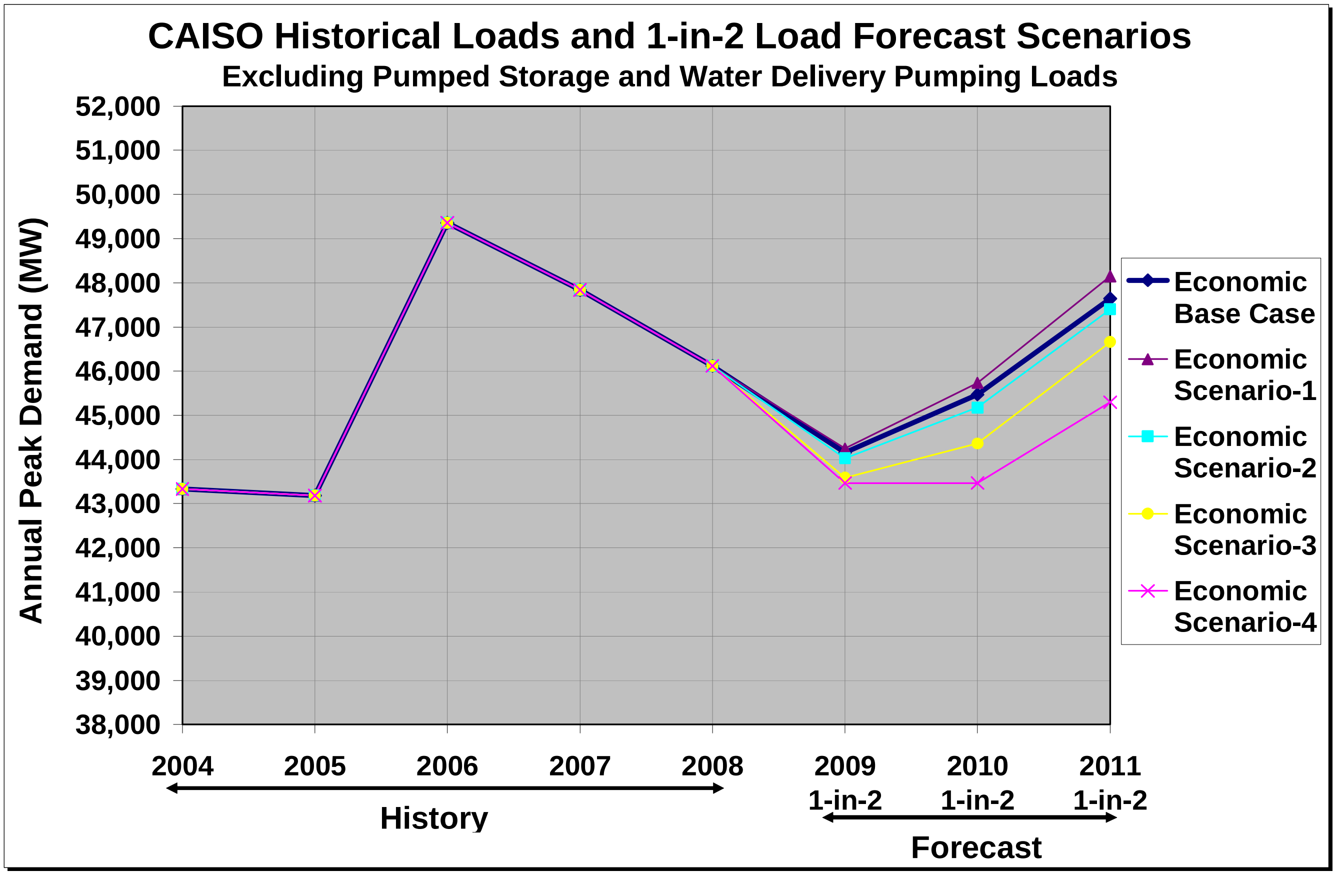


Table 8 show the 2004 through 2008 historical annual peak demands and the forecast 1-in-2 peak demands for the base case and four scenarios, again prior to adding in the pumping loads. *Figure 11* and *Table 8* demonstrate the impact that the current recession is expected to have on 2009-2011 forecast peak loads. As previously stated, it is very difficult to accurately forecast the depth and duration of a recession. These forecasts are developed as a near-term projection of 2009 and to provide an indication of how loads are expected to recover as the recession wanes.

Table 8

CAISO 2009 1-in-2 Peak Demand Forecast Scenarios Excluding Water Delivery & Pumped Storage Pump-back Loads								
	Historical					Forecast		
ISO Forecasts	2004	2005	2006	2007	2008	2009 1-in-2	2010 1-in-2	2011 1-in-2
ISO Base Case	43,335	43,182	49,358	47,840	46,118	44,162	45,473	47,640
Year-to-Year Change		-0.4%	14.3%	-3.1%	-3.6%	-4.2%	3.0%	4.8%
ISO S1						44,246	45,733	48,147
Year-to-Year Change						-4.1%	3.4%	5.3%
ISO S2						44,029	45,173	47,397
Year-to-Year Change						-4.5%	2.6%	4.9%
ISO S3						43,586	44,358	46,661
Year-to-Year Change						-5.5%	1.8%	5.2%
ISO S4						43,466	43,465	45,296
Year-to-Year Change						-5.8%	0.0%	4.2%
NP26 Forecasts								
NP26 Base Case	19,410	19,610	22,261	21,005	21,705	21,072	21,318	21,841
Year-to-Year Change		1.0%	13.5%	-5.6%	3.3%	-2.9%	1.2%	2.5%
NP26 S1						21,097	21,391	21,974
Year-to-Year Change						-2.8%	1.4%	2.7%
NP26 S2						21,032	21,234	21,781
Year-to-Year Change						-3.1%	1.0%	2.6%
NP26 S3						20,908	21,030	21,624
Year-to-Year Change						-3.7%	0.6%	2.8%
NP26 S4						20,884	20,817	21,288
Year-to-Year Change						-3.8%	-0.3%	2.3%
SP26 Forecasts								
SP26 Base Case	25,097	25,891	27,228	27,844	26,032	24,551	24,446	24,673
Year-to-Year Change		3.2%	5.2%	2.3%	-6.5%	-5.7%	-0.4%	0.9%
SP26 S1						24,593	24,551	24,863
Year-to-Year Change						-5.5%	-0.2%	1.3%
SP26 S2						24,505	24,356	24,609
Year-to-Year Change						-5.9%	-0.6%	1.0%
SP26 S3						24,359	24,113	24,423
Year-to-Year Change						-6.4%	-1.0%	1.3%
SP26 S4						24,282	23,803	24,004
Year-to-Year Change						-6.7%	-2.0%	0.8%

The 2009 base case peak demand forecasts developed for this Assessment of 2009 loads are given by area in *Table 9 and 10. Table 9* is provided to show the difference between the 2009 base case peak demand forecasts and the 2008 actual summer peak demands. *Table 10* shows the forecasts for the 1-in-2 through the 1-in-20 probability forecasts with the ISO *2008 Summer Assessment* forecast provided as a point of reference. Based on 2008 summer and subsequent peak loads and on economic forecasts, SP26 is experiencing greater load reductions than NP26. There is a greater decline in load in SP26 than can be explained by the GDP forecast. Since the 2008 actual GDP data has not been included in the Moody's data set, it is unknown if this is due to the recession hitting the Southern California region sooner and possibly to a greater extent than the Northern California region, or if there may be other factors beyond the current recession that are impacting SP26 loads. Further analysis would be required to understand and explain this trend.

It is worth noting that while these forecasts show a decline in loads that last for several years, the trend does show the loads begin to rebound in 2010. The recovery process is the most difficult part of a recession to forecast. *This forecast is intended to gain an understanding of the expected loads for the 2009 summer period. These forecasts are not intended to be used for resource planning decisions and should not be used for this purpose.*

Table 9

2009 Peak Demand Forecasts			
Base Case versus 2008 Actual Peak Demand			
CAISO			
Probability	**Forecast**	**2008 Actual**	% Below 2008 Actual
1-in-2	**45,379**	46,814	-3.1%
NP25			
Probability	**Forecast**	**2008 Actual**	% Below 2008 Actual
1-in-2	**21,370**	21,833	-2.1%
SP25			
Probability	**Forecast**	**2008 Actual**	% Below 2008 Actual
1-in-2	**25,412**	26,446	-3.9%

Table 10

2009 Peak Demand Forecasts				
Base Case (Baseline Economic Forecast) versus 2008 Forecast				
CAISO				
Probability	Percentile	**Forecast**	**2008 Forecast**	% Below 2008 Forecast
1-in-2	0.5	**45,379**	48,900	-7.2%
1-in-5	0.8	**47,469**	50,958	-6.8%
1-in-10	0.9	**48,524**	52,110	-6.9%
1-in-20	0.95	**49,459**	53,103	-6.9%
NP25				
Probability	Percentile	**Forecast**	**2008 Forecast**	% Below 2008 Forecast
1-in-2	0.5	**21,370**	21,969	-2.7%
1-in-5	0.8	**22,282**	22,842	-2.4%
1-in-10	0.9	**22,756**	23,306	-2.4%
1-in-20	0.95	**23,152**	23,709	-2.3%
SP25				
Probability	Percentile	**Forecast**	**2008 Forecast**	% Below 2008 Forecast
1-in-2	0.5	**25,412**	28,331	-10.3%
1-in-5	0.8	**26,905**	29,935	-10.1%
1-in-10	0.9	**27,638**	30,764	-10.2%
1-in-20	0.95	**28,202**	31,502	-10.5%

Imports

There are numerous factors that contribute to the level of interchange between the ISO and other balancing areas. Key factors for any given year and on any given day can be driven by conditions that impact just a local area, to conditions that impact a regional area, to conditions that impact the entire Western Interconnection. These factors typically include market dynamics, demand within various areas, accuracy of day-ahead forecasts, availability of generation, transmission availability and congestion, hydro conditions, as well as others. The degree to which any one of these interrelated factors influence import levels on any given day can vary greatly.

This Assessment is primarily concerned with the imports that come to bear to meet the highest peak demands during the summer season or during moderate loads coupled with losses of high amounts of generation and/or transmission. There are two different types of contingencies where more than normal imports are needed to meet peak demands. Further, a scheduling coordinator's or the ISO's ability to act at the time it is determined that higher than normal import levels are needed is quite different under these two contingencies. One contingency is the type that is allows for advanced planning, such as a weather event that is forecast in advance, or a forced outage that extends for multiple days, that allow scheduling coordinators and the ISO to plan ahead and line up needed imports in advance. The other type of contingency are those that occur during real-time, after energy trading for that day is over, such as a loss of a significant amount of generation and/or transmission, or a significantly under-forecast peak demand. Under these circumstances it may be too late to utilize the capabilities of other balancing areas to deal with these types of contingencies.

Modeling the complex dynamics that lead to a given import level on any given day or for any given set of contingencies is beyond the scope of this Assessment. The dynamics associated with imports are complex and there is no single import amount that can be used in these analyses that can represent every scenario. Consequently, three levels of imports were developed for both the deterministic and probabilistic analysis: high, moderate and low.

Table 11 shows the historical summer 2008 imports at time of peak for the days where the peak demand was within the range of the 2008 summer forecast peak demand probabilistic data set. *Table 11* demonstrates higher imports at time of peak than in recent years, particularly in NP26 where imports were consistently higher than previous years.

Table 11

2008 Imports When Load is Within Probabilistic Range of Summer Peak Demand (Noncoincident)

ISO				SP26				NP26			
Weekday	Date	Load	Imports	Weekday	Date	Load	Imports	Weekday	Date	Load	Imports
4	6/19/2008	44,138	10,045	3	6/18/2008	24,253	9,182	5	6/20/2008	20,369	1,767
5	6/20/2008	46,814	10,431	4	6/19/2008	25,300	8,530	1	7/7/2008	20,598	2,083
1	7/7/2008	43,805	9,596	5	6/20/2008	26,446	8,665	2	7/8/2008	21,833	2,654
2	7/8/2008	44,622	8,892	1	6/23/2008	24,252	9,763	3	7/9/2008	21,603	3,368
3	7/9/2008	43,548	9,774	2	8/5/2008	24,182	8,282	4	7/10/2008	20,837	2,940
4	8/14/2008	44,204	9,977	3	8/6/2008	24,697	8,369	3	8/13/2008	20,117	2,023
4	8/28/2008	44,146	10,281	4	8/7/2008	25,019	8,865	4	8/14/2008	19,882	1,268
5	8/29/2008	44,511	10,477	5	8/8/2008	24,310	10,424	5	8/15/2008	19,693	875
4	9/4/2008	44,210	11,418	4	8/14/2008	24,523	8,627	3	8/27/2008	19,964	2,458
5	9/5/2008	44,185	10,625	1	8/25/2008	24,830	10,009	4	8/28/2008	21,206	3,292
				2	8/26/2008	24,651	10,050	5	8/29/2008	21,132	3,112
				3	9/3/2008	24,641	9,796	4	9/4/2008	19,619	1,811
				4	9/4/2008	24,607	9,585	5	9/5/2008	20,013	3,016
				5	9/5/2008	24,379	8,013				
		Max	11,418			Max	10,424			Max	3,368
		Min	8,892			Min	8,013			Min	875
		Ave	10,152			Ave	9,154			Ave	2,359

With expectations for recession impacted load growth to be lower than previous years in the ISO and the Western Interconnect, along with generation additions that continue to reach operational status, summer 2009 imports should be available to maintain the levels observed during the summer 2008 period to fill the gap left by the low hydro conditions. *Table 12* shows the amounts of imports used for the high, moderate and low import scenarios for the 2009 Assessment along with the 2008 import scenarios for comparison purposes. The moderate import levels are the average of the high and the low import amounts in *Table 11*. Graphs of actual import levels during peak operating hours for the ISO system and the SP26 and NP26 zones are included in *Appendix B*.

Table 12

2009 Summer Outlook - Import Scenarios			
	CAISO	SP26	NP26
High Net Interchange (MW)	11,400	10,400	3,300
Moderate Net Interchange (MW)	10,100	9,200	2,050
Low Net Interchange (MW)	8,800	8,000	800
2008 Summer Outlook - Import Scenarios			
	CAISO	SP26	NP26
High Net Interchange (MW)	10,000	10,000	1,600
Moderate Net Interchange (MW)	8,750	9,000	800
Low Net Interchange (MW)	7,500	8,000	0

Transmission additions

The ISO has a number of highly significant ongoing transmission initiatives to increase import capability into the ISO and to increase the internal capabilities for transmitting energy from remote wind generation sites. A number of projects are expected to provide some level of congestion relief or increased import capability by summer 2009. For the purposes of this Assessment it is assumed that the impacts from these projects are reflected in the increased high, moderate and low import scenarios for 2009.

Demand response and interruptible load programs

The California Energy Commission (CEC) provided the amounts for DR and Interruptible Load programs, collectively known as DR programs, for the three California investor-owned utilities (IOUs). These program amounts have been approved by the CPUC for the 2009 RA program period. The CPUC performed a thorough review of the 2009 DR projections from the IOUs and used a new assessment process to determine expected performance and enrollment, based on new DR evaluation methodologies that were developed in ongoing CPUC DR proceedings. This resulted in lower DR projections for 2009, which were more in line with the derating of DR program totals the ISO had used in the past. Consequently, the ISO used the CEC provided DR amounts without any further derate.

Starting June 1, 2009 the California Department of Water Resources (CDWR) will not be able to commit its normal 200 MW of pumping load for load reduction. Each month's amount will now be determined five days before the start of each summer month based on a projection of the on-line load that would be available for curtailment. The amount is expected to range form 200 MW down to zero based on current water conditions. This Assessment used the CPUC projections of 2009 DR program totals minus the 200 MW of CDWR pumping loads since the 200 MW cannot be relied upon.

Summer 2009 deterministic analysis summary

Table 13 is the supply and demand outlook for the 2009 summer from a planning perspective. This table shows the planning reserves based on the 1-in-2 peak demand forecasts prior to accounting for any generation outages or transmission curtailments, including the hydro derate scenario values. The import amounts are based on the moderate import levels from *Table 12*.

Table 13

Summer 2009 Outlook			
Resource Adequacy Planning Conventions	**CAISO**	**SP26**	**NP26**
Existing Generation	47,500	22,558	24,929
Retirements (Known)	22	0	22
High Probability CA Additions	1,476	378	1,098
Hydro Derates	-1,000	-208	-792
Net Interchange (Moderate)	10,100	9,200	2,050
Total Net Supply (MW)	58,098	31,929	27,306
Demand (1-in-2 Summer Temperature)	45,379	25,412	21,370
DR & Interruptible Programs	2,090	1,496	593
Planning Reserve[1]	**32.6%**	**31.5%**	**30.6%**

[1] Planning Reserve calculation (Total Net Supply + Demand Response + Interruptibles)/1-in-2 Demand)-1.

Tables 14 through *16* move from the planning perspective to more of a real-time perspective by adding in generation and transmission outages/curtailments and by considering demand scenarios greater than the 1-in-2 used in *Table 13*. The import amounts in *Table 14, 15* and *16* are based on the three import scenarios shown in *Table 12*, previously discussed in this Assessment. The ISO and particularly SP26 are highly dependent on imports to meet peak demand, especially during the summer high load periods.

Table 14 shows how the import assumption impacts the operating reserve amount using 1-in-2 level generation and transmission outage/curtailment levels. *Table 15* calculates the operating reserve under weather conditions that produce 1-in-5 peak demand coincident with 1-in-5 level generation and transmission outage/curtailment levels and *Table 16* calculates the operating reserve under weather conditions that produce 1-in-10 peak demands coincident with 1-in-10 level generation and transmission outage/curtailment levels. The conditions portrayed in *Table 16* are rare and no attempt is made to determine the probability of the conditions occurring in *Tables 14* through *16*. These tables, and the graphs to follow, provide a comparison of the range of impacts of various assumptions and conditions in a deterministic fashion. This deterministic analysis provides a quick reference view into the individual and cumulative impacts of these issues that will be looked at in a probabilistic approach later in this Assessment.

Table 14

Summer 2009 Loads and Resources Outlook

1-in-2 Demand and 1-in-2 Generation & Transmission Outage Scenarios

Summer 2009 Outlook - High Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,500	22,558	24,929
Retirements (Known)	22	0	22
High Probability CA Additions	1,476	378	1,098
Hydro Derates	-1,000	-208	-792
Net Interchange	11,400	10,400	3,300
Outages (1-in-2 Generation & Transmission)	-3,094	-1,459	-1,861
Total Net Supply (MW)	56,304	31,670	26,695
Demand (1-in-2 Summer Temperature)	45,379	25,412	21,370
DR & Interruptible Programs	2,090	1,496	593
Operating Reserve[1]	**28.7%**	**30.5%**	**27.7%**

Summer 2009 Outlook - Moderate Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,500	22,558	24,929
Retirements (Known)	22	0	22
High Probability CA Additions	1,476	378	1,098
Hydro Derates	-1,000	-208	-792
Net Interchange	10,100	9,200	2,050
Outages (1-in-2 Generation & Transmission)	-3,094	-1,459	-1,861
Total Net Supply (MW)	55,004	30,470	25,445
Demand (1-in-2 Summer Temperature)	45,379	25,412	21,370
DR & Interruptible Programs	2,090	1,496	593
Operating Reserve[1]	**25.8%**	**25.8%**	**21.8%**

Summer 2009 Outlook - Low Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,500	22,558	24,929
Retirements (Known)	22	0	22
High Probability CA Additions	1,476	378	1,098
Hydro Derates	-1,000	-208	-792
Net Interchange	8,800	8,000	800
Outages (1-in-2 Generation & Transmission)	-3,094	-1,459	-1,861
Total Net Supply (MW)	53,704	29,270	24,195
Demand (1-in-2 Summer Temperature)	45,379	25,412	21,370
DR & Interruptible Programs	2,090	1,496	593
Operating Reserve[1]	**22.9%**	**21.1%**	**16.0%**

[1] Operating Reserve calculation (Total Net Supply + Demand Response + Interruptibles)/Demand)-1.

Table 15

Summer 2009 Loads and Resources Outlook

1-in-5 Demand and 1-in-5 Generation & Transmission Outage Scenarios

Summer 2009 Outlook - High Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,500	22,558	24,929
Retirements (Known)	22	0	22
High Probability CA Additions	1,476	378	1,098
Hydro Derates	-1,000	-208	-792
Net Interchange	11,400	10,400	3,300
1-in-5 Outages (1-in-5 Generation & Transmission)	-4,440	-2,084	-2,628
Total Net Supply (MW)	54,958	31,045	25,928
1-in-5 Demand (1-in-5 Summer Temperature)	47,469	26,905	22,282
DR & Interruptible Programs	2,090	1,496	593
Operating Reserve[1]	**20.2%**	**20.9%**	**19.0%**

Summer 2009 Outlook - Moderate Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,500	22,558	24,929
Retirements (Known)	22	0	22
High Probability CA Additions	1,476	378	1,098
Hydro Derates	-1,000	-208	-792
Net Interchange	10,100	9,200	2,050
1-in-5 Outages (1-in-5 Generation & Transmission)	-4,440	-2,084	-2,628
Total Net Supply (MW)	53,658	29,845	24,678
1-in-5 Demand (1-in-5 Summer Temperature)	47,469	26,905	22,282
DR & Interruptible Programs	2,090	1,496	593
Operating Reserve[1]	**17.4%**	**16.5%**	**13.4%**

Summer 2009 Outlook - Low Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,500	22,558	24,929
Retirements (Known)	22	0	22
High Probability CA Additions	1,476	378	1,098
Hydro Derates	-1,000	-208	-792
Net Interchange	8,800	8,000	800
1-in-5 Outages (1-in-5 Generation & Transmission)	-4,440	-2,084	-2,628
Total Net Supply (MW)	52,358	28,645	23,428
1-in-5 Demand (1-in-5 Summer Temperature)	47,469	26,905	22,282
DR & Interruptible Programs	2,090	1,496	593
Operating Reserve[1]	**14.7%**	**12.0%**	**7.8%**

[1] Operating Reserve calculation (Total Net Supply + Demand Response + Interruptibles)/Demand)-1.

Table 16

Summer 2009 Loads and Resources Outlook

1-in-10 Demand and 1-in-10 Generation & Transmission Outage Scenarios

Summer 2009 Outlook - High Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,500	22,558	24,929
Retirements (Known)	22	0	22
High Probability CA Additions	1,476	378	1,098
Hydro Derates	-1,000	-208	-792
Net Interchange	11,400	10,400	3,300
High Outages (1-in-10 Generation & Transmission)	-5,547	-2,669	-3,084
Total Net Supply (MW)	53,851	30,459	25,472
High Demand (1-in-10 Summer Temperature)	48,524	27,638	22,756
DR & Interruptible Programs	2,090	1,496	593
Operating Reserve[1]	**15.3%**	**15.6%**	**14.5%**

Summer 2009 Outlook - Moderate Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,500	22,558	24,929
Retirements (Known)	22	0	22
High Probability CA Additions	1,476	378	1,098
Hydro Derates	-1,000	-208	-792
Net Interchange	10,100	9,200	2,050
High Outages (1-in-10 Generation & Transmission)	-5,547	-2,669	-3,084
Total Net Supply (MW)	52,551	29,259	24,222
High Demand (1-in-10 Summer Temperature)	48,524	27,638	22,756
DR & Interruptible Programs	2,090	1,496	593
Operating Reserve[1]	**12.6%**	**11.3%**	**9.1%**

Summer 2009 Outlook - Low Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,500	22,558	24,929
Retirements (Known)	22	0	22
High Probability CA Additions	1,476	378	1,098
Hydro Derates	-1,000	-208	-792
Net Interchange	8,800	8,000	800
High Outages (1-in-10 Generation & Transmission)	-5,547	-2,669	-3,084
Total Net Supply (MW)	51,251	28,059	22,972
High Demand (1-in-10 Summer Temperature)	48,524	27,638	22,756
DR & Interruptible Programs	2,090	1,496	593
Operating Reserve[1]	**9.9%**	**6.9%**	**3.6%**

[1] Operating Reserve calculation (Total Net Supply + Demand Response + Interruptibles)/Demand)-1.

Figures 12, 13 and *14* provide graphical representations of the deterministic analysis results based on the inputs from *Tables 14* through *16*.

Figures 12, 13 and *14* show that under the nine scenarios presented no firm load shedding would be needed in the ISO, NP26 or SP26. Only in the NP26 1-in-10 demand & outage scenario with low imports does the operating reserve margin drop significantly below 7 percent (3.6 percent).

Figure 12

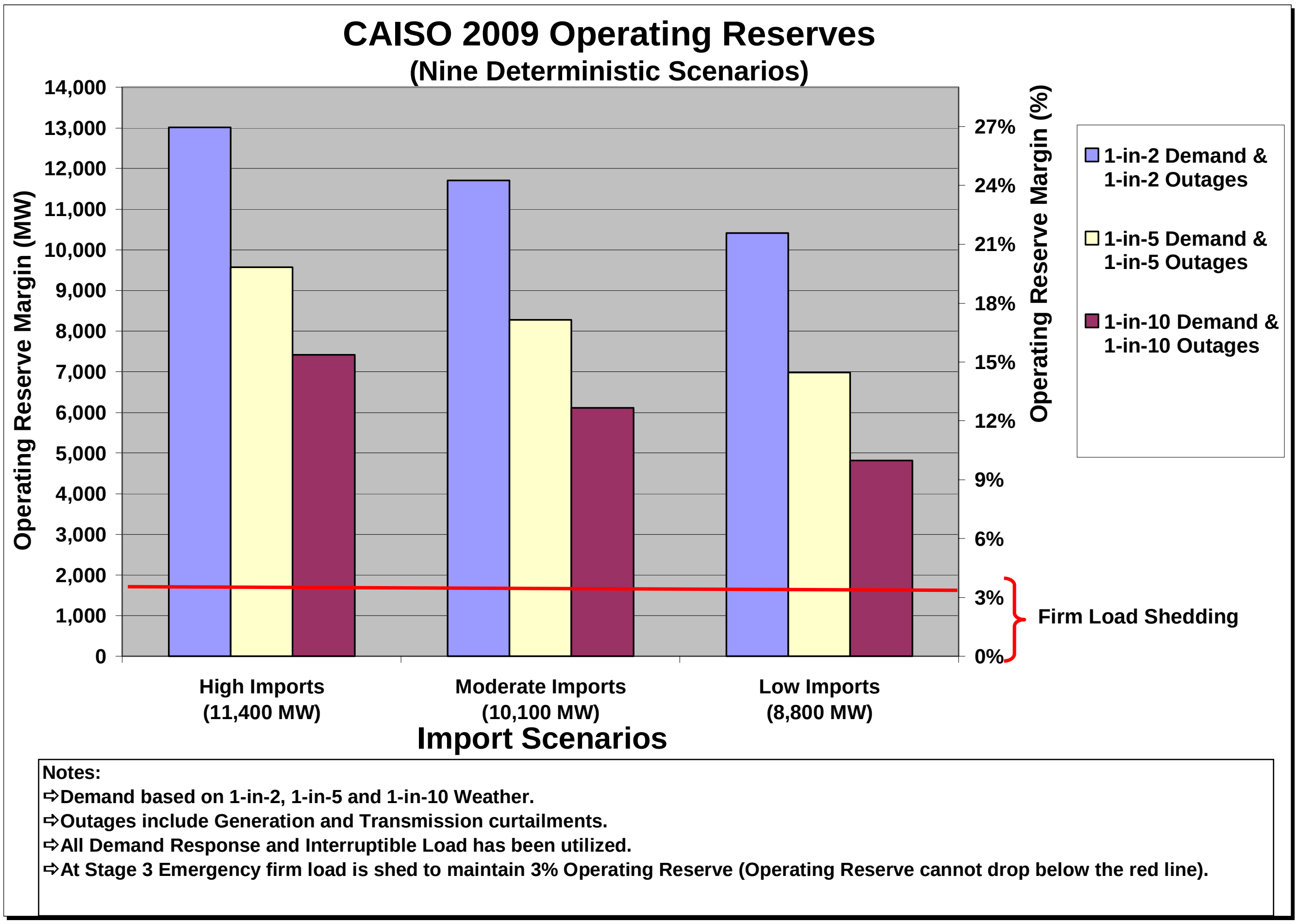


Figure 13

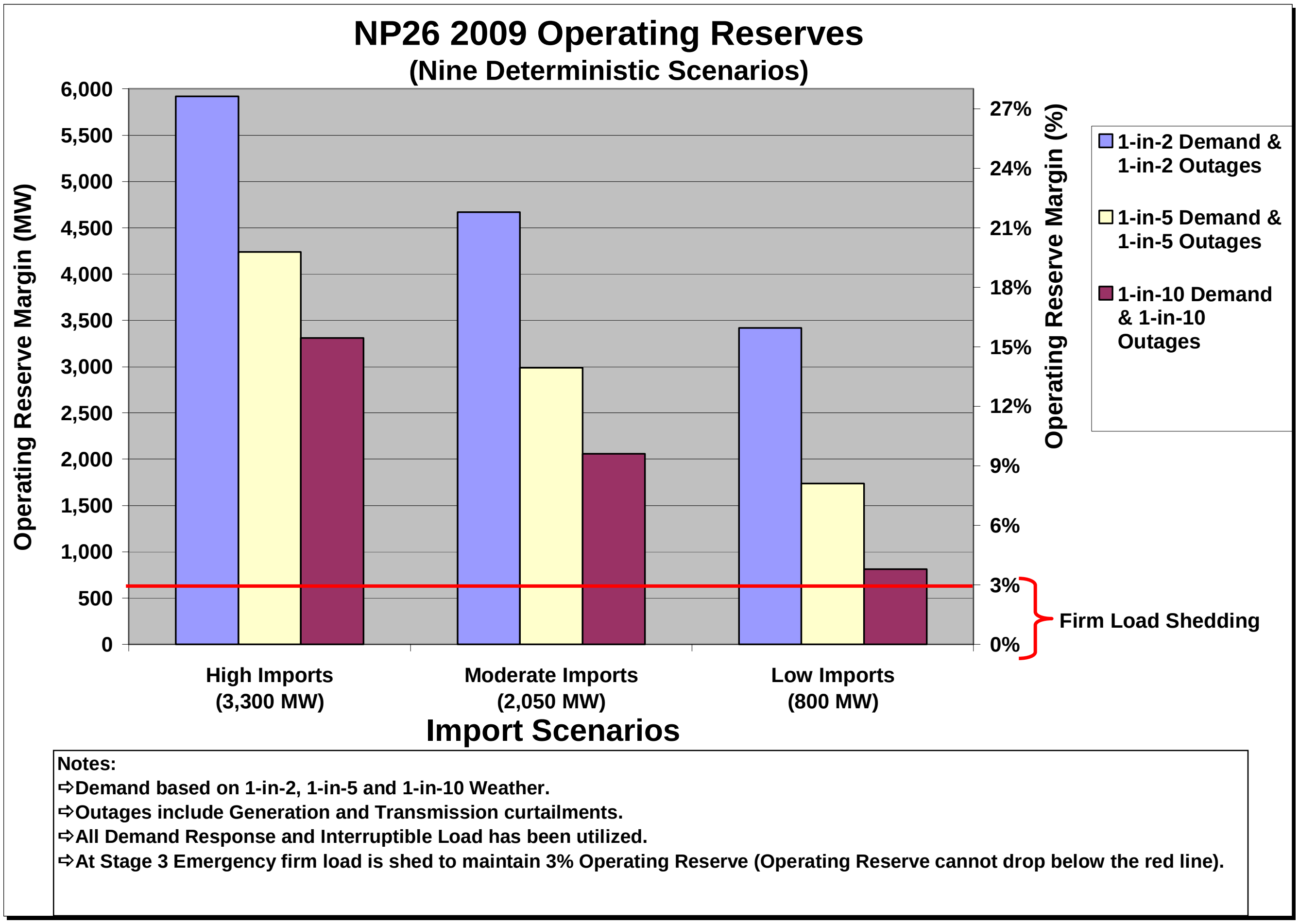
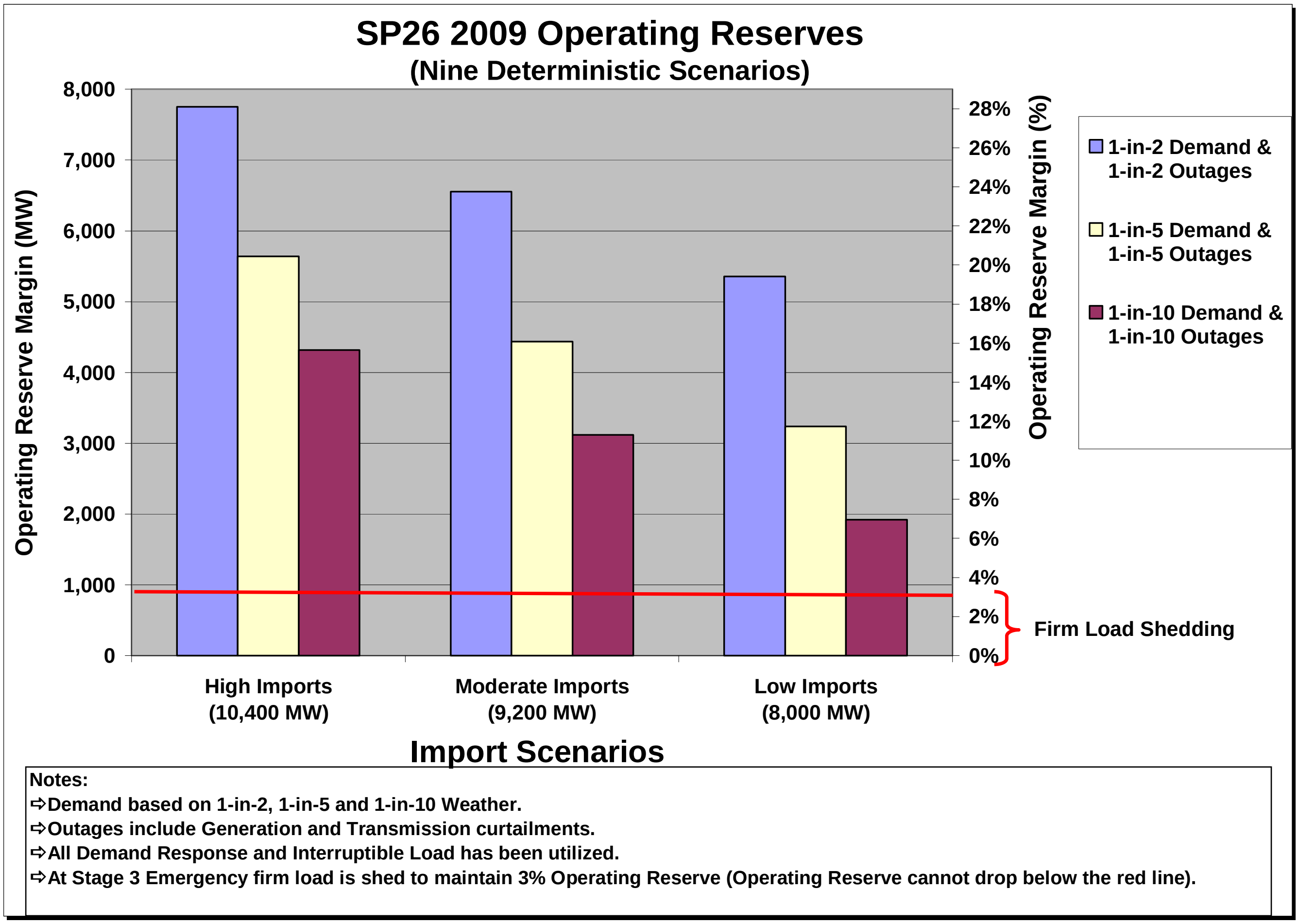

NP26 2009 Operating Reserves
(Nine Deterministic Scenarios)
Operating Reserve Margin (MW)
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
27%
24%
21%
18%
15%
12%
9%
6%
3%
0%
Operating Reserve Margin (%)
1-in-2 Demand & 1-in-2 Outages
1-in-5 Demand & 1-in-5 Outages
1-in-10 Demand & 1-in-10 Outages
Firm Load Shedding
High Imports (3,300 MW)
Moderate Imports (2,050 MW)
Low Imports (800 MW)
Import Scenarios
Notes:
⇨Demand based on 1-in-2, 1-in-5 and 1-in-10 Weather.
⇨Outages include Generation and Transmission curtailments.
⇨All Demand Response and Interruptible Load has been utilized.
⇨At Stage 3 Emergency firm load is shed to maintain 3% Operating Reserve (Operating Reserve cannot drop below the red line).

Figure 14



The assessment of these conditions (normal to extreme) allows the ISO to frame the electric system challenges and focus management effort on measures that will minimize possible impacts. Due to the low hydro conditions, supplies in NP26 will be tighter since NP26 has significantly more hydro generation than SP26. All of these various scenarios show the operating reserve margin after using all DR programs. Therefore, it is critical that these programs operate as expected and to the levels expected when called on. This highlights one of the main purposes of this Assessment, which is to focus the ISO's summer preparations on the conditions and contingencies that pose the greatest risk to reliability. As a result of this analysis, the ISO and its market participants will be better prepared, and can prepare others, to manage the system under identified conditions and minimize the chance of firm load shedding. Although resources will be tight this summer under the more extreme circumstances if low hydro conditions persist, increased import projections and the reduced peak demand load due to the recession help to mitigate the risk from the adverse hydro conditions. In the meantime, it is the ISO's job to manage the risks associated with extreme weather or other conditions, as was done successfully during the extreme heat wave of July 2006 and other extreme conditions.

Probabilistic analysis

A probabilistic model is used to develop the probabilities for the entire range of operating reserves based on the inputs described in previous sections. Existing generation, known retirements and high probability additions are fixed single value inputs to the model and these input values are shown in the previous deterministic tables such as *Table 14*. The randomly generated forced and planned generation outages and curtailments are based on actual occurrences, as shown in graphs in *Appendix C*, and were used to develop a range of inputs of probable generation outage amounts. Transmission curtailments used by the model were developed based on actual curtailments for hour-ending 1200 through hour-ending 1900, May 15 through September 15. The range of demand inputs was developed using the process described in the *Demand forecast* section of Section III. DR and interruptible loads are also fixed single value inputs to the model (values shown in *Tables 14* through *16*). After the model develops the range of operating reserves the analysis focuses on the lower operating reserve margin range where the probability of entering into a stage three emergency condition is determined. A stage three is the point where operating reserves drop to a level where firm load shedding is needed or imminent to maintain adequate operating reserves. A stage three is typically declared when operating reserves are reduced to approximately 3 percent. The three import scenarios used different demand ranges, as it was not considered appropriate to model all demand levels with all import levels, such as low imports over the full range of high demand conditions.

Figure 15 shows an example of the entire range of probabilities for all of the operating reserve outcomes of the probabilistic model for the ISO.

Figure 15

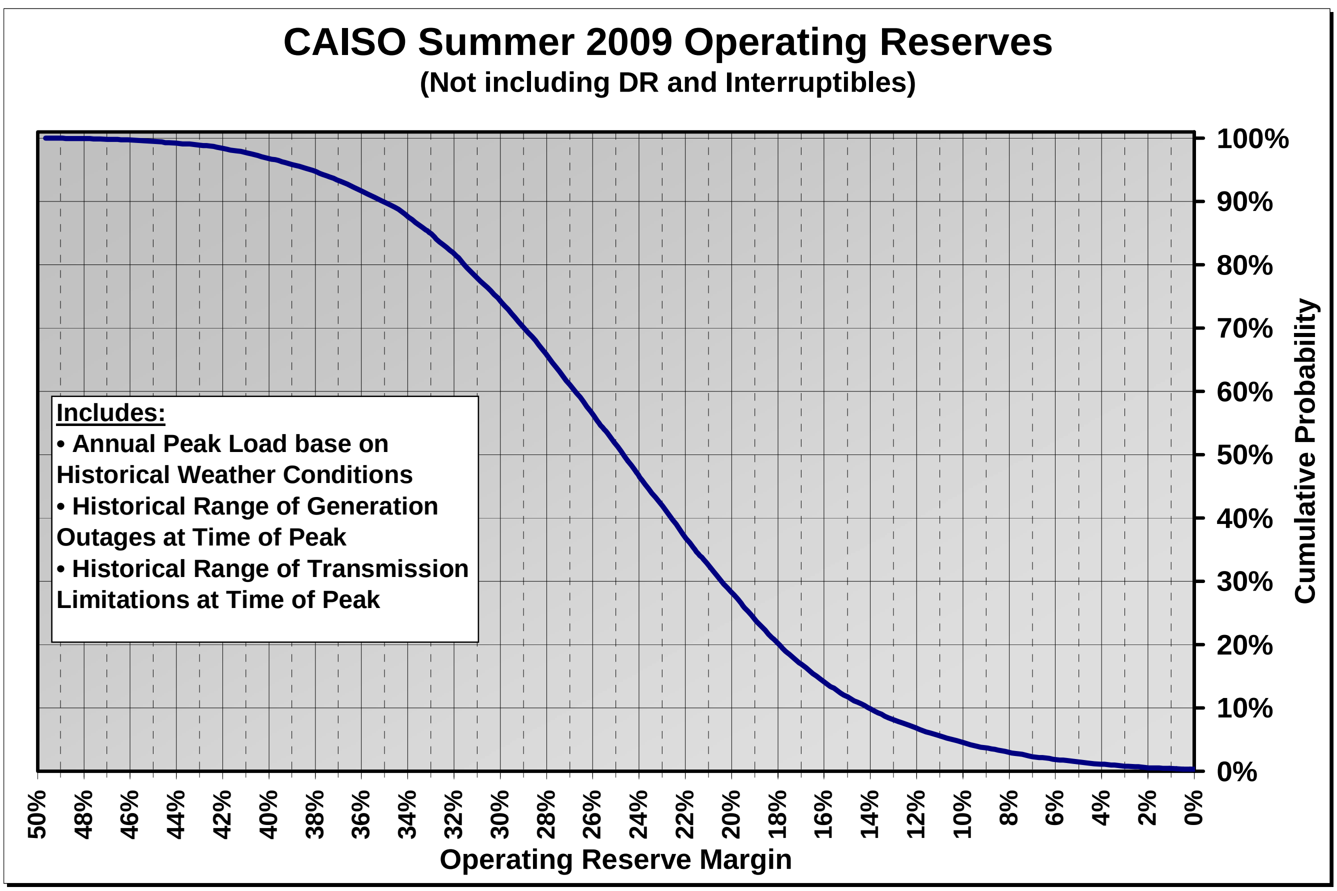
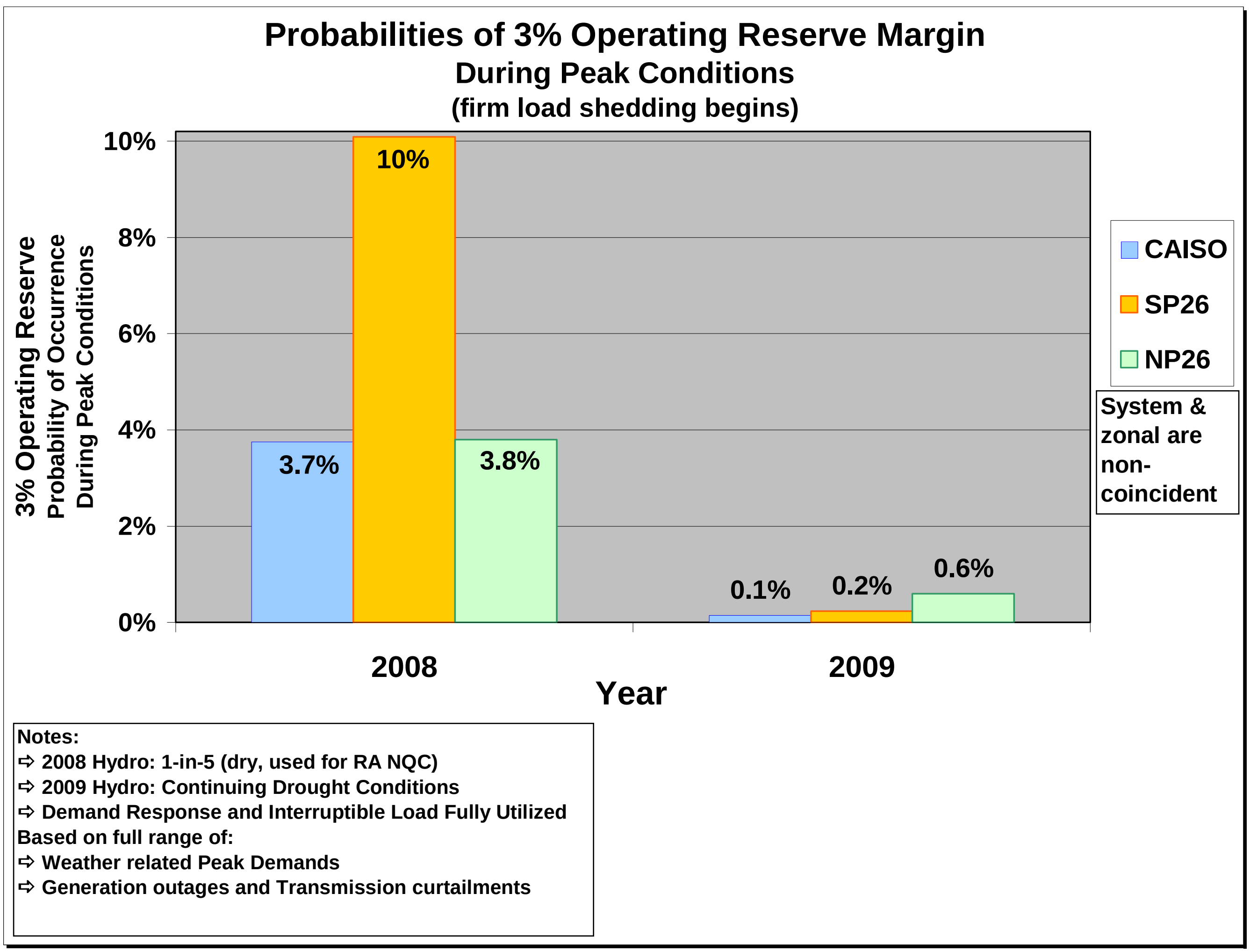


Figure 16 represents probabilities for having the operating reserve margin fall to 3 percent or less for the ISO as a whole and for the SP26 and NP26 zones. The probabilities projected for 2008 are shown for reference purposes. While the hydro scenario projects 1,000 MW of derates for the ISO, this is more than offset by the forecast reduced peak demand load, due to the current recession, the 1,476 MW of new generation, and the increased imports demonstrated over the 2008 summer period. The probability for shedding firm load in 2009 has diminished in all areas as compared to 2008.

While supply is adequate to handle a broad range of operating conditions, system operations will be challenging at the extremes. Conservation and demand response programs will continue to be important this summer and have an increasingly important role in years to come. Scheduling coordinators must continue to practice diligence during more severe conditions to avoid shedding firm load.

Figure 16



IV. ENVIRONMENTAL ISSUES IMPACTING FUTURE GENERATION

Once-Through cooling

Within the ISO balancing area and the State of California, there are a significant number of thermal generating units that use once-through-cooling (OTC) technology, utilizing large amounts of ocean or estuarial water. The OTC process is used for condensing low-pressure steam to water as part of the thermal cycle of these units. The State Water Resources Control Board (SWRCB) continues to work on a proposal that would require these units to greatly reduce the amount of ocean or estuarial water they use in the cooling process in order to minimize the intake and mortality of marine life. Further, the CEC and the CPUC have recommended that a significant number of aged generating units (greater than 30 years old) be retired or repowered, essentially within the same timeframe. *Table 17* shows the amount of capacity that could be affected.

Considering these issues from the perspective of the interconnected electrical grid in California, there are reliability and market implications in the ISO balancing area of removing these units from service, even assuming different levels of offsetting generation additions and/or repowering. The ISO continues to participate in the Inter Agency Working Group which is providing input to the SWRCB as it works to develop the OTC policy. The SWRCB expects to release a draft policy by July 1, 2009 followed by a 60-day comment period and public workshop. They expect to adopt the policy by the end of 2009. There are no expected impacts on summer 2009 reliability from the OTC policy process.

Table 17

Once-Through Cooled and Aged Units Slated for Retirement/Repowering	
Coastal Units Using Once Through Cooling	
Breakdown of O-T-C Units by Type and Location	**NQC[1] MW**
CAISO Fossil Units	14,151
Nuclear Units	4,530
LADWP Units	2,391
Units in CAISO NP26	7,813
Units in CAISO SP26	10,868
Total Units in CAISO	18,681
Total Units in California	21,072
Aged Non-O-T-C Units Slated to be Retired/Repowered	
Breakdown of Units by Location	**NQC[1] MW**
Units in CAISO SP26	1,276
Total Generation At Risk of Retirement	
Breakdown of Units by Location	**NQC[1] MW**
NP26 Total At Risk Generation	7,813
SP26 Total At Risk Generation	12,143
Total CAISO At Risk Generation	19,956
Total California At Risk Generation	22,347
1) Net Qualifying Capacity	

South Coast Air Quality Management District priority reserve issue

A recent court ruling limiting the supply of air emissions credits in the South Coast Air Quality Management District (SCAQMD) has resulted in a new challenge for adding new generation in the SCAQMD, impacting local area reliability and potentially system reliability. Air quality requirements in the SCAQMD require offsetting new sources of emissions with reductions in emissions from existing sources. Since these offsets, or emission credits, are in short supply the SCAQMD established a priority reserve of emission credits that were set aside for use by entities that serve a public interest. In August 2007 the SCAQMD adopted rule 1309.1, amending its priority reserve rules by establishing air quality and economic criteria that allowed these offsets to be purchased for new power plants licensed by the CEC. The SCAQMD priority reserve rule was challenged in Superior Court and in July 2008, the court decision found the air district's California Environmental Quality Act (CEQA) analysis to be inadequate and indicated that a sufficient environmental document would require significant new analysis. The SCAMD believes it cannot reasonably provide this new analysis and as a consequence, the SCAQMD is unable to issue any offsets for power plants or for any facilities.

If new gas-fired power plants cannot be licensed in the Los Angeles basin because air emission credits from the SCAQMD priority reserve process are not available, new generation will not be built in the Los Angeles basin. Consequently, aging, less efficient generating facilities that have been slated for retirement will continue to operate to maintain local and system reliability. This could have a negative impact on Southern California's ability to meet summer peak and local capacity requirements in the next few years and conflicts with some of the possible solutions to the OTC issue discussed above.

The ISO is working closely with the CPUC, CEC, and other agencies related to these issues. The ISO does not anticipate these policies impacting the availability of generation for summer 2009. Nevertheless, these new and important environmental policies are impacting the addition of new generation.

As with all forward looking supply and demand evaluations, this Assessment is based on various forecasts and engineering judgments which rely heavily on historical information in estimating available future supply and demand. The ISO will continue to monitor the supply and demand situation for changes and make adjustments to these results as necessary.

V. APPENDICES

A. 2008 Summer Peak Load Summary Graphs

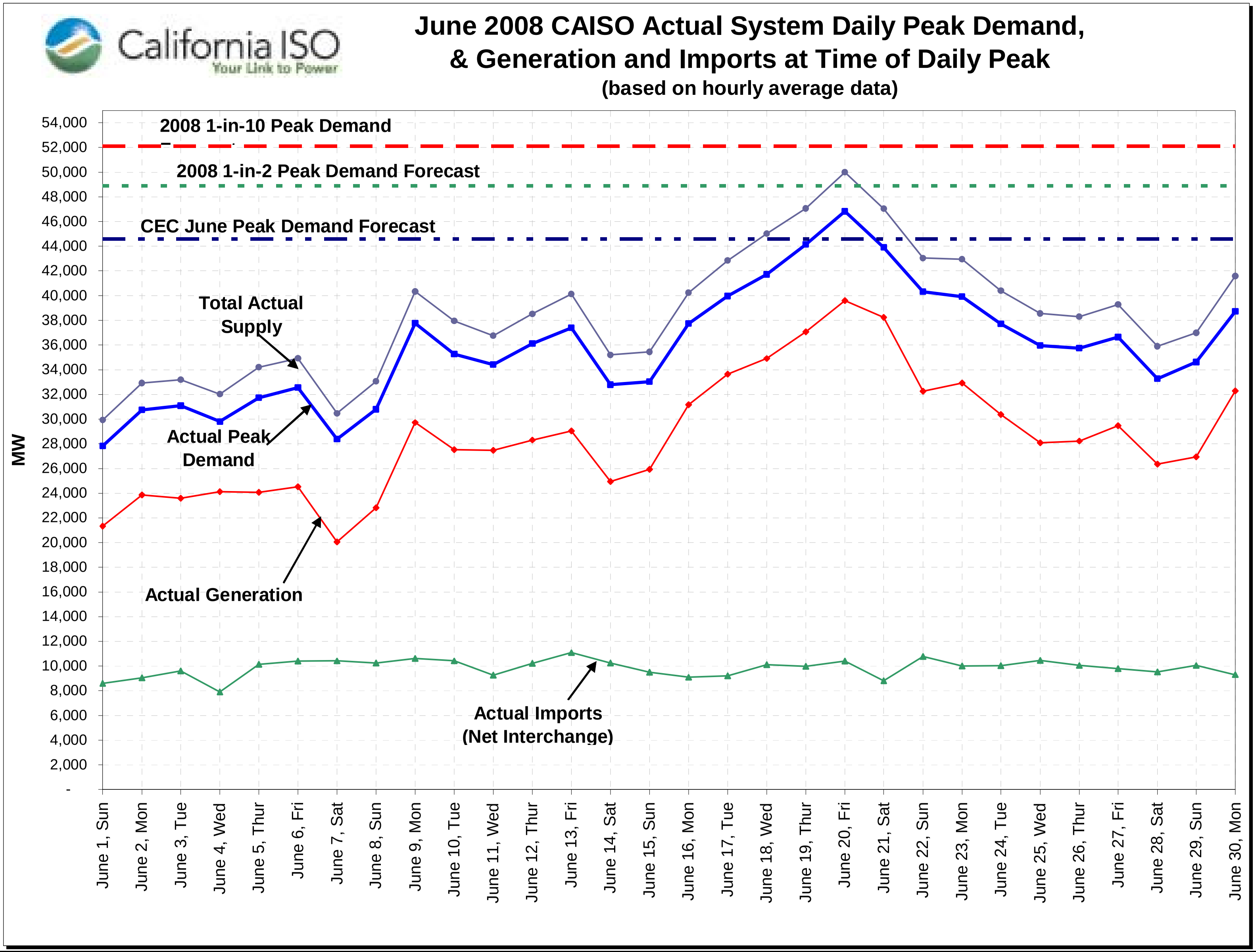
B. 2008 – 2006 Summer Imports Summary Graphs

C. 2008 – 2006 Summer Generation Outage Graphs

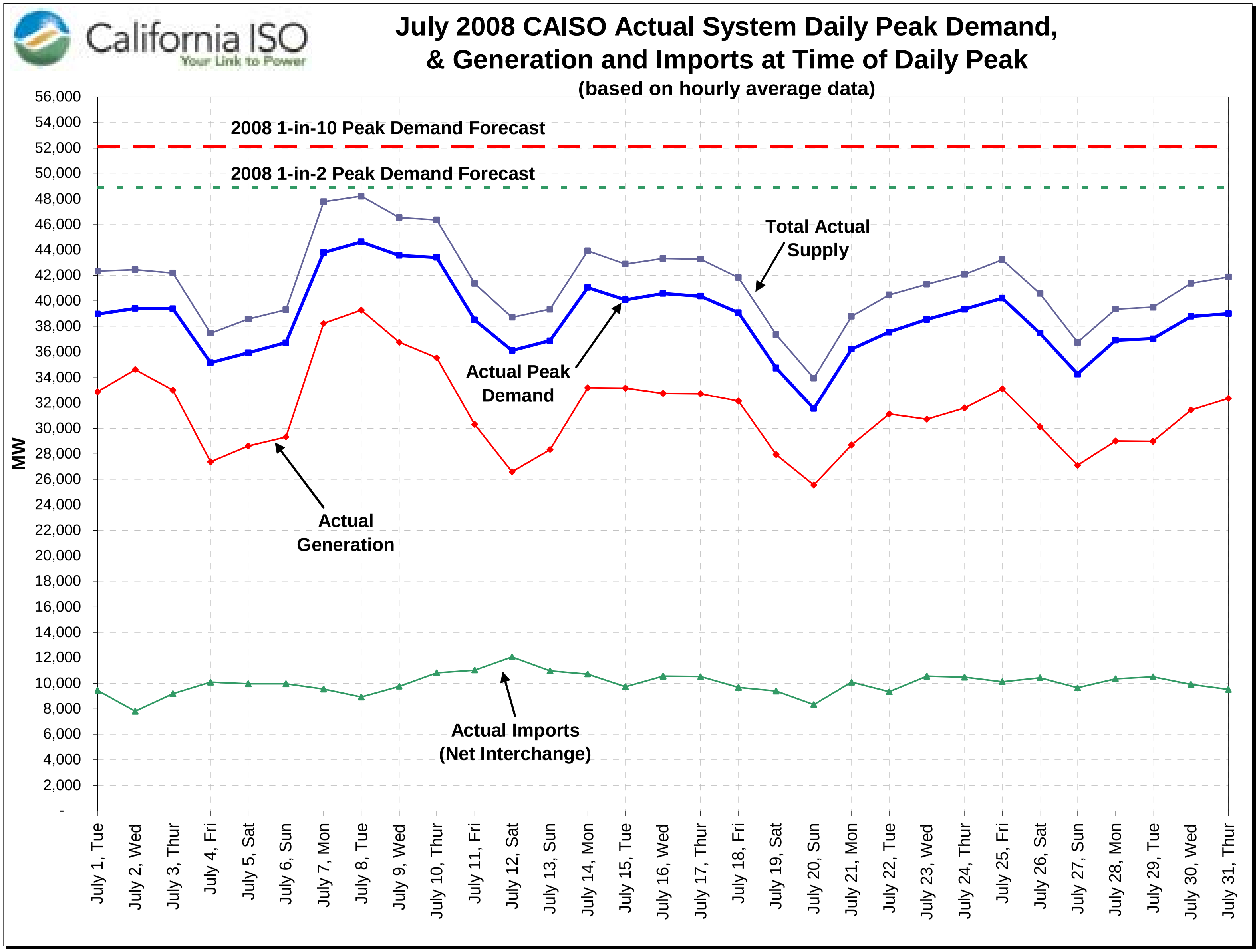
D. 2009 California Hydro Conditions

E. Summer 2009 Potential New Generation

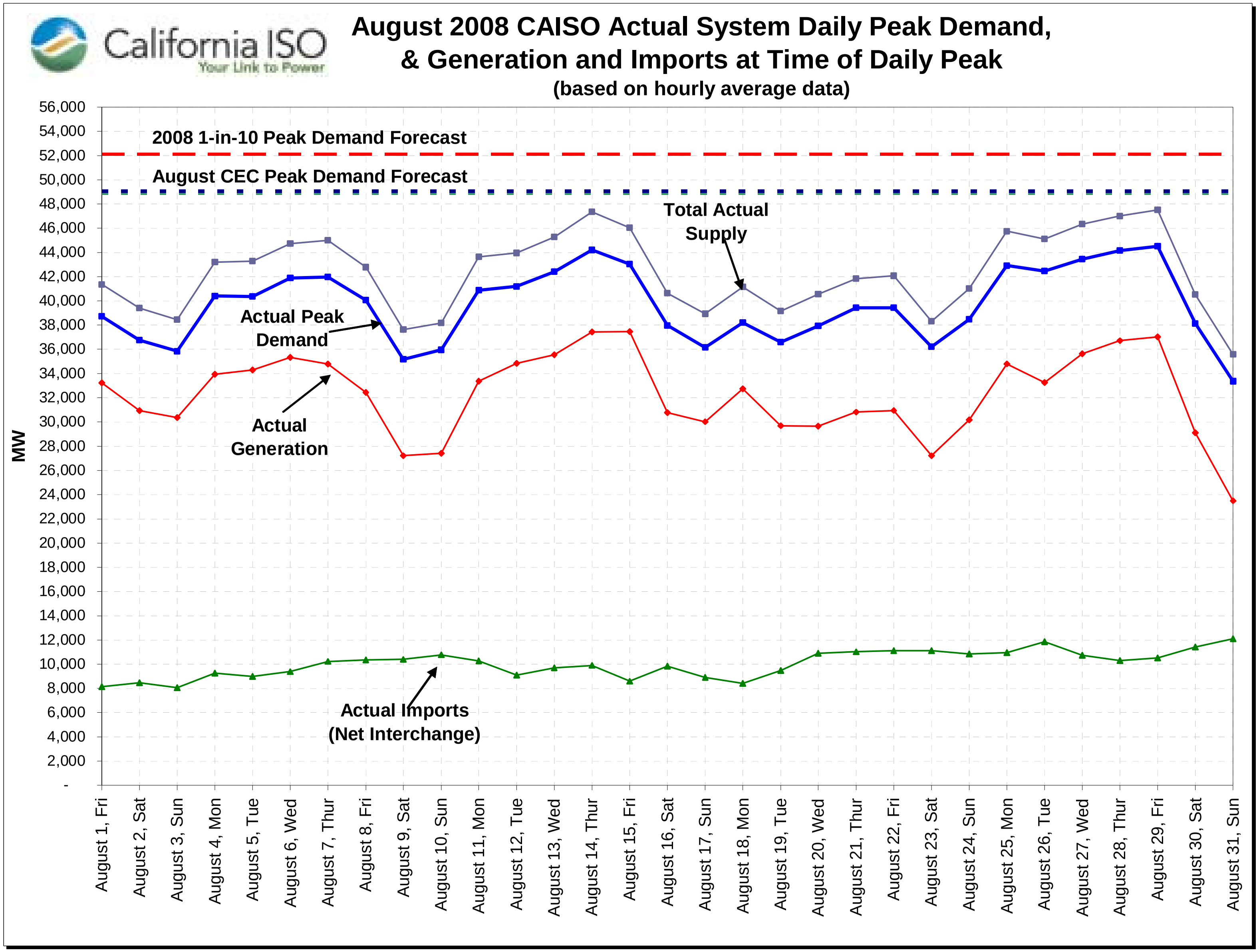
Appendix A: 2008 Summer Peak Load Summary Graphs



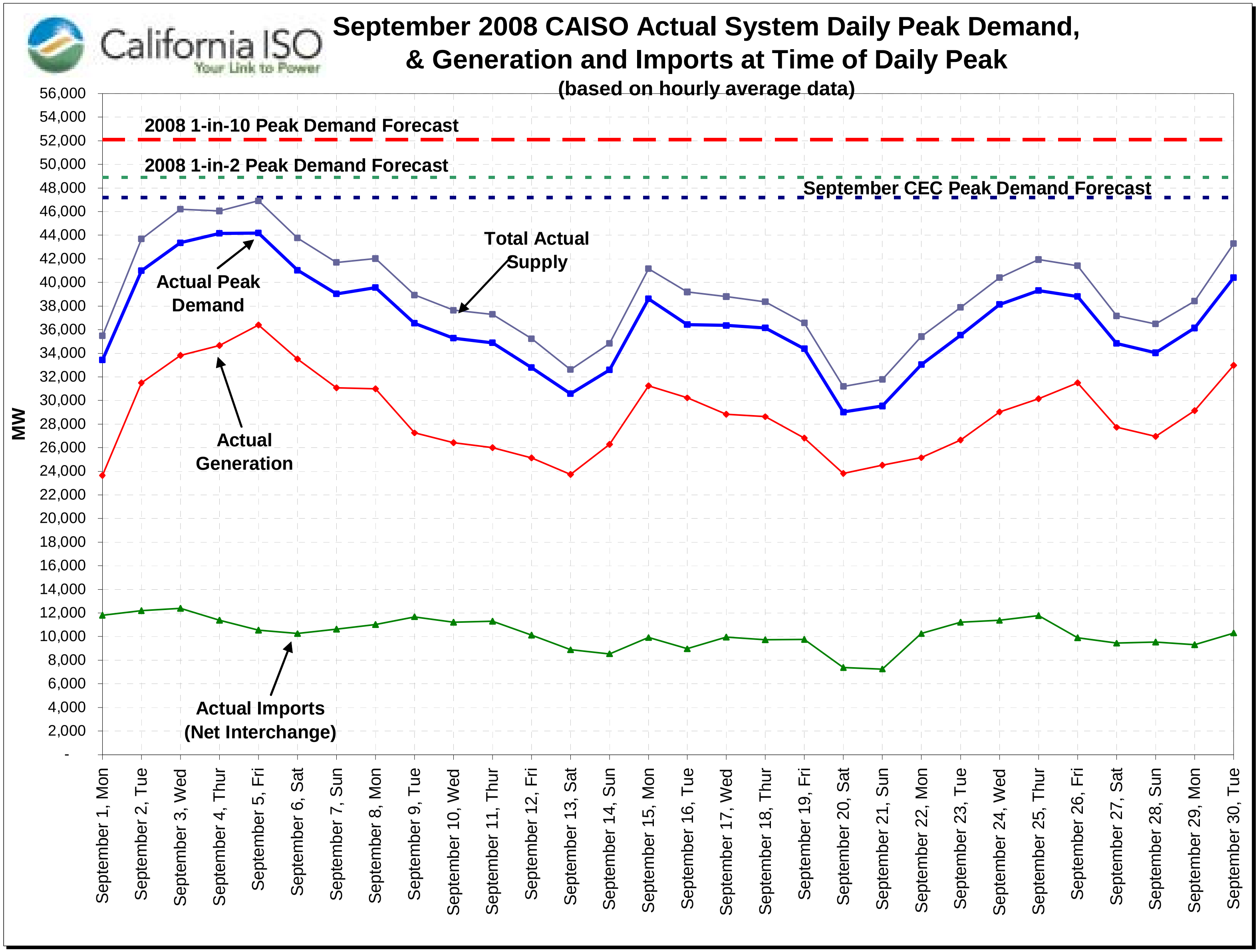
Appendix A – Continued



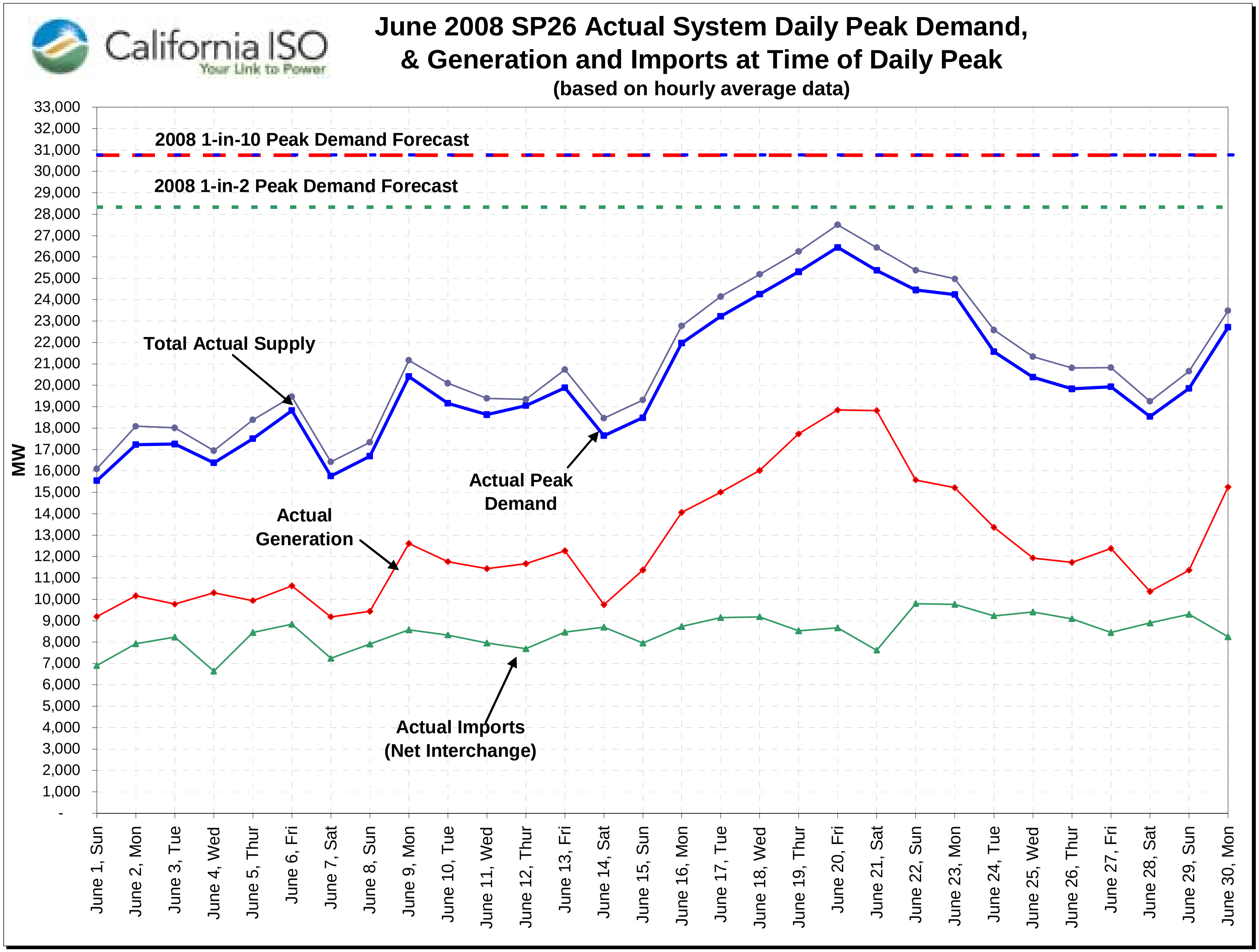
Appendix A – Continued



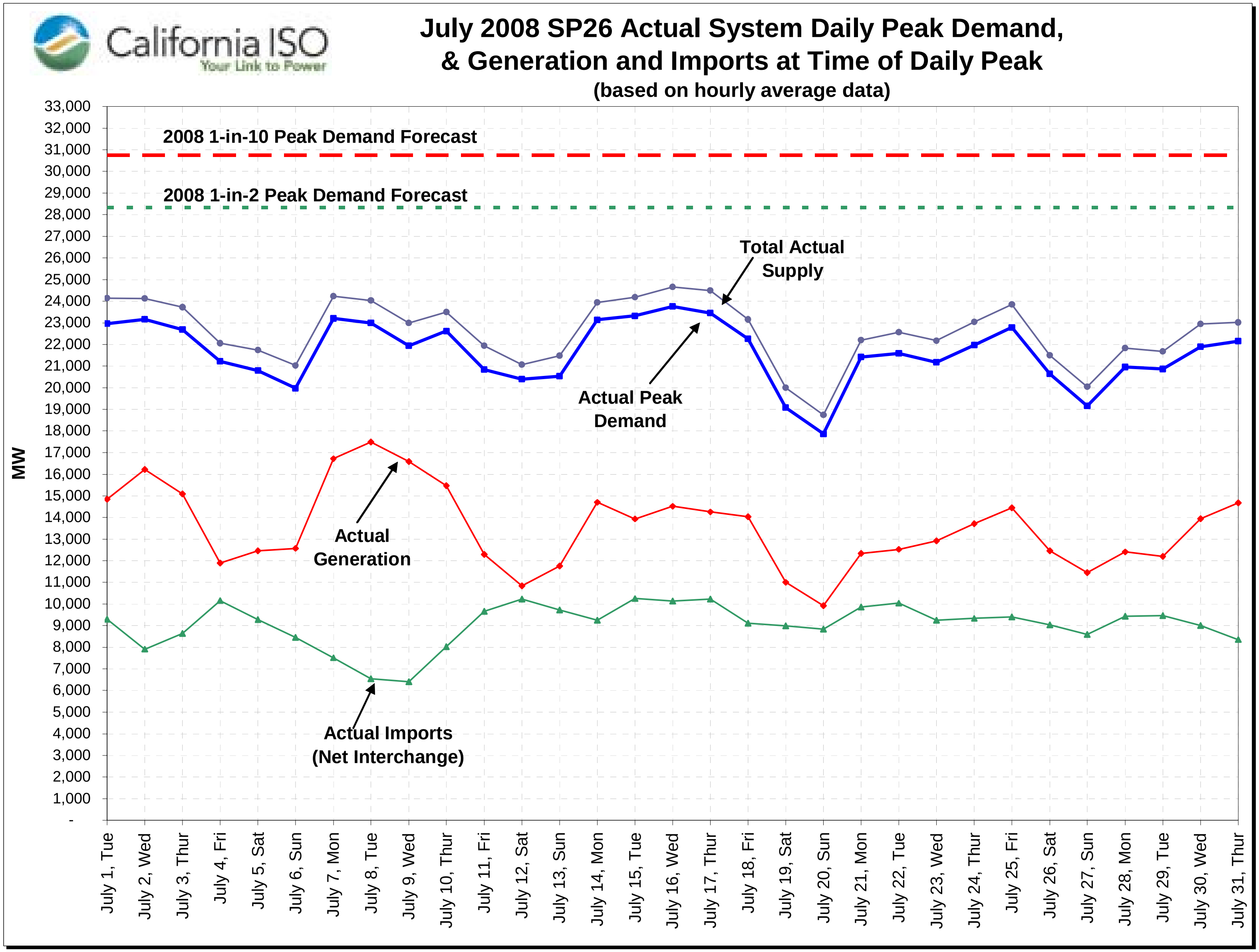
Appendix A – Continued



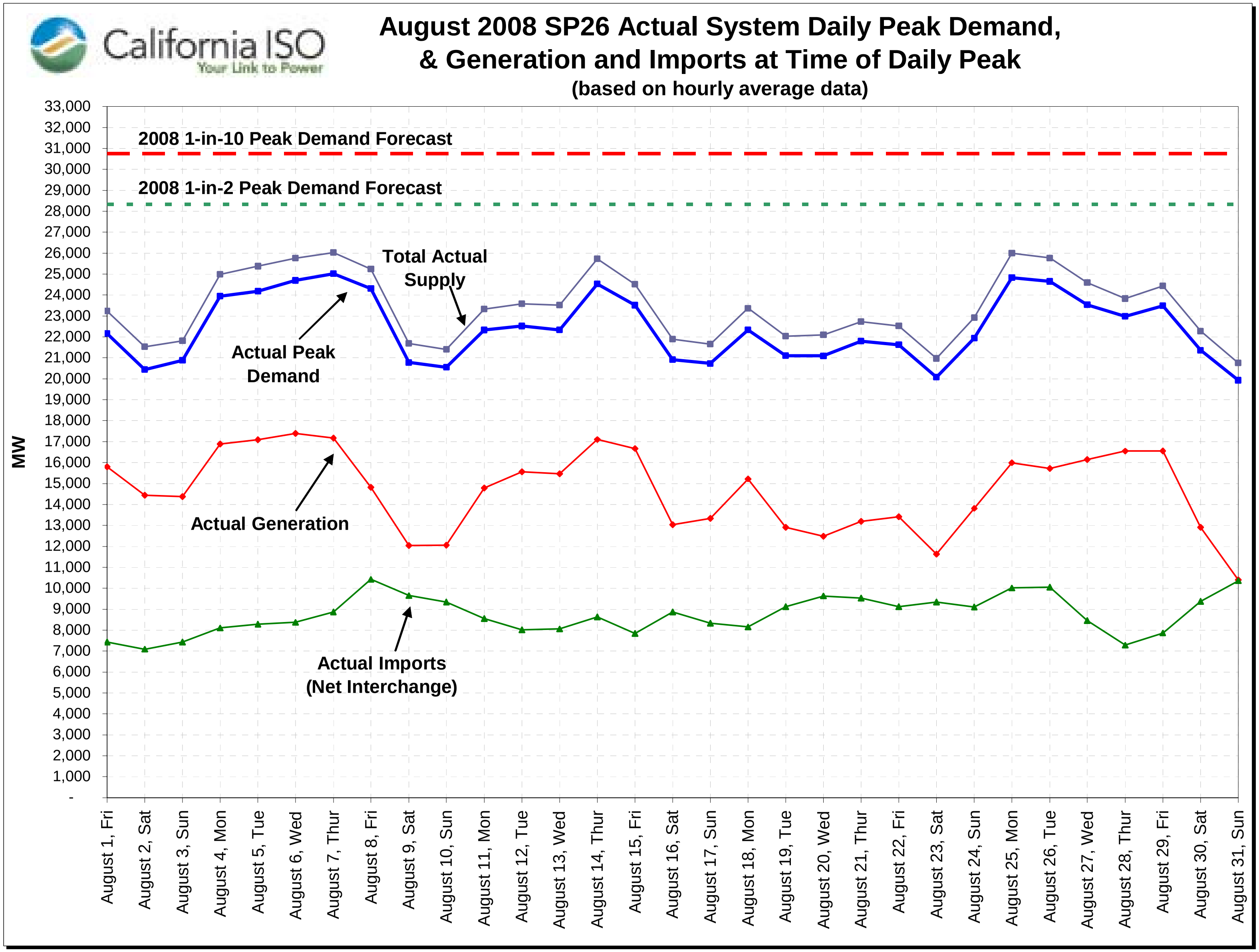
Appendix A – Continued



Appendix A – Continued



Appendix A – Continued



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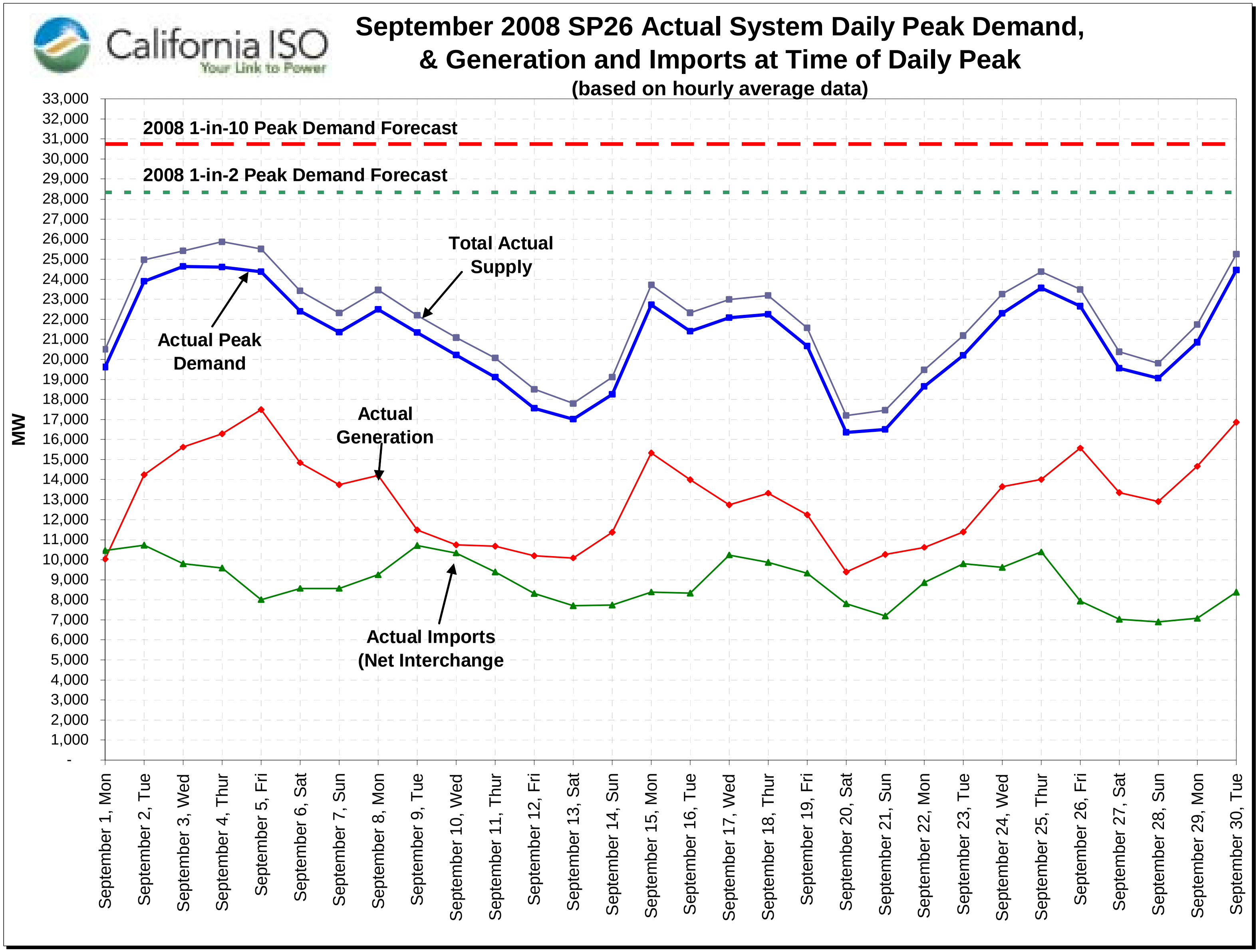

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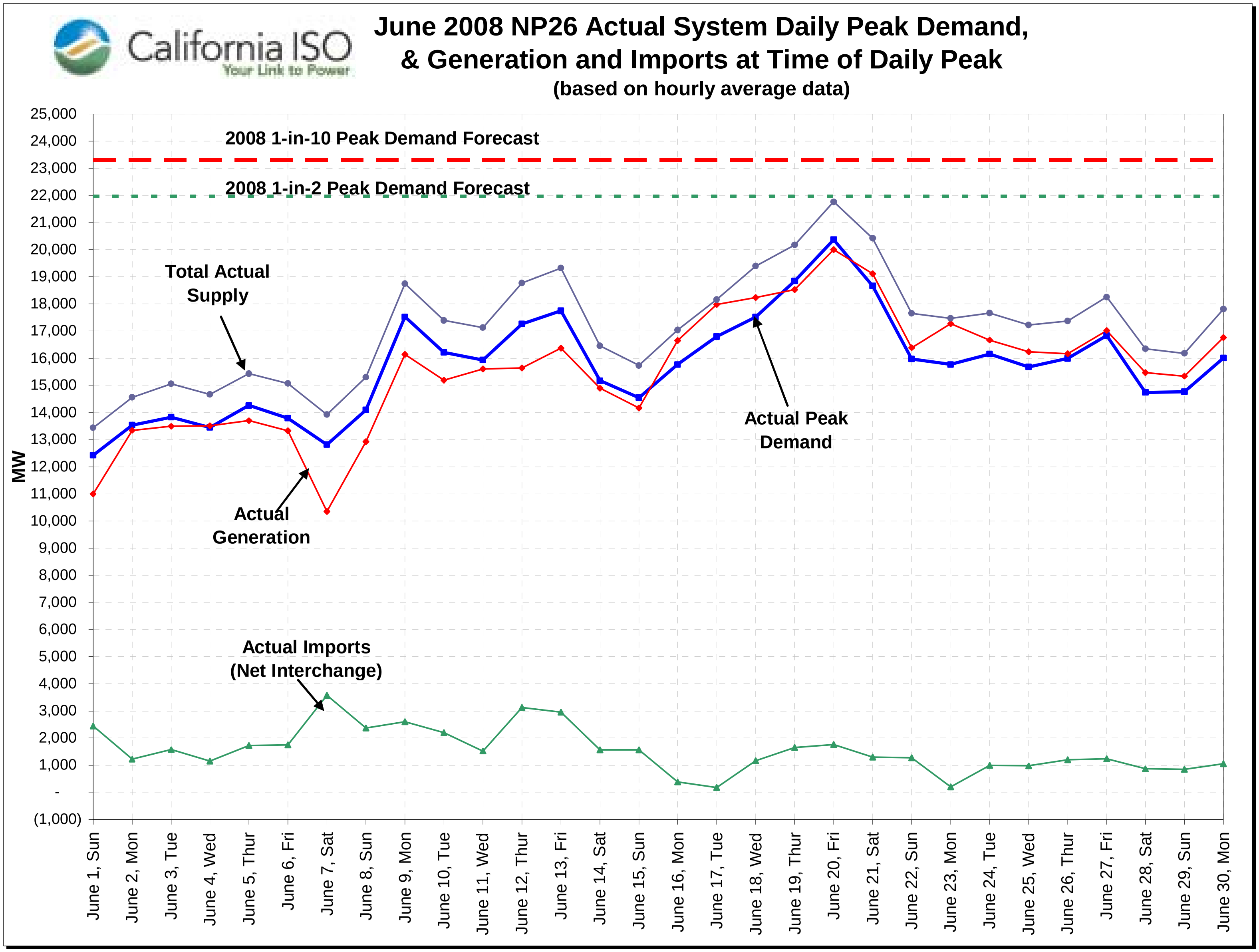
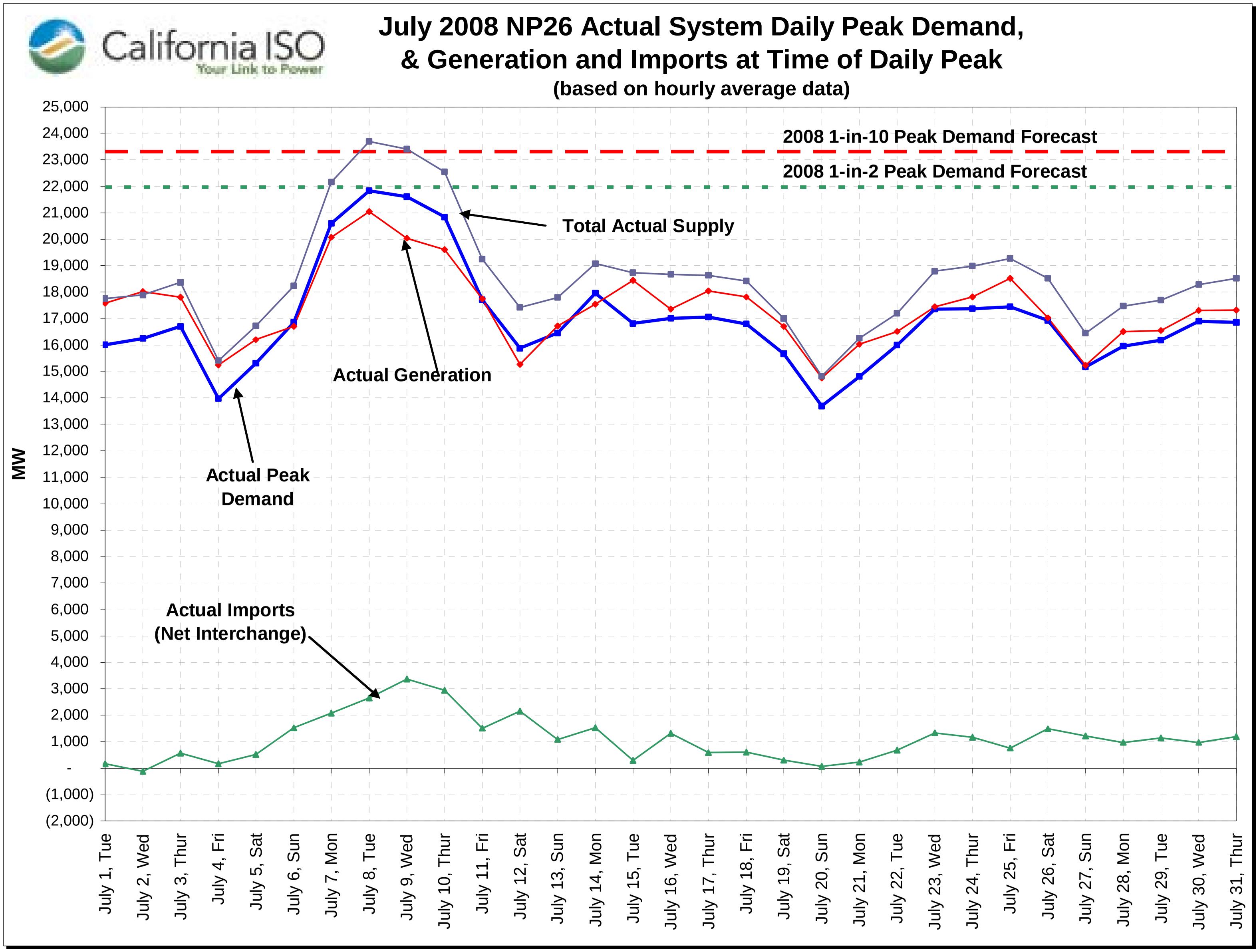
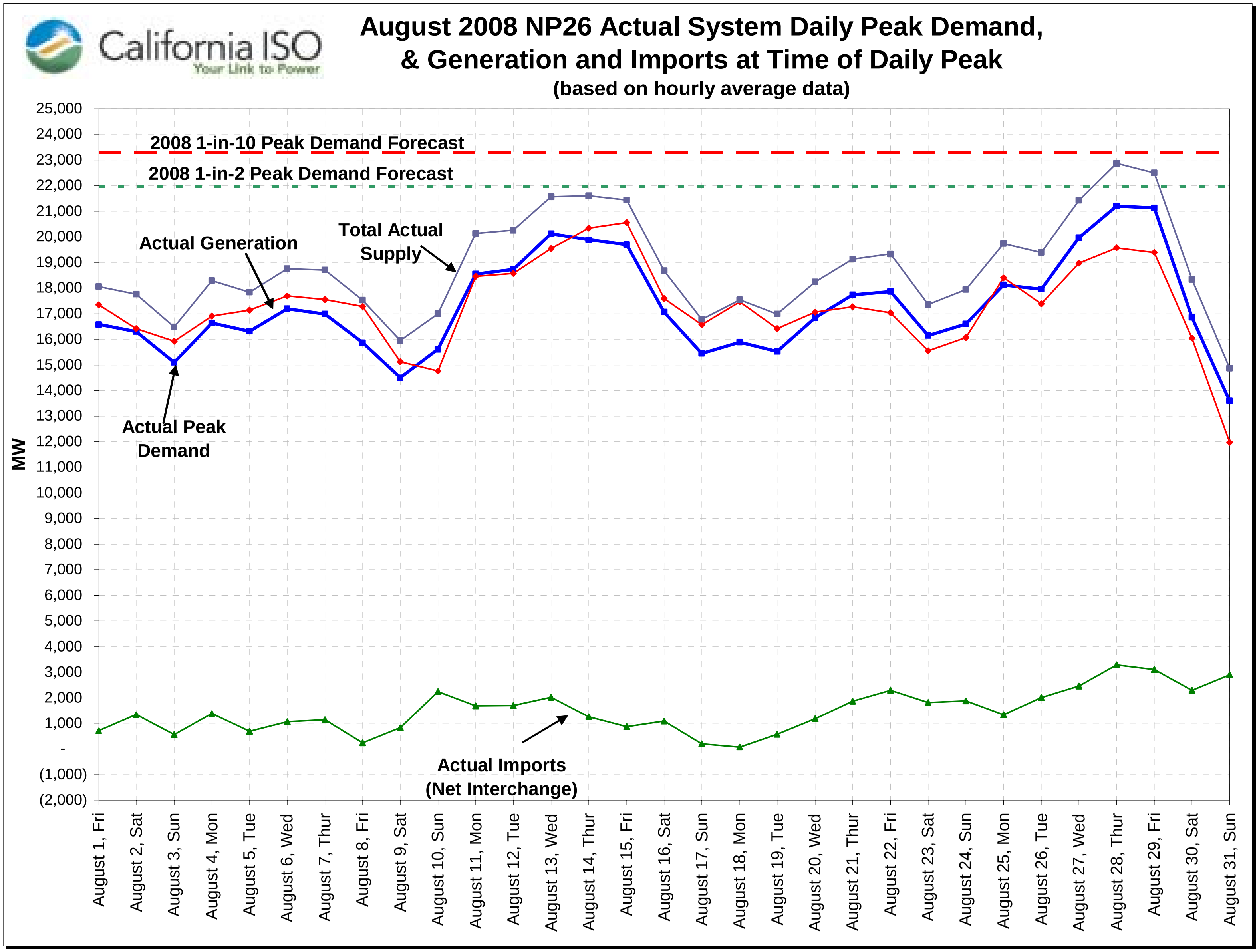


Appendix A – Continued



Appendix A – Continued



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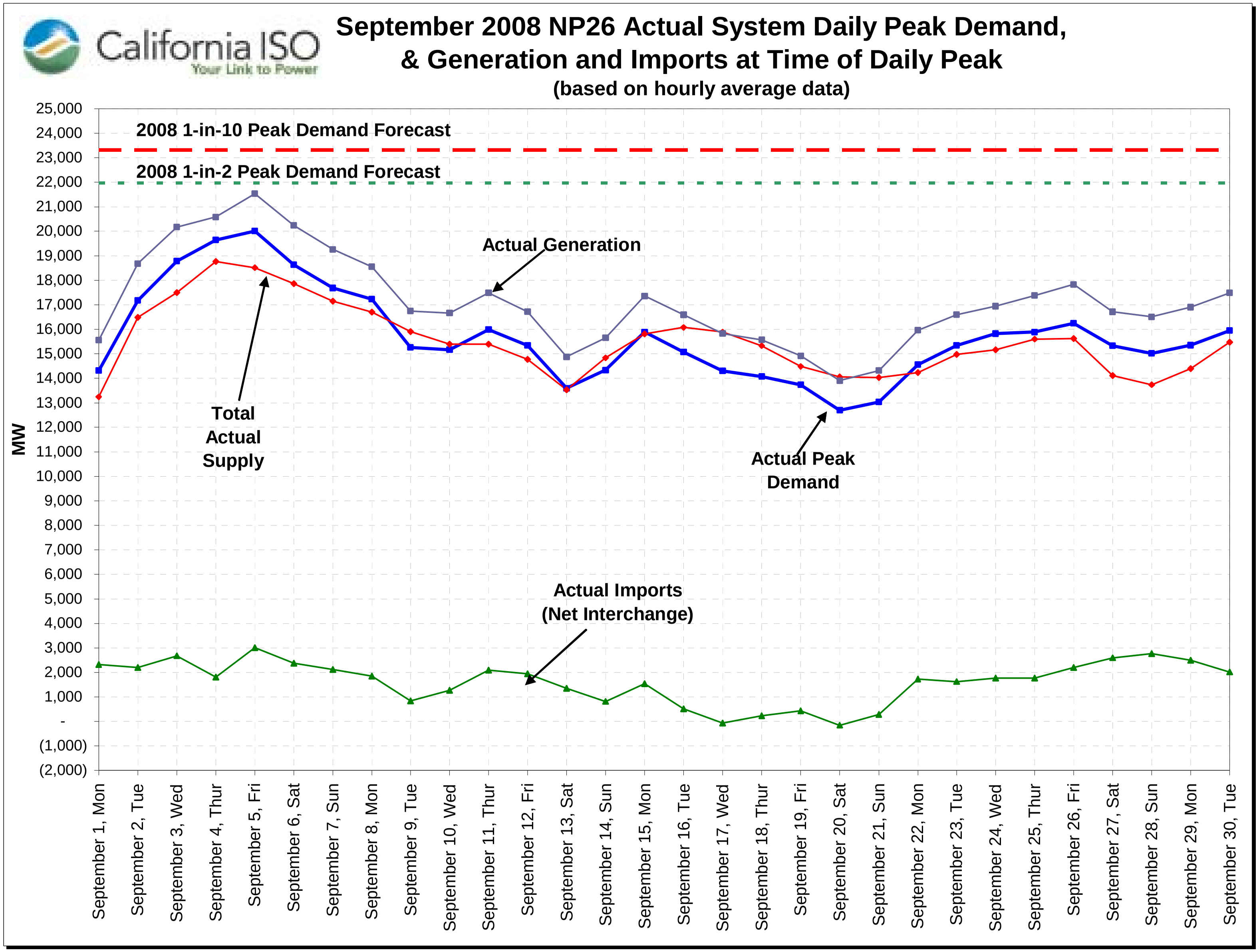
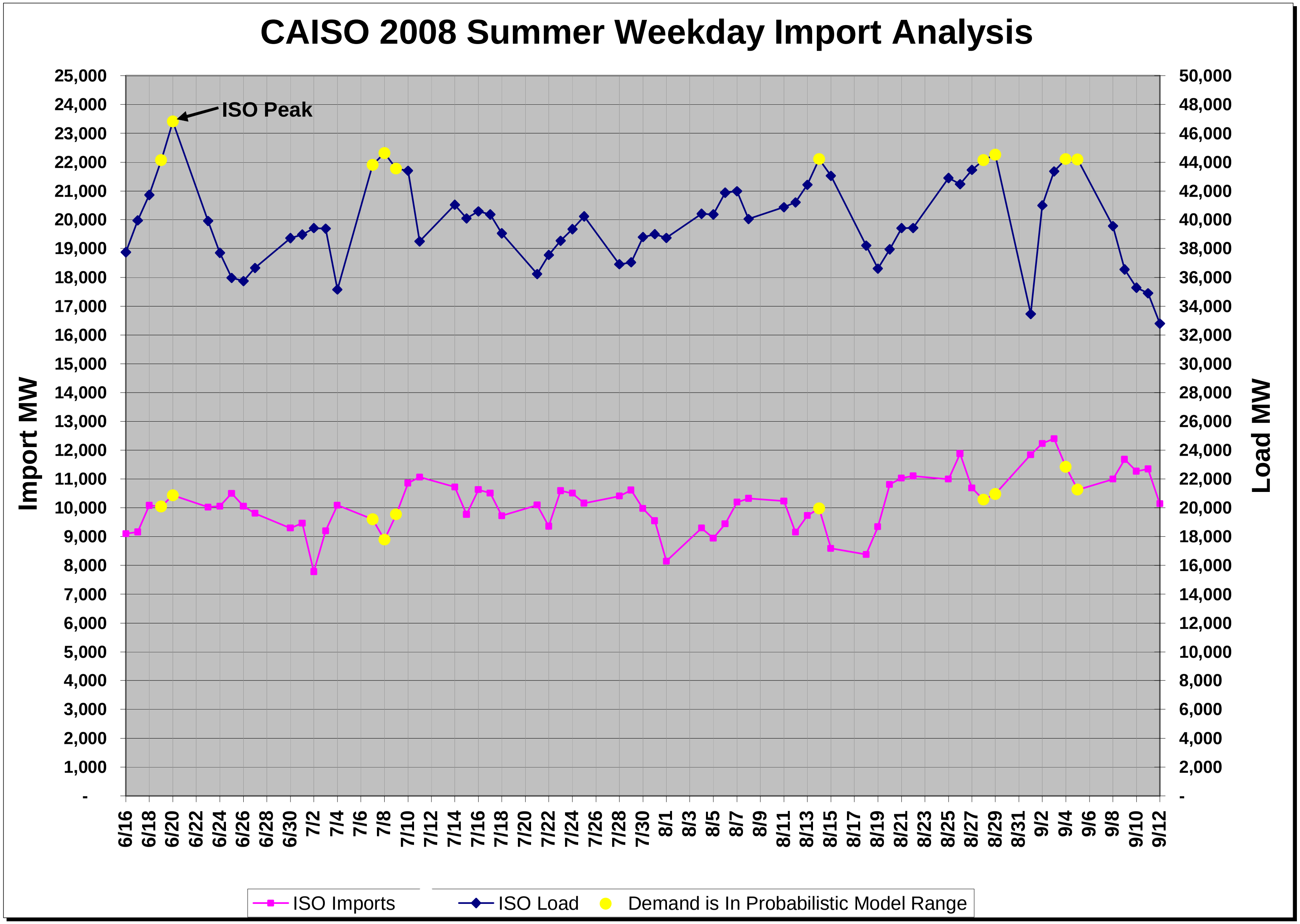


Appendix B: 2008 – 2006 Summer Imports Summary Graphs



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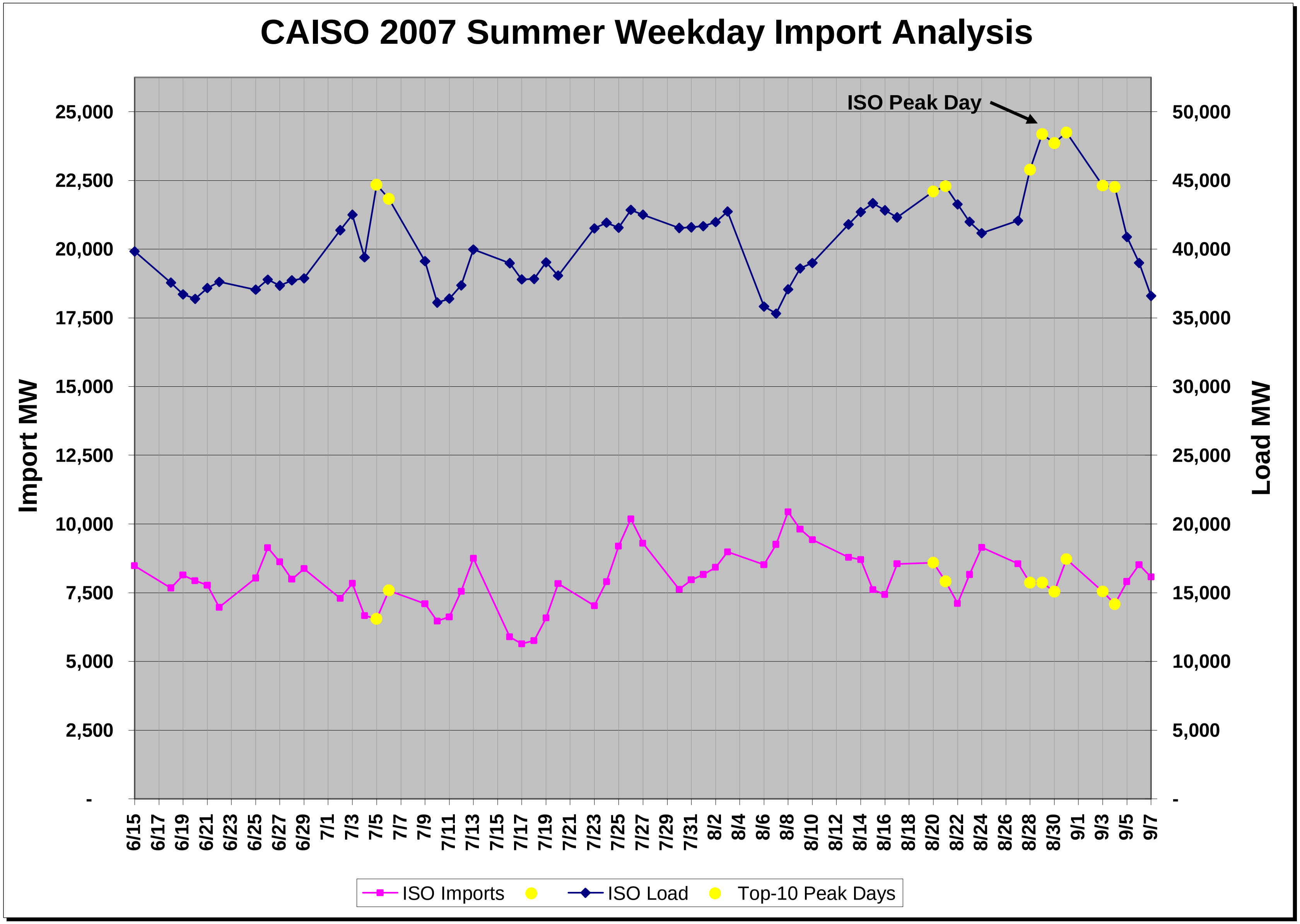

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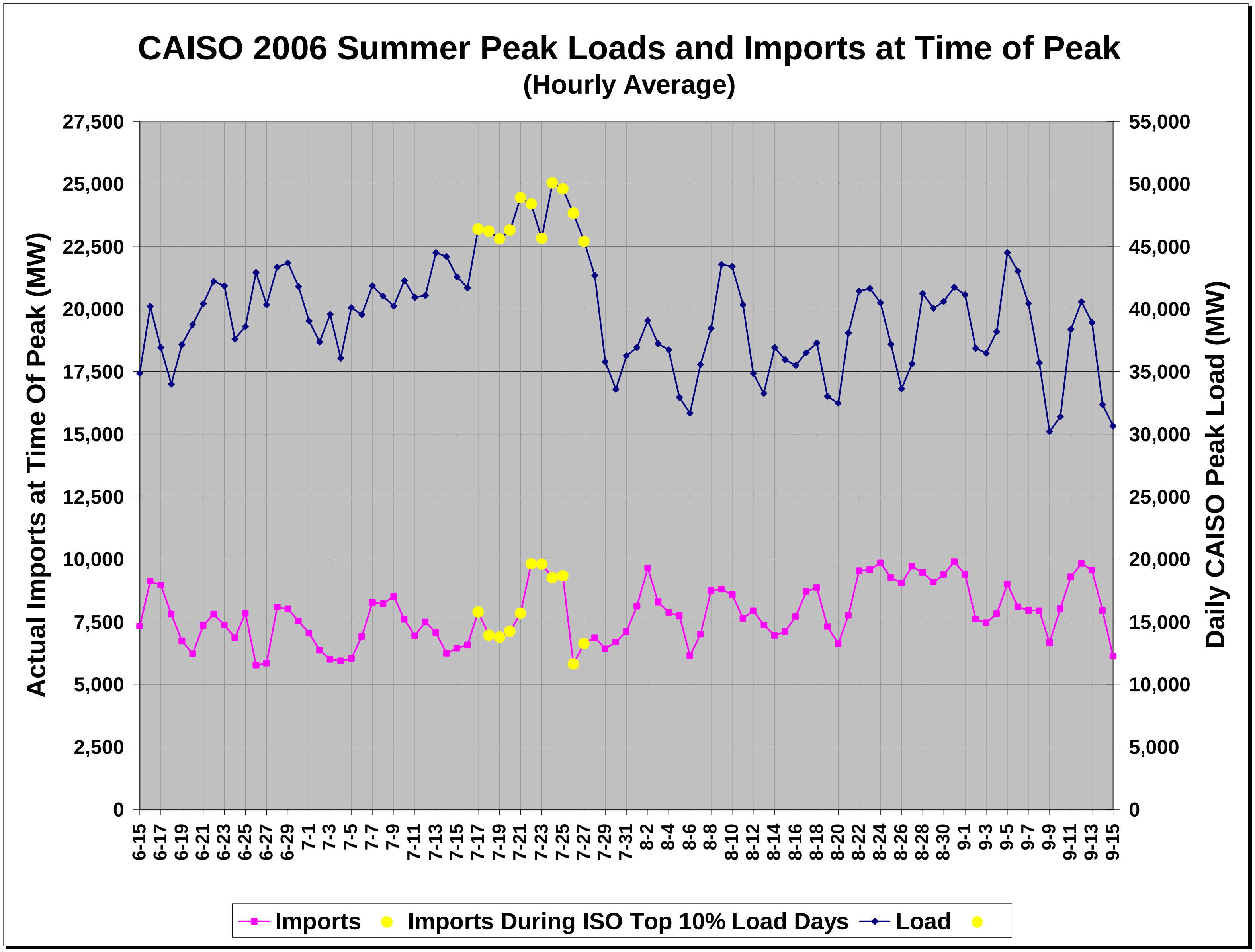

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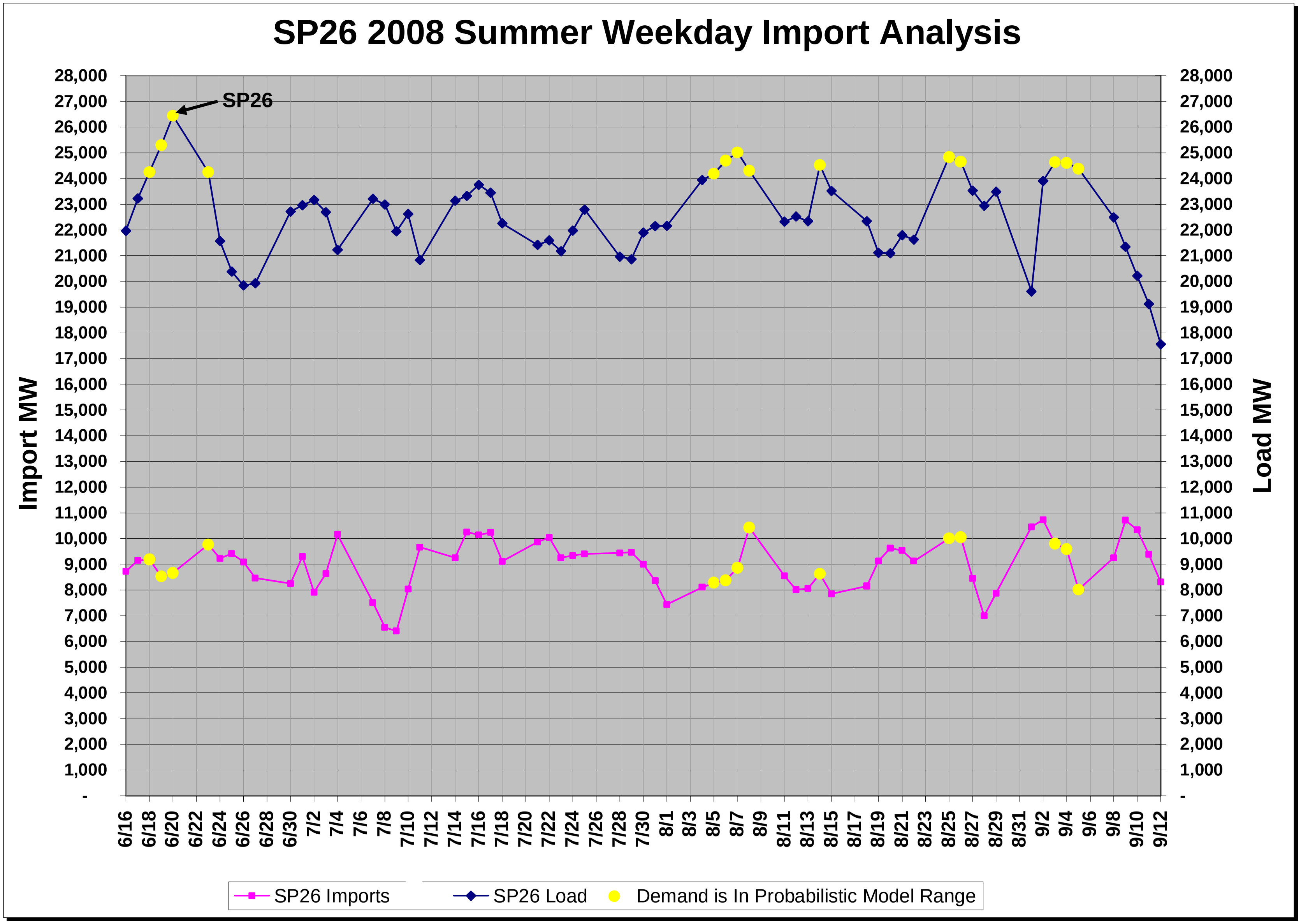

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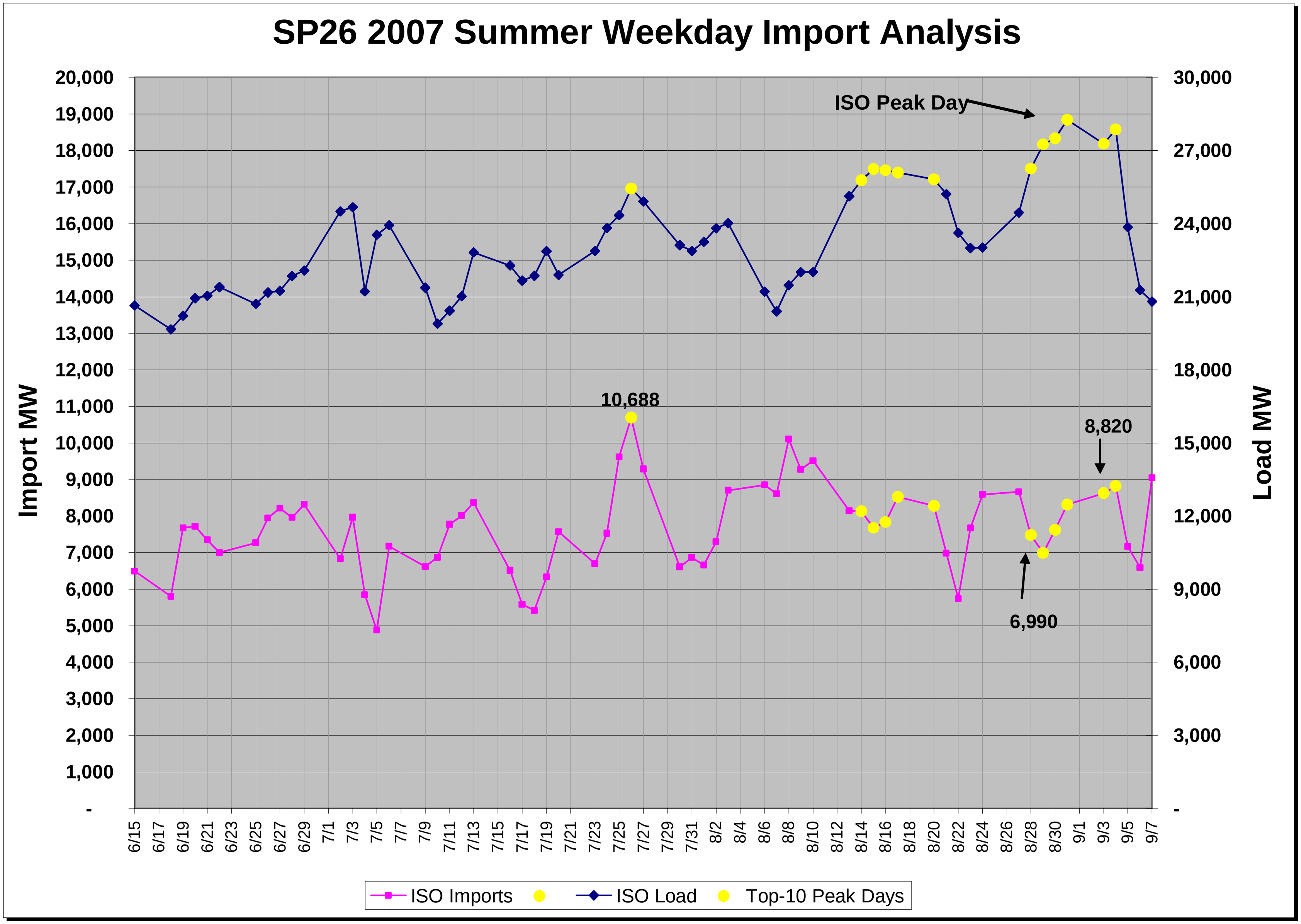

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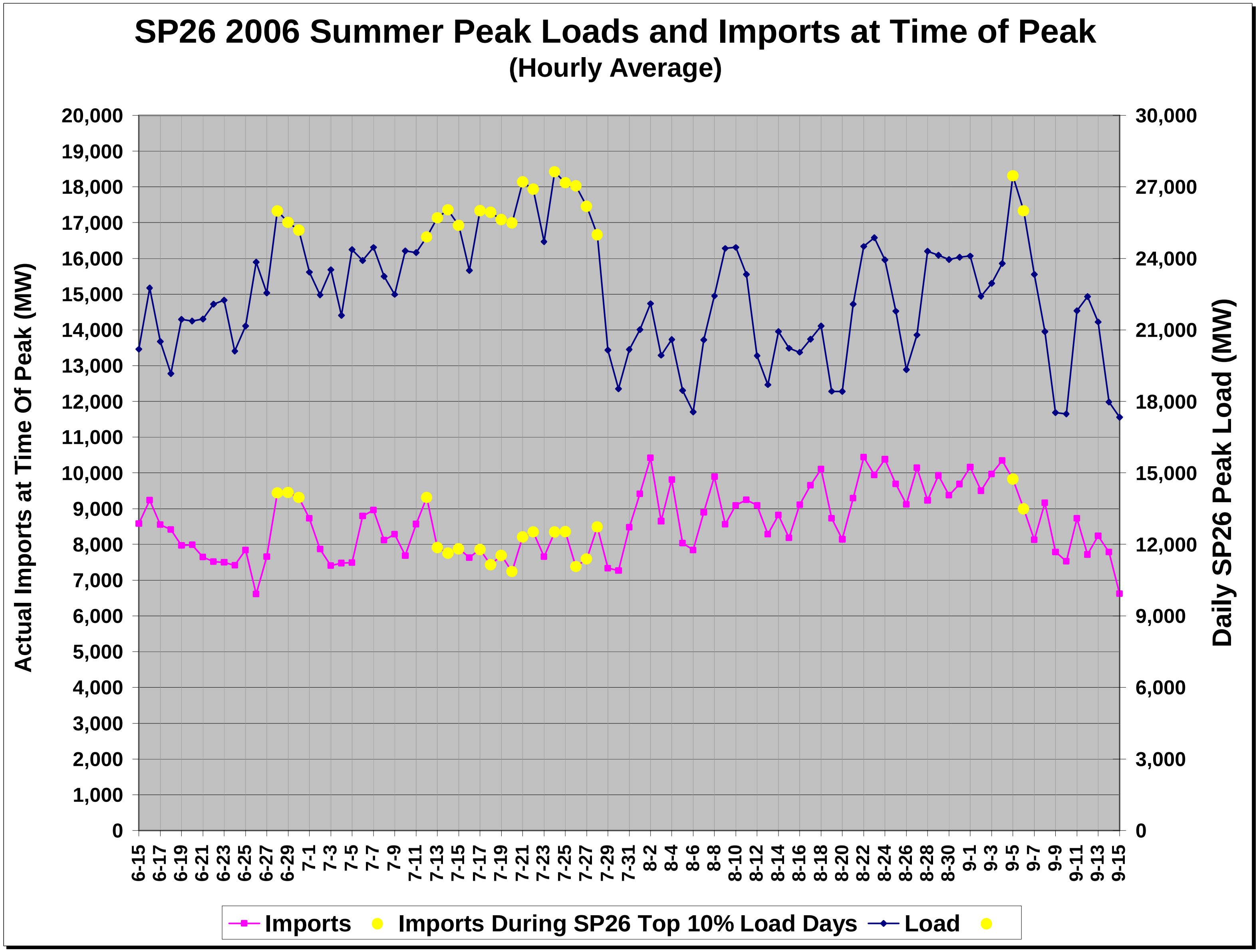

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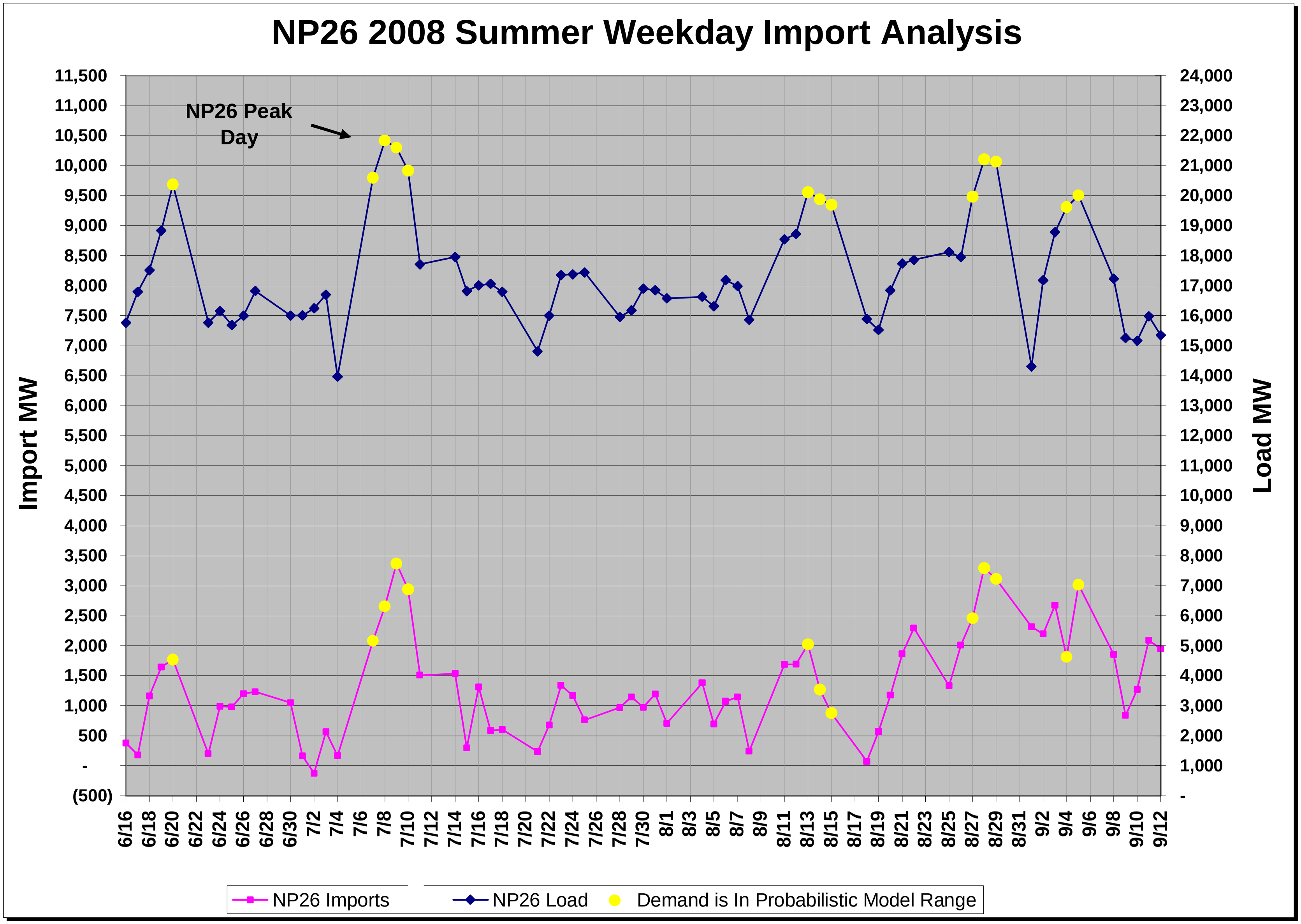
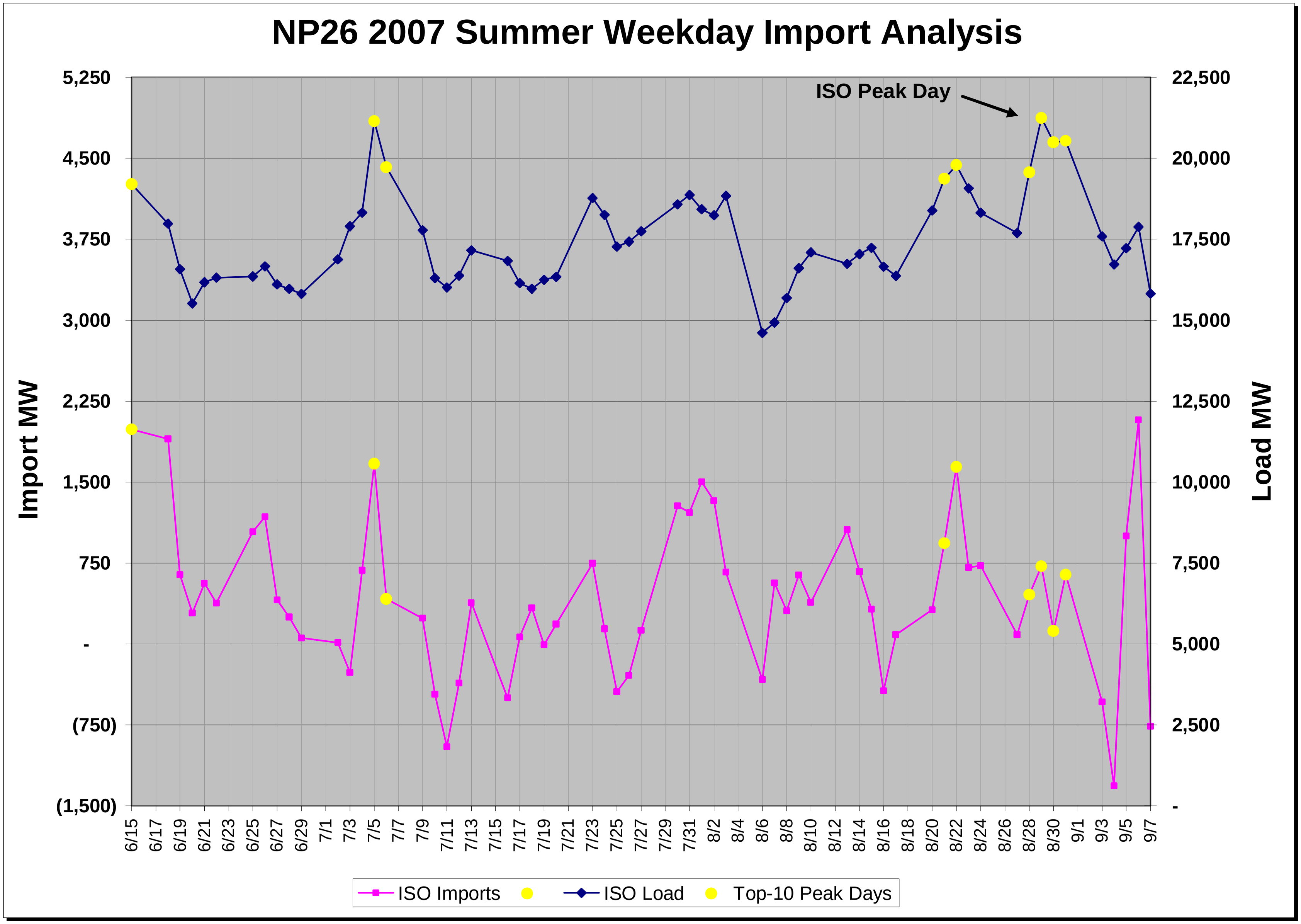


Appendix B – Continued



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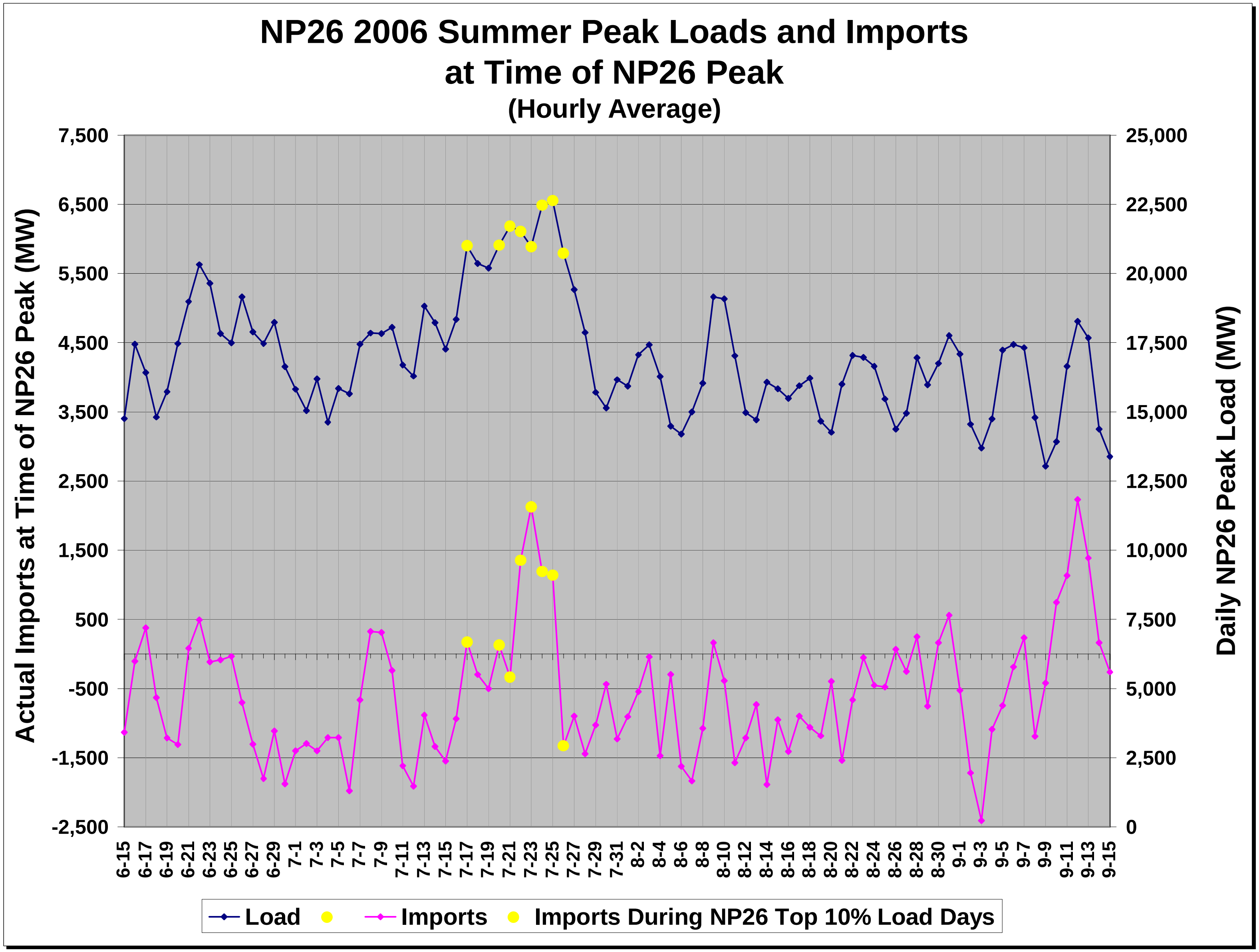
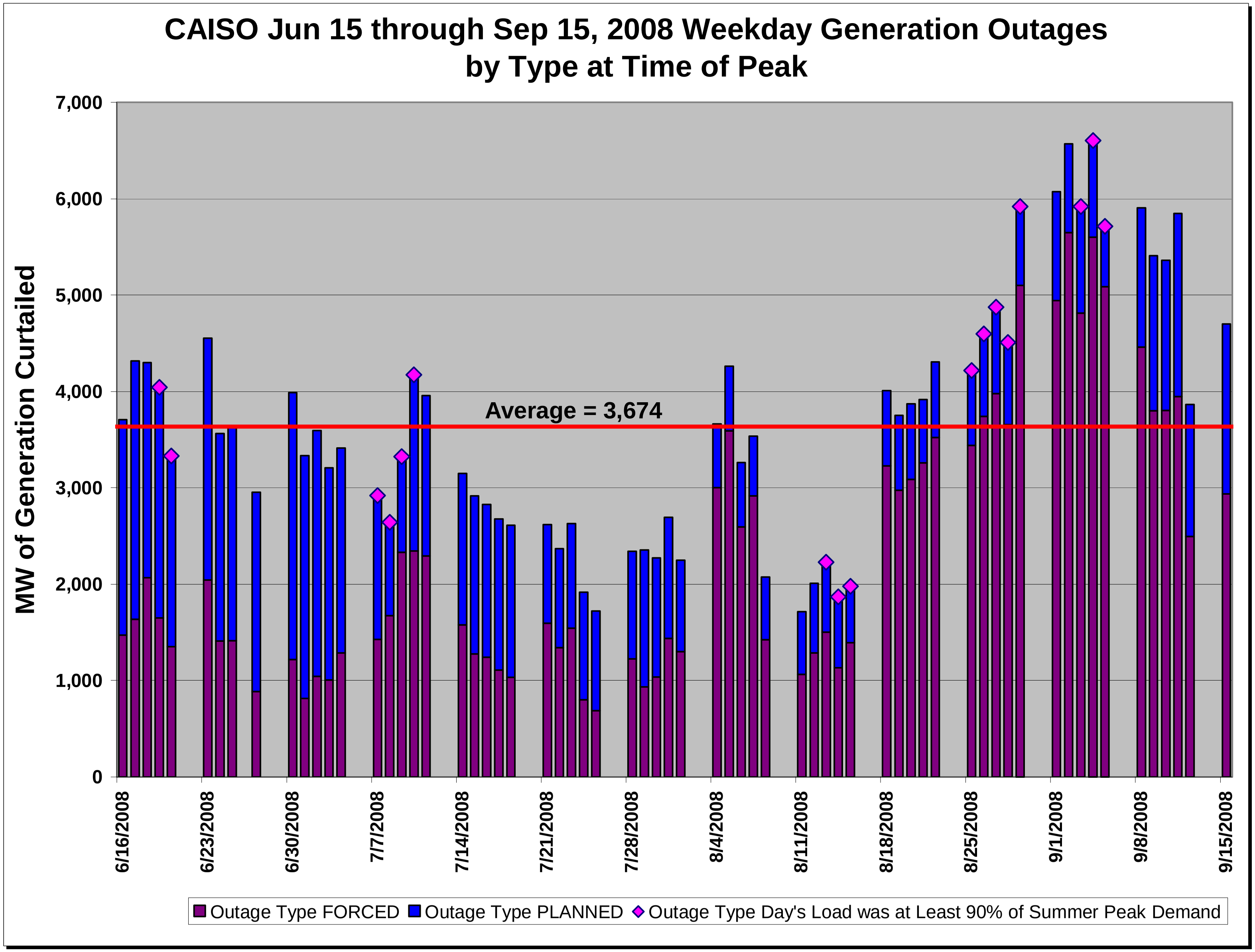


Appendix C: 2006 – 2008 Summer Generation Outage Graphs



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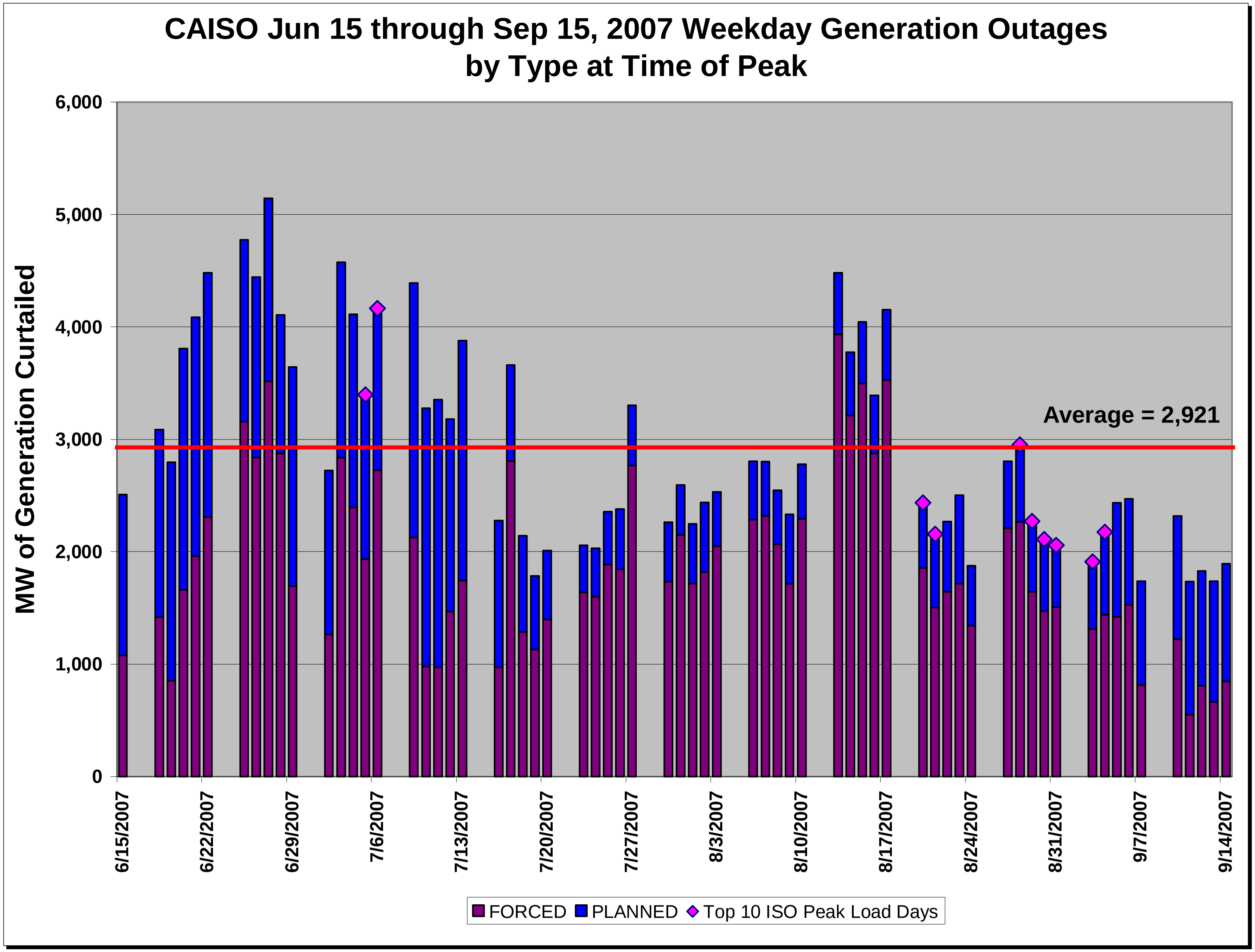

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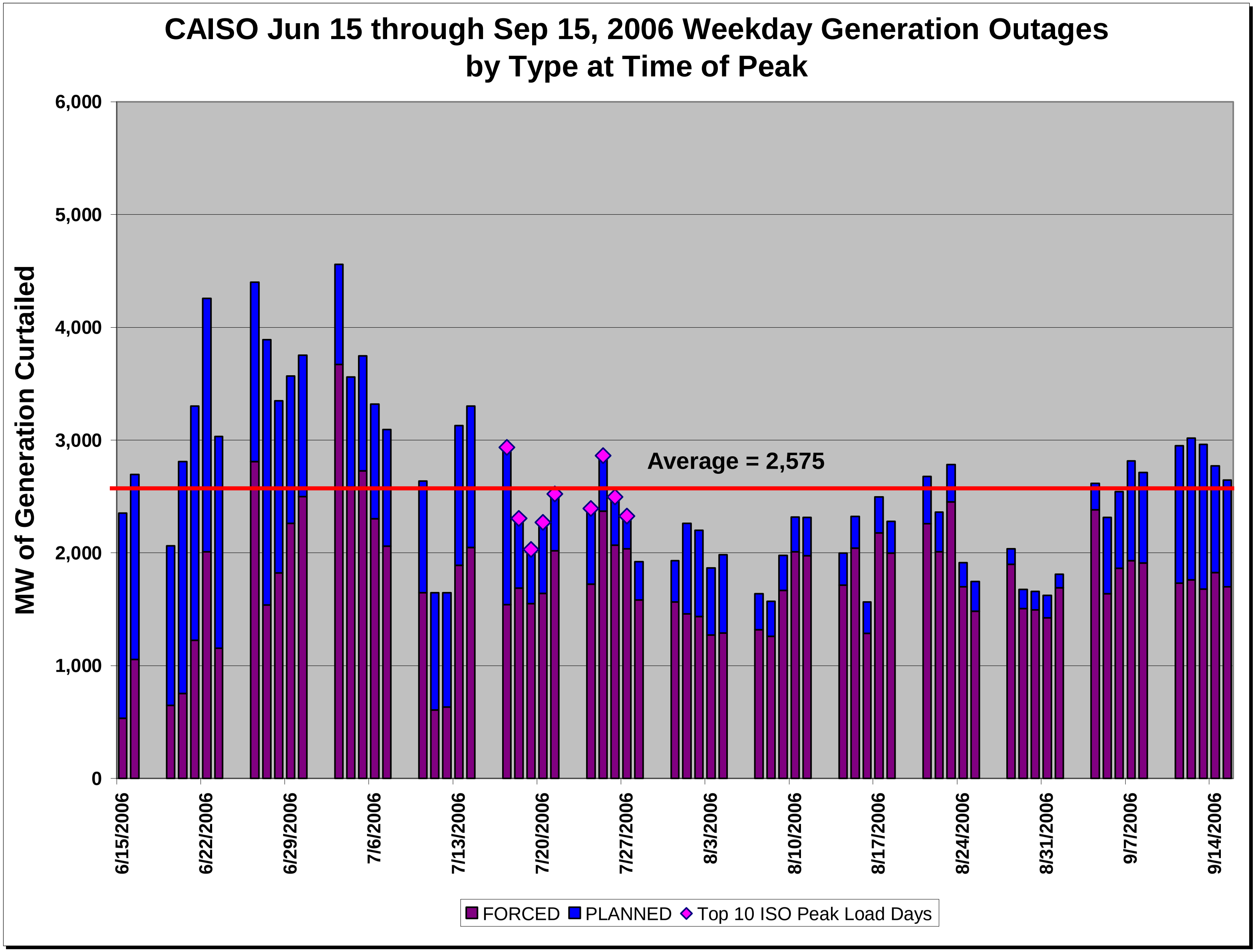

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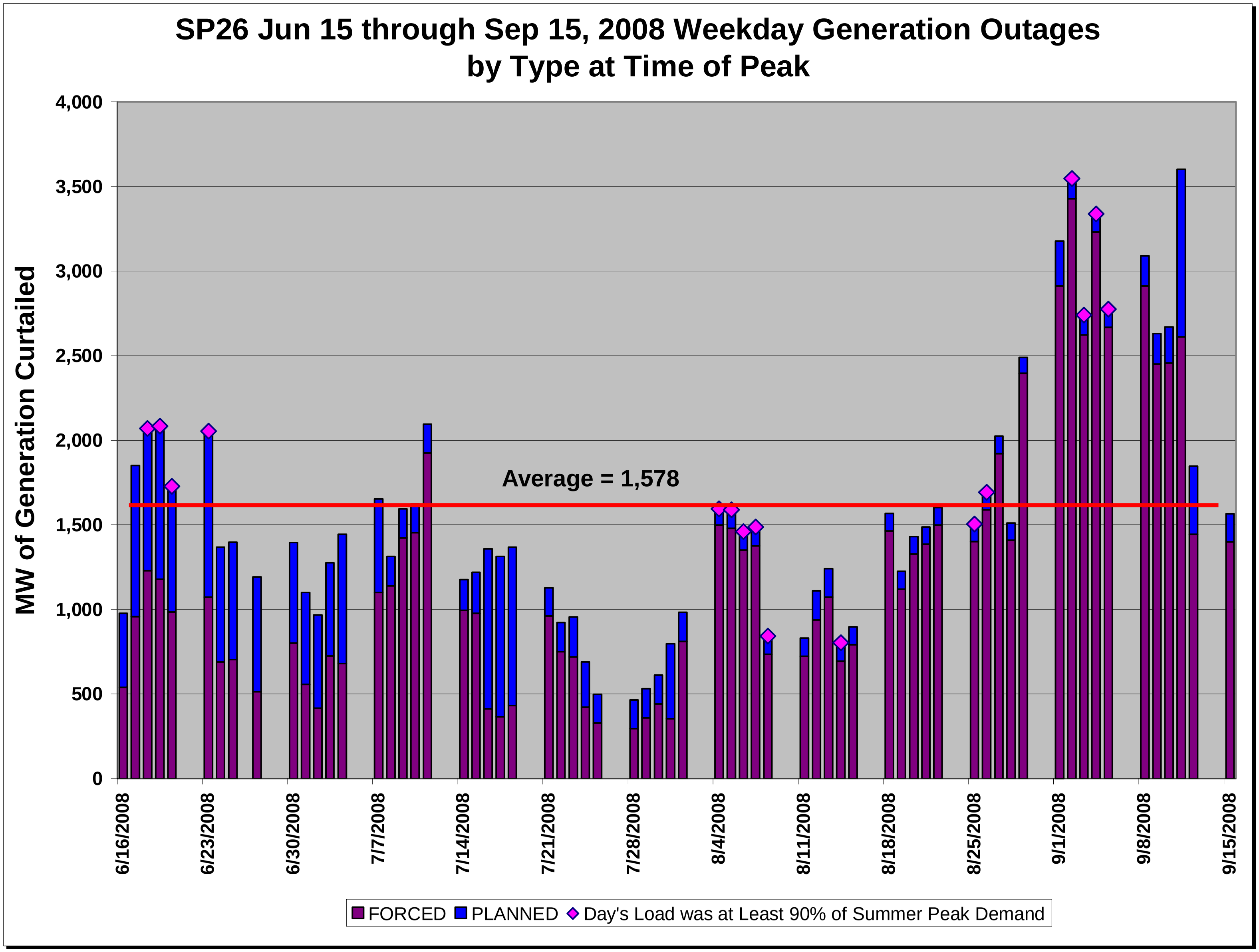

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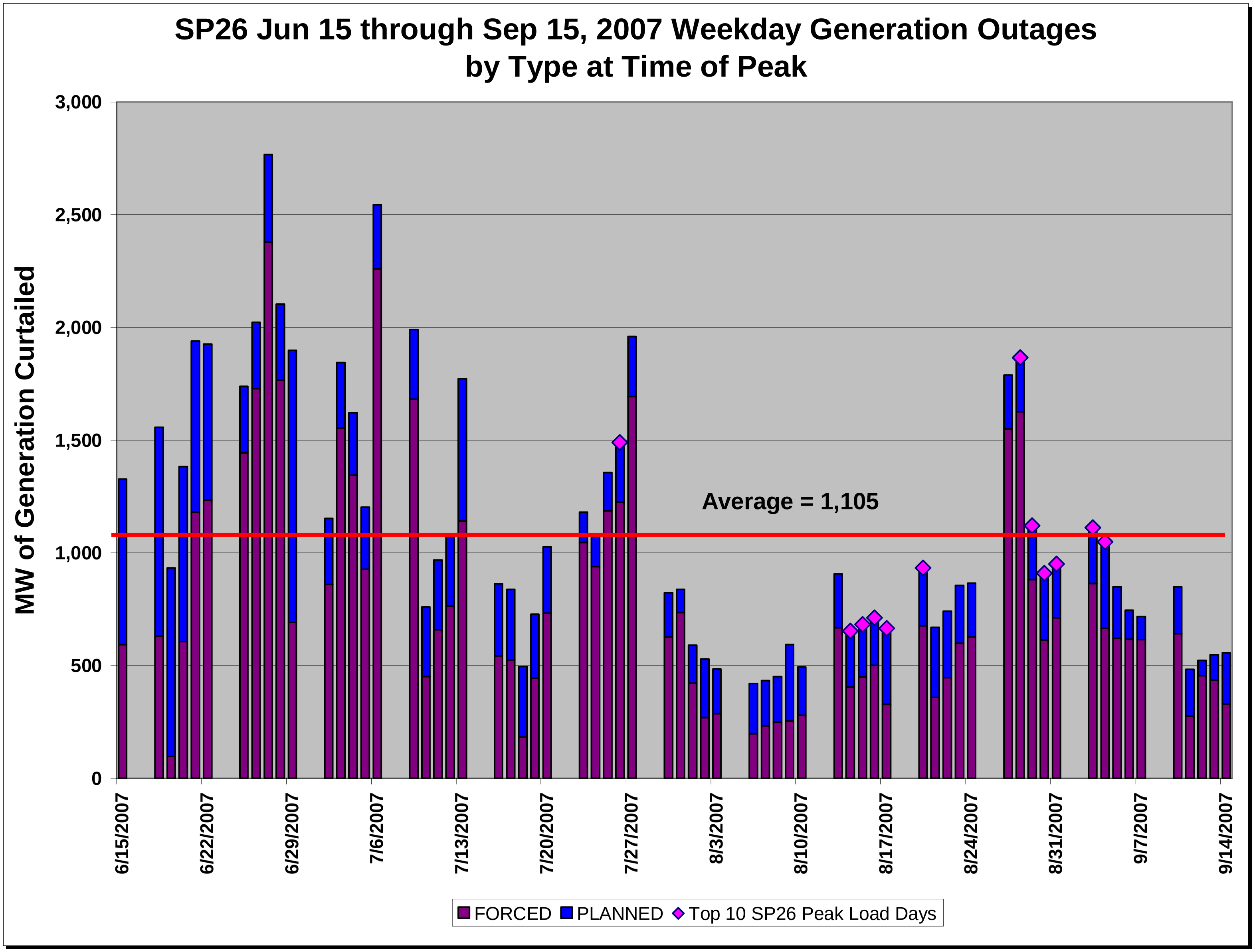

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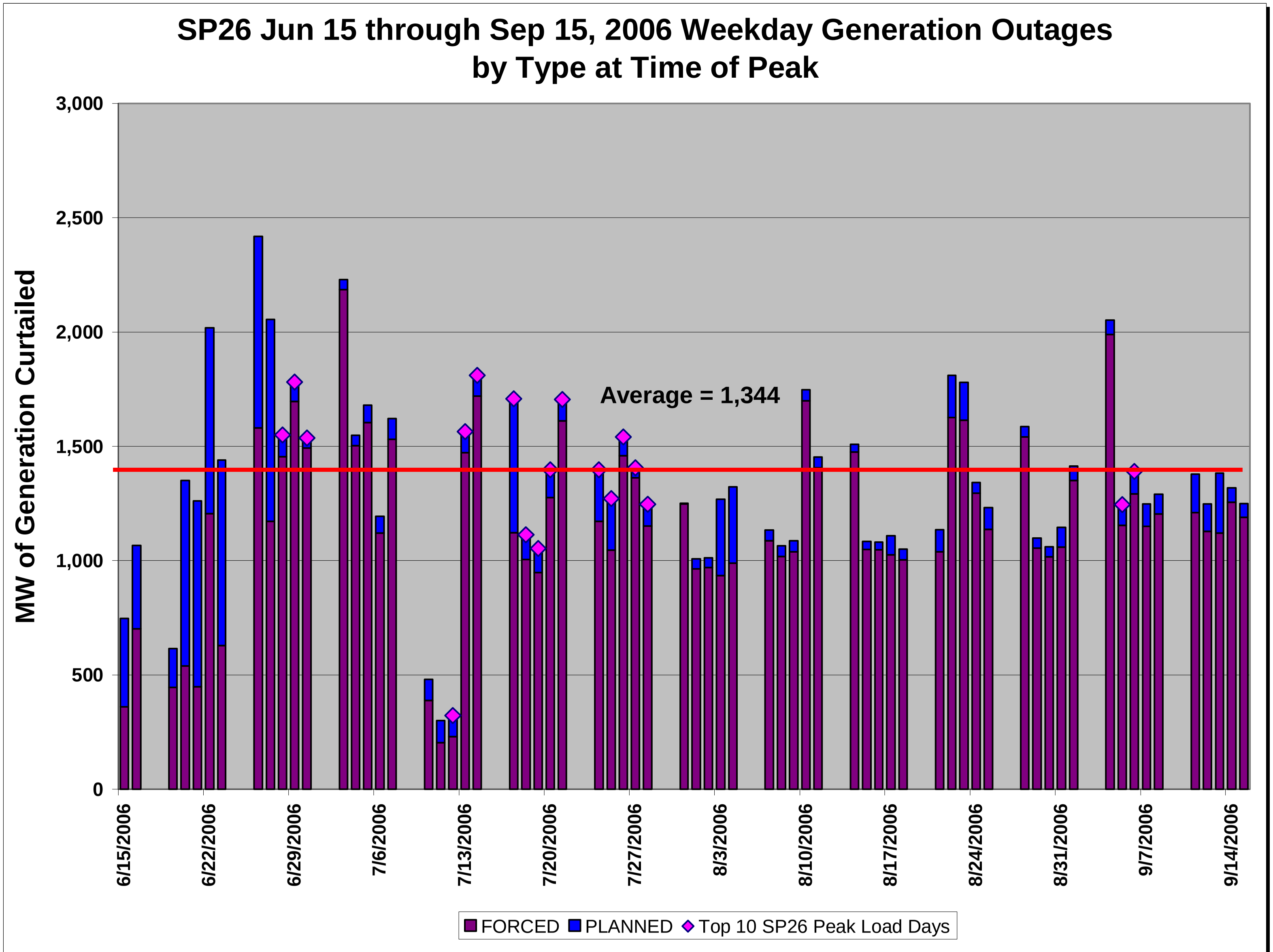

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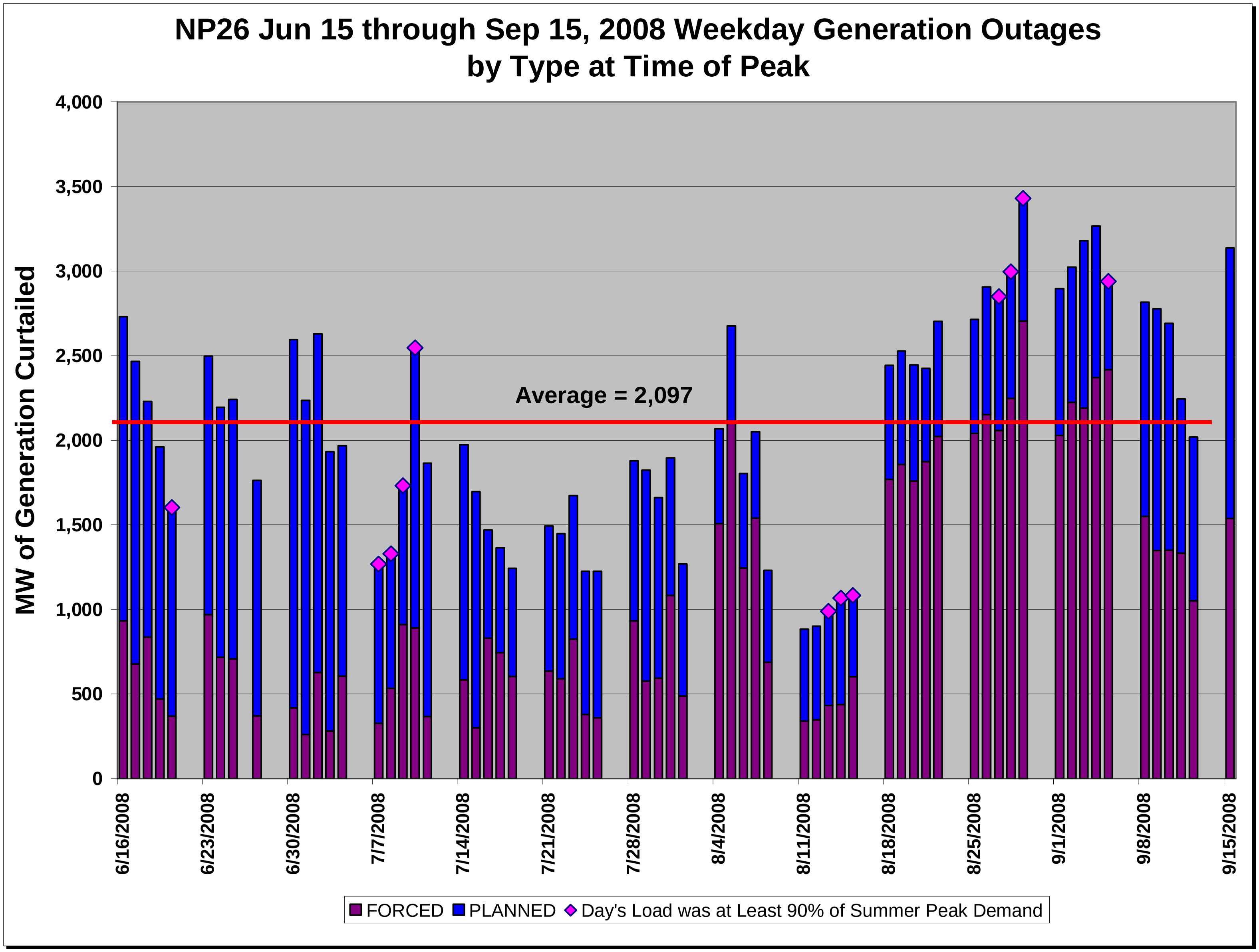

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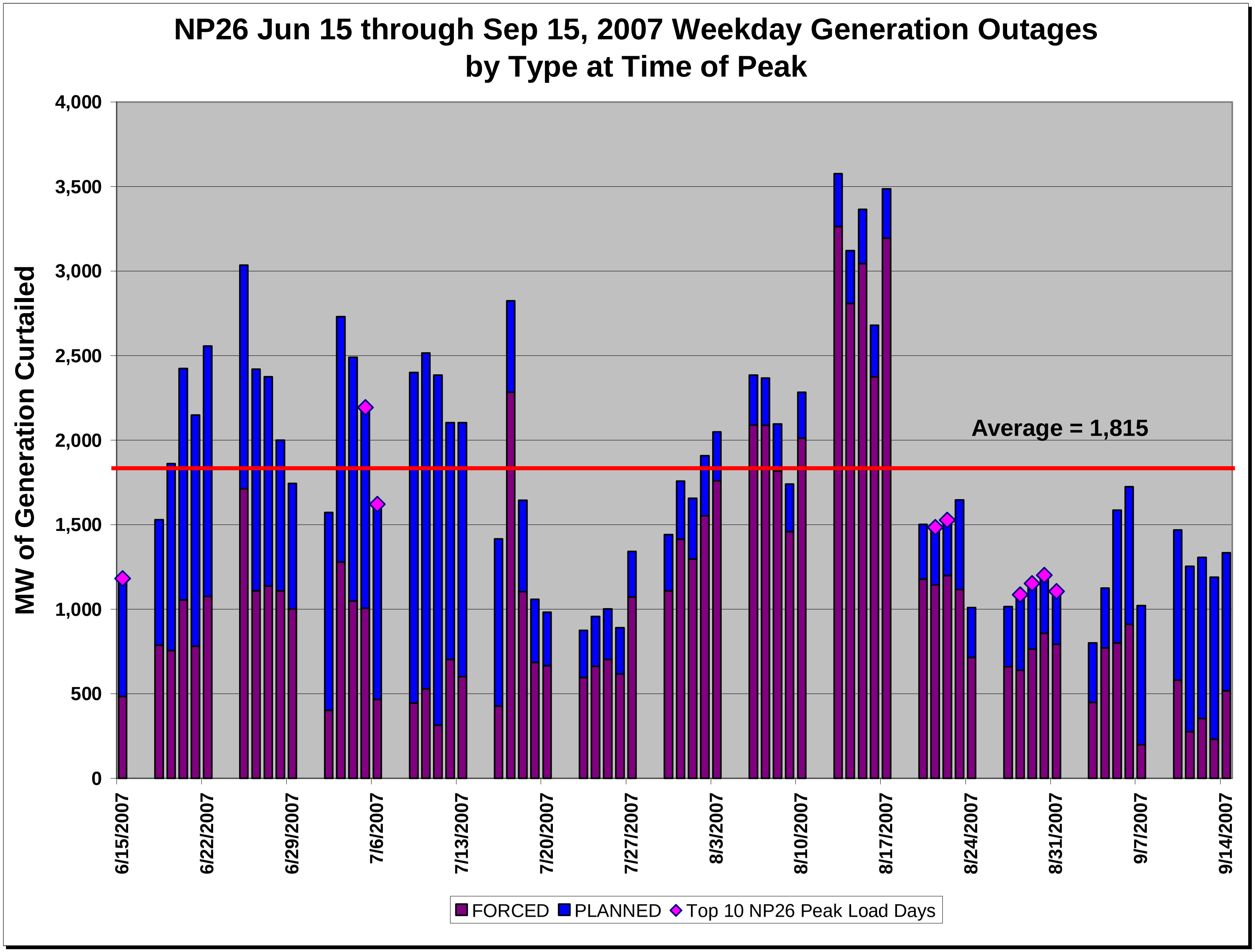
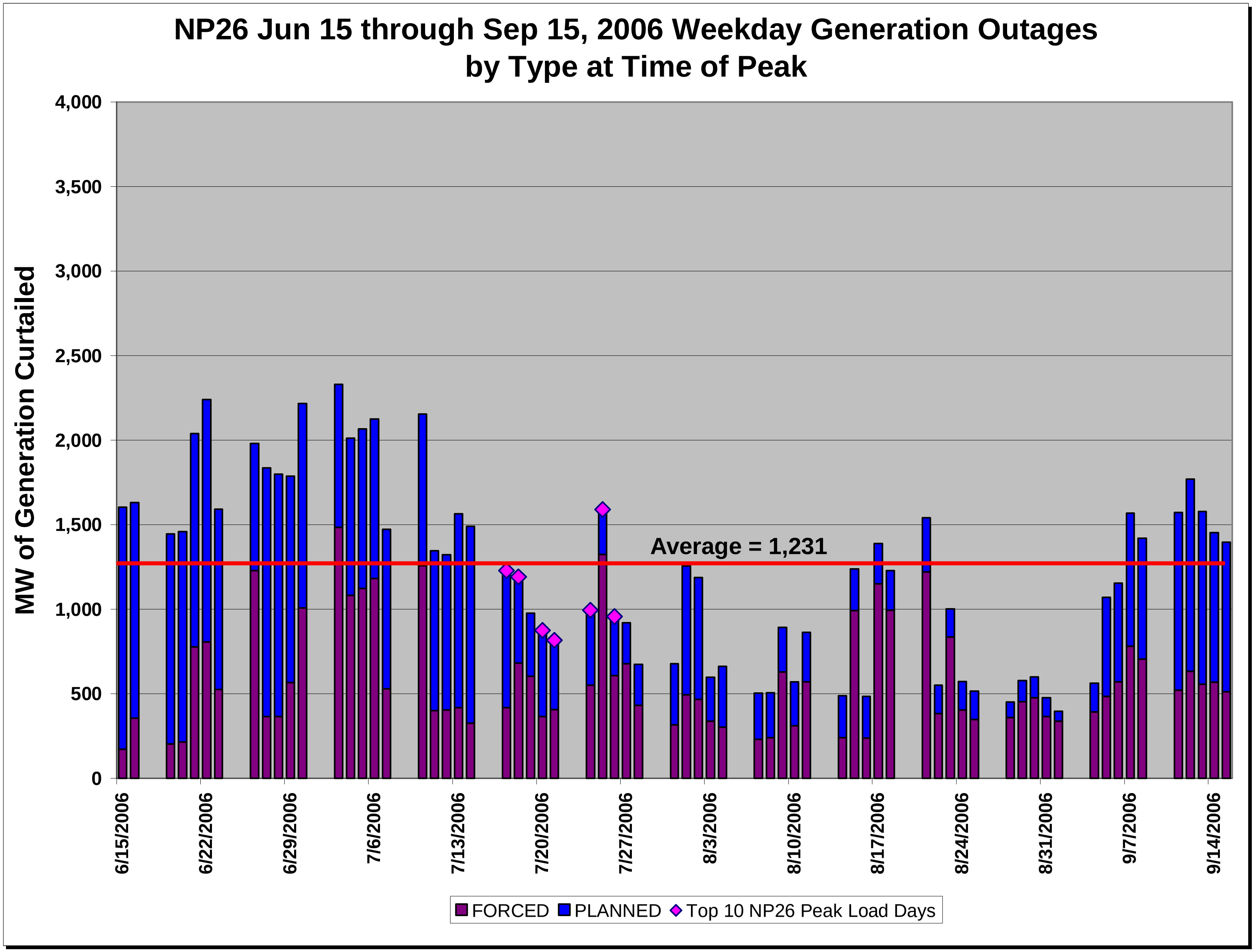
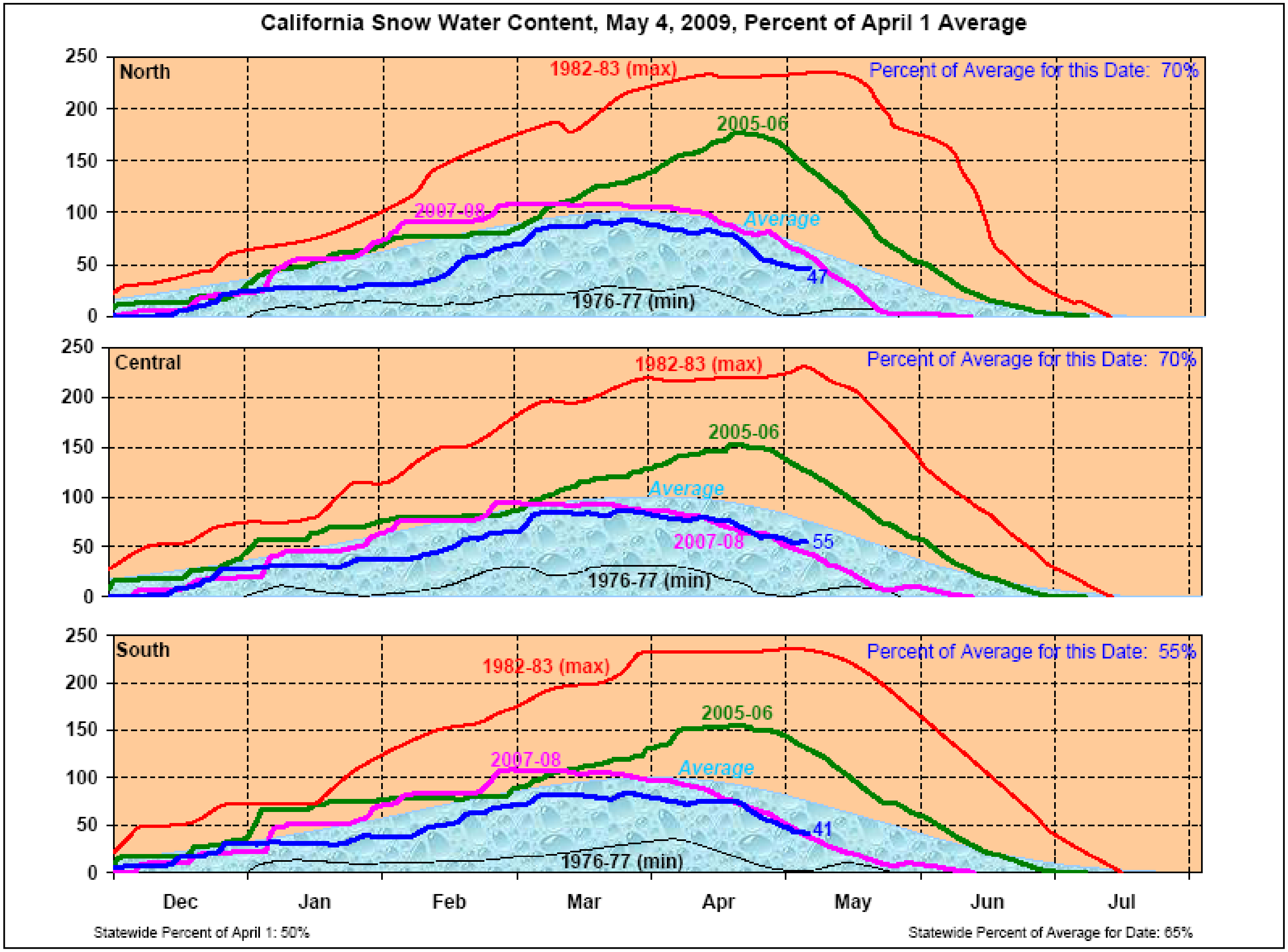


Appendix C – Continued

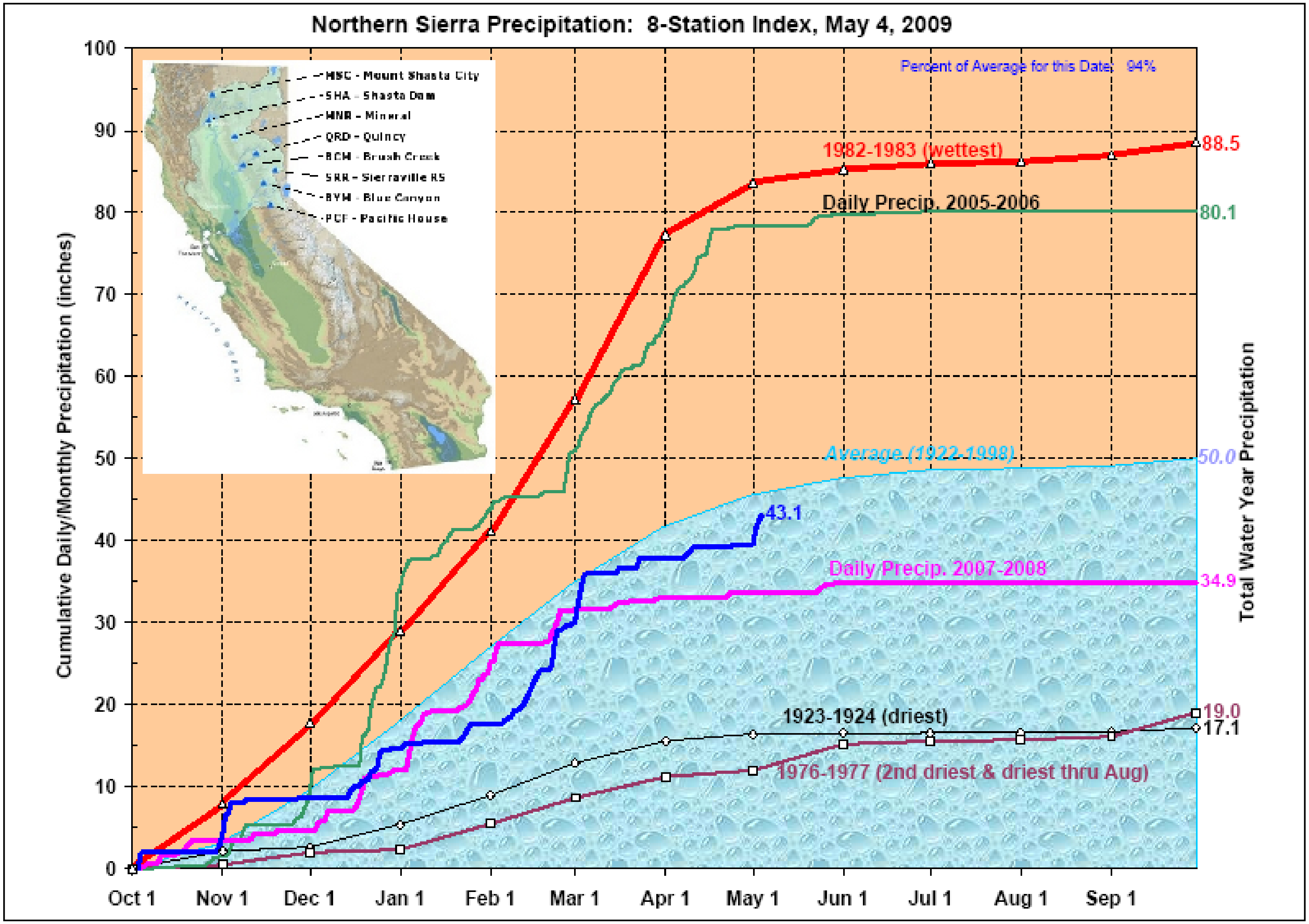


Appendix D: 2009 California Hydro Conditions



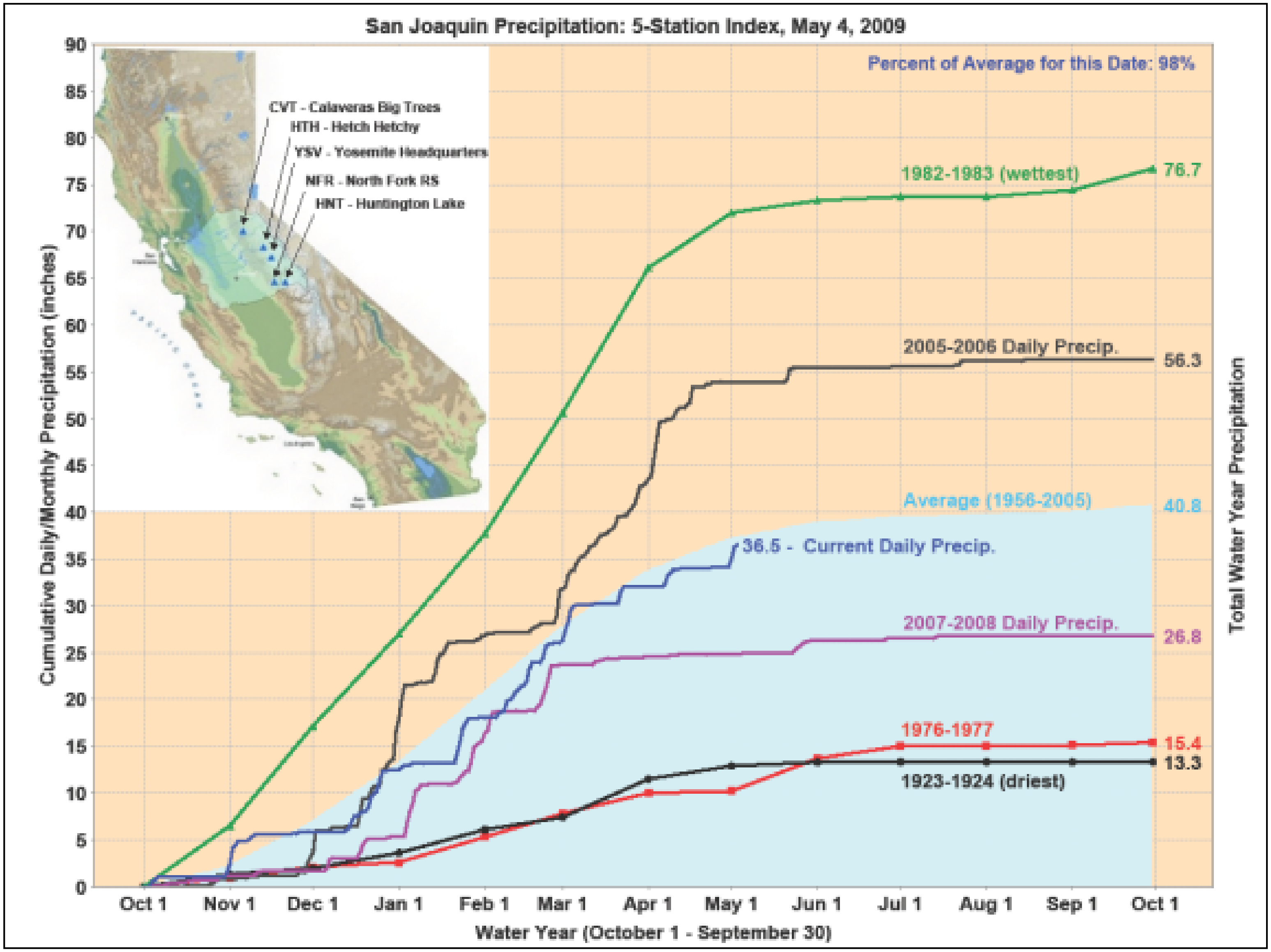
Source: California Department of Water Resources

Appendix D – Continued



Source: California Department of Water Resources

Appendix D – Continued



Source: California Department of Water Resources

Appendix D – Continued

California Reservoir Storage Summary

Ending at midnight - 05/06/2009

For selected reservoirs in Northern and Southern California

Water Storage

Reservoir Name	StaID	Reservoir Capacity (AF)	Current Storage (AF)	Current % of Capacity	Historical Average Storage	Current % of Average	Storage Last Year This Date	Current % of 2008
TRINITY RIVER								
TRINITY LAKE	CLE	2,447,700	1,272,713	52%	2,075,209	61%	1,677,290	76%
SACRAMENTO RIVER								
SHASTA	SHA	4,552,000	3,133,631	69%	3,986,116	79%	2,927,318	107%
FEATHER RIVER								
OROVILLE	ORO	3,537,600	2,173,298	61%	2,968,240	73%	1,716,577	127%
STANISLAUS RIVER								
NEW MELONES	NML	2,420,000	1,290,220	53%	1,484,467	87%	1,402,934	92%
TUOLUMNE RIVER								
DON PEDRO	DNP	2,030,000	1,370,301	68%	1,479,485	93%	1,384,142	99%
SAN LUIS CREEK								
SAN LUIS	SNL	2,039,000	925,750	45%	1,833,859	50%	1,399,592	66%
Total Storage (AF)		17,026,300	10,165,913	**60%**	13,827,376	**74%**	10,507,853	**97%**

AF - Acre Feet

http://cdec.water.ca.gov/cgi-progs/reservoirs/RES

Source: California Department of Water Resource