California Independent
System Operator Corporation

California ISO

2008 Summer Loads and Resources Operations Preparedness Assessment

April 28, 2008

Grid Assets
California ISO
Version 1.0

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I. Executive Summary

This 2008 Summer Operations Loads and Resource Operations Preparedness Assessment (Assessment) is designed to provide the California Independent System Operator (CAISO) and interested parties an assessment of the supply and demand picture for the ensuing summer season. In the development of this year's Assessment, the use of deterministic and probabilistic methodologies were employed to characterize the current state of the 2008 summer supply and demand situation to help the CAISO 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 CAISO needs to take action to mitigate the risk of outages. 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 2008 summer peak load period for the CAISO system, and the South of Path 26 (SP26) and North of Path 26 (NP26) sub-regions or zones. This Assessment describes the inputs used in the analyses such as 2008 summer peak demand, 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 2008 summer peak demand periods.

The California Public Utilities Commission (CPUC) Resource Adequacy (RA) program standards require 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 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 2008 summer months. 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 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 CAISO regardless of contractual arrangements; both because Scheduling Coordinators are only required to schedule energy to meet 95% of their forecast day-ahead requirement and to better understand how the system will respond under contingencies when all resources within the CAISO could be called on to perform. Although there may be some resources within the CAISO that do not receive a contract under the RA program and contract with entities outside the CAISO, those arrangements tend to be short-term, and such units continue to provide system stability to the CAISO 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 CAISO 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 the variety of circumstances that can lead to any given set of operating conditions.

Table 1 is the supply and demand outlook for the 2008 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 the California Energy Commission (CEC) assumed import levels for its 2008 Supply and Demand Outlook, which are based on what the CEC assumes the physical system is capable of delivering into the CAISO.

While Table 1 shows 489 MW of new generation coming on-line by the summer of 2008, a total of 1,800 MW are expected to come on-line by the end of calendar year 2008 and a total of 2,800 MW are expected by summer 2009 (since the end of summer 2007). It should be noted that a significant portion of this new generation will be intermittent generation such as wind generation. California is transitioning to a vastly different electricity system in response to renewable, greenhouse gas, and water quality goals. As the CAISO generating fleet transitions into a lower carbon, higher renewable, hybrid system, the CAISO 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.

Table 1

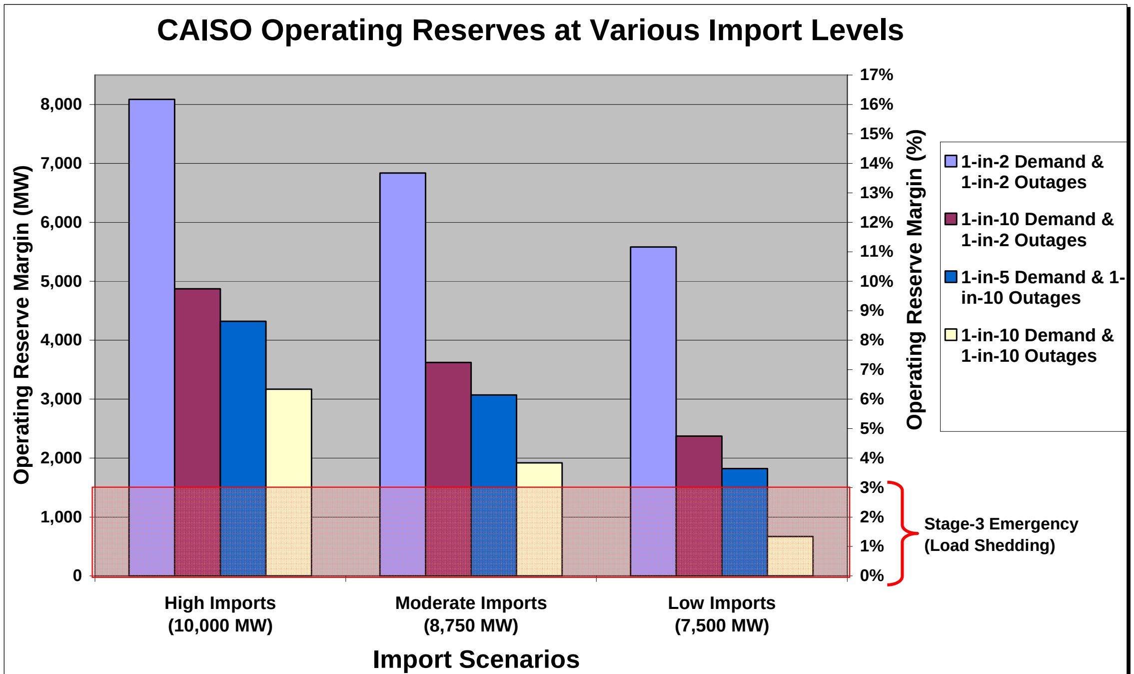
Summer 2008 Outlook - CEC Assumed Imports

Resource Adequacy Planning Conventions	**CAISO**	**SP26**	**NP26**
Existing Generation	47,716	22,376	25,349
Retirements (Known)	-122	-122	0
High Probability CA Additions	489	442	47
Net Interchange	10,350	10,100	250
Total Net Supply (MW)	58,432	32,796	25,646
Demand (1-in-2 Summer Temperature)	48,900	28,331	21,969
DR & Interruptible Programs (80% of CPUC 2008 estimates)	2,130	1,427	703
Planning Reserve[1]	**23.9%**	**20.8%**	**19.9%**

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

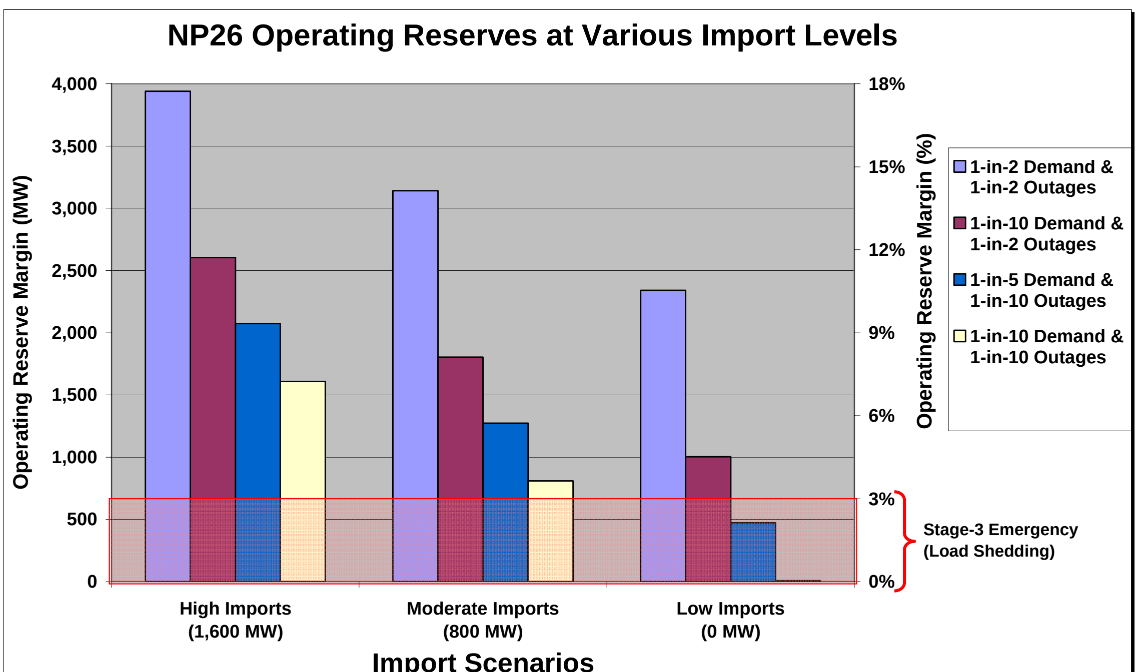
Figures 1, 2 and 3 are graphical representations of the deterministic analysis results, including 1-in-2 and 1-in-10 generation and transmission outages/curtailments, and 1-in-2, 1-in-5 and 1-in-10 peak demand scenarios for the CAISO, NP26 and SP26. The assessment of theses extreme conditions allows the CAISO to frame the electric system challenges and focus management effort on measures that will minimize possible impacts. Figures 1 and 2 show that the only scenario where the shedding of firm load occurs in the CAISO and NP26 are the low import scenario coupled with the 1-in-10 peak demand/1-in-10 outage scenarios. These are low probability occurrences. It is worth noting, however, that voluntary conservation and on-call interruptible loads will need to be utilized in a number of other, more likely scenarios. While voluntary conservation is encouraged and can exist outside of formal programs, voluntary conservation is also a component of more formal demand response programs that are triggered at CAISO declared Stage 1 Emergencies when operating reserve margins fall below 7%. On-call interruptible loads may be called upon by CAISO during declared Stage 2 Emergencies when operating reserve margins fall or are expected to fall below 5%. A Stage 3 Emergency is called when operating reserve margins reach approximately 3%.

Figure 1



Notes:
⇨Demand based on 1-in-2 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 2



Notes:
⇨Demand based on 1-in-2 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 3 shows that, similar to years past, conditions are more difficult in SP26. As a result voluntary conservation and on-call interruptible loads could be needed more frequently than normal. This highlights one of the main purposes of this Assessment, which is to focus the CAISO and the industry on conditions and contingencies that pose the greatest risk to reliability. This process of collectively focusing on the issues of greatest concern helps every one involved to be better prepared to take appropriate measures during adverse conditions, mitigating the risk of outages. Although resources are tight this summer in SP26, the outlook for summer 2009 improves when approximately 1,700 MW of expected additional generation comes on line in southern California. Meanwhile, it is the CAISO'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 during the wildfires in southern California last year.

Figure 3

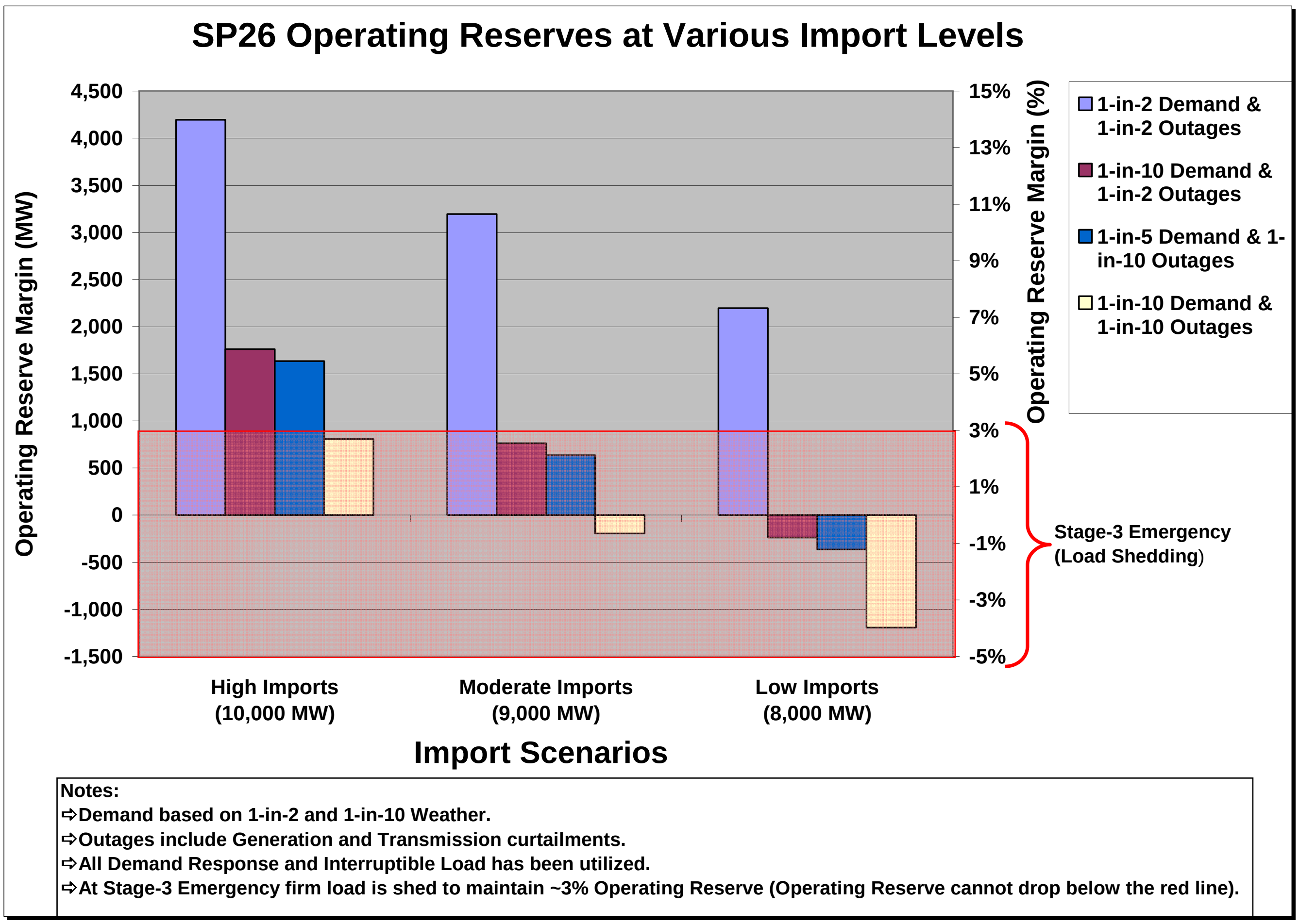


Table 2 contains the results of the probabilistic model showing the probabilities of Stage 1, 2 and 3 emergencies (defined in Table 2), based on scenarios using a range of high, moderate and low import levels. The probabilities in Table 2 are not based on the discrete 1-in-2 and 1-in-10 peak demand and outage scenarios described in Figures 1, 2 and 3 above. Peak demand, generation and transmission outages/curtailments are based on a full range of forecast possibilities, ranging from the 1-in-1 to the 1-in-100 probability events, for the moderate import scenario. The full range of demands for the high and the low import scenarios were modified as described in the footnotes in Table 2. Explanations for the modification of these scenarios can be found in the Probabilistic Analysis section of this report.

Table 2

Operating Reserve Margins - Probability of Occurrence based High, Moderate & Low Import Scenarios

CAISO

Import Scenario Range (MW)	7% Operating Reserve Before DR	5% Operating Reserve After DR, Before Interruptibles	3% Operating Reserve After DR and Interruptibles
10,000 - 7,500[1]	30%	13%	3.7%

SP26

Import Scenario Range (MW)	7% Operating Reserve Before DR	5% Operating Reserve After DR, Before Interruptibles	3% Operating Reserve After DR and Interruptibles
10,000 - 8,000[1]	47%	31%	10%

NP26

Import Scenario Range (MW)	7% Operating Reserve Before DR	5% Operating Reserve After DR, Before Interruptibles	3% Operating Reserve After DR and Interruptibles
1,600 - 0[1]	28%	10%	3.8%

[1] **Import Scenario Ranges**
- ⇨ High Import Case Demand Floor made a 1-in-2 Event
- ⇨ Moderate Import Case used Full Range of Demand
- ⇨ Low Import Case Demand Events Between 1-in-5 & 1-in-20 Removed

Notes:
- ⇨ Normal Hydro
- ⇨ Demand Response and Interruptible Load effectiveness of 80%
- ⇨ 356 MW of Net New Generation (new generation - retirements)

Based on full range of:
- ⇨ Weather related Peak Demands
- ⇨ Generation outages and Transmission curtailments

Operating Reserve Emergency Trigger Points
- ⇨ Stage-1 Emergency, 7% Operating Reserves, allowing DR to be utilized
- ⇨ Stage-2 Emergency, 5% Operating Reserves, allowing DR to be utilized
- ⇨ Stage-3 Emergency, 3% Operating Reserves, firm load shedding begins

Supply for the summer 2008 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 SP26 under a variety of conditions is essential to maintaining adequate supplies during high demand and/or high outage conditions. Conservation and demand response programs will continue to be important this summer and have an increasingly important role in years to come. The CAISO is counting on the continued success and further refinement of the Resource Adequacy program. The CAISO 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 generation additions are on track to meet the expected increased supply needs for 2009, concerted efforts are needed to ensure that generation is added to replace generation under pressure to retire as well as to meet ongoing load growth.

As with all forward looking supply and demand evaluations, this Assessment is based on various forecasts and engineering judgments that rely heavily on historical information in estimating available future supply and demand. The CAISO 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 2007 Operations

Demand

Figure 4 shows the daily peak demand for the CAISO system, and the two zones NP26 and SP26. The 2007 summer was fairly typical where the NP26 summer highest peak demand was earlier in the summer while the SP26 summer highest peak demand occurred later in the summer. The system peaked on August 31, 2007. Weather conditions during the 3-day period from August 29 through August 31, 2007 were roughly equivalent to 1-in-2 weather in NP26 and closer to a 1-in-10 weather event in SP26. The weather front that brought warmer temperatures moved from north to south, so that NP26 experienced its peak for the week on August 29 and SP26 peaked on August 31.

Figure 4

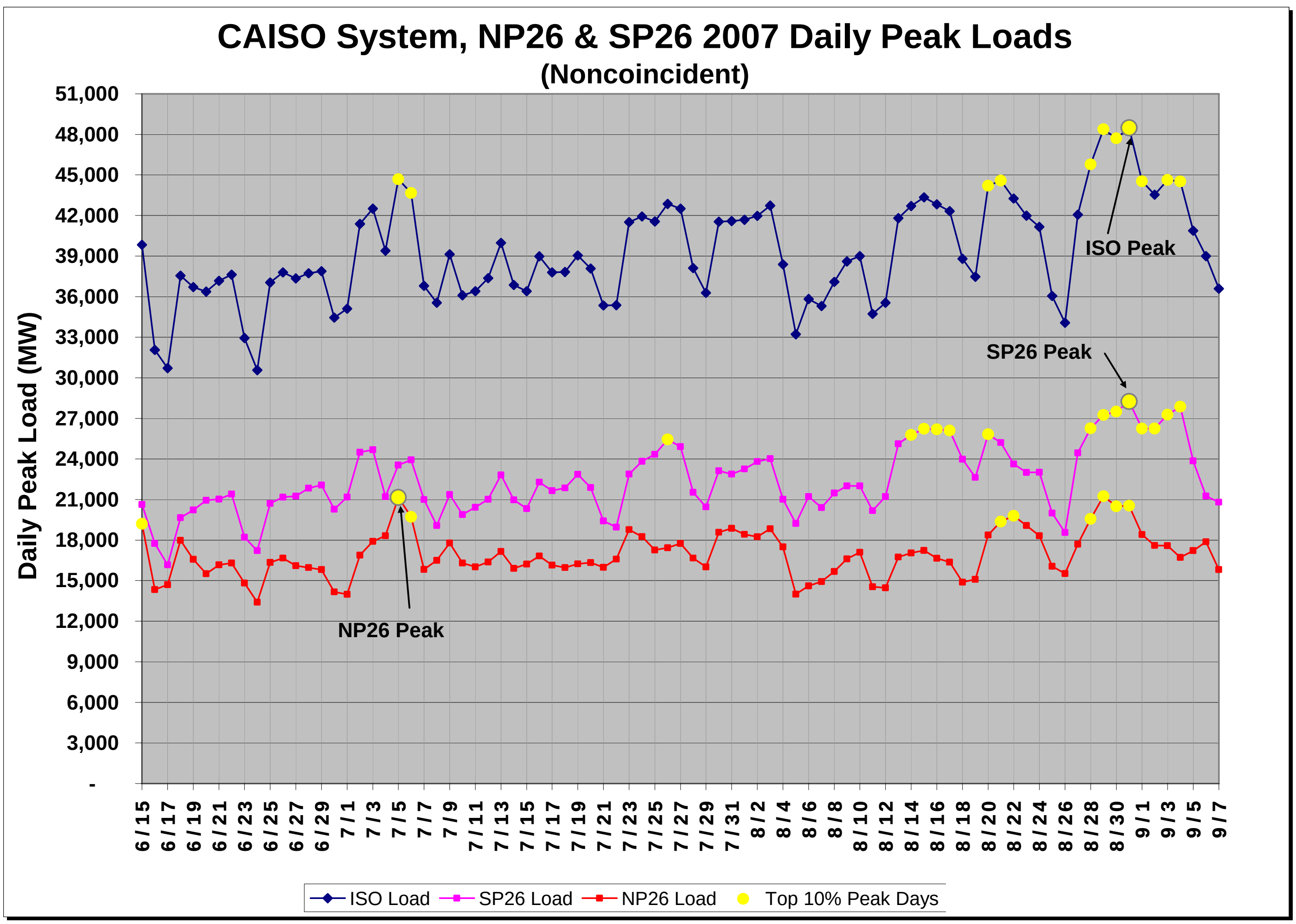


Table 3 shows the difference between actual 2007 peak loads and the 2007 1-in-2 and 1-in-10 forecast peak demand.

Table 3
(Hourly Average Demand)

CAISO Peak Actual Peak Demand vs. Forecast							
	2007 1-in-2 Forecast	**2007 Actual**	**2007 1-in-10 Forecast**	**Difference from 1-in-2 Forecast**		**Difference from 1-in-10 Forecast**	
	MW	**MW**	**MW**	**MW**	**%**	**MW**	**%**
ISO Control Area	47,847	48,490	50,609	643	1.3%	(2,119)	-4.2%
SP26	27,189	28,251	28,783	1,062	3.9%	(532)	-1.8%
NP26	21,268	21,245	22,661	(23)	-0.1%	(1,416)	-6.2%

Generation Outages

There were no extraordinary generation outage events during the 2007 summer. Graphs in Appendix C show the weekday hour-ending 1600 outage amounts for the 2006 and 2007 summer seasons (excluding weekends and holidays). The average of the forced and planned outages for the CAISO during the period of June 15 through September 15 for 2006 and 2007 are 2,575 and 2,921 respectively.

Renewable Resources and Wind Generation

California is a national leader in the development of renewable resources as it positions itself at the forefront of diversifying resources and reducing greenhouse gases. Renewable resources, including wind, solar, geothermal, biomass and small hydroelectric, currently comprise approximately 6,000 MW of installed generation in the CAISO. These resources delivered more than 21 million megawatt-hours of energy to California electric customers in 2006. This represents 11% of the total energy required to serve load in the CAISO controlled grid. To further develop environmentally friendly power, the state of California enacted a 20% Renewables Portfolio Standard (RPS). This statute requires each retail seller of energy to deliver sufficient energy from renewable resources to serve 20% of retail load by December 31, 2010.

The CAISO has two significant initiatives to facilitate the development and integration of renewable resources. First, the Participating Intermittent Resource Program (PIRP) was put in place to better integrate wind generators into the hour-ahead markets. This program was a major breakthrough because it provides an opportunity to forecast and schedule energy production from intermittent generating resources. It enables wind generators to participate in the CAISO markets without being penalized for the inherent intermittency of wind generation. Second, in 2006 the CAISO led a new initiative with the FERC to address locationally constrained remote resources. The program provides a financial mechanism for fostering transmission upgrades that enable renewable resources in remote areas to connect with the CAISO grid.

In 2007 the CAISO initiated a study and published a report on the “Integration of Renewable Resources” to help policy makers understand the unique requirements that are necessary to ensure that the operation and design of the transmission grid fully supports this renewable standard. This analysis is another major initiative by the CAISO that addresses the transmission and operational impacts of interconnecting the wave of renewable resources that will be coming on line. The report analyzes the issues, documents the results, and recommends steps that should be implemented to reliably integrate the planned intermittent resources.

The report is available at http://www.caiso.com/1ca5/1ca5a7a026270.pdf.

Because California has large quantities of renewable resources already on-line, a significant amount of historical data is available to accurately model and forecast future performance of the various types of renewable resources. Small hydroelectric, biomass and geothermal generation are more predictable resources, and the integration of these resources into both the markets and operations do not present significant problems. Concentrated solar is an intermittent resource, but the amount of generation from this resource is still small, so it does not result in significant integration issues. The amount of concentrated solar generation is expected to increase to more than 1,000 MW by the 20% RPS date, however, this amount will be substantially less than the more than 4,000 MW of anticipated new wind generation.

Wind generating facilities are the fastest renewable resource to install and interconnect to the power grid. Wind generation presents enormous benefits as well as significant operational challenges. Wind generation energy production is extremely variable, and in California, it often produces its highest energy output when the demand for power is at a low point. During some periods of the year, wind generation is hard to forecast because it does not follow a predictable day-to-day production pattern.

Typically, during the summer, wind generation peaks when the total system load is low and is at its lowest production levels when the total system load is high. Figure 5, shows the variation of average hourly wind generation and the actual wind generation (red dots) at the time of the daily system peak load during the week with the hottest average temperatures within the CAISO-controlled grid in 2006.

Figure 5

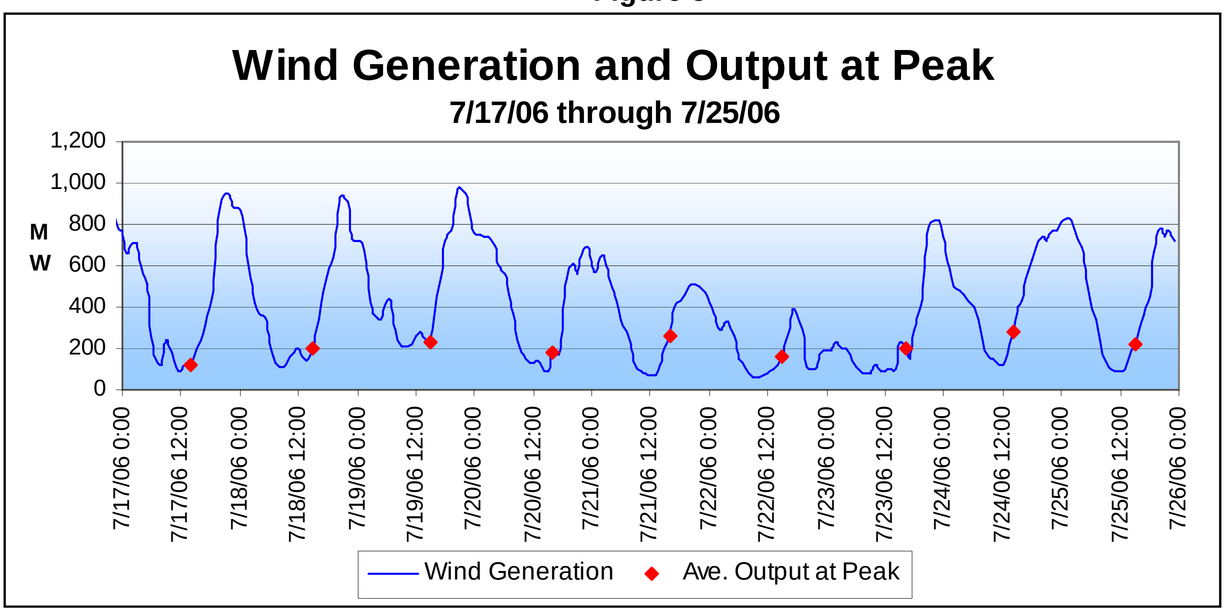


Table 4 represents the three-year average installed capacity and generation produced from wind units over the peak hour for each month. This method was utilized to represent the historical contribution of wind at time of monthly peak demand. It is recognized that there are numerous, as well as more rigorous methods, for determining the capacity available from wind resources during peak periods. The calculation of wind generation's capacity contribution is not a high level concern for this Assessment, but will become more of an issues as wind generation in the CAISO increases.

Table 4

CAISO 3-Year Average Wind Generation at Time of Daily Peak (2005-2007)

CAISO

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Nameplate	2,608	2,608	2,608	2,678	2,684	2,684	2,684	2,684	2,684	2,684	2,592	2,592
Generation	657	293	463	43	323	502	434	287	219	52	187	123
Average CF	25%	11%	18%	2%	12%	19%	**16.2%**	**10.7%**	**8.1%**	2%	7%	5%

SP26

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Nameplate	1,309	1,309	1,309	1,329	1,329	1,329	1,329	1,329	1,329	1,329	1,293	1,293
Generation	590	196	373	26	186	406	346	173	52	34	159	77
Average CF	45%	15%	29%	2%	14%	31%	**26.0%**	**13.0%**	**3.9%**	3%	12%	6%

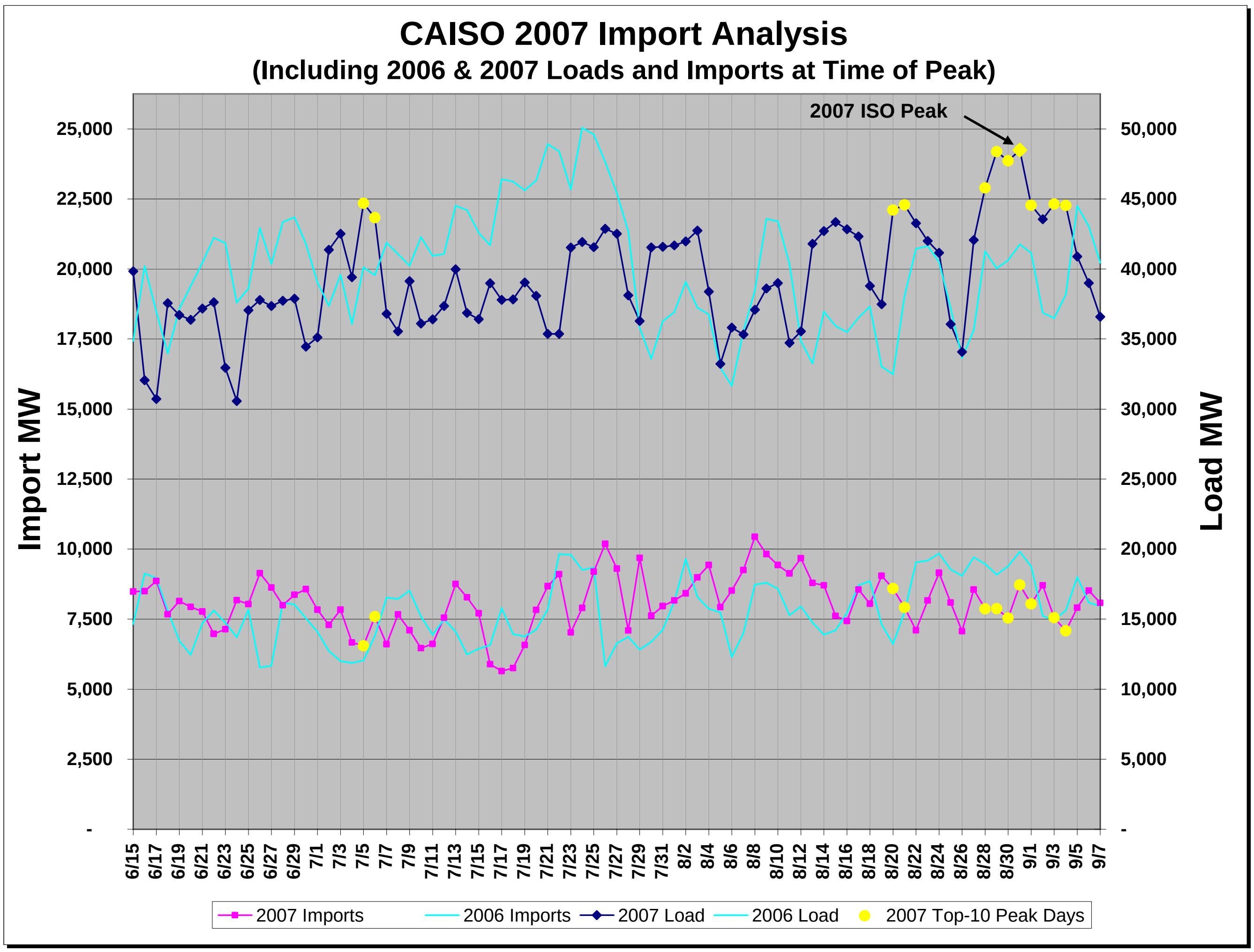
NP26

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Nameplate	1,279	1,279	1,279	1,310	1,316	1,316	1,316	1,316	1,316	1,316	1,279	1,279
Generation	74	105	102	24	150	102	94	120	182	23	32	51
Average CF	6%	8%	8%	2%	11%	8%	**7.1%**	**9.1%**	**13.8%**	2%	2%	4%

Net Interchange/Imports

Figure 6 shows the 2006 and the 2007 peak hour loads and the net interchange over the peak hour during the summer peak load period. This graphical representation of the daily peaks and the imports at time of peak provides some insight into the relationship between peak load and import levels. While there are numerous factors that contribute to the level of interchange between the CAISO and other balancing authorities, Figure 6 does provide insight into the typical range of imports for various load levels. Appendix B contains graphs of daily peak demand and import levels at time of peak for the CAISO, SP26 and NP26.

Figure 6



III. Summer 2008 Assessment

Generation

The CAISO maintains a list of generation within its balancing area for its network modeling purposes that includes units that are under an agreement with the CAISO as well as a small number that are not. While not all units are under the CAISO's dispatch, they all play a role in meeting the loads within the balancing area. Table 5 breaks out the total capacity of units within the CAISO by those units that are CAISO-dispatched units under Participating Generator Agreement (PGA) with the CAISO, Qualifying Facilities (QF) units that are under contract and are on the PGA of the purchasing entity, and Municipal Units, some of which are under a Metered Subsystem Agreement with the CAISO, but not all. In addition, CAISO Load Serving Entities (LSEs) either own or have long-term contracts for an additional 3,616 MW of capacity located outside the balancing area. These units are known as dynamically scheduled units and require firm transmission to be scheduled into the CAISO market.

Table 5 shows the both the Net Dependable Capacity (NDC) and the Net Qualifying Capacity (NQC). The NDC represents the maximum level a generating unit has demonstrated it is capable of maintaining, also know as Pmax. The NQC is based on the Resource Adequacy (RA) program's Qualifying Capacity calculation, which determines the maximum capacity eligible to be counted for meeting the resource adequacy requirement. Establishing qualifying capacity is used to determine a given resource's contribution toward meeting the year-ahead resource adequacy requirement of an LSE. NQC is a more realistic method for determining the actual capacity that should be available to meet peak load during the hours and ambient conditions seen at time of monthly peak demand. This is particularly true for renewable resources and energy limited resources that may demonstrate a capability to run at levels that are close to their nameplate ratings, but typically do not produce at those levels during summer peak load hours and conditions.

NQC values are developed for units that choose to be made available for RA contract with an LSE. Not all generators choose to be part of the RA capacity counting process and in those cases the NQC was assumed to equal the NDC. This allows for an approximation of total NQC available to the CAISO.

All together the CAISO has 48,136 MW of NQC physically within the balancing area and 3,616 MW of capacity that is outside the balancing area but obligated to an LSE within the CAISO. ***While the vast majority of this capacity is available to meet CAISO metered load, not all capacity can be counted as available to the CAISO and these numbers are shown for informational purposes only.***

Table 5

Market Participation Status	Net Dependable Capacity (MW)	Net Qualifying Capacity (MW)
Participating Units (Including QFs on their Own PGA)	44,492	42,546
QF Units Not on their Own PGA	9,271	4,956
Municipal Units	639	634
Total Capacity within the CAISO	54,402	48,136
Dynamically Scheduled Units	3,616	3,616
Total Capacity Available to the CAISO	58,018	51,752
Note: Not all MWs are available to meet CAISO Metered Load.		

Resource Type Breakdown

Table 6 provides a breakdown of the total generation in Table 5 by unit type. This list is further disaggregated to the individual market participant level in Attachment 1 to this Assessment. A market participant may be an individual unit or an aggregation of units forming a single market participant.

Table 6

CAISO Generator Breakdown (MW)		
Unit Type	**NDC**	**NQC**
BIOMASS	748	533
COGENERATION	1,948	1,225
COMBINED CYCLE	11,859	11,265
COMBUSTION TURBINE	6,559	5,513
GEOTHERMAL	1,507	1,163
HYDRO	6,653	6,077
HYDRO - PUMPED STORAGE	2,540	2,488
NUCLEAR	4,550	4,486
PEAKER - AGGREGATED	124	99
RECIPROCATING ENGINE	187	174
SOLAR - THERMAL	466	355
THERMAL	14,023	13,980
VARIOUS UNIT TYPES	489	163
WIND	2,751	617
TOTAL	54,402	48,136
Note: Not all MWs are available to meet CAISO Metered Load.		

Generation Additions & Retirements

As shown in Table 7, a total of 489 MW of additional generation capacity is expected to come on line by July 1, 2008. The Inland Empire Energy Center Units 1 and 2 have slipped beyond July 1 initial synchronization cutoff date. Unit 1 has been counted in the total since one of the two units could be available while in test mode or in commercial operation during different portions of the summer period. While it appears that the projects that have yet to come on-line are on track to meet the estimated initial synchronization date, the commercial operation date could be delayed, causing less than 489 MW of additional generation capacity to be available for the summer 2008 peak demand period.

Appendix E contains a table that shows the current list of generation that has a higher likelihood of becoming operational by the summer of 2009. While some of the estimated parallel dates are prior to the summer of 2008, those projects are not far enough along to be considered viable for 2008.

Table 7

Participating Generator Status - Generator Additions Between 9/1/07 and 7/1/08									
PGA Owner	**Resource Type**	**Est. Initial Sync. Date**	**Actual Initial Sync. Date**	**Actual COD Estimated COD**	**NP (MW)**	**Est. NQC (MW)**	**Project Type**	**Contract Type**	**PTO Area**
Bottle Rock Power / Bottle Rock Power Corporation	Geo	4/5/2007	4/5/2007	9/22/2007	55.0	17	New	PGA	PGE
Marina-LFG2 / Monterey Regional Waste Management District	IC	8/13/2007	8/20/2007	9/1/2007	2.6	2.6	New	PGA	PGE
Palo Alto COBUG/NCPA	IC	9/25/2007		10/15/2007	5.2	4.5	New	MSSAA	PGE
Puente Hills GTE Facility Phase II / County Sanitation District No. 2 of Los Angeles County	IC	11/10/2007		12/7/2007	9.3	9.3	Rule 21 No Export Conversion	QF PGA	SCE
Chowchilla Biomass / Global Common LLC	Bio	5/2/2008			12.5	11.6	Re-Power	PGA	PGE
El Nido / Global Common LLC	Bio	5/30/2008			12.5	11.6	Re-Power	PGA	PGE
Dillon Wind Project / PPM Energy, Inc.	Wind	2/27/2008	3/7/2008	4/18/2008	45.0	8.2	New	PGA	SCE
Garnet Energy Center	Wind	6/2/2008			6.5	1.2	New	PGA	SCE
Inland Empire Energy Center Unit 1 / GE	CC	5/4/2008		8/13/08	405.0	378	New	PGA	SCE
Inland Empire Energy Center Unit 2 / GE[1]	CC	6/21/2008		8/22/08	~~405.0~~	0	New	PGA	SCE
Wellhead Power Margarita / Wellhead Power[1]	CT	7/1/2008			49.0	45.6	New	PGA	SDGE
				NP26 subtotal	88	*47*			
				SP26 subtotal	920	*442*			
				CAISO Total	1,008	*489*			

(1) Projects with greater risk of not meeting Est. Sync. Date

Table 8 lists the units that have retired since summer 2007. No other retirements are expected, however, a generator is only required to give a 90 day notice prior to retiring.

Table 8

Generation Retirements Since Summer 2007									
Resource ID	**Generating Unit Name / Description**	**NDC (MW)**	**PTO Area**	**Owner or QF ID**	**ISO Classification**	**Unit Type**	**Fuel Type**	**Zone**	**Commercial Operating Date**
APPGEN_6_UNIT 1	AES PLACERITA INC. (AGGREGATE)	122	SCE	AES PLACERITA	COGENERATION	COMBINED CYCLE	NATURAL GAS	SP15	1/1/1988

The CAISO overall generation forecast for 2008 is built off the final NQC list for Compliance Year 2008, posted on December 11, 2007. 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 CAISO, SP26 and NP26 for the summer peak period shown in Table 9. The NQC values for the wind generation portion of Table 9 have been adjusted based on the information in Table 4. 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 CAISO total. If the CAISO 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 CAISO, it is possible that a small number of units could have contractual arrangements to deliver their production to an entity outside the CAISO.

Table 9

Total Generation In the CAISO for Summer 2008				
	NQC (MW)	**Additions for 2008 (MW)**	**Retirements (MW) prior to Summer 2008**	**Total Expected Capacity for 2008 (MW)**
ISO Control Area	47,716	489	122	48,083
SP26	22,376	442	122	22,696
NP26	25,349	47	0	25,396

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 and 2007 summer peak load period (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.

2008 Hydro Conditions

Hydro conditions in 2008 are expected to be normal for the Pacific Northwest as well as for the Southwest region. In California as of April 1, Water Year 2008 statewide hydrologic conditions were as follows: precipitation, 90% of average to date; runoff, 55% of average to date; and reservoir storage, 85% of average for the date. Snowpack water content was about 100% of average to date (and about 100% of the April 1 average, the normal date of maximum accumulation). In comparison, the snowpack on April 1 last year stood at about 40%.

January and early February brought significant amounts of precipitation to California, including heavy snowfall in the mountains. The large water supply reservoirs received some inflow from these storms; however, the amounts were muted because much of the precipitation fell as snow. Because precipitation was significantly below average last year, dry hydrologic conditions still prevail. Storage in most of the major water supply reservoirs is still well below average.

For the purposes of this Assessment, the 2008 California hydro capacity is assumed to be adequate to meet the RA NQC values for hydro capacity. Additional information on current hydro conditions in California is provided in Appendix D.

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 balancing area) and CAISO 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 January 2008.

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 typical pump loads during summer peak conditions.

The weather variables are comprised of 24 weather stations located throughout the large population centers within the CAISO. 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 based on a weighted average of the daily maximum and daily minimum temperatures for a given day and the two days prior to that day.

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 CAISO's weather database goes back to 1950. The forecast process has the capability to produce up to 406 different weather related peak demand load forecasts, however, not all 406 weather scenarios were used to develop the 2008 load forecast. Prior to 1995, much of the weather parameters used by the model are synthesized since prior to that time most weather stations only recorded temperature data. 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 some stations prior to 1995. Using the synthesized data tended to normalize the pre-1995 data and reduce its usefulness for developing weather scenarios for future peak demand forecasts. Consequently, only 1995 through 2007 historical weather were used which produces 91 weather scenarios. This tends to give the extreme temperature year of 2006 a greater weighting and increases the high-side forecasts, however, this was determined to be acceptable in light of global warming discussions. The 91 different weather scenarios were used to develop a range of load forecast for the probability analysis and for developing the 1-in-2, 1-in-5 and 1-in-10 peak demand forecasts.

There are three main models representing three distinct areas; CAISO, SP26 and NP26, as well as models that forecast various sub-regions within the CAISO that have similar weather characteristics. Each model utilizes its own set of weather, economic and demographic input variables based on its location. The economic data used does forecast a downturn in the economy, however, only slightly for 2008.

For comparative purposes, the 1-in-2 and the 1-in-10 forecasts produced by the forecasting process are given by area in Table 10.

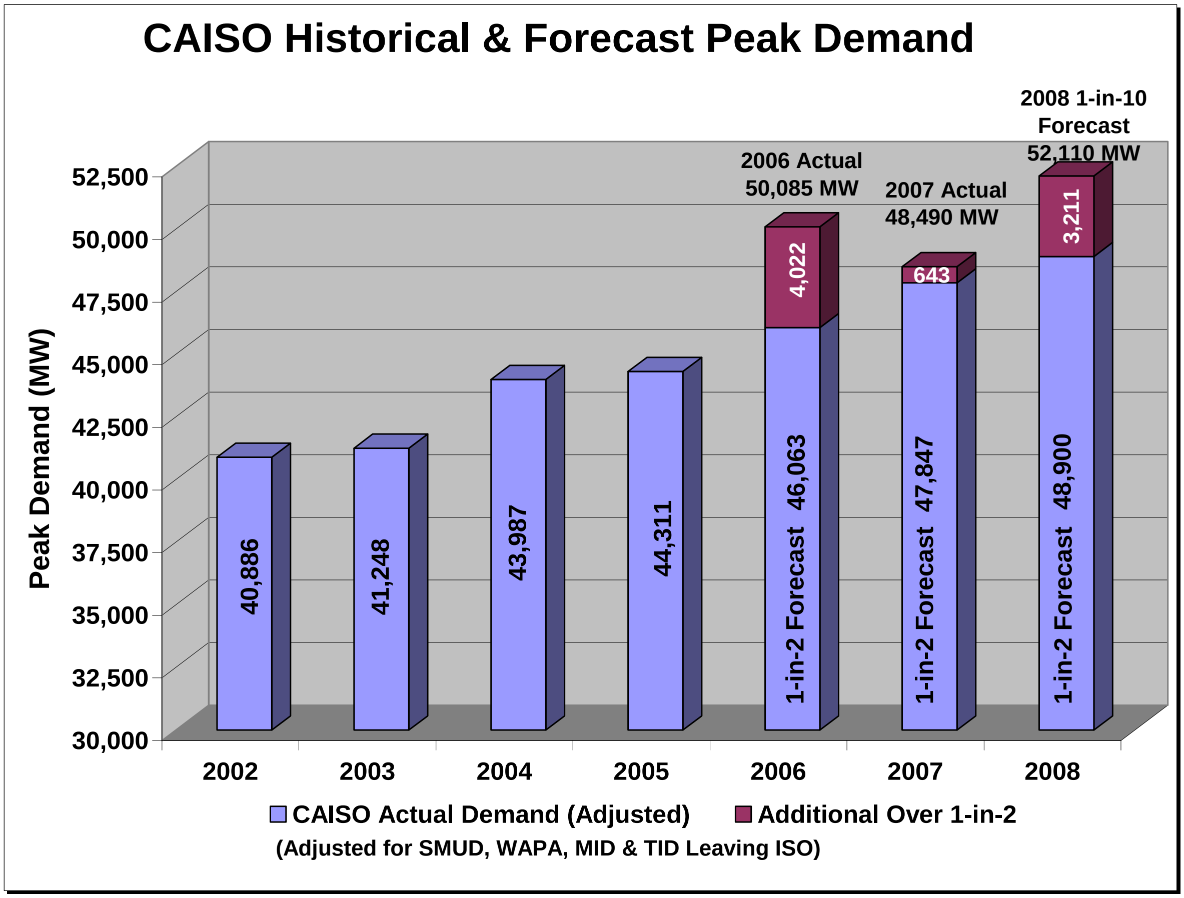
Table 10

CAISO Peak Demand Forecasts

	2007 Actual (MW)	2008 1-in-2 Forecast (MW)	2008 1-in-2 Forecast Change from 2007 Actual	2008 1-in-10 Forecast (MW)	1-in-10 Forecast Increase Over 1-in-2 Forecast
ISO Control Area	48,490	48,900	0.8%	52,110	6.6%
SP26	28,251	28,331	0.3%	30,764	8.6%
NP26	21,245	21,969	3.4%	23,306	6.1%

Figure 7 shows historical peak demands and the difference between the forecast load and the actual load during recent years as well as the 2008 forecast peak demand.

Figure 7



Imports

There are numerous factors that contribute to the level of interchange between the CAISO and other balancing areas. Key factors for any given year and on any given day can be driven by conditions that impact only 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, the ability that a Scheduling Coordinator or the CAISO has to act when it is determined that there is a need to procure higher than normal import levels is quite different under these two contingencies. One type of contingency is the type that is able to be planned for in advance, 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 CAISO 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, it was decided to develop three levels of imports for analysis in both the deterministic and probabilistic analysis: High, Moderate and Low. Table 11 shows the summer 2007 imports at time of peak for the days where the peak demand equaled 90 percent or more of the 2007 summer peak demand. The import level on June 15, 2007 in NP26 was thrown out as it occurred in mid-June, which is not considered a critical date.

Table 11

Imports on Top 10% of Summer 2007 Peak Demand Weekdays
(Noncoincident)

CAISO			NP26			SP26		
Date	**Load (Top 10%)**	**Imports**	**Date**	**Load (Top 10%)**	**Imports**	**Date**	**Load (Top 10%)**	**Imports**
8/31/2007	48,490	8,721	8/29/2007	21,245	720	8/31/2007	28,251	8,313
8/20/2007	44,198	8,593	7/5/2007	21,147	1,669	9/4/2007	27,866	8,820
8/21/2007	44,577	7,917	8/31/2007	20,538	641	8/30/2007	27,501	7,621
8/29/2007	48,371	7,873	8/30/2007	20,492	120	9/3/2007	27,274	8,626
8/28/2007	45,780	7,863	8/22/2007	19,791	1,640	8/29/2007	27,252	6,990
7/6/2007	43,659	7,585	7/6/2007	19,726	416	8/28/2007	26,259	7,477
9/3/2007	44,624	7,549	8/28/2007	19,563	456	8/15/2007	26,238	7,678
8/30/2007	47,713	7,534	8/21/2007	19,370	933	8/16/2007	26,185	7,833
9/4/2007	44,523	7,086	~~6/15/2007~~	~~19,199~~	~~1,989~~	8/17/2007	26,091	8,521
7/5/2007	44,689	6,547		Max	1,669	8/20/2007	25,813	8,279
	Max	8,721		Min	120	8/14/2007	25,780	8,133
	Min	7,534		Ave	809	7/26/2007	25,435	10,688
	Ave	7,955					Max	10,688
							Min	6,990
							Ave	8,248

Table 12 shows the amounts the CEC assumes for its 2008 Supply and Demand Outlook, which are based on what the CEC assumes the physical system is capable of delivering into the CAISO. Analyses of actual imports during the 2007 and 2006 summer seasons, along with the CEC assumptions for physical system capability, were used to determine the High, Moderate and Low Import Scenarios shown in the bottom three rows of Table 12. Graphs of actual import levels during peak operating hours for the CAISO system and the SP26 and NP26 zones are included in Appendix B.

Table 12

Summer 2008 Outlook - Import Scenarios			
	CAISO	**SP26**	**NP26**
CEC Assumed Imports (MW)	10,350	10,100	250
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 CAISO has a number of highly significant ongoing transmission initiatives to increase import capability into the CAISO and to increase the internal capabilities for transmitting energy from remote wind generation sites. While a number of projects are expected to provide some level of either congestion relief or increased import capability during 2008, the amount of the impact of these projects have not been quantified. For the purposes of this Assessment it is assumed that no new transmission capability will be energized prior to summer 2008 that will increase import capability into the CAISO.

Demand Response and Interruptible Load Programs

The CEC provided the amounts for Demand Response (DR) and Interruptible Load programs for the three California Investor-Owned Utilities that are approved by the CPUC for use in the 2008 RA Program. These values have been reduced to 80 percent of the CPUC values based on CAISO actual experience of historical load reductions when these programs were call on during Stage 1 and Stage 2 emergencies.

Summer 2008 Deterministic Analysis Summary

Table 13 is the supply and demand outlook for the 2008 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 the CEC assumed import levels for its 2008 Supply and Demand Outlook, which are based on what the CEC assumes the physical system is capable of delivering into the CAISO.

Table 13

Summer 2008 Outlook - CEC Assumed Imports			
Resource Adequacy Planning Conventions	**CAISO**	**SP26**	**NP26**
Existing Generation	47,716	22,376	25,349
Retirements (Known)	-122	-122	0
High Probability CA Additions	489	442	47
Net Interchange	10,350	10,100	250
Total Net Supply (MW)	58,432	32,796	25,646
Demand (1-in-2 Summer Temperature)	48,900	28,331	21,969
DR & Interruptible Programs (80% of CPUC 2008 estimates)	2,130	1,427	703
Planning Reserve[1]	**23.9%**	**20.8%**	**19.9%**

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

Tables 14 through 17 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 CAISO 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-10 peak demand while maintaining the same 1-in-2 level generation and transmission outage/curtailment levels used in Table 14.

Table 16 calculates the operating reserve under weather conditions that produce 1-in-5 peak demand coincident with 1-in-10 level generation and transmission outage/curtailment levels and Table 17 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 17 are rare and no attempt is made to determine the probability of the conditions occurring in Tables 14 through 17. These tables and the graphs to follow provide a comparison of the range and impact and 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 later in a probabilistic approach.

Table 14

Summer 2008 Loads and Resources Outlook

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

Summer 2008 Outlook - High Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,716	22,376	25,349
Retirements (Known)	-122	-122	0
High Probability CA Additions	489	442	47
Net Interchange	10,000	10,000	1,600
Outages (1-in-2 Generation & Transmission)	-3,230	-1,597	-1,790
Total Net Supply (MW)	54,853	31,099	25,207
Demand (1-in-2 Summer Temperature)	48,900	28,331	21,969
DR & Interruptible Programs (80% of CPUC 2008 estimates)	2,130	1,427	703
Operating Reserve[1]	**16.5%**	**14.8%**	**17.9%**

Summer 2008 Outlook - Moderate Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,716	22,376	25,349
Retirements (Known)	-122	-122	0
High Probability CA Additions	489	442	47
Net Interchange	8,750	9,000	800
Outages (1-in-2 Generation & Transmission)	-3,230	-1,597	-1,790
Total Net Supply (MW)	53,603	30,099	24,407
Demand (1-in-2 Summer Temperature)	48,900	28,331	21,969
DR & Interruptible Programs (80% of CPUC 2008 estimates)	2,130	1,427	703
Operating Reserve[1]	**14.0%**	**11.3%**	**14.3%**

Summer 2008 Outlook - Low Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,716	22,376	25,349
Retirements (Known)	-122	-122	0
High Probability CA Additions	489	442	47
Net Interchange	7,500	8,000	0
Outages (1-in-2 Generation & Transmission)	-3,230	-1,597	-1,790
Total Net Supply (MW)	52,353	29,099	23,607
Demand (1-in-2 Summer Temperature)	48,900	28,331	21,969
DR & Interruptible Programs (80% of CPUC 2008 estimates)	2,130	1,427	703
Operating Reserve[1]	**11.4%**	**7.7%**	**10.7%**

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

Table 15

Summer 2008 Loads and Resources Outlook

Including 1-in-10 Demand and 1-in-2 Generation & Transmission Outage Scenarios

Summer 2008 Outlook - High Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,716	22,376	25,349
Retirements (Known)	-122	-122	0
High Probability CA Additions	489	442	47
Net Interchange	10,000	10,000	1,600
Outages (1-in-2 Generation & Transmission)	-3,230	-1,597	-1,790
Total Net Supply (MW)	54,853	31,099	25,207
High Demand (1-in-10 Summer Temperature)	52,110	30,764	23,306
DR & Interruptible Programs (80% of CPUC 2008 estimates)	2,130	1,427	703
Operating Reserve[1]	**9.4%**	**5.7%**	**11.2%**

Summer 2008 Outlook - Moderate Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,716	22,376	25,349
Retirements (Known)	-122	-122	0
High Probability CA Additions	489	442	47
Net Interchange	8,750	9,000	800
Outages (1-in-2 Generation & Transmission)	-3,230	-1,597	-1,790
Total Net Supply (MW)	53,603	30,099	24,407
High Demand (1-in-10 Summer Temperature)	52,110	30,764	23,306
DR & Interruptible Programs (80% of CPUC 2008 estimates)	2,130	1,427	703
Operating Reserve[1]	**7.0%**	**2.5%**	**7.7%**

Summer 2008 Outlook - Low Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,716	22,376	25,349
Retirements (Known)	-122	-122	0
High Probability CA Additions	489	442	47
Net Interchange	7,500	8,000	0
Outages (1-in-2 Generation & Transmission)	-3,230	-1,597	-1,790
Total Net Supply (MW)	52,353	29,099	23,607
High Demand (1-in-10 Summer Temperature)	52,110	30,764	23,306
DR & Interruptible Programs (80% of CPUC 2008 estimates)	2,130	1,427	703
Operating Reserve[1]	**4.6%**	**-0.8%**	**4.3%**

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

Table 16

Summer 2008 Loads and Resources Outlook

Including 1-in-5 Demand and 1-in-10 Generation & Transmission Outage Scenarios

Summer 2008 Outlook - High Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,716	22,376	25,349
Retirements (Known)	-122	-122	0
High Probability CA Additions	489	442	47
Net Interchange	10,000	10,000	1,600
High Outages (1-in-10 Generation & Transmission)	-4,933	-2,552	-2,784
Total Net Supply (MW)	53,149	30,144	24,212
1-in-5 Demand (1-in-5 Summer Temperature)	50,958	29,935	22,842
DR & Interruptible Programs (80% of CPUC 2008 estimates)	2,130	1,427	703
Operating Reserve[1]	**8.5%**	**5.5%**	**9.1%**

Summer 2008 Outlook - Moderate Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,716	22,376	25,349
Retirements (Known)	-122	-122	0
High Probability CA Additions	489	442	47
Net Interchange	8,750	9,000	800
High Outages (1-in-10 Generation & Transmission)	-4,933	-2,552	-2,784
Total Net Supply (MW)	51,899	29,144	23,412
1-in-5 Demand (1-in-5 Summer Temperature)	50,958	29,935	22,842
DR & Interruptible Programs (80% of CPUC 2008 estimates)	2,130	1,427	703
Operating Reserve[1]	**6.0%**	**2.1%**	**5.6%**

Summer 2008 Outlook - Low Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,716	22,376	25,349
Retirements (Known)	-122	-122	0
High Probability CA Additions	489	442	47
Net Interchange	7,500	8,000	0
High Outages (1-in-10 Generation & Transmission)	-4,933	-2,552	-2,784
Total Net Supply (MW)	50,649	28,144	22,612
1-in-5 Demand (1-in-5 Summer Temperature)	50,958	29,935	22,842
DR & Interruptible Programs (80% of CPUC 2008 estimates)	2,130	1,427	703
Operating Reserve[1]	**3.6%**	**-1.2%**	**2.1%**

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

Table 17

Summer 2008 Loads and Resources Outlook

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

Summer 2008 Outlook - High Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,716	22,376	25,349
Retirements (Known)	-122	-122	0
High Probability CA Additions	489	442	47
Net Interchange	10,000	10,000	1,600
High Outages (1-in-10 Generation & Transmission)	-4,933	-2,552	-2,784
Total Net Supply (MW)	53,149	30,144	24,212
High Demand (1-in-10 Summer Temperature)	52,110	30,764	23,306
DR & Interruptible Programs (80% of CPUC 2008 estimates)	2,130	1,427	703
Operating Reserve[1]	**6.1%**	**2.6%**	**6.9%**

Summer 2008 Outlook - Moderate Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,716	22,376	25,349
Retirements (Known)	-122	-122	0
High Probability CA Additions	489	442	47
Net Interchange	8,750	9,000	800
High Outages (1-in-10 Generation & Transmission)	-4,933	-2,552	-2,784
Total Net Supply (MW)	51,899	29,144	23,412
High Demand (1-in-10 Summer Temperature)	52,110	30,764	23,306
DR & Interruptible Programs (80% of CPUC 2008 estimates)	2,130	1,427	703
Operating Reserve[1]	**3.7%**	**-0.6%**	**3.5%**

Summer 2008 Outlook - Low Imports

Resource Adequacy Planning Conventions	CAISO	SP26	NP26
Existing Generation	47,716	22,376	25,349
Retirements (Known)	-122	-122	0
High Probability CA Additions	489	442	47
Net Interchange	7,500	8,000	0
High Outages (1-in-10 Generation & Transmission)	-4,933	-2,552	-2,784
Total Net Supply (MW)	50,649	28,144	22,612
High Demand (1-in-10 Summer Temperature)	52,110	30,764	23,306
DR & Interruptible Programs (80% of CPUC 2008 estimates)	2,130	1,427	703
Operating Reserve[1]	**1.3%**	**-3.9%**	**0.0%**

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

Figures 8, 9 and 10 provide a graphical representations of the deterministic analysis results based on the inputs from Tables 14 through 17. The assessment of theses extreme conditions allows the CAISO to frame the electric system challenges and focus management effort on measures that will minimize possible impacts. Figures 8 and 9 show that the only scenario where the shedding of firm load occurs in the CAISO and NP26 are the low import scenario coupled with the 1-in-10 peak demand/1-in-10 outage scenarios. These are low probability occurrences. It is worth noting, however, that voluntary conservation and on-call interruptible loads will need to be utilized in a number of other, more likely scenarios. While voluntary conservation is encouraged and can exist outside of formal programs, voluntary conservation is also a component of more formal demand response programs that are triggered by the CAISO during Stage 1 Emergencies when operating reserve margins fall below 7%. On-call interruptible loads may be called upon by CAISO during Stage 2 Emergencies when operating reserve margins fall or are expected to fall below 5%. A Stage 3 Emergency is called when operating reserve margins reach approximately 3%. This is when firm load may be shed.

Figure 8

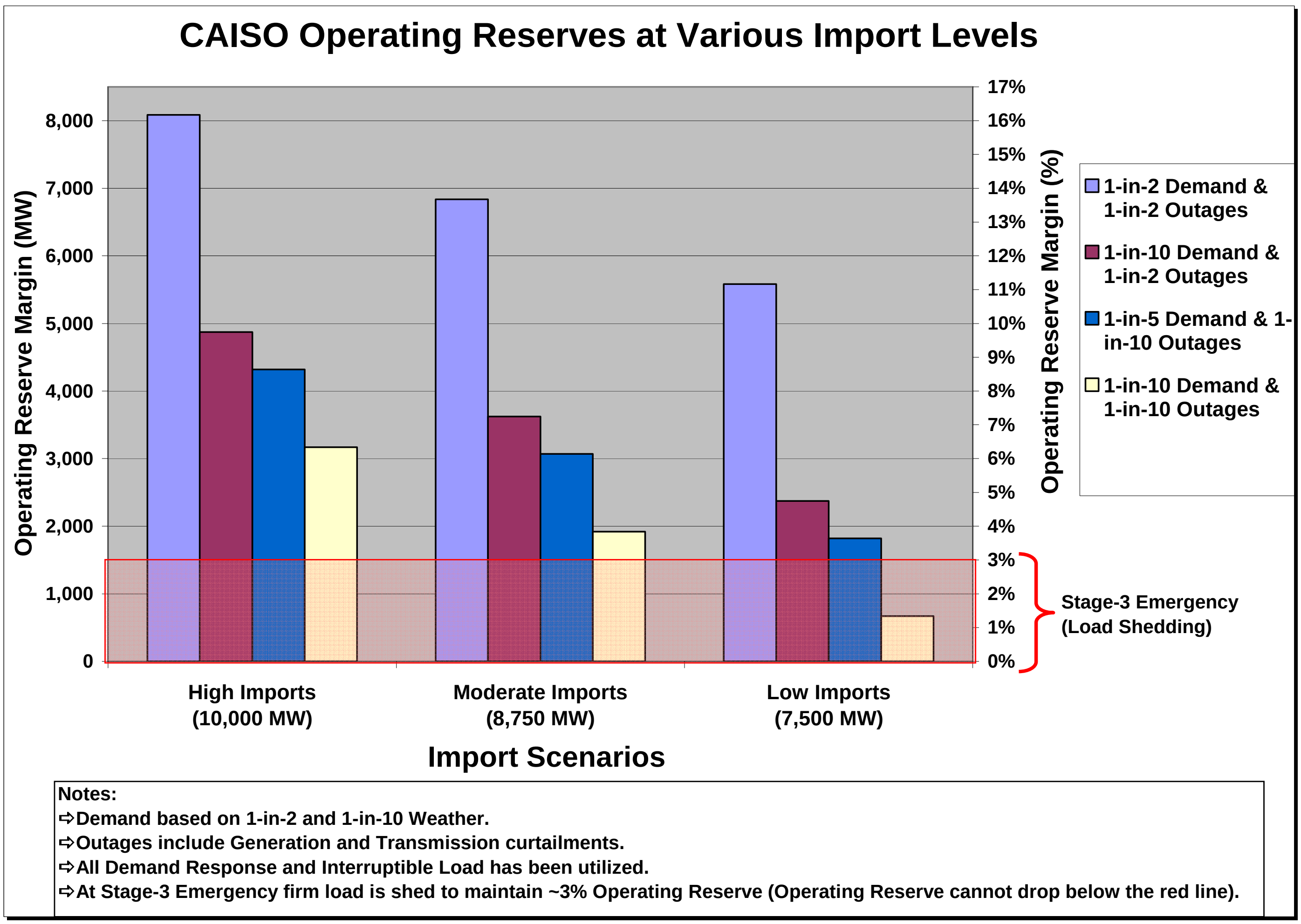


Figure 9

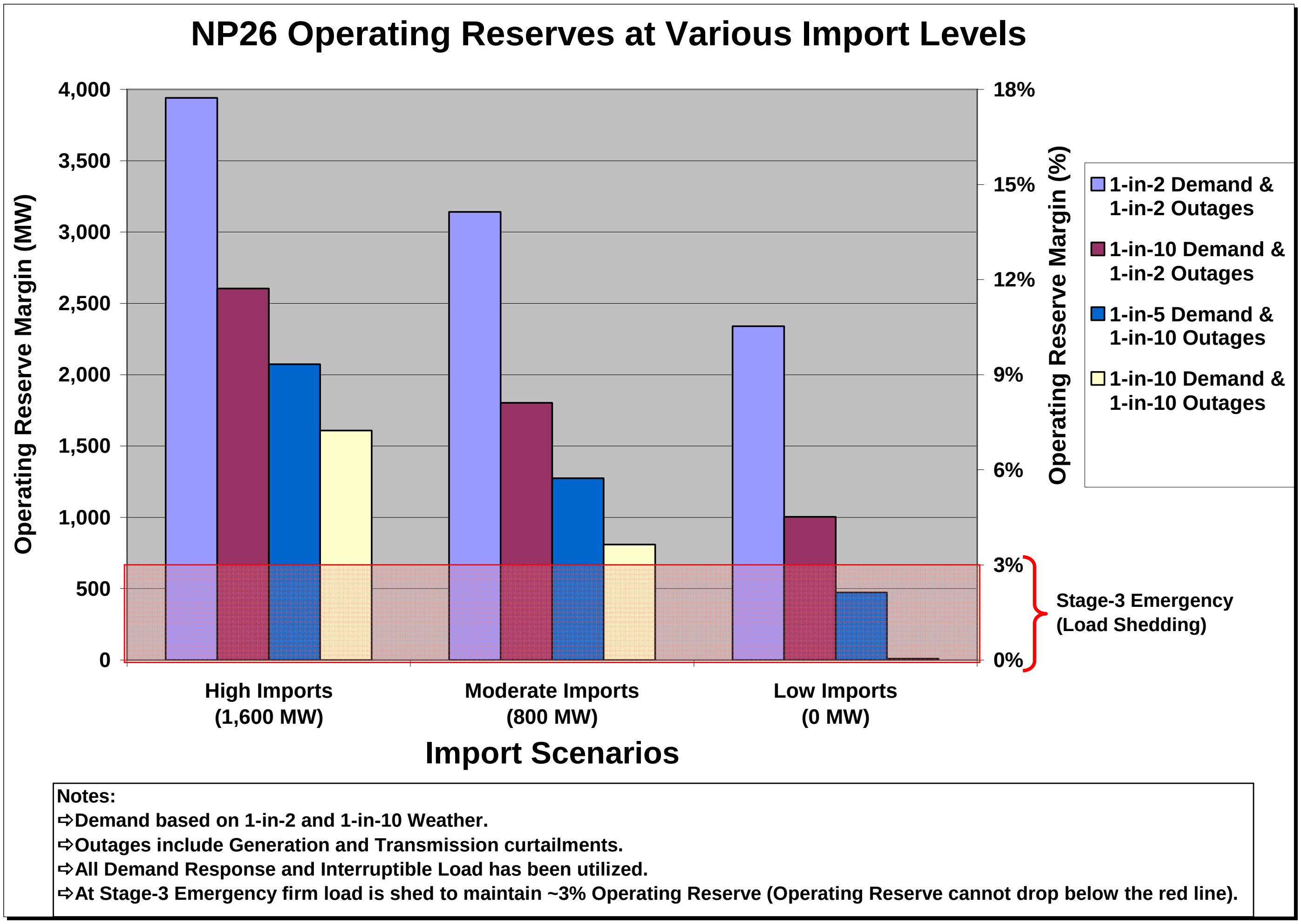
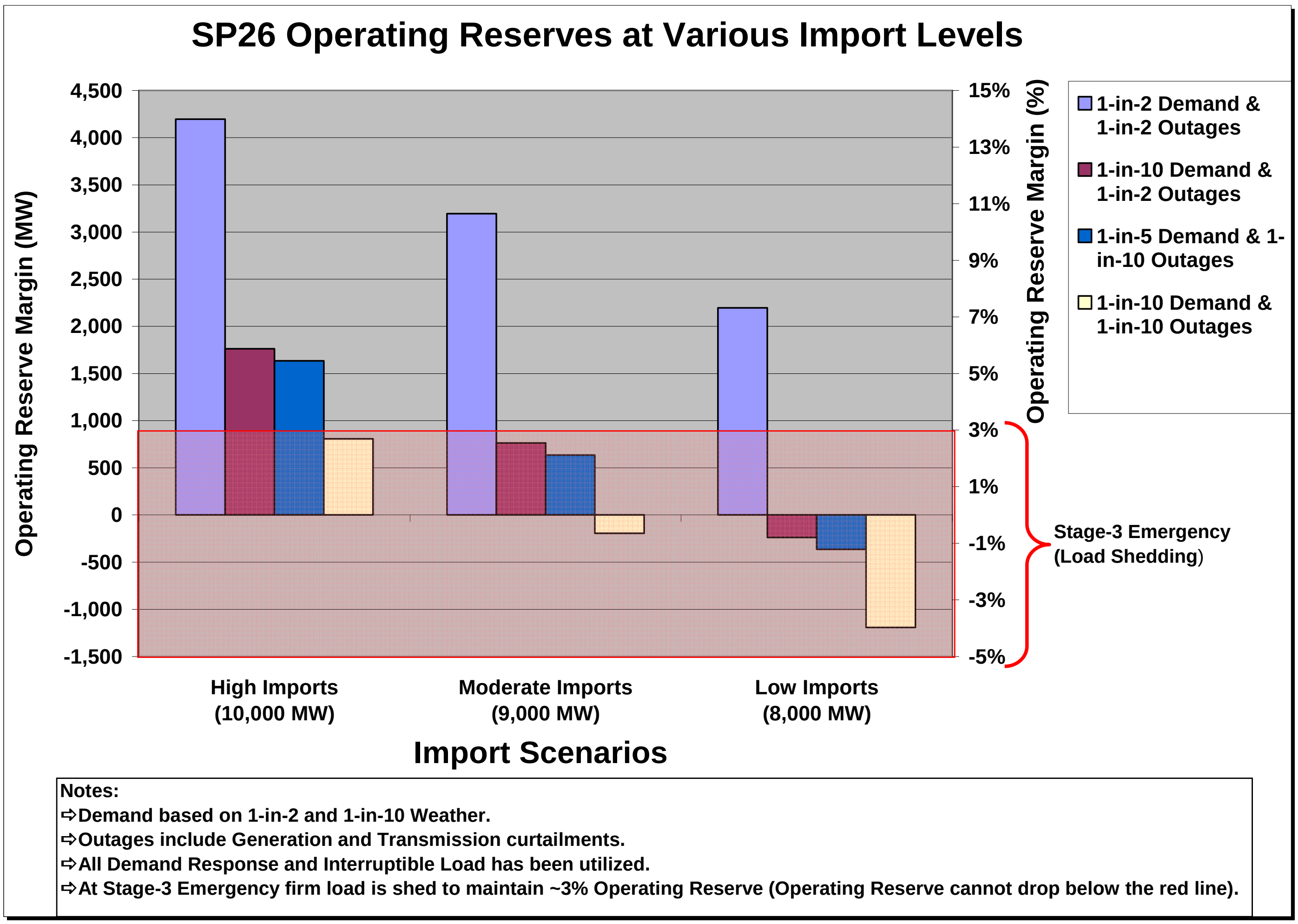

NP26 Operating Reserves at Various Import Levels
Operating Reserve Margin (MW)
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
18%
15%
12%
9%
6%
3%
0%
Operating Reserve Margin (%)
1-in-2 Demand & 1-in-2 Outages
1-in-10 Demand & 1-in-2 Outages
1-in-5 Demand & 1-in-10 Outages
1-in-10 Demand & 1-in-10 Outages
Stage-3 Emergency (Load Shedding)
High Imports (1,600 MW)
Moderate Imports (800 MW)
Low Imports (0 MW)
Import Scenarios
Notes:
⇨Demand based on 1-in-2 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 10 shows that, similar to past summers, conditions are more difficult in SP26. As a result, voluntary conservation and on-call interruptible loads could be needed more frequently than normal. This highlights one of the main purposes of this Assessment, which is to focus the CAISO's summer preparations on the conditions and contingencies that pose the greatest reliability risk. As a result of this analysis, the CAISO will be better prepared, and can prepare others, to manage the system under identified conditions and minimize the chance of load shedding. Although resources are tight this summer, Summer 2009 looks much better because up 1,700 MW of additional generation is expected to be on line by then. In the meantime, it is the CAISO'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.

Figure 10

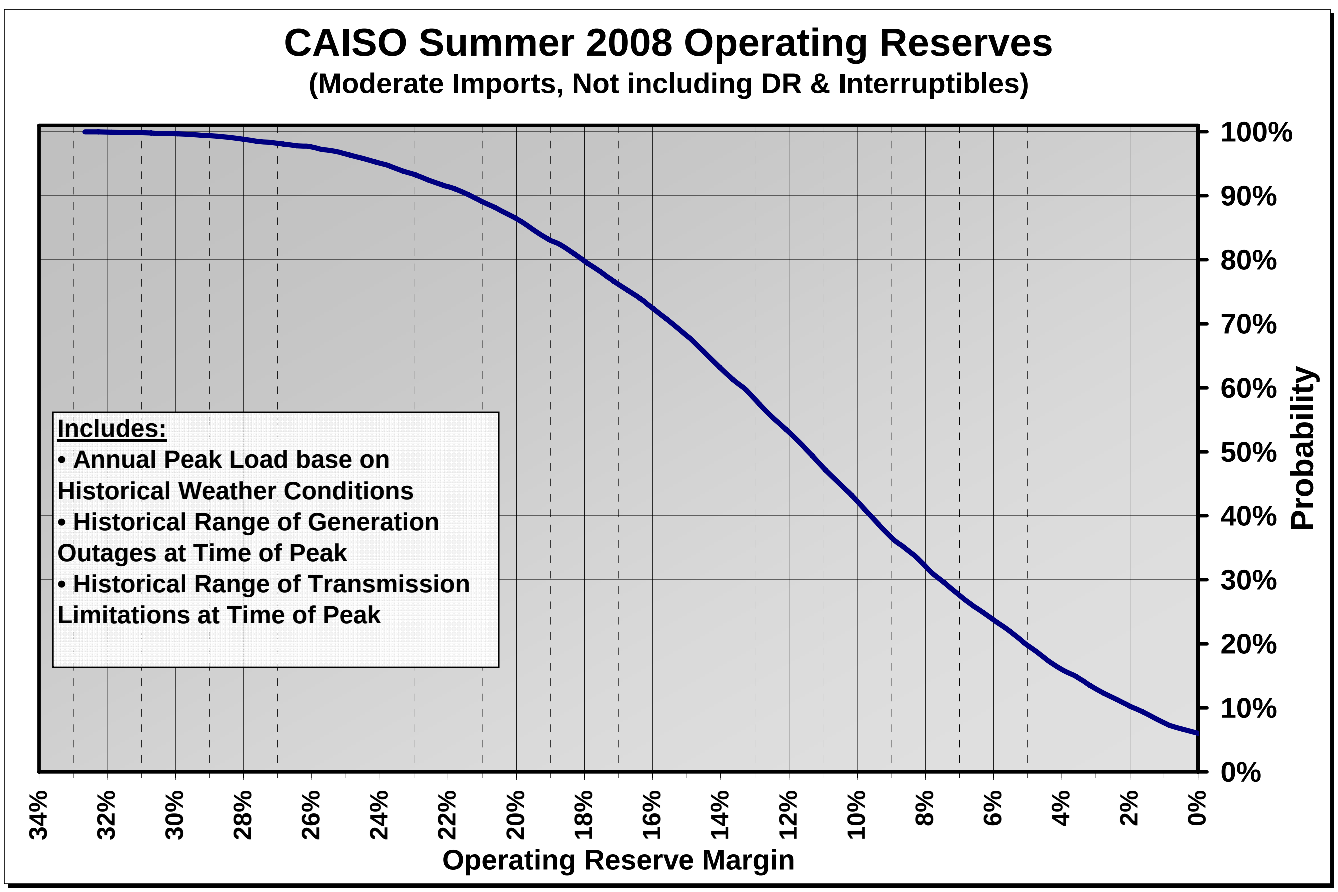


Probabilistic Analysis

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 the 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 is based on the methodology discussed in the previous Demand section, and DR and Interruptible Loads are also fixed single value inputs to the model (values shown in Tables 13 through 17). After the model develops the range of operating reserves the analysis focused on the lower operating reserve margin range where the probability of entering into various stages of emergency conditions is determined.

Figure 11 shows an example of the entire range of probabilities for all of the operating reserve outcomes of the probabilistic model for the CAISO.

Figure 11



The three import scenarios used different demand ranges, as it was not considered appropriate to model all import scenarios over the full range of demand conditions. The Moderate import probability model did use the entire range of demand based on all weather scenarios from the peak demand forecast process. The High import probability model used the demand above the 1-in-2 forecast amount. Recent historical data shows that import levels above the Moderate amount were infrequent and future imports at the high levels would be more closely tied to need, such as demands above the 1-in-2 level. In the Low import probability model demands between the 1-in-5 and the 1-in-20 forecast demand amounts were taken out. It was considered too extreme to include demands above the 1-in-5 level in the Low import scenario. When demand climbs to 1-in-5 levels and higher the rise in demand does not come unexpectedly and there is time to procure higher levels of imports to meet the higher demand. It is not a given, however, that even moderate levels of imports could be procured during extreme heat waves driven by 1-in-20 weather events and higher. These heat waves are typically wide spread and neighboring balancing authorities would likely be experiencing the same extreme weather related loads. Under those most extreme conditions the CAISO may not be able to procure enough energy from other areas to get import to levels above the Low scenario amounts.

The results of the three models were combined using a weighted average using the number of individual scenarios in each model as the weighting factor. This averaging of the three import scenario models provides a method for considering the most likely operating conditions of each import scenario, and considers a broad range of conditions without any one scenario dominating the results. This produced a more robust analysis than using one single import level. The CAISO, NP26 and SP26 were modeled in this fashion.

Table 18 is contains the results of the probabilistic model for the CAISO, SP26 and NP26 based on the methodology discussed above.

Table 18

Operating Reserve Margins - Probability of Occurrence based High, Moderate & Low Import Scenarios

CAISO

Import Scenario Range (MW)	7% Operating Reserve Before DR	5% Operating Reserve After DR, Before Interruptibles	3% Operating Reserve After DR and Interruptibles
10,000 - 7,500[1]	30%	13%	3.7%

SP26

Import Scenario Range (MW)	7% Operating Reserve Before DR	5% Operating Reserve After DR, Before Interruptibles	3% Operating Reserve After DR and Interruptibles
10,000 - 8,000[1]	47%	31%	10%

NP26

Import Scenario Range (MW)	7% Operating Reserve Before DR	5% Operating Reserve After DR, Before Interruptibles	3% Operating Reserve After DR and Interruptibles
1,600 - 0[1]	28%	10%	3.8%

[1] Import Scenario Ranges
- ➪ High Import Case Demand Floor made a 1-in-2 Event
- ➪ Moderate Import Case used Full Range of Demand
- ➪ Low Import Case Demand Events Between 1-in-5 & 1-in-20 Removed

Notes:
- ➪ Normal Hydro
- ➪ Demand Response and Interruptible Load effectiveness of 80%
- ➪ 356 MW of Net New Generation (new generation - retirements)

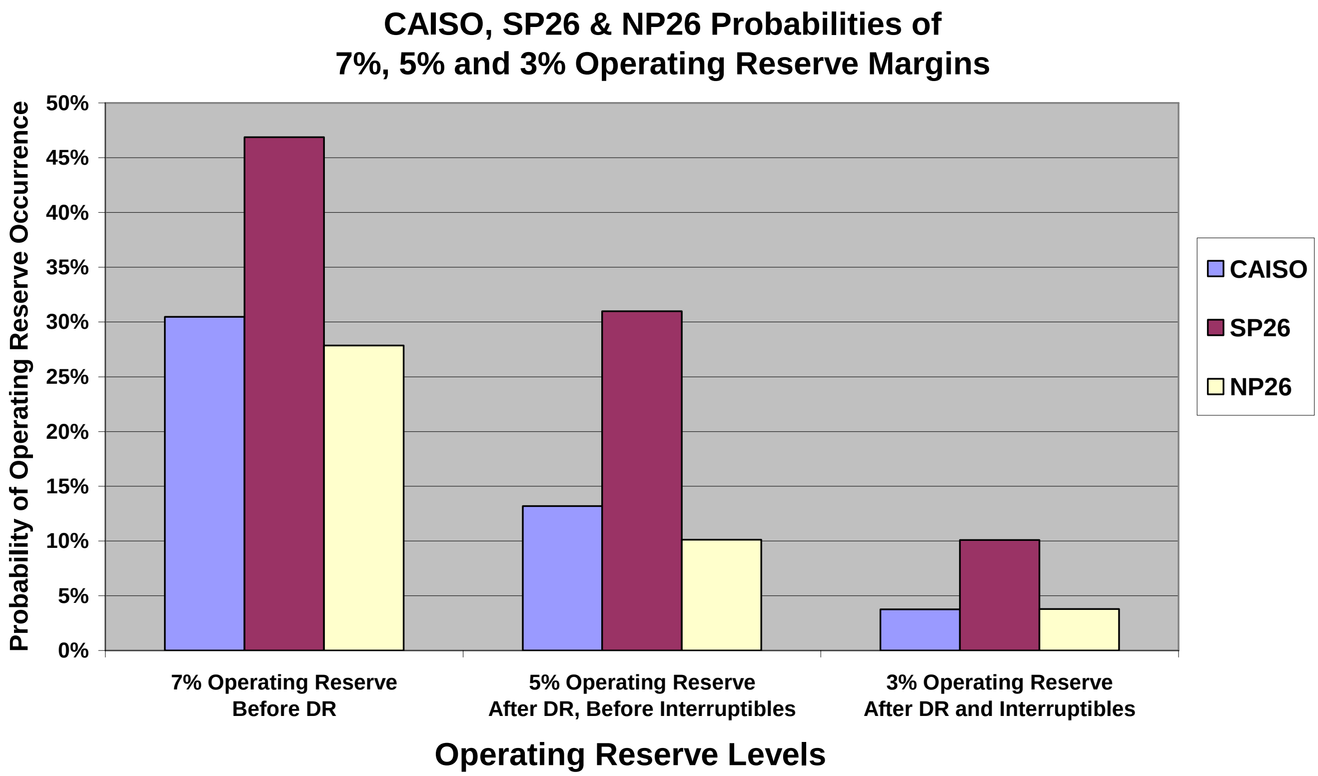
Based on full range of:
- ➪ Weather related Peak Demands
- ➪ Generation outages and Transmission curtailments

Operating Reserve Emergency Trigger Points
- ➪ Stage-1 Emergency, 7% Operating Reserves, allowing DR to be utilized
- ➪ Stage-2 Emergency, 5% Operating Reserves, allowing DR to be utilized
- ➪ Stage-3 Emergency, 3% Operating Reserves, firm load shedding begins

Figure 12 is a graphical representation of Table 18. Table 18 and Figure 12 indicate that the probabilities for calling on voluntary conservation (at 7% operating reserve margin) are significant for all three areas and the probability for needing to utilize on-call interruptible loads (at 5% operating reserve margin) in SP26 is significant as well. The probability for circumstances leading to a Stage 3 Emergency in SP26 has increased from prior years and this highlights the need to maximize imports into SP26 under a variety of conditions, not just extreme peak demand. The Scheduling Coordinators in SP26 and the CAISO must practice diligence during more severe conditions to avoid shedding firm load in SP26.

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.

Figure 12



Notes:
- **Normal Hydro**
- **Demand Response and Interruptible Load effectiveness of 80%**
- **356 MW of Net New Generation (new generation - retirements)**

Based on full range of:
- **Weather related Peak Demands**
- **Generation outages and Transmission curtailments**

Operating Reserve Emergency Trigger Points
- **Stage-1 Emergency, 7% Operating Reserves, allowing DR to be utilized**
- **Stage-2 Emergency, 5% Operating Reserves, allowing DR to be utilized**
- **Stage-3 Emergency, 3% Operating Reserves, firm load shedding begins**

Environmental Issues Impacting Future Generation

Once-Through Cooling

Within the CAISO balancing area and the State of California, there are a significant number of thermal generating units that use once-through-cooling (O-T-C) technology, utilizing large amounts of ocean or estuarial water. The O-T-C 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) is considering a proposal that would require these units to stop or 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 has recommended that a significant number of aged generating units (greater than 30 years old) be retired or repowered by 2012.

Considering the SWRCB and CEC proposals, from the perspective of the interconnected electrical grid in California, there are reliability and market implications in the CAISO balancing area of removing these units from service, even assuming different levels of offsetting generation additions. A complex technical analysis is needed to fully assess and understand these implications. The CAISO has completed the first phase of a comprehensive study that is being conducted in an open, stakeholder process. The full report based on the full transmission study process is due to be completed in the fourth quarter of 2008. The Phase I report documents the reliability risks associated removing O-T-C generation from service and shows that the greatest risk is with regard to resource adequacy on a system and zonal basis. A decision to retain the level of system and zonal reliability similar to what exists today will constrain the ability to take existing generation out of service more than local reliability requirements. Depending on how the electric system and zonal impacts are handled, the risk of shedding firm load could increase four-fold. Table 19 shows the amount of capacity that could be affected by these proposals.

Table 19

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 by 2012	
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	

A copy of the Phase I report can be found at http://www.caiso.com/1f80/1f80a4a5568f0.pdf.

Air Quality Issues

California passed several landmark Greenhouse Gas (GHG) reduction legislation initiatives in 2006 that will have an impact on generation from an air quality/emissions perspective. Two state laws represent the bulk of GHG reduction policy in this state. Below are summaries of these laws.

AB 32, the Global Warming Act of 2006, creates a statewide GHG limit to reduce emissions to 1990 levels by 2020, estimated to be about a 25% reduction. The California Air Resources

Board (CARB) is responsible for monitoring and reducing GHG emissions, by establishing a GHG emissions cap on all major GHG emitting sources, including the electricity and natural gas sectors.

SB 1368 requires the CPUC and CEC to create an emissions performance standard (EPS) for new long-term energy investments in "base load generation." The EPS, mandated by the statute to be set at a rate of emissions no higher than that for combined-cycle natural gas base load generation, applies to all load-serving entities, including investor-owned utilities, publicly-owned utilities, energy service providers, and community choice aggregators. The Standard applies to investments of five years or longer in base-load generation, defined as contracts with power plants intending to operate at a capacity factor of at least 60% per annum.

The CAISO is working closely with the CPUC, CEC, and CARB to implement AB 32 and SB 1368. The CAISO does not anticipate these policies impacting the availability of generation for summer 2008. Nevertheless, these new and important environmental policies will impact the addition of new generation in the future.

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 CAISO will continue to monitor the supply and demand situation for changes and make adjustments to these results as necessary.

IV. Appendices

A. 2007 Summer Peak Load Summary Graphs

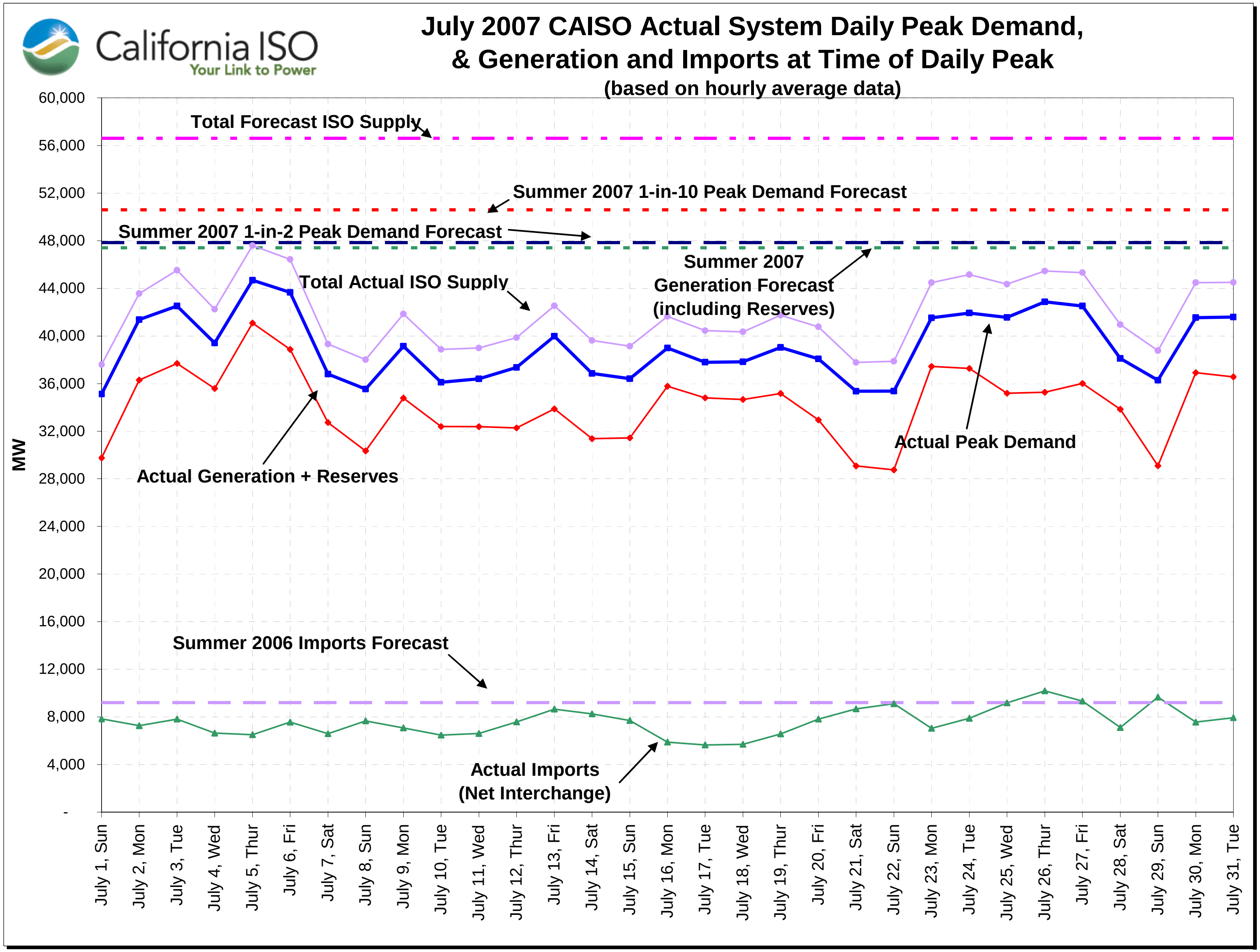
B. 2007 & 2006 Summer Imports Summary Graphs

C. 2007 & 2006 Summer Generation Outage Graphs

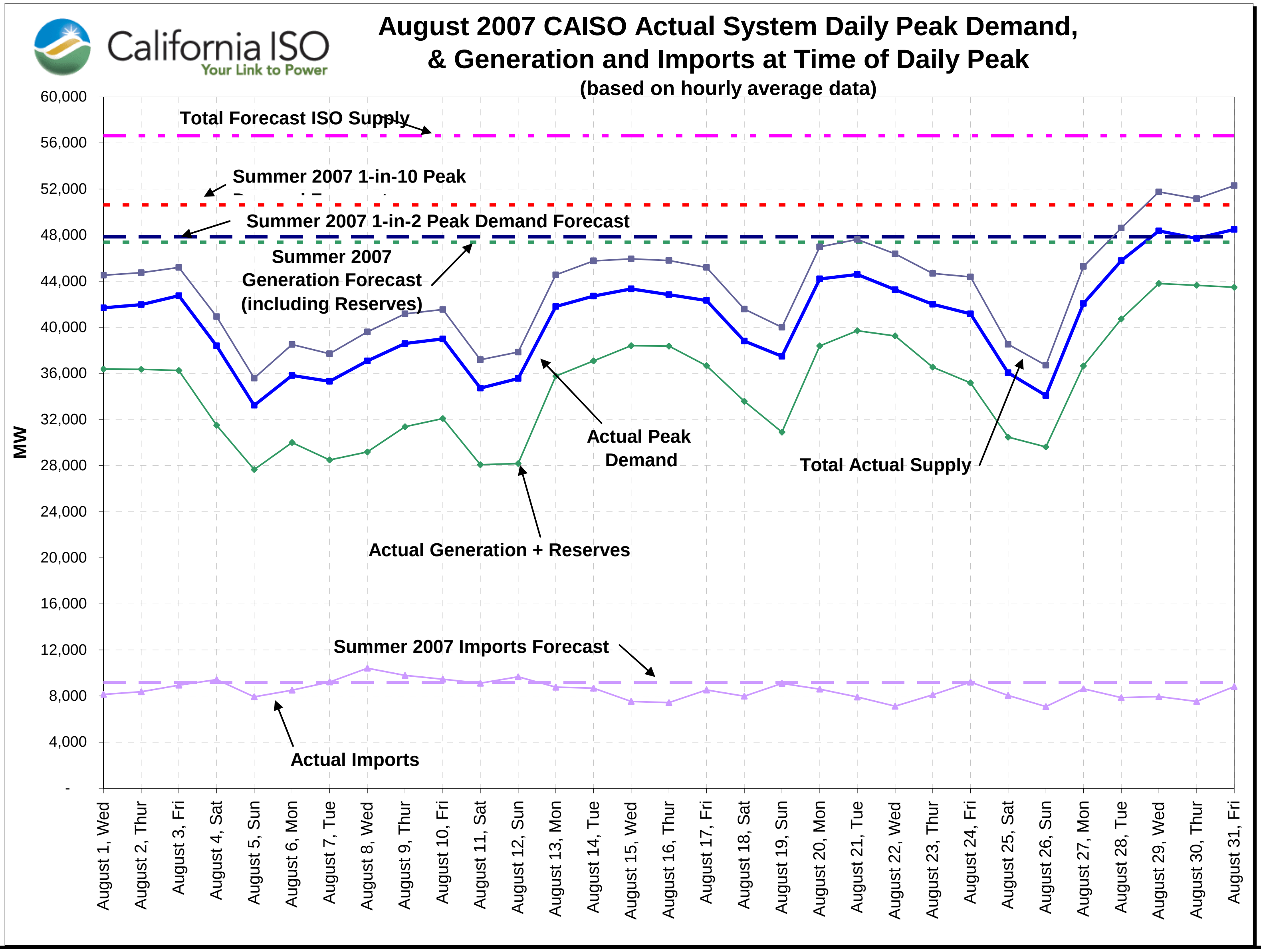
D. 2008 California Hydro Conditions

E. Summer 2009 Potential New Generation

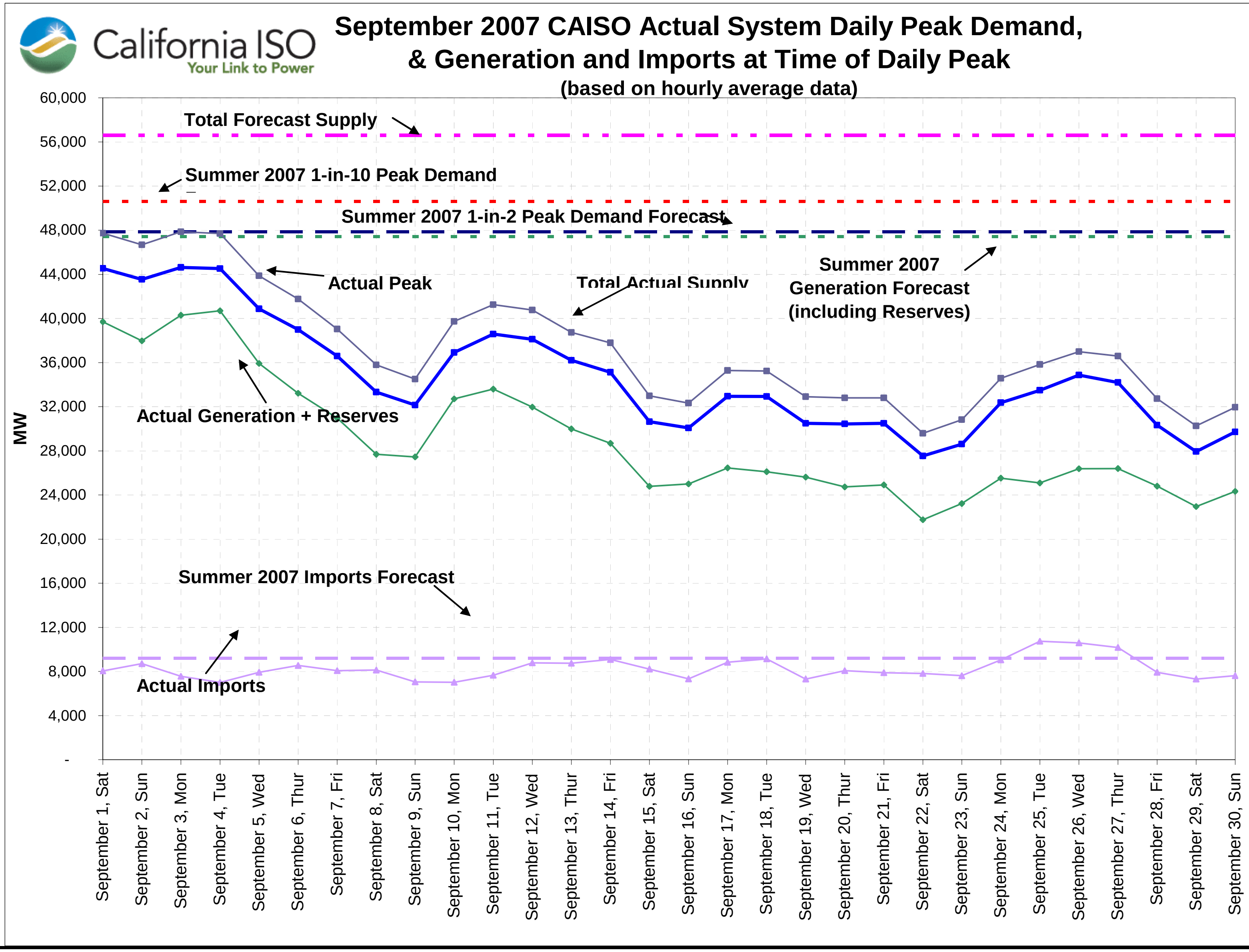
Appendix A - 2007 Summer Peak Load Summary Graphs



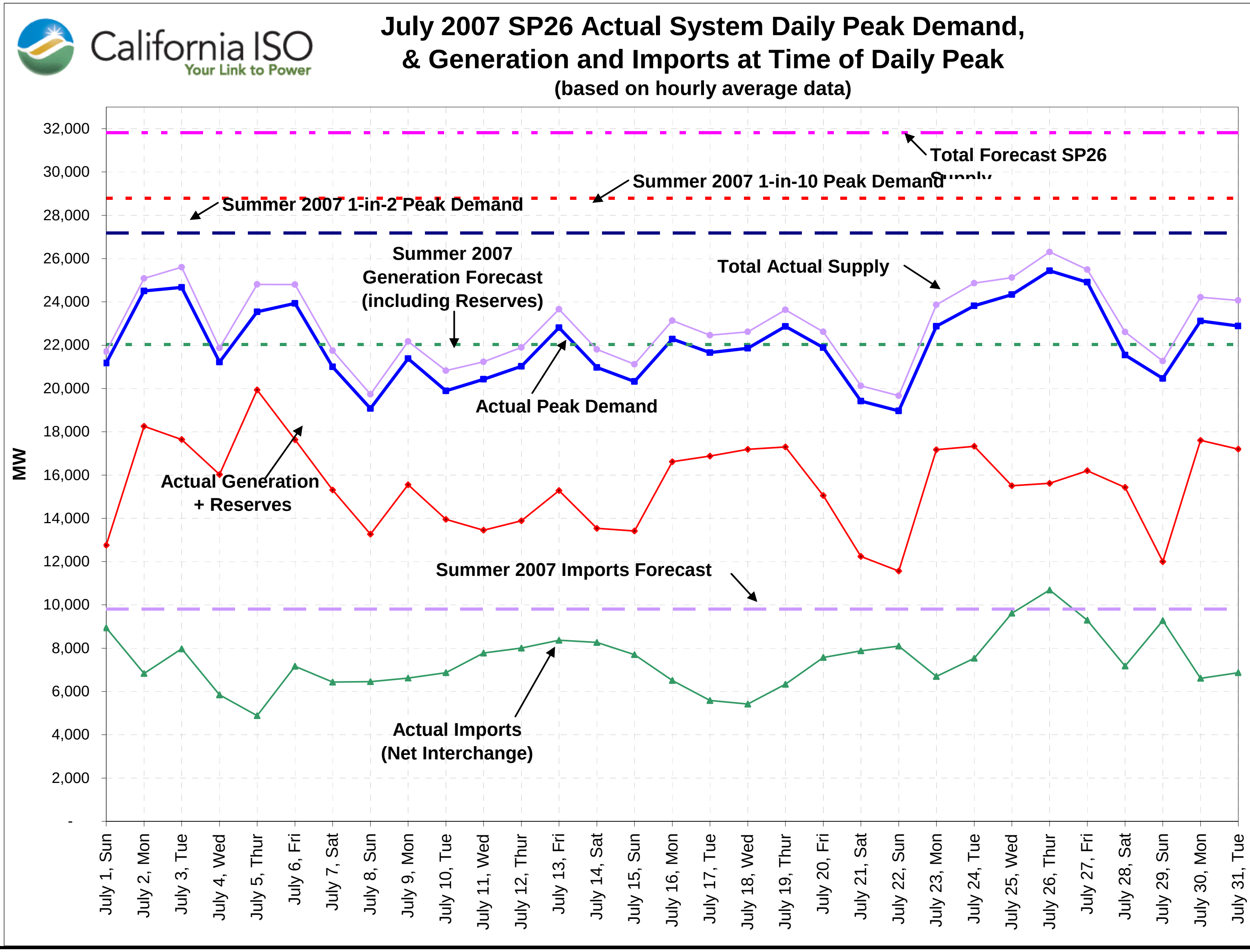
Appendix A – Continued



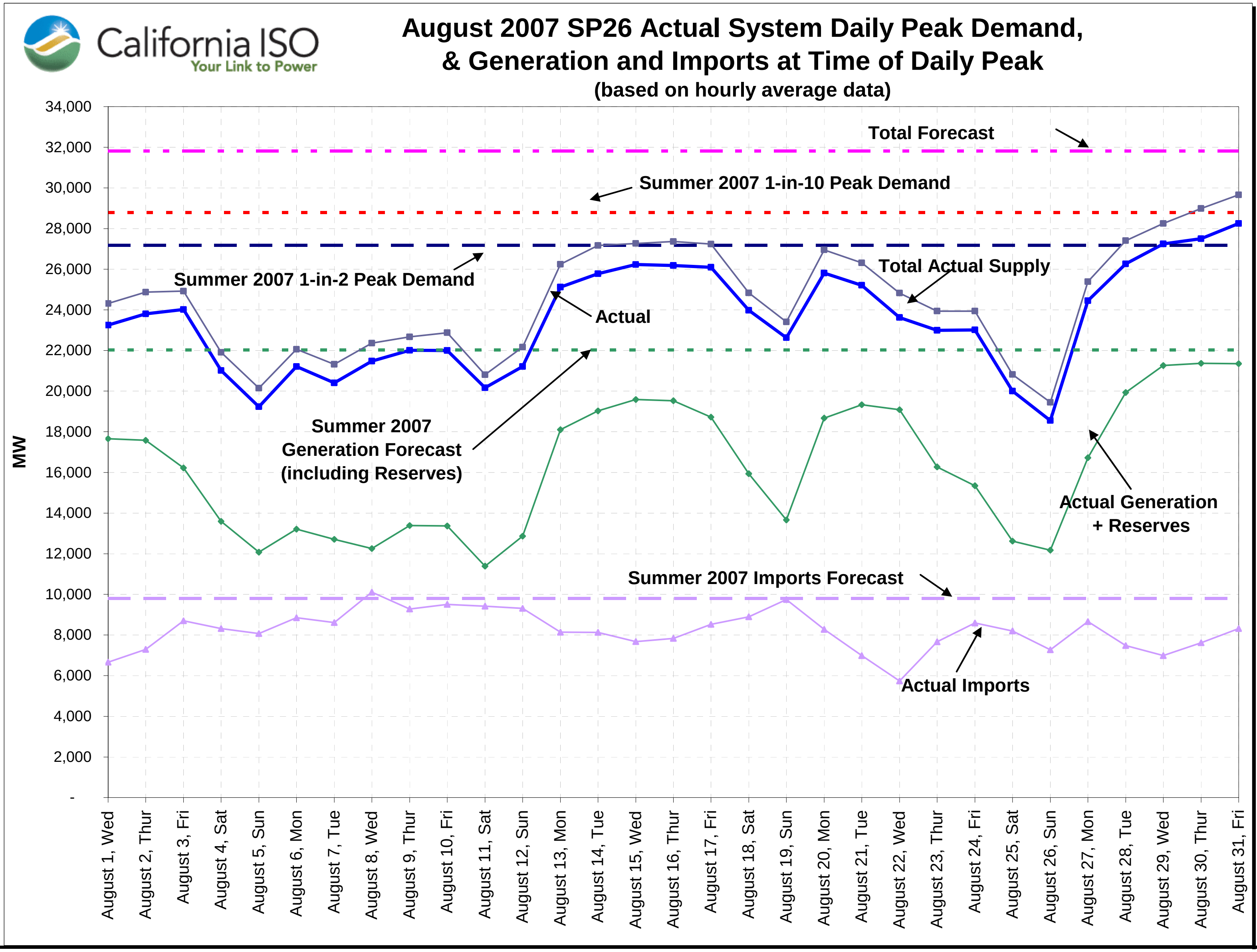
Appendix A – Continued



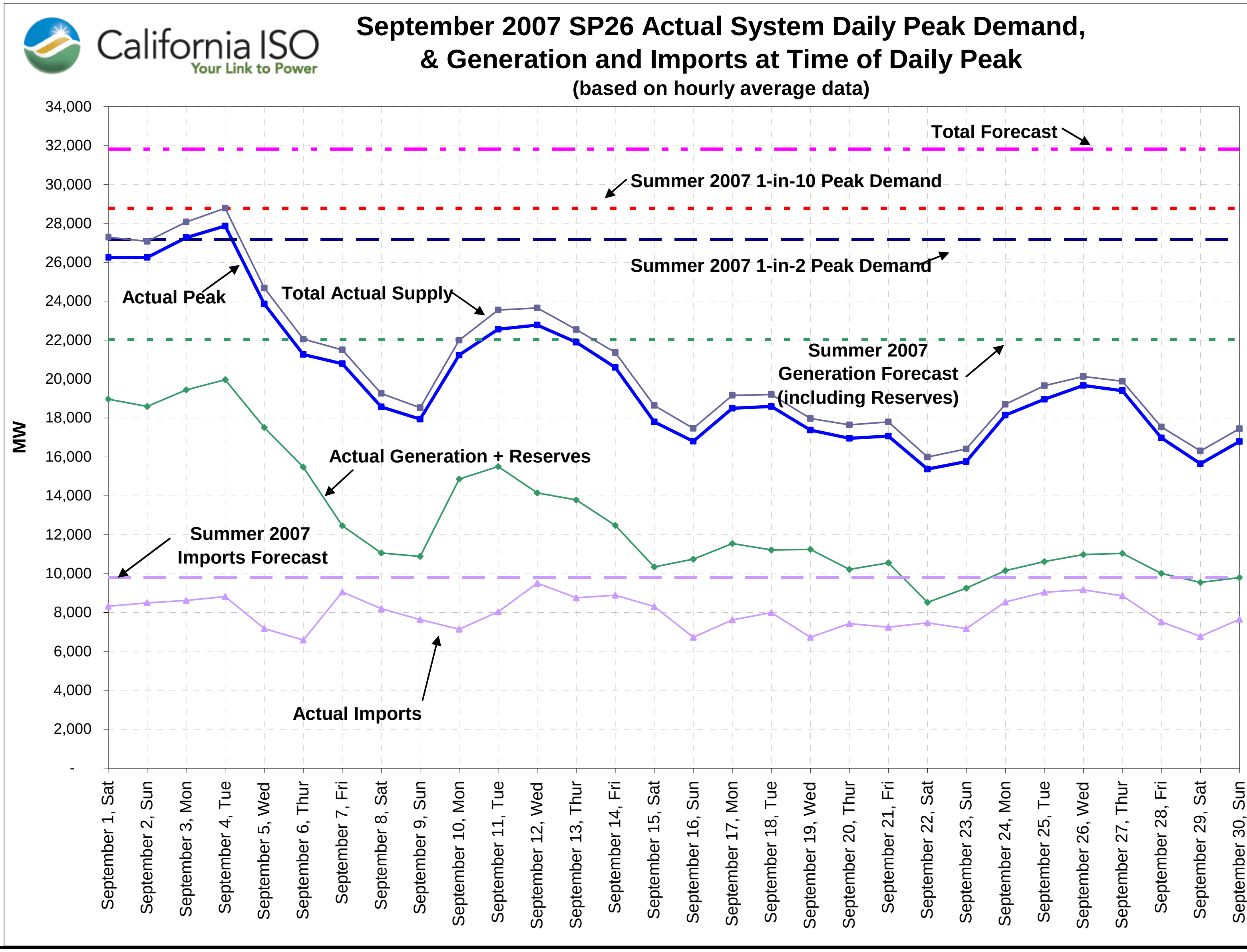
Appendix A – Continued



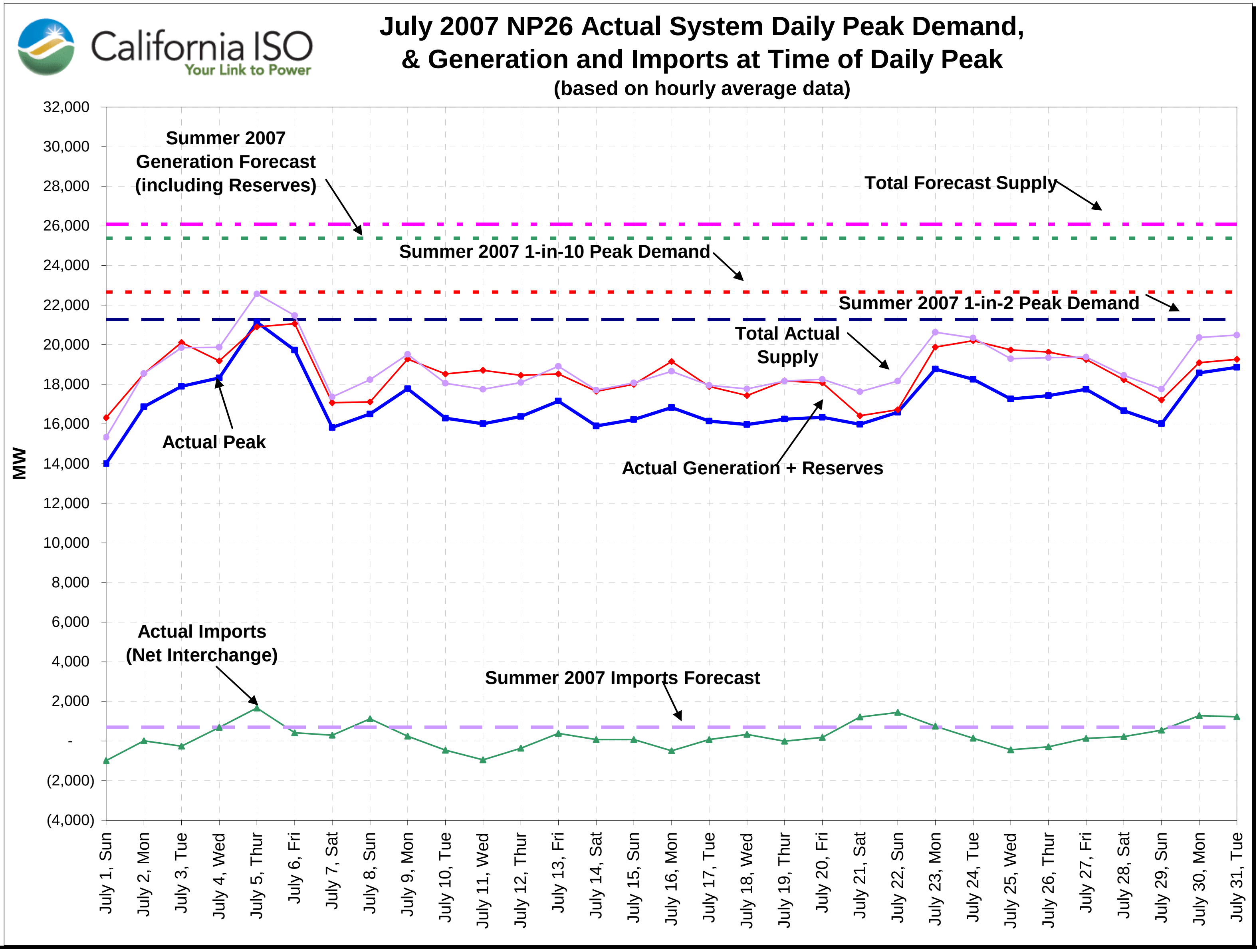
Appendix A – Continued



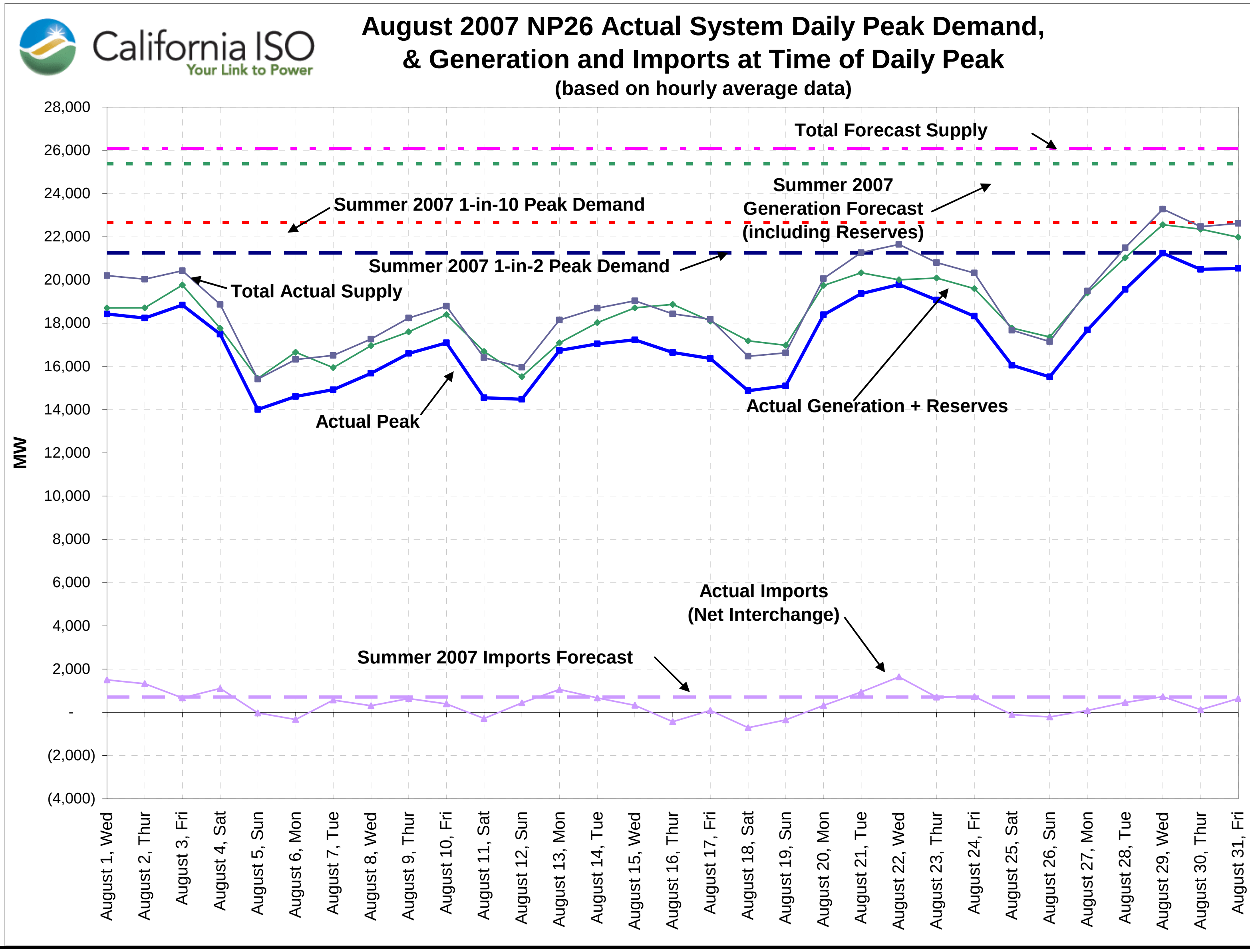
Appendix A – Continued



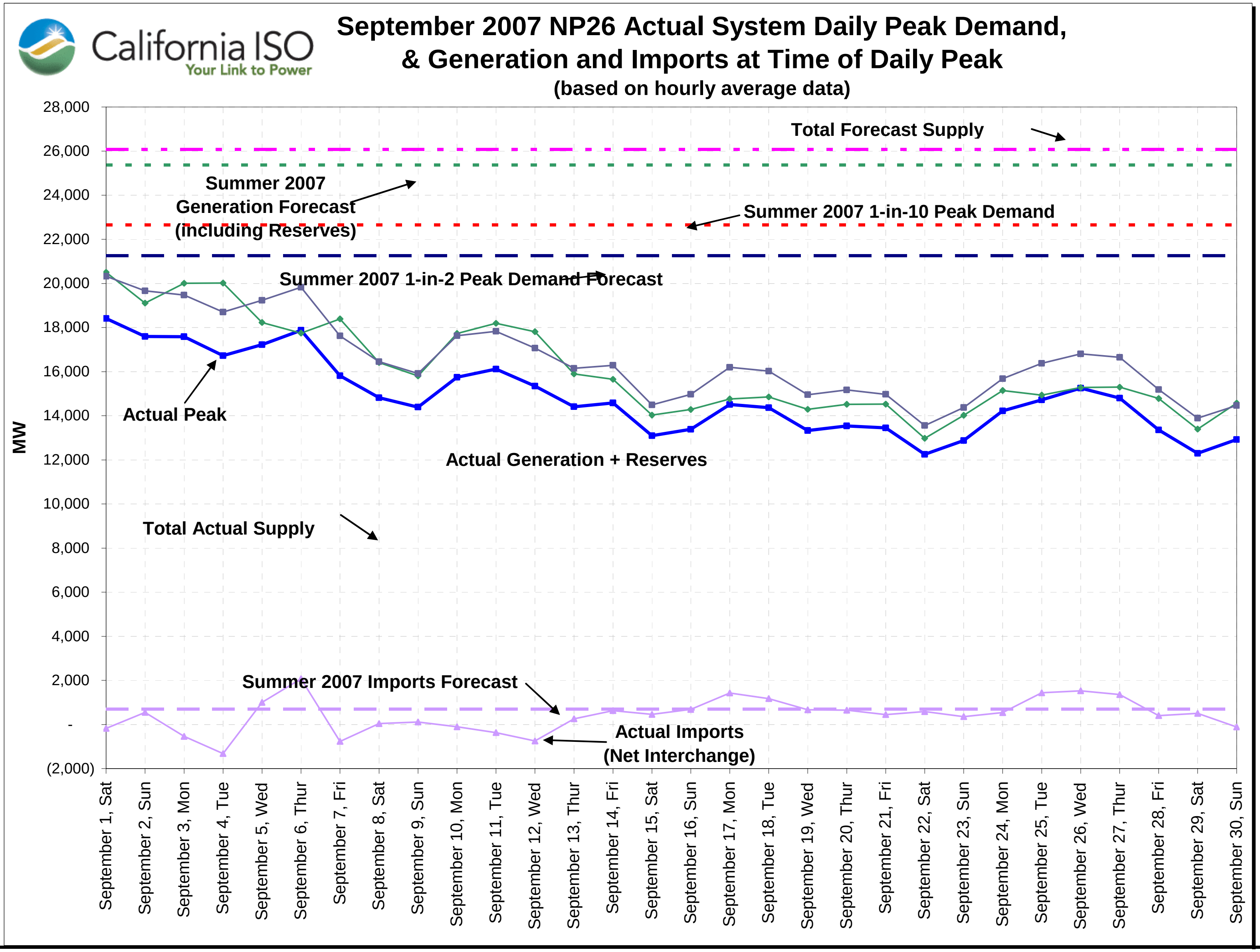
Appendix A – Continued



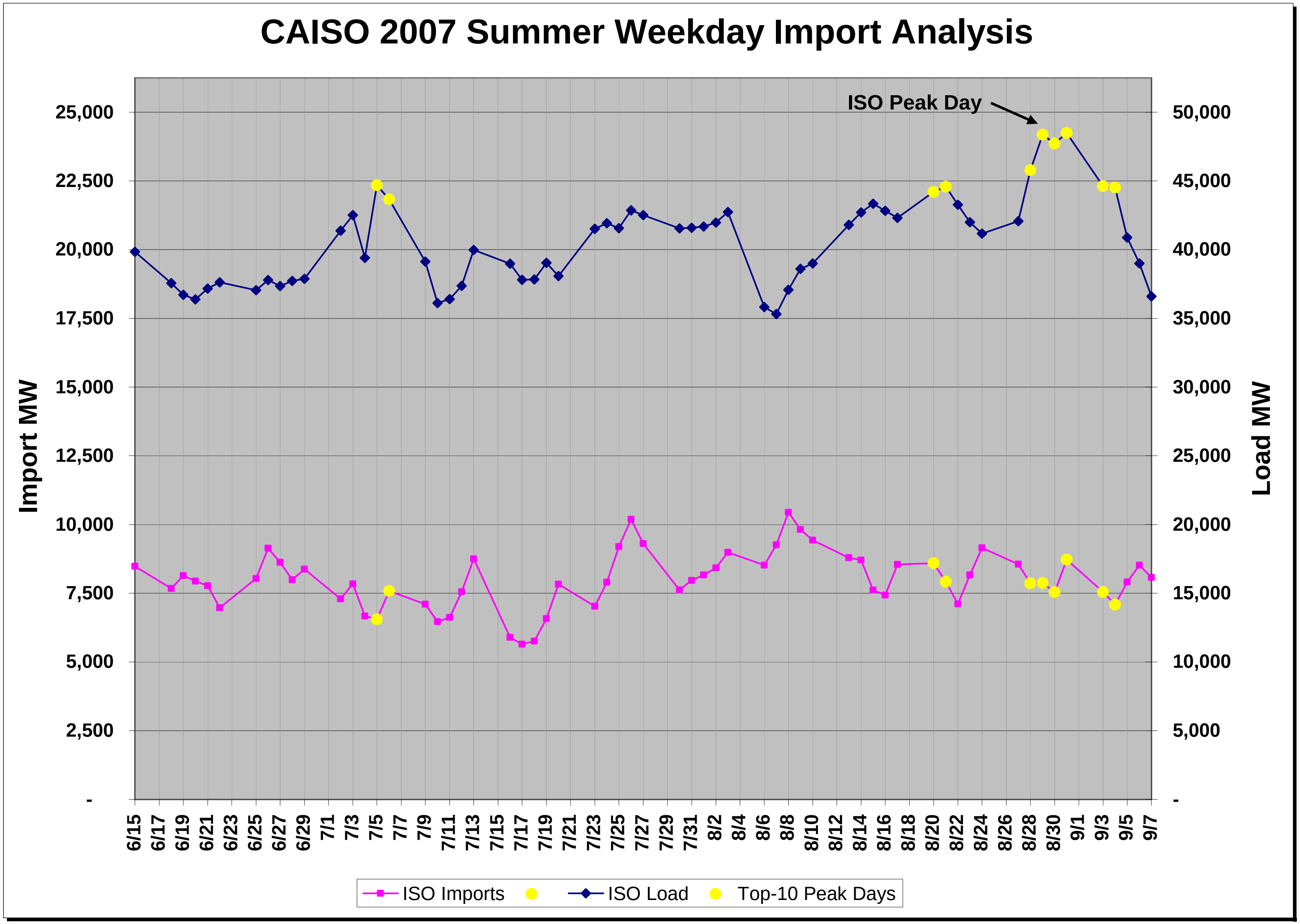
Appendix A – Continued



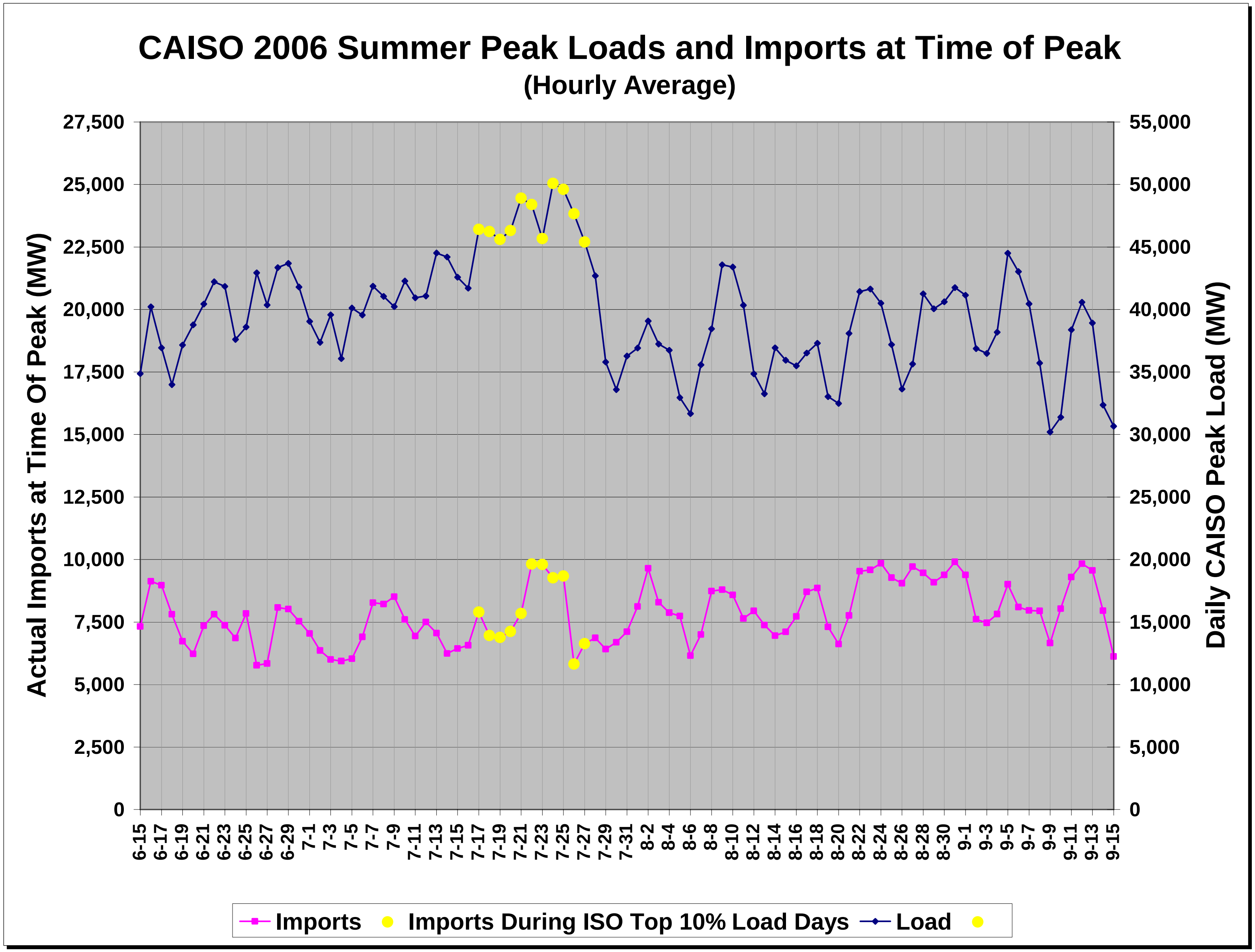
Appendix A – Continued



Appendix B - 2006 & 2007 Summer Imports Summary Graphs



Appendix B – Continued



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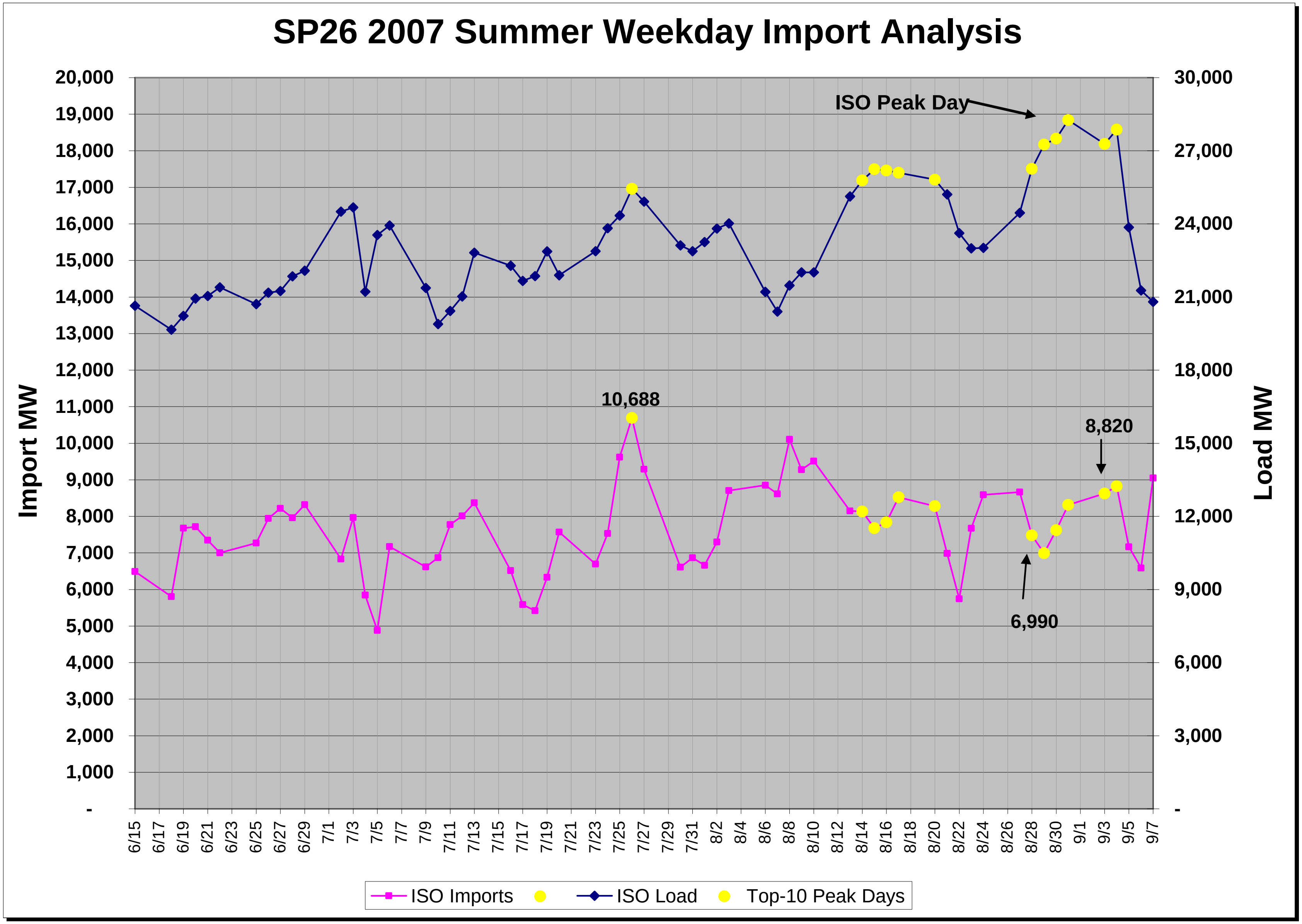

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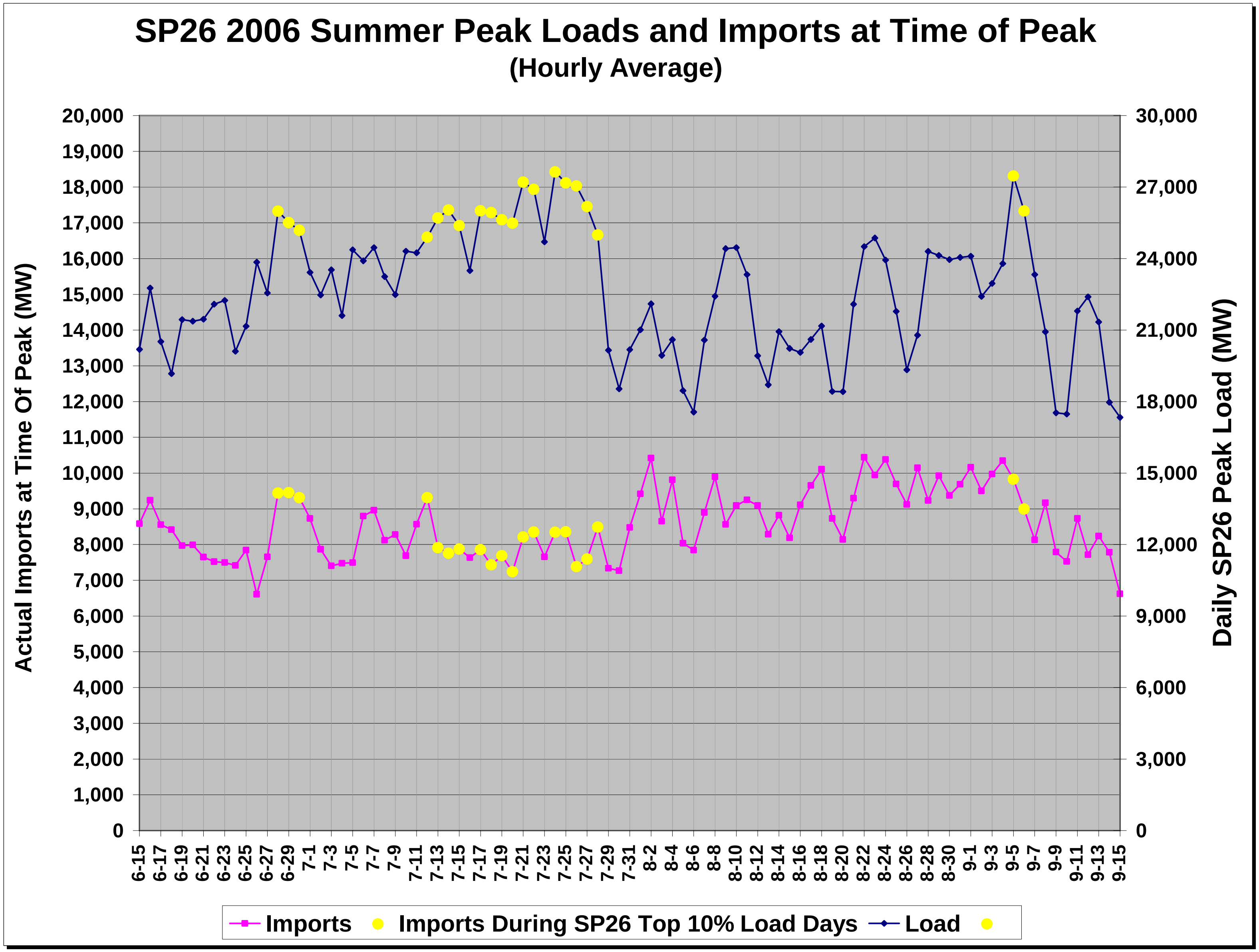

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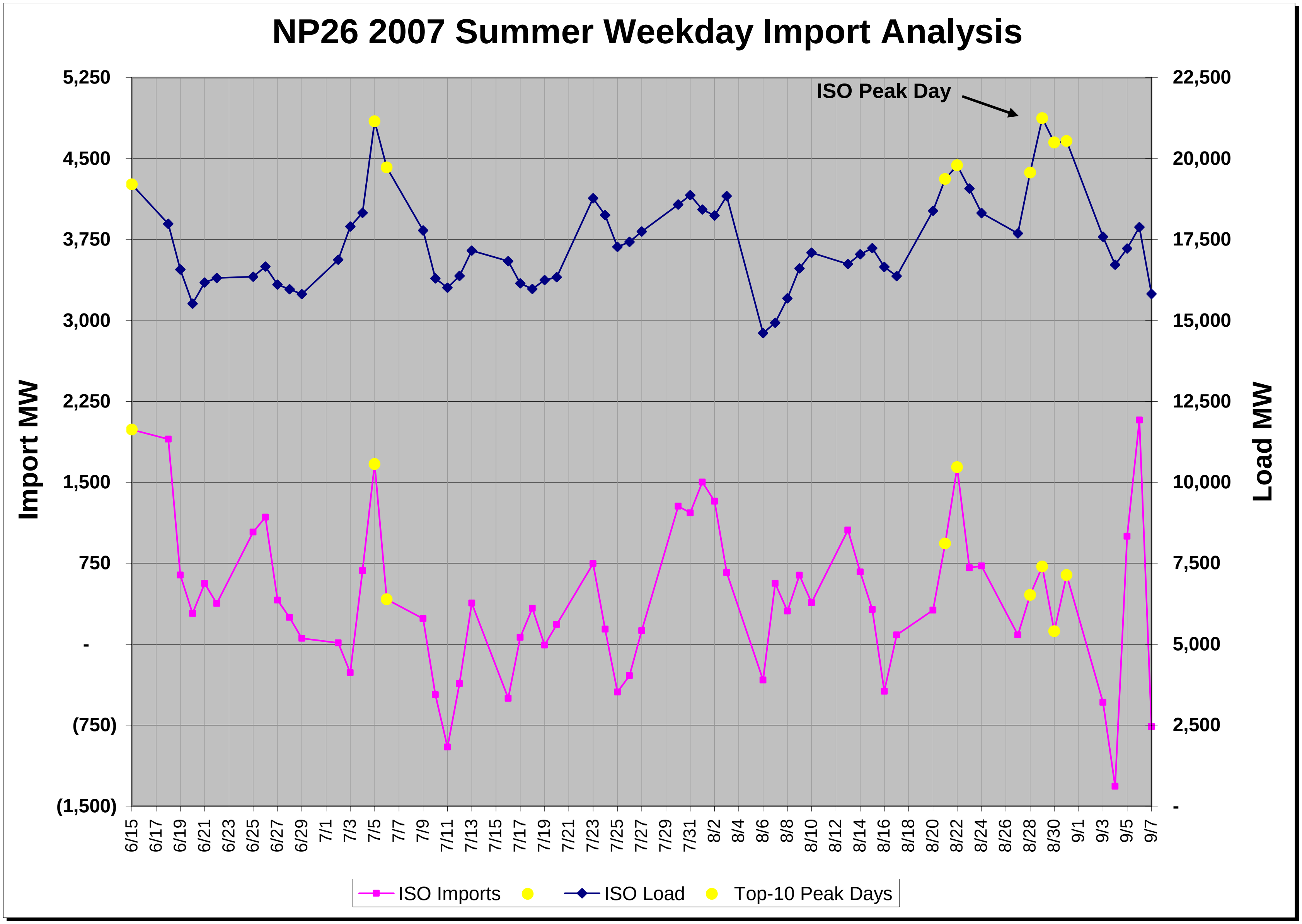

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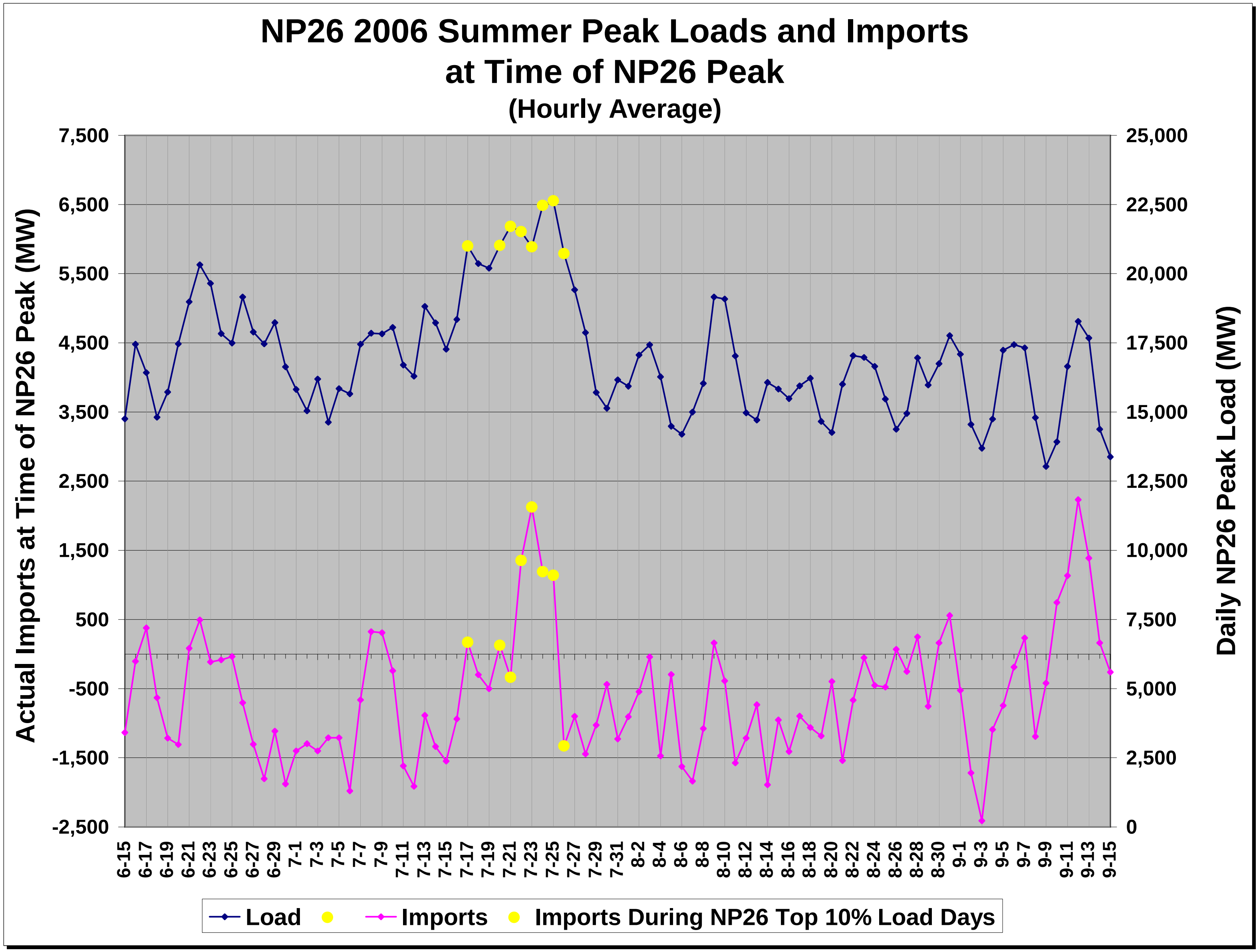
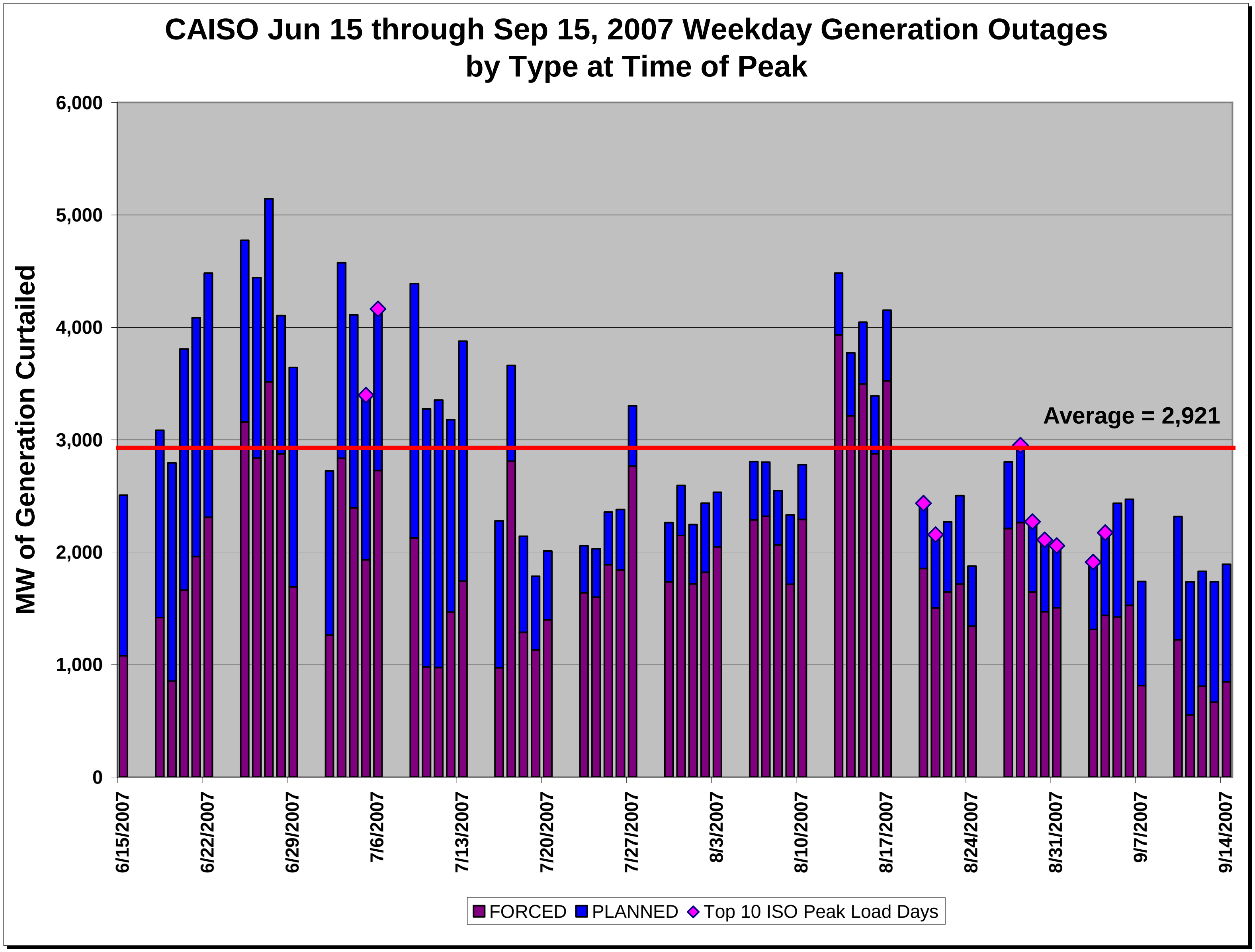
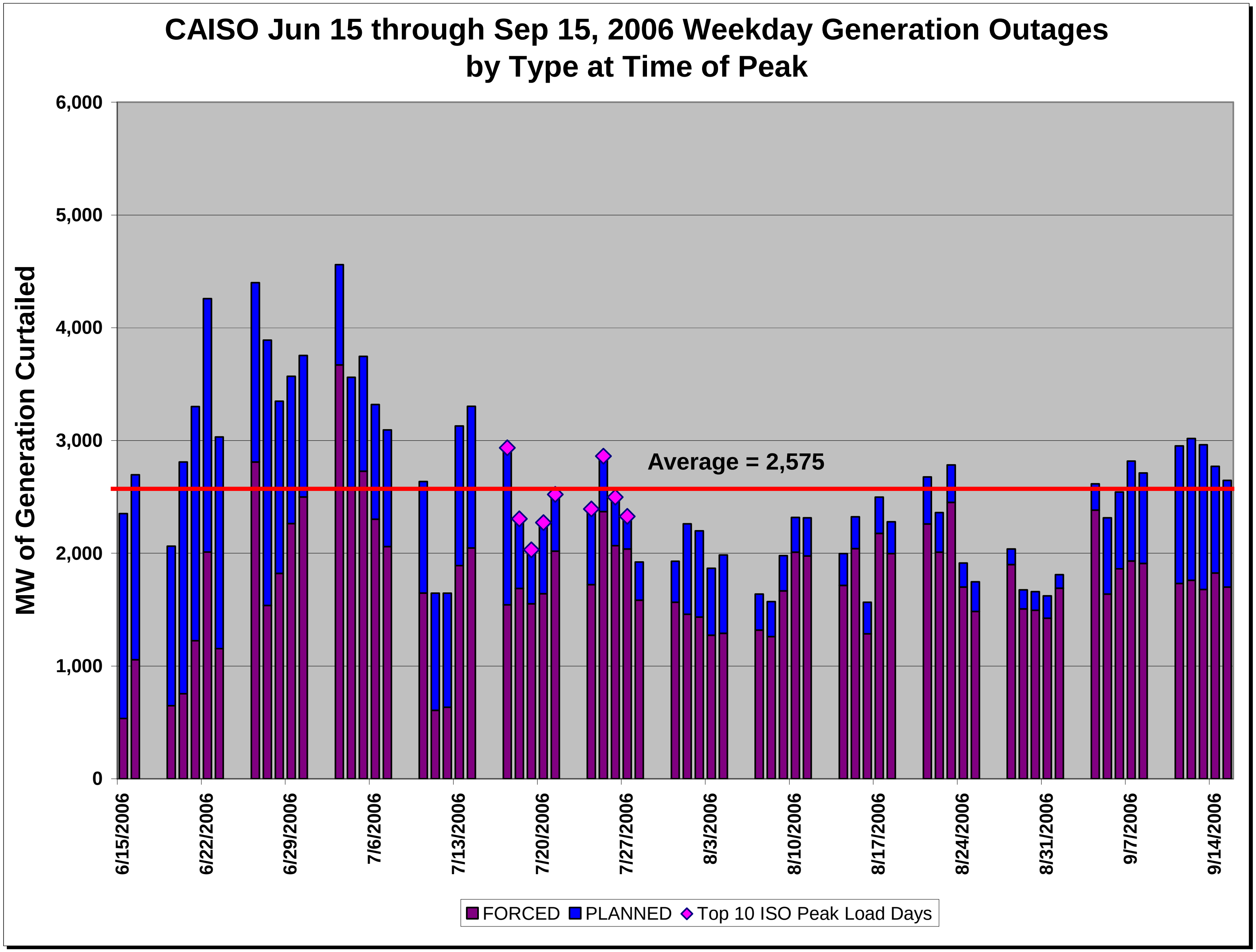


Appendix C – 2006 & 2007 Summer Generation Outage Graphs



Appendix C – Continued



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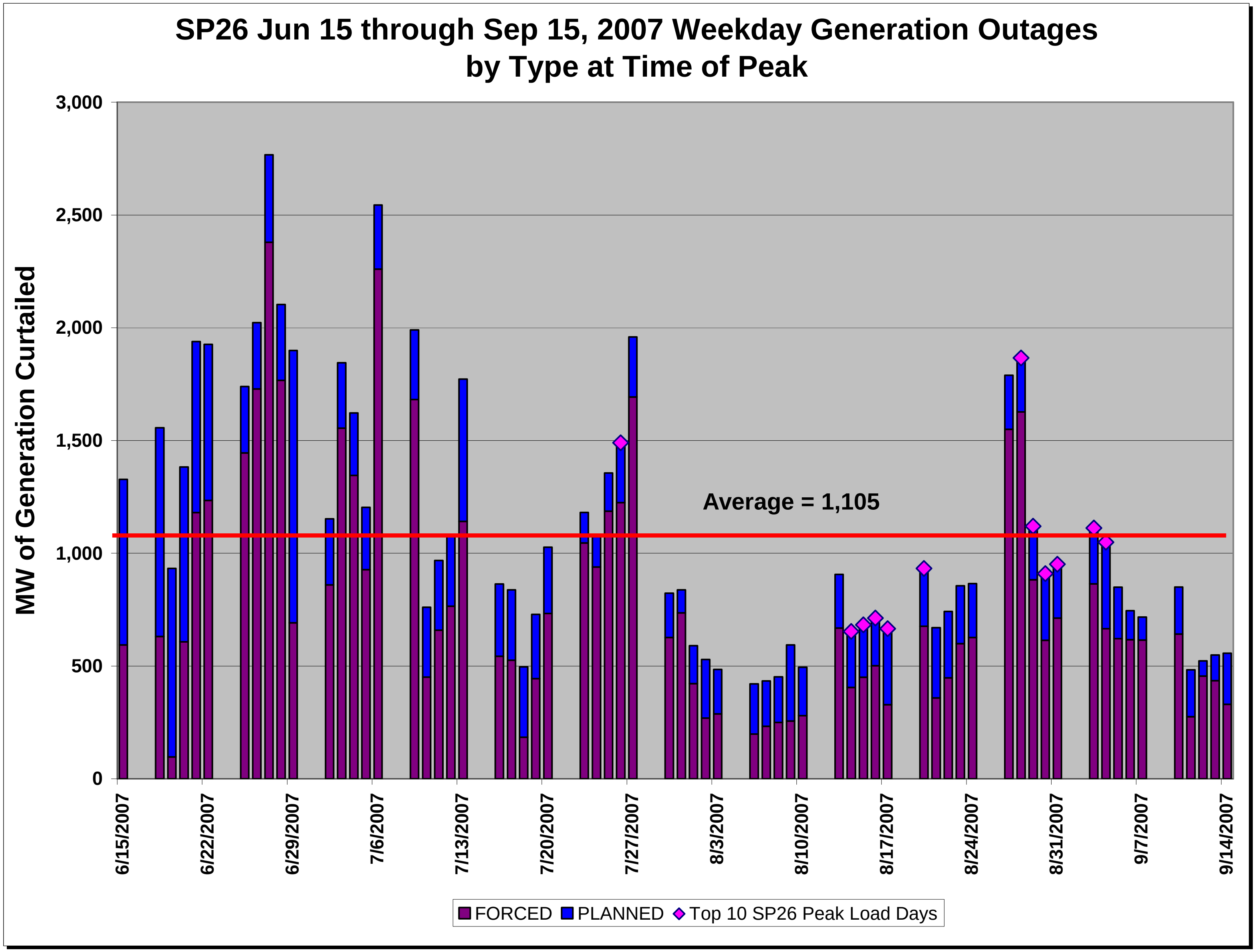

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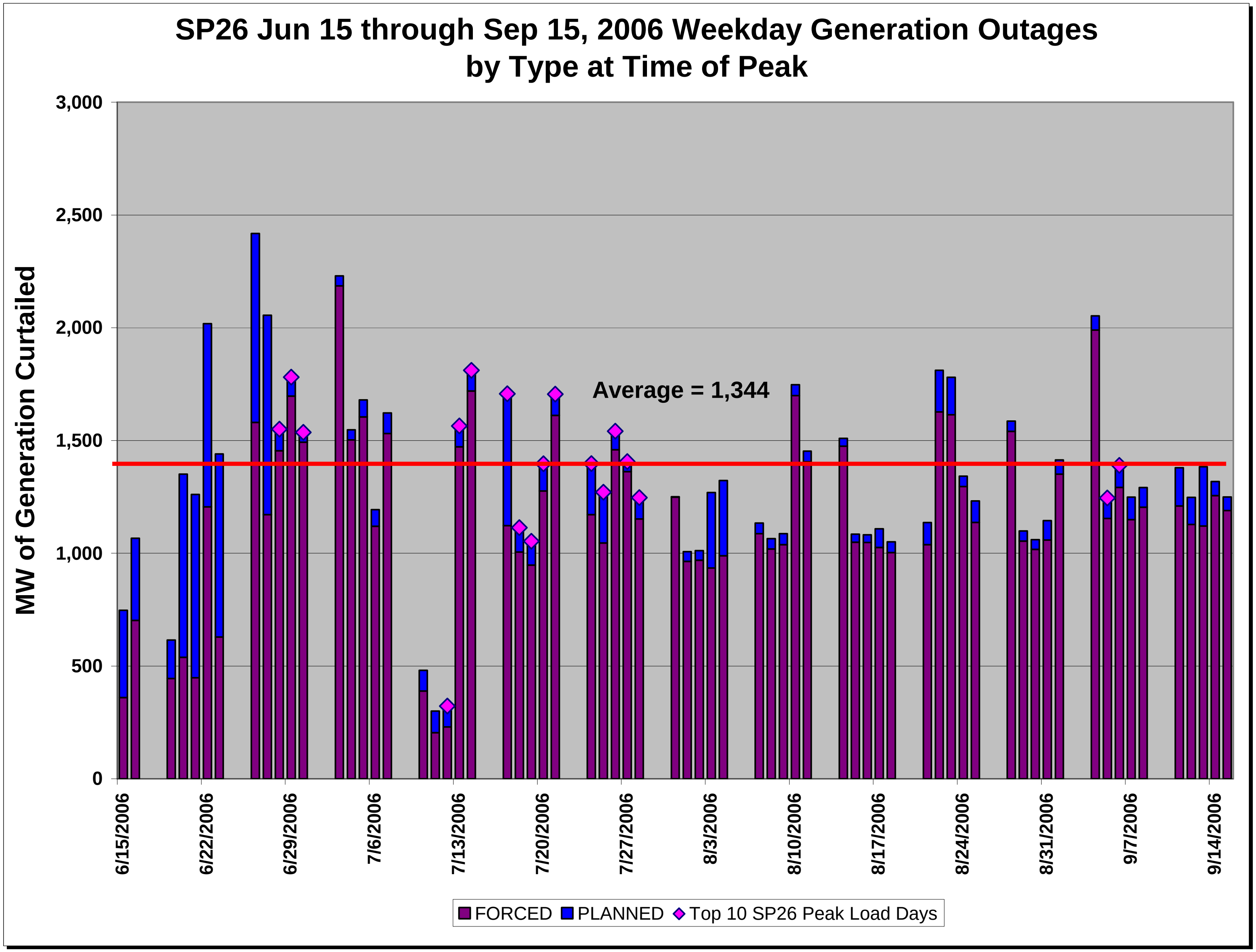

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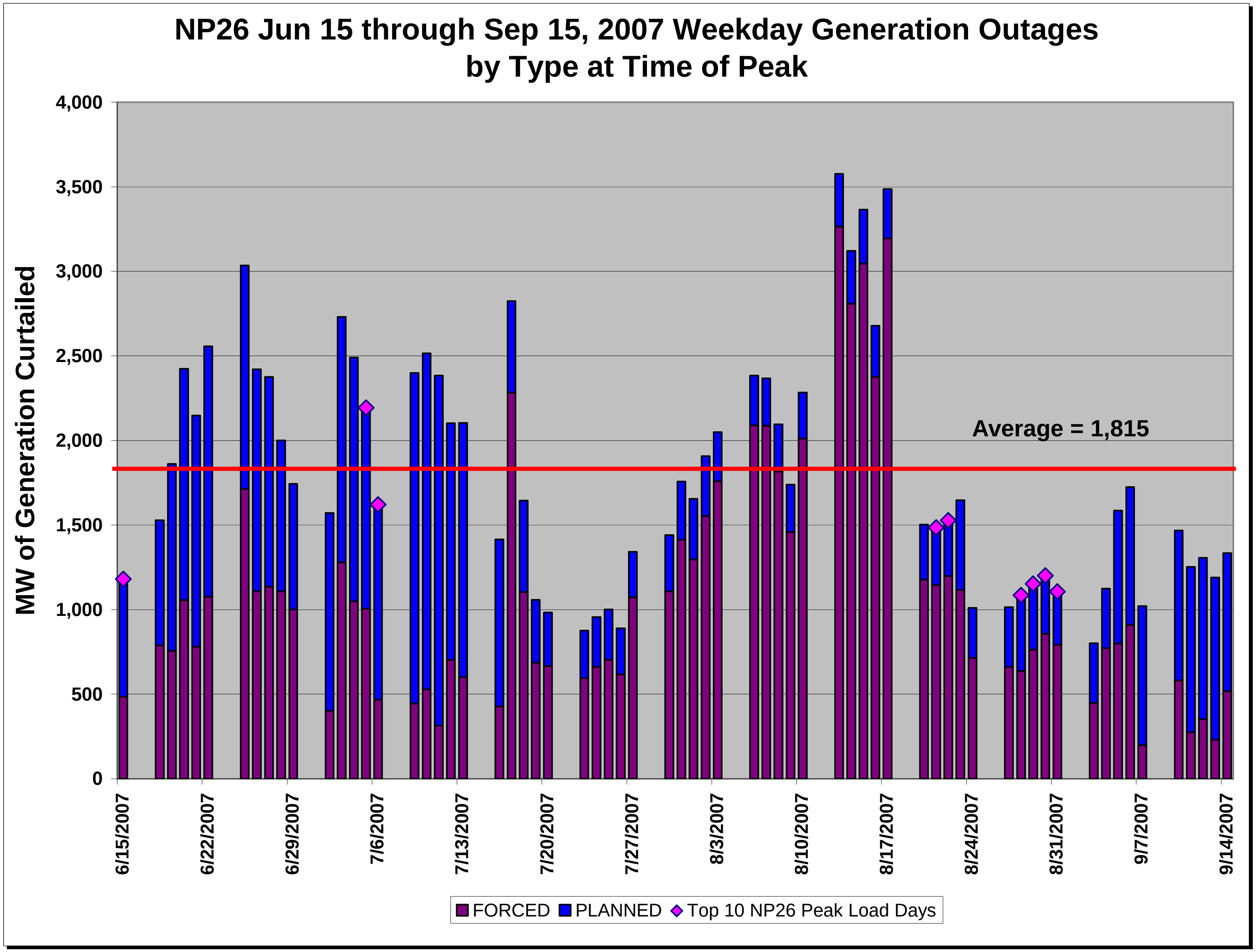

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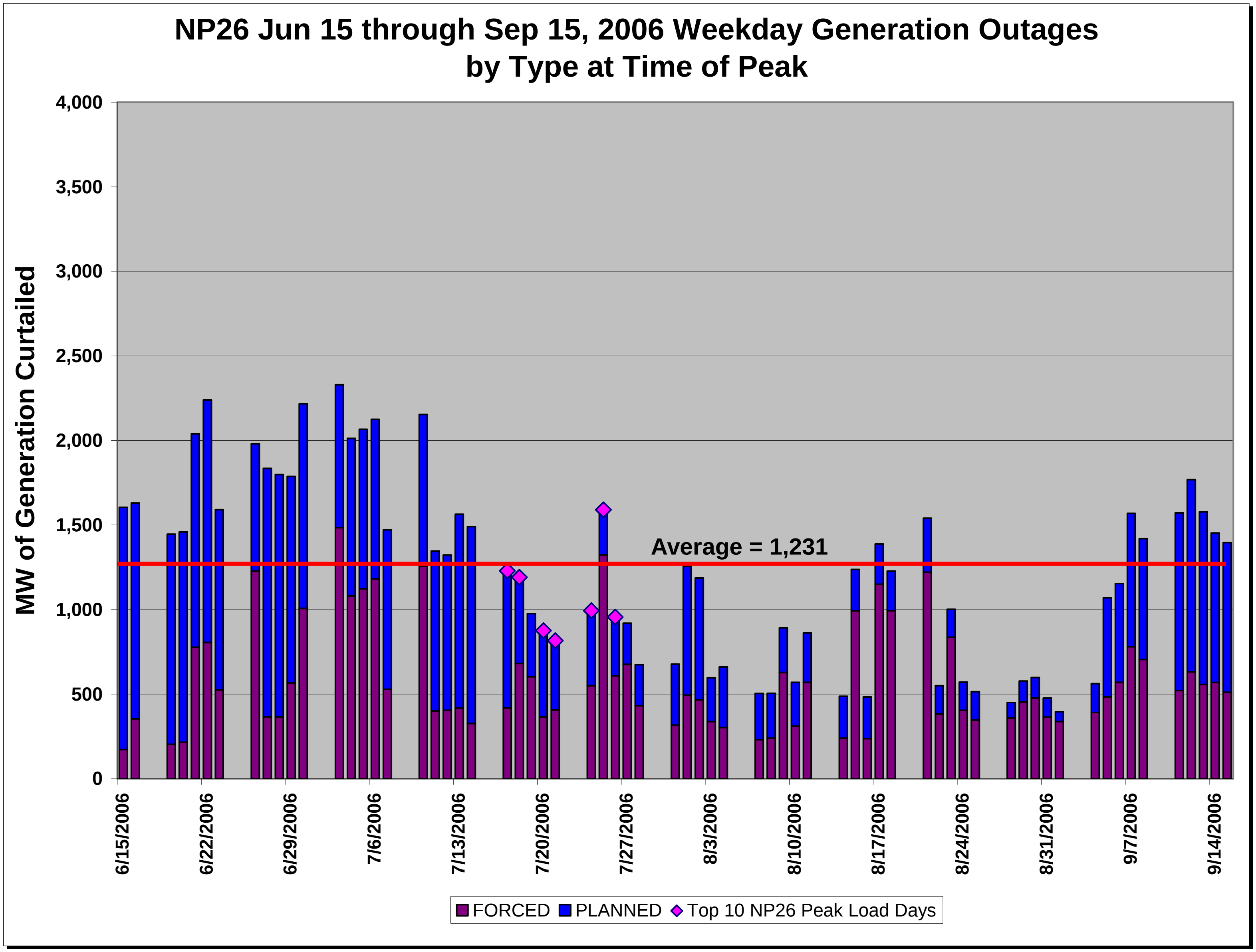
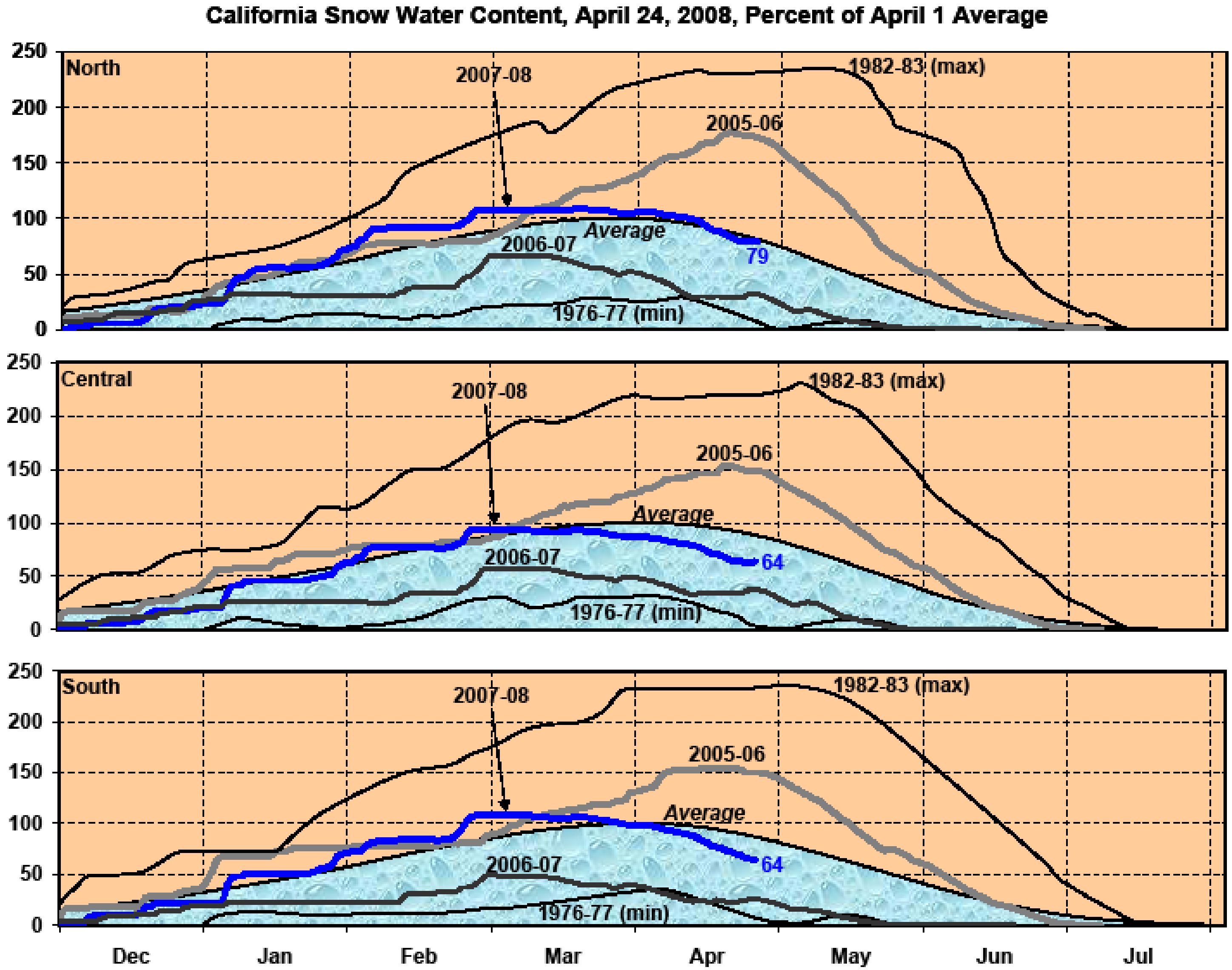
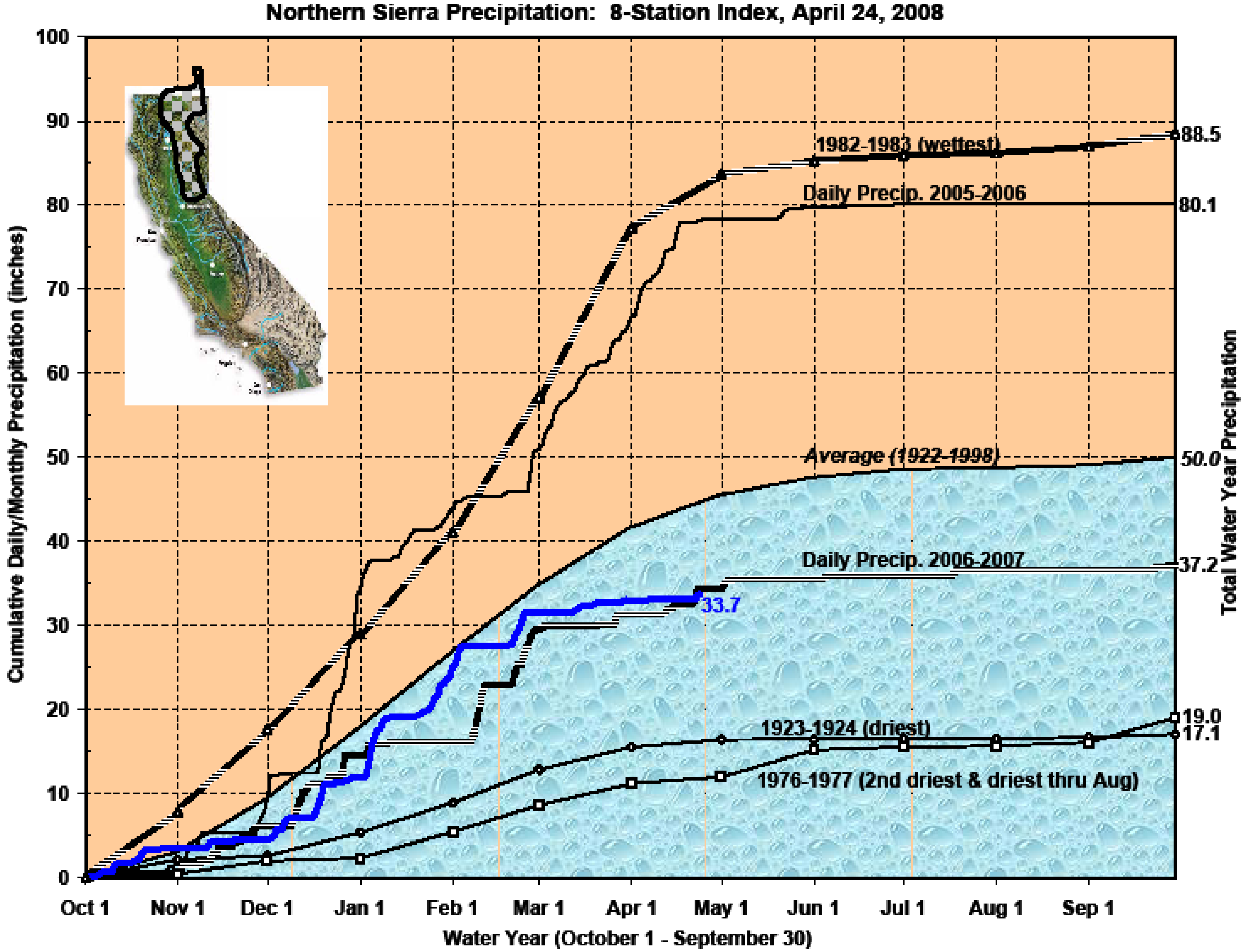


Appendix D – 2008 California Hydro Conditions



Source: California Department of Water Resources

Appendix D – Continued



Source: California Department of Water Resources

Appendix E – Potential 2009 New Generation

Projects with Potential for Reaching Operational Status for Summer 2009

Number	Fuel Type	Prime Mover Type	Project Type	Cap in MW	Est. Parallel	Zone
1	Wind	Wind	New	6.5	6/2/2008	SP15
2	Natural Gas	Combined Cycle	New	405	6/2/2008	SP15
3	Agricultural Waste	Steam Turbine	New	2.2	6/2/2008	SP15
4	Landfill Gas	Reciprocating Engine	New	1.6	7/1/2008	NP15
5	Natural Gas	Combustion Turbine	New	49	7/1/2008	SP15
6	Natural Gas	Combined Cycle	New	530	9/1/2008	NP15
7	Water	Hydro	New	20	9/1/2008	SP15
8	Water	Hydro	New	20	9/1/2008	SP15
9	Wind	Wind		33.1	11/1/2008	SP15
10	Wind	Wind		34	11/1/2008	SP15
11	Wind	Wind	New	201	11/1/2008	SP15
12	Landfill Gas	Reciprocating Engine	New	11.4	11/3/2008	NP15
13	Landfill Gas	Reciprocating Engine	New	3.8	11/28/2008	NP15
14	Wind	Wind	New	150	12/1/2008	NP15
15	Other	Steam Turbine	New	27	12/31/2008	SP15
16	Landfill Gas	Reciprocating Engine	New	9.2	12/31/2008	SP15
17	Wind	Wind	New	201	1/1/2009	SP15
18	Natural Gas	Combustion Turbine	New	119	3/16/2009	NP15
19	Wind	Wind		30	4/1/2009	NP15
20	Natural Gas	Reciprocating Engine	New	118	4/1/2009	NP15
21	Natural Gas	Combined Cycle	New	615	5/1/2009	SP15
22	Wind	Wind	Upgrade-Existing	51	6/1/2009	SP15
23	Wind	Wind	New	60	6/1/2009	SP15
24	Wind	Wind	New	102	6/15/2009	NP15
			Total	2,800	MW	
			Total Wind	869	MW	
			Wind Percent	31%		
			Total Renewable	897	MW	
			Renewable Percent	32%		
			SP26	1,734	MW	
			NP26	1,066	MW	