California Independent
System Operator Corporation

California ISO

# 2010 Summer Loads and Resources Operations Preparedness Assessment

May 10, 2010

Grid Assets
California ISO
Version 2.1

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# I. EXECUTIVE SUMMARY

The *2010 Summer Loads and Resource Operations Preparedness Assessment* is designed to provide the California Independent System Operator Corporation and interested parties an assessment of the supply and demand picture for the ensuing summer season. The impact that the current recession is having on peak demand loads is of particular interest this year and is addressed in this report.

Each year as part of its annual summer preparation process the ISO works with generators, transmission owners, and other balancing authorities in the West. Identifying issues of concern is one of the primary purposes of the Assessment in order to focus summer preparations on the conditions and contingencies that pose the greatest reliability risk. As a result the ISO is better prepared to manage the system under identified conditions as are its market participants, minimizing the chances of load shedding.

The Assessment uses deterministic and probabilistic methodologies to characterize the current state of the 2010 summer supply and demand situation to help the ISO and the electricity industry prepare for contingencies that may arise. The deterministic approach examines potential issues and circumstances that can lead to low operating reserves. Whereas, the probabilistic approach assesses 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 2010 summer peak load period for the ISO system, and the South of Path 26 and North of Path 26 zones. The South of Path 26 zone includes the Southern California Edison and San Diego Gas & Electric service territories and the North of Path 26 zone includes the Pacific Gas & Electric service territory. This report describes the inputs used in the analyses, such as forecast peak demand, generation resources, imports, and generation outages, and provides results and findings for a variety of operational scenarios.

### *Findings*

Supply for the summer is adequate to handle a broad range of operating conditions and the probability of involuntary load curtailment is low, less than 1% for the ISO as a system. However, demand response and conservation programs will be required if extreme conditions arise. The need to maximize imports into southern California is also essential to maintaining adequate supplies during high demand and high outage conditions. Conservation through the Flex Your Power program and the utility demand response programs are vital under extreme conditions.

Hydro conditions for 2010 have improved with the statewide average snow water content measured at 150% of historical average as of May 3, 2010. The amount of runoff available for hydro generation 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 that results in decreased runoff during the mid to late summer peak demand periods.

The same El Nino weather pattern that brought above normal precipitation to California during the current spring and the previous winter produced below normal precipitation in the Pacific Northwest. Hydro conditions in the northwest are well below normal with Columbia River flows during April-September predicted to be 65% of normal at The Dalles Dam. The result will be less than normal hydro generated energy flowing to California this spring and summer, causing California generation to run more hours. However, because of reduced loads a result of the recession, the northwest should have enough surplus generation during California peak load periods to produce typical imports levels.

An additional 1,760 MW of new generation is expected to come on line between the beginning of last summer and by June 1, 2010. Of that amount, 674 MW have reached commercial status and are included in the existing generation shown in *Table 1* and 1,086 MW are shown as yet to come on line but expected to by this summer. The 1,760 MW consists of 1,680 MW of thermal generation and 80 MW of renewables, with 1,727 MW located South of Path 26 and 33 MW North of Path 26.

*Table 1* is the supply and demand outlook for the 2010 summer from a planning perspective. It shows the planning reserve based on the 1-in-2 peak demand forecast prior to accounting for any generation outages or transmission curtailments. The 47,139 MW forecast peak demand developed by the ISO is 2.9% above last summer's peak of 45,809 MW and was developed using Moody's Economy.com's baseline forecast of gross domestic product for the economic indicator[1]. The forecasted 2.9% increase represents a modest economic recovery over 2009 and increased water pumping during 2010 peak periods compared to 2009 because of increased water availability in 2010.

*Table 1* shows the planning reserve margins are robust due to the ongoing recession's impact on electric loads. The generation shown is based on current generation in service along with the generation expected to go commercial or retire prior to the 2010 summer. The import levels shown as net interchange are unchanged from last year's assessment and are based on moderate import levels experienced at the time of peak demand for each area represented during the 2008 summer season, prior to or in the beginning stages of the recession. The import levels experienced during the 2008 summer peak loads are expected to be representative of the availability of imports for the 2010 summer[2].

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[1] The load forecasts presented in this Assessment are short-term, recession driven forecasts, intended to be used to gain an understanding of the expected loads for the 2010 summer period. These forecasts are not intended to be used for resource planning decisions and should not be used for that purpose.

[2] 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 their levels during a given set of contingencies. Because no single import amount can be used to represent every scenario, this assessment examines high, moderate and low import levels, which are used in the supporting supply adequacy analyses.

**Table 1**

| **Summer 2010 Supply & Demand Outlook** | | | |
|---|---|---|---|
| **Resource Adequacy Planning Conventions** | **ISO** | **SP26** | **NP26** |
| Existing Generation[1] | 49,807 | 23,326 | 26,481 |
| Retirements (known/expected)[2] | (6) | 0 | (6) |
| High Probability CA Additions | 1,086 | 1,057 | 29 |
| Hydro Derates | 0 | 0 | 0 |
| Net Interchange (Moderate) | 10,100 | 9,200 | 2,050 |
| Total Net Supply (MW) | 60,988 | 33,583 | 28,555 |
| Demand (1-in-2 Summer Temperature) | 47,139 | 27,198 | 21,154 |
| DR & Interruptible Programs[3] | 2,403 | 1,668 | 734 |
| **Planning Reserve[4]** | **34.5%** | **29.6%** | **38.5%** |

[1] as of 3/22/2010 (refer to Table 8)
[2] as of 3/22/2010 (refer to Table 8)
[3] (refer to Table 9)
[4] Planning Reserve calculation (Total Net Supply + Demand Response + Interruptibles)/ Forecast Demand)-1.

*Figures 1* and *2* are graphical representations of the deterministic analysis results, including 1-in-2 and 1-in-10 generation and transmission outages and curtailments, and 1-in-2 and 1-in-10 peak demand scenarios for the ISO, NP26 and SP26 areas. These scenarios show the operating reserve margin after using all demand response programs. Analyzing the more extreme conditions frames the electric system challenges and identifies the magnitude of operating reserves during these conditions, which helps to focus efforts on measures that will minimize impacts.

Two deterministic scenarios are presented, the normal 1-in-2 operating scenario and the extreme 1-in-10 operating scenario with low imports. These figures show that no firm load shedding would be needed in the extreme scenario. The zonal analysis for NP26 and SP26 are on a noncoincidental basis and *Figure 1* shows that the operating reserve margins for the two zones drop to 5% in the extreme scenario.

*Figure 2* shows that the reserve margins for NP26 and SP26 approach 1,000 MW in the extreme scenario. While the extreme scenario is by nature a low probability event, it shows that the ISO must continue to be prepared to deal with extreme events that could lead to firm load shedding.

Figure 1

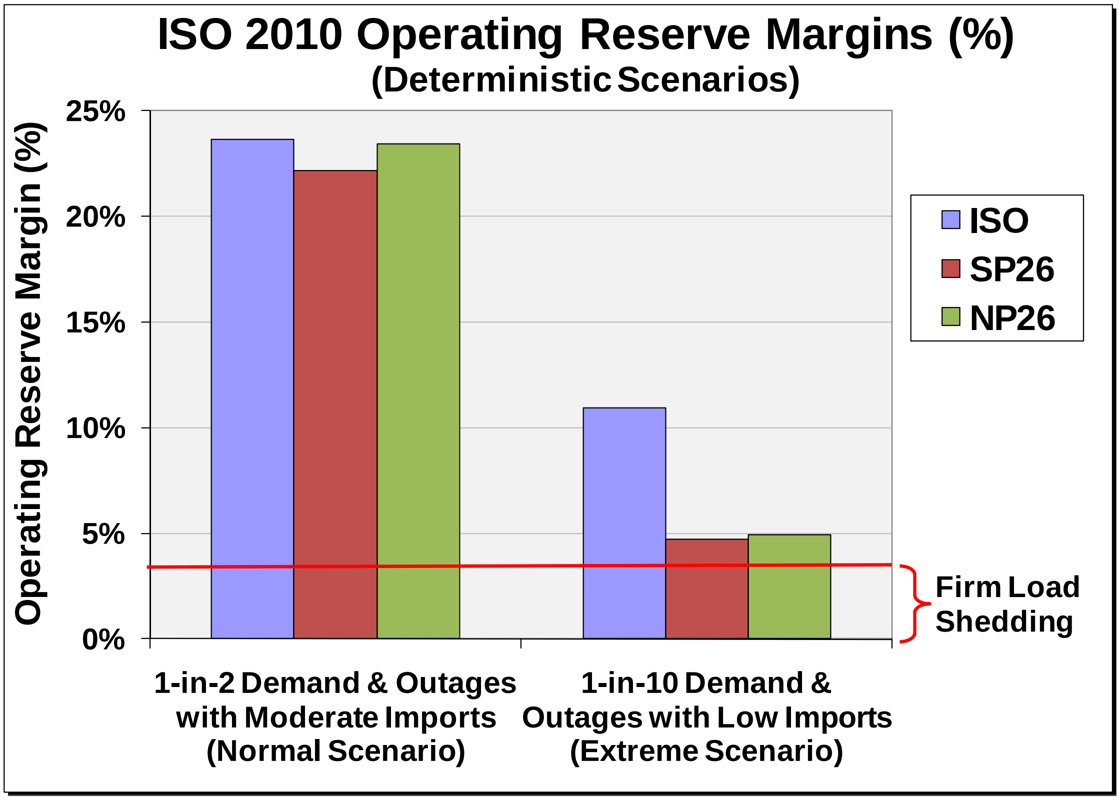



Figure 2

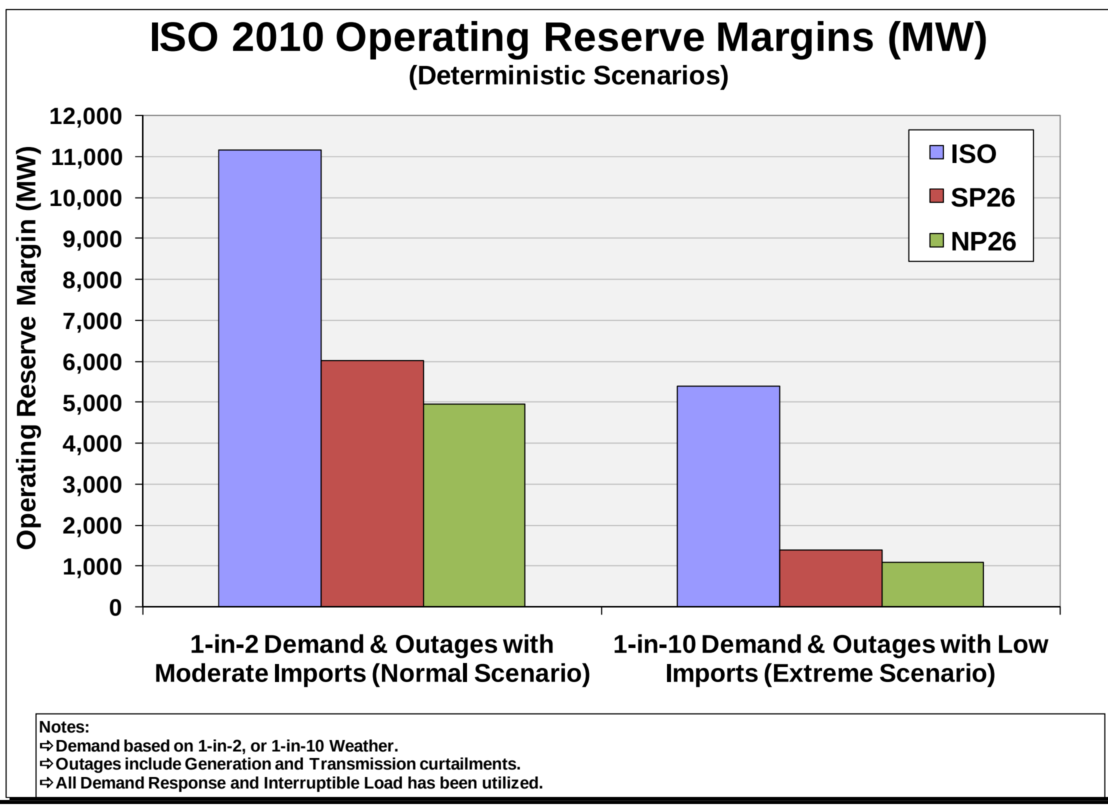
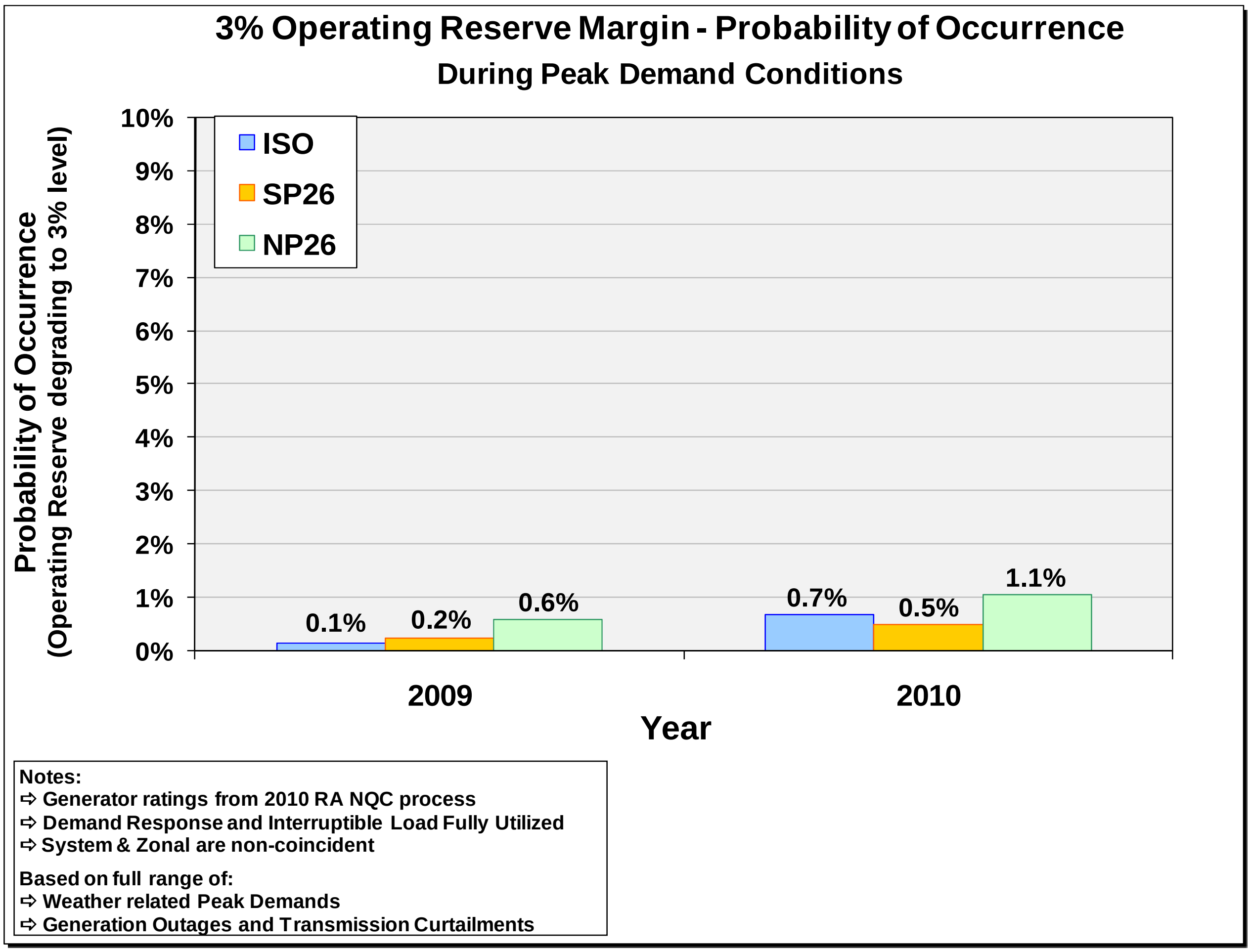


*Figure 3* represents probabilities for having the operating reserve margin fall to 3% or less, where firm load shedding begins. The probabilities projected for 2009 are shown for reference purposes. The probability for firm load shedding remains at low levels as the recession continues to reduce peak demand loads. As with the deterministic analysis the probabilities shown are based on full utilization of all demand response programs and on the assumption that imports this summer will reach levels experienced during the 2008 summer, particularly under extreme conditions if they arise.

**Figure 3**




Under typical operating scenarios where demand response is used the programs are utilized in increments to maintain required operating reserve margins. Under the extreme conditions when all of the programs are called on some of the programs are likely to be used as the last option before shedding firm load. Consequently it is critical that these programs operate in the time frame and to the levels expected when called on.

All analyses show the risk of firm load shedding is low this summer. Nevertheless, it is the ISO's job to manage the risks associated with extreme weather and other conditions, as was done successfully during the extreme heat wave of July 2006.

While electrical peak demand continues to be below historical trends 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 should take place as the economy returns to more normal conditions.

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 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 2009 OPERATIONS

***Demand***

*Figure 4* shows the daily peak demand for the ISO system, and the NP26 and SP26 zones. The system peaked on September 3, 2009, coincident with the SP26 peak. NP26 peaked on July 14, 2009.

**Figure 4**

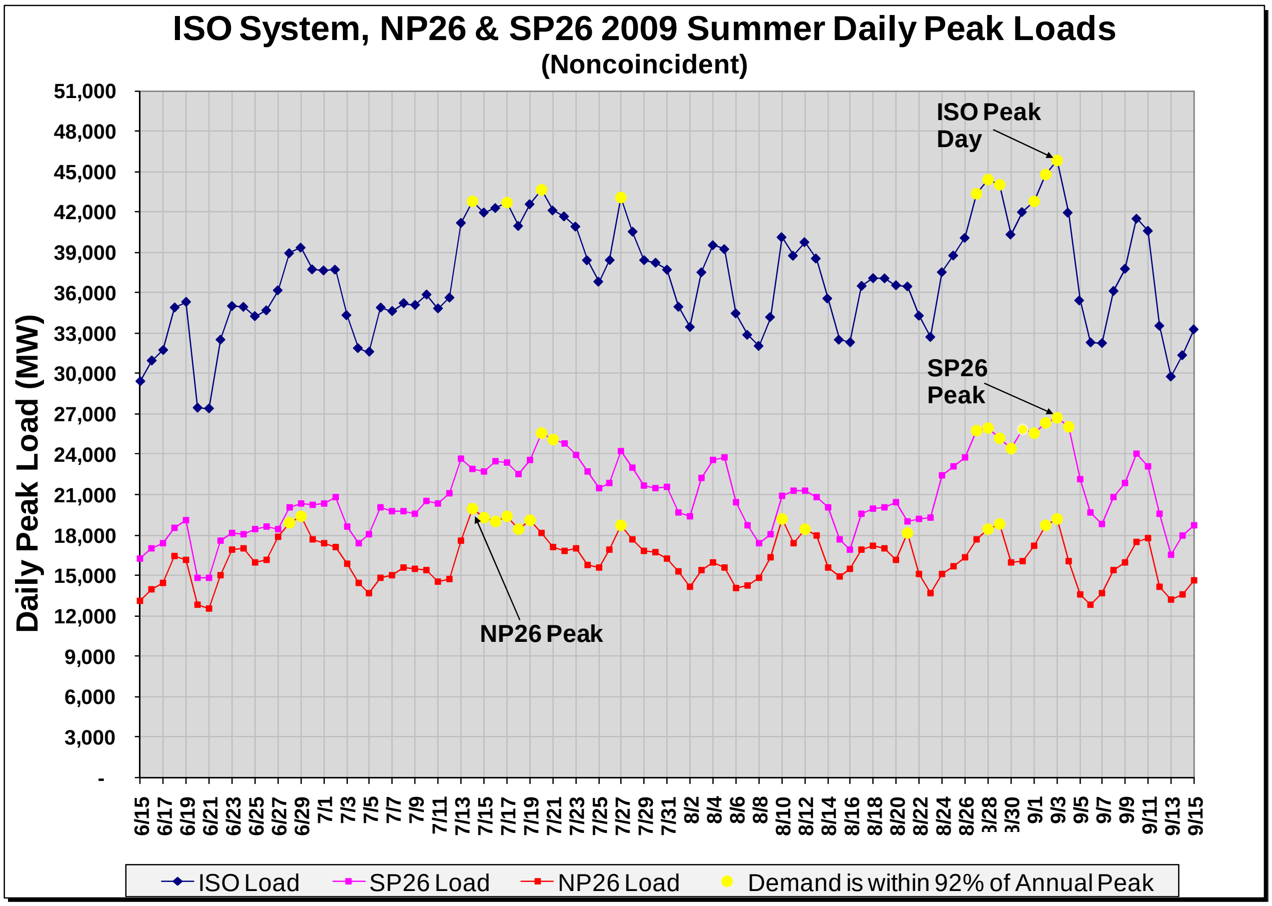


*Table 3* shows the difference between actual 2009 peak loads and the 2009 1-in-2 peak demand forecast.

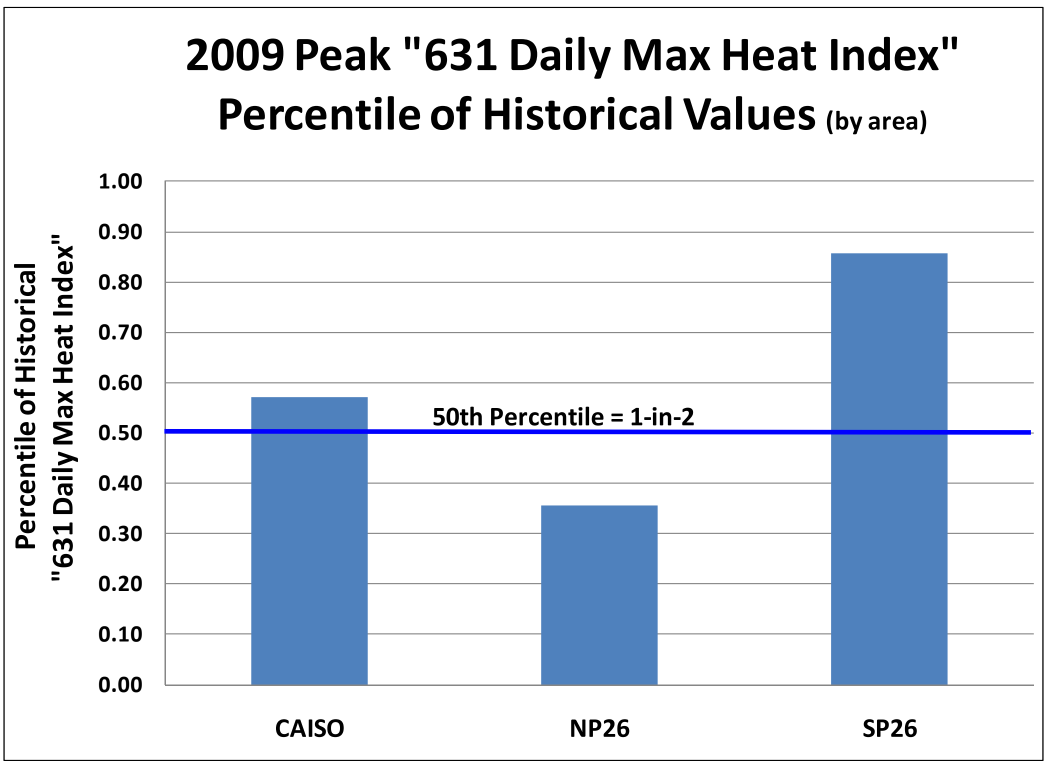
**Table 3**

(Hourly Average Demand)

| ISO Actual Peak Demand vs. Forecast | | | | |
|---|---|---|---|---|
| | 2009 1-in-2 Forecast | 2009 Actual | Difference from 1-in-2 Forecast | |
| | MW | MW | MW | % |
| ISO Control Area | 45,379 | 45,809 | 430 | 0.9% |
| SP26 | 25,412 | 26,742 | 1,330 | 5.2% |
| NP26 | 21,370 | 19,946 | -1,423 | -6.7% |

*Figure 5* shows the 2009 daily maximum heat index 631 heat buildup during the peak period rated against historical values for this weather parameter. The ISO experienced slightly above 1-in-2 weather conditions and is reflected in the actual load being slightly above the forecast. The weather during the NP26 peak period was below 1-in-2 weather conditions and is reflected in the actual load being below the 1-in-2 forecast. The weather during the SP26 peak period was above 1-in-2 weather conditions and is reflected in the actual load being higher than the 1-in-2 forecast.

**Figure 5**




While the forecast for the ISO as a whole was quite accurate, the differences from the zonal forecasts were more than could be attributed to weather conditions and reveals the forecast model having greater difficulty predicting zonal loads, which was due to the economic forecast inputs being less accurate in the more granular levels. This should be less of an issue for the 2010 forecast because more historical economic information leads to better forecasts of the recession moving forward. However, the forecast model is still dependent on forecasts of economic conditions and if those forecasts are flawed, the load forecast will be somewhat flawed as well.

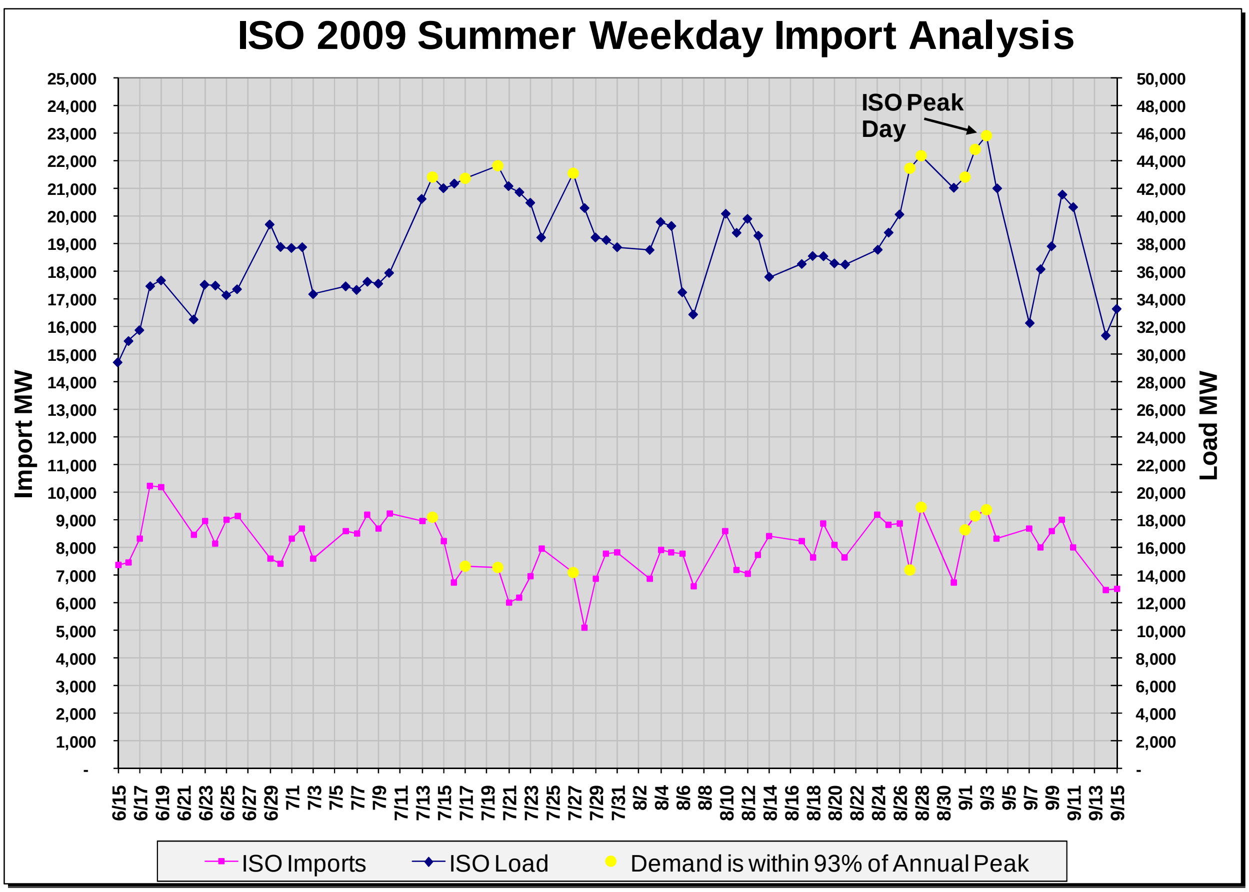
### *Generation outages*

While 2009 saw generation outages trending higher over previous summer periods, there were no noteworthy outages during the 2009 summer. Graphical information of generation outages over the last three years for the ISO, NP26 and SP26 are presented in *Appendix C*.

### *Net interchange*

*Figure 6* shows the 2009 peak hour loads and the net interchange (also known as imports) over the weekday peak hours of 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. Import levels were down during the 2009 summer period versus the 2008 summer (*Appendix B*). This decline is primarily due to the ongoing recession which diminishes the need for imported energy. Import levels used in this analysis were unchanged from those used for the 2009 Assessment, which were based on 2008 import levels (see *Table 14*).

**Figure 6**



# III. SUMMER 2010 ASSESSMENT

### *Generation additions & retirements*

As shown in *Table 4*, a total of 674 MW of generation capacity has come on line since the beginning of summer 2009, through March 22, 2010. Most of this new capacity, 600 MW, comes from the Otay Mesa generating facility in the San Diego region.

**Table 4**

**New Generating Capacity**

**(Generation that acheived commercial operation since June 2009, not included in 2009 Summer Assessment)**
**(June 2009 through 3/22/10)**

| PGA Owner | COD | Resource ID | NP (MW) | NQC (est) | Prime Mover Type | PTO Area |
|---|---|---|---|---|---|---|
| Toland Landfill G-T-E-Facility | 8/25/2009 | SAUGUS_2_TOLAND | 2.8 | 2.6 | Landfill Gas | SCE |
| Keller Canyon Landfill Generating Facility | 8/1/2009 | KIRKER_7_KELCYN | 3.8 | 3.5 | Recip. Engine | PG&E |
| Miramar Energy Facility II | 8/7/2009 | MRGT_6_MEF2 | 49 | 46 | Gas Turbine | SDG&E |
| Otay Mesa | 10/3/2009 | OTMESA_2_PL1X3 | 689.0 | 600.0 | Combined Cycle | SDG&E |
| Garnet Energy Center Expansion | 6/2/2009 | GARNET_1_WIND | 2.5 | 0.4 | Wind Turbine | SCE |
| Chino RT Solar Project | 12/1/2009 | CHINO_2_SOLAR | 2.0 | 1.7 | Solar PV | SCE |
| Vaca-Dixon Solar Station | 12/23/2009 | VACADX_1_SOLAR | 2.0 | 1.7 | Solar PV | SCE |
| Blythe Solar 1 Project | 12/18/2009 | BLYTHE_1_SOLAR1 | 21 | 18 | Solar PV | SCE |
| | | **ISO TOTAL** | **772** | **674** | **PG&E NQC** | **4** |
| | | | | | **SCE NQC** | **24** |
| | | | | | **SDG&E NQC** | **646** |
| | | | | | **NP26 NQC** | **4** |
| | | | | | **SP26 NQC** | **670** |

*Table 5* shows a total of 1,086 MW of additional generation capacity that is expected to come on line in the ISO by June 1, 2010, with 1,057 MW this occurring in SP26.

**Table 5**

High Probability Generation Additions Expected
After March 22, 2010 and by Summer 2010

| Project Name | Est. Initial Sync | Actual Initial Sync | Estimated COD | Resource ID | NP (MW) | Net Capacity Increase | Resource Type | Project Type | Contract Type | PTO Area |
|---|---|---|---|---|---|---|---|---|---|---|
| CalRENEW-1(A) | 3/31/10 | | 4/15/10 | MENBIO_6_RENEW1 | 5.0 | 4.7 | Photovoltaic | New | QF-PGA | PG&E |
| Blue Lake Power Biomass Re-Power | 4/5/10 | | 5/1/10 | BLULKE_6_BLUELK | 13.8 | 12 | Biomass | Re-Power | PGA | PG&E |
| Big Creek Water Works Re-Power | 5/1/10 | | 5/10/10 | GRSCRK_6_BGCKWW | 5.0 | 4.7 | Hydro | Re-Power | PGA | PG&E |
| Copper Mountain Solar 1 Pseudo Tie PILOT | 5/1/10 | | 6/15/10 | COPMTN_2_SOLAR1 | 48 | 8.0 | Photovoltaic | New | PGA | PG&E |
| | | | | | **72** | **29** | | | | **PG&E (NP26) Total** |
| Chiquita Canyon Landfill | 4/5/10 | | 5/1/10 | SAUGUS_7_CHIQCN | 9.2 | 8.6 | Landfill Recip Engine | New | QF-PGA | SCE |
| Inland Empire Energy Center Unit 2 | 7/22/08 | 7/27/08 | 5/3/10 | INLDEM_5_UNIT 2 | 405 | 376 | Combined Cycle | New | PGA | SCE |
| Rialto RT Solar | 5/1/10 | | 5/10/10 | VISTA_2_RIALTO | 2.0 | 1.9 | Photovoltaic | New | PGA | SCE |
| Blythe Energy Project Phase II | 5/28/10 | | 6/1/10 | BUCKBL_2_PL1X3 | 560 | 520 | Combined Cycle | New | PGA | SCE |
| Calabasas Gas To Energy Facility | 4/15/10 | | 6/1/10 | MOORPK_2_CALABS | 13.8 | 13 | Landfill - CT | New | QF-PGA | SCE |
| | | | | | **990** | **919** | | | | **SCE Total** |
| Orange Grove | 1/29/10 | 1/30/10 | 4/15/10 | OGROVE_6_PL1X2 | 99 | 92 | Combustion Turbine | New | PGA | SDG&E |
| El Cajon Energy Center | 5/1/10 | | 5/15/10 | ELCAJN_6_LM6K | 49.5 | 46 | Combustion Turbine | New | PGA | SDG&E |
| | | | | | **149** | **138** | | | | **SDG&E Total** |
| | | | | | **1,139** | **1,057** | | | | **SP26 Total** |
| | | | | | **1,210** | **1,086** | | | | **ISO Total** |

*Table 6* shows that a total of 403 MW of generation capacity in the ISO is expected to retire by June 1, 2010. Generation retirements representing 397 MW have occurred since last summer in the San Diego area with an additional 5.6 MW expected by the beginning of summer 2010 in the PG&E area (shown in *Table 6)*. It is worth noting that a participating generator is only required to give a 90 day notice prior to retiring units.

**Table 6**

| Generating Resources Expected to Retire (since end of 2009 Summer) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Resource ID | Resource Name | Net Dependable (MW) | NQC (MW) | PTO Area | Classification | Fuel Type | Zone | COD |
| SOBAY_7_SY3 | SOUTHBAY UNIT 3 | 175 | 175 | SDG&E | THERMAL | NATURAL GAS | SP26 | 1/1/64 |
| SOBAY_7_SY4 | SOUTHBAY UNIT 4 | 222 | 222 | SDG&E | THERMAL | NATURAL GAS | SP26 | 12/1/71 |
| | Subtotal - Completed Retirements | | 397 | | | | | |
| DOWCHM_1_UNITS | DOW CHEMICAL CALPINE PITTSBURG PLANT | 80.5 | 5.6 | PG&E | COGENERATION | NATURAL GAS | NP26 | 7/1/77 |
| Subtotal - Retirements Expected Prior to Summer 2010 | | | 5.6 | | | | | |
| | | Total | 403 | MW | | | | |

*Table 7* shows the total generation capacity changes within the ISO since the beginning of summer 2009 (not included in the 2009 Assessment) and expected by June 1, 2010.

**Table 7**

| Total Expected Generation Changes Since Beginning of Summer 2009 and Prior to Summer 2010 | | | | |
|---|---|---|---|---|
| | **Additions COD Since Summer 2009 (MW)** | **Additions Expected Prior to Summer 2010 (MW)** | **Retirements prior to Summer 2010 (MW)** | **Total Expected New Capacity for Summer 2010 (MW)** |
| ISO Control Area | 674 | 1,086 | (403) | 1,357 |
| SP26 | 670 | 1,057 | (397) | 1,330 |
| NP26 | 4.0 | 29 | (6) | 28 |

The ISO current on line generation shown in *Table 8* is developed using the final net qualifying capacity list used for the California Public Utilities Commission resource adequacy program for compliance year 2010, posted on October 29, 2009 at http://www.caiso.com/23a4/23a4aec6183d0.xls. Generators who chose not to participate in the net qualifying capacity process have been added using the ISO Master Control Area Generating Capability List, posted on the ISO website at http://www.caiso.com/14d4/14d4c4ff59780.html.

This assessment utilizes all capacity within the ISO regardless of contractual arrangements to better understand how the system will respond under contingencies. Although there may be some resources that do not receive a contract under the resource adequacy program and contracts instead 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. Nevertheless, the ISO is counting on the continued success of the resource adequacy program, which 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. Under this program load-serving entities are required to show that they have 90% of their resource obligation under contract a year in advance and 100% of their obligation under contract one month in advance. This process ensures that enough capacity is under contract prior to each month to meet the 15% minimum planning reserve margin requirement for the ISO as a whole.

The net qualifying capacity values for the wind generation have been adjusted based on actual output at time of peak over a three-year period (which produced amounts similar to the net qualifying capacity values). If the ISO balancing area experiences extreme weather conditions beyond what is taken into account by the net qualifying capacity calculation process, it is possible that not all of the capacity accounted for will be available because the unit ratings of combustion turbines and some other resources are impacted by high ambient temperatures.

**Table 8**

| Total Generation In the ISO for Summer 2010 | | | | |
|---|---|---|---|---|
| | **Current Online NQC (MW)** | **Additions by Summer 2010 (MW)** | **Retirements prior to Summer 2010 (MW)** | **Total Expected Capacity for Summer 2010 (MW)** |
| ISO Control Area | 49,807 | 1,086 | (6) | 50,888 |
| SP26 | 23,326 | 1,057 | 0 | 24,383 |
| NP26 | 26,481 | 29 | (6) | 26,505 |

***Demand response and interruptible load programs***

The California Energy Commission provided the amounts for demand response and interruptible load programs, collectively known as demand response programs, for the three California investor-owned utilities. These program amounts have been approved by the California Public Utilities Commission for the 2010 resource adequacy program period. *Table 9* shows these amounts for the 2010 summer based on resource adequacy criteria.

**Table 9**

| Demand Response and Interruptible Programs for Summer 2010 (based on weighted average of monthly summer amounts) | | | |
|---|---|---|---|
| | Demand Response Programs | Interruptible Programs | Total Program Amounts |
| NP26 | 418 | 317 | 734 |
| SP26 | 377 | 1,291 | 1,668 |
| ISO | 795 | 1,608 | 2,403 |

***Generation outage rates***

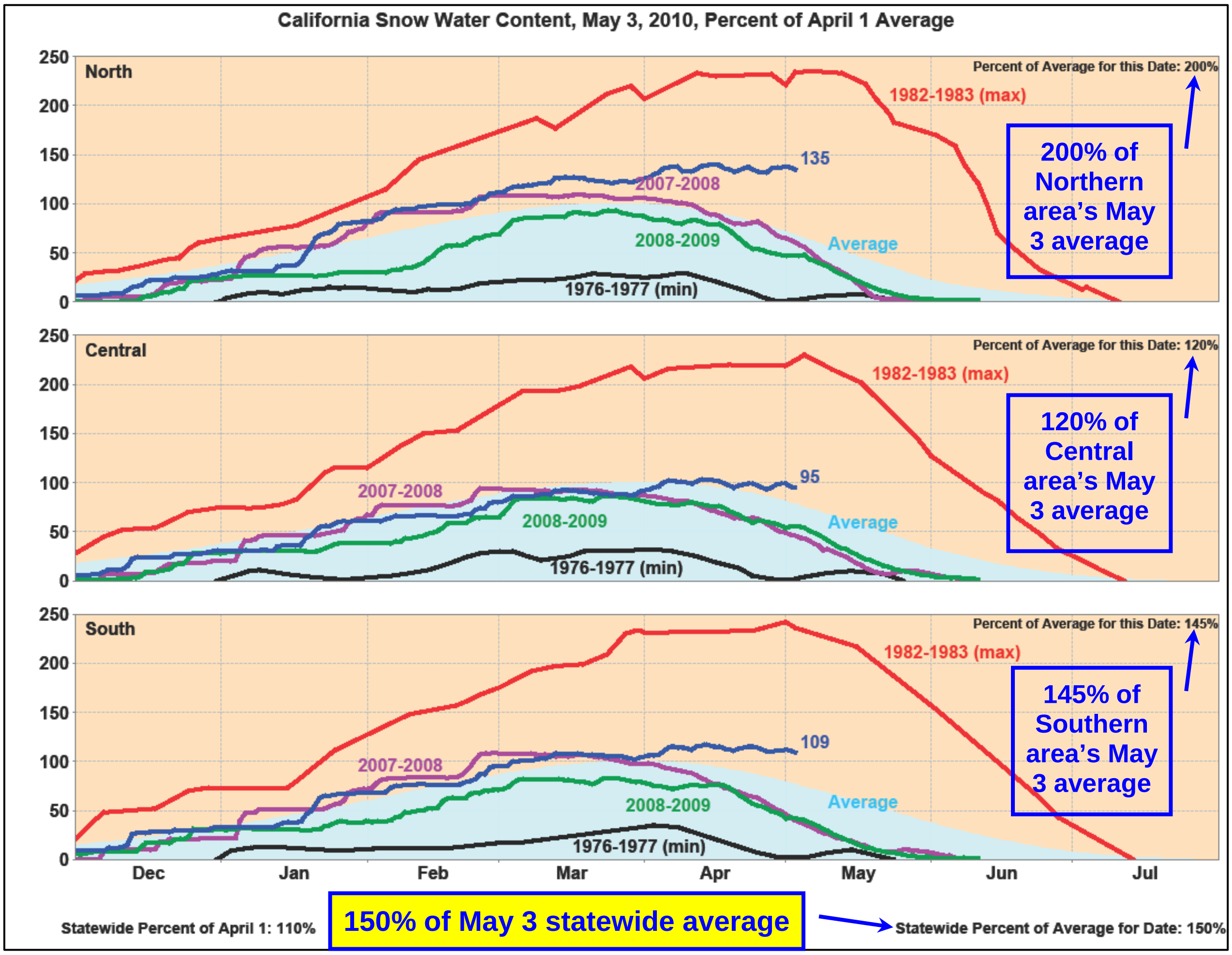
Graphs in *Appendix C* show the weekday hour-ending 1600 forced and planned outage amounts during the summer peak days from June 15 through September 15 for the 2007, 2008, and 2009 summer peak load periods (excluding holidays). The graphs do not include ambient derates (also known as normal outages) as these amounts are accounted for in the net qualifying capacity 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***

*Figure 7* shows the California snow water content as of May 3, 2010 and indicates that snowpack was 150% of average statewide for this date. Precipitation for the Northern Sierra 8-Station Index was 107% of average and the San Joaquin 5-Station Index was 114% of average as shown in graphs in *Appendix D*. Snowpack is the best indicator of 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 conditions between now and then. There is always the risk that unusually warm conditions could produce accelerated snowpack melting that results in decreased runoff during the mid to late summer peak demand periods. Additional charts are provided in *Appendix D* that show the year-to-date precipitation, which include references to key historical annual trends.

The same El Nino weather pattern that brought above normal precipitation to California produced below normal precipitation in the Pacific Northwest. The Northwest River Forecast Center, a division of the National Oceanic Atmospheric Administration, predicted in its April 1, 2010 official report that April-September Columbia River flows would be 65% of normal at The Dalles Dam, which is located on the border between Washington and Oregon. The result will be less than normal hydro generated energy flowing to California this spring and summer causing California generation to run more hours. However, because of reduced loads a result of the recession, the northwest should have enough surplus generation during California peak load periods to justify continuing to use the import levels used for the 2009 Assessment (see *Table 14*).

**Figure 7**




### *Demand forecast*

The economic recession is expected to continue to have a significant impact on peak demands this summer. The ISO estimates that the forecast peak demand will be approximately 3% above the actual 2009 summer peak demand.

The ISO mid-term load forecast models are developed using Itron's MetrixND forecast model, which uses 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 2010.

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 2009 historical weather were used which produces 105 weather scenarios. The scenarios were used to develop a range of load forecasts for the probability analysis using a random number generation process. This distribution is used to develop the 1-in-2, 1-in-10, and other 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 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, demographic and operational variables. The model uses historical and forecasts of gross domestic product and population as independent variable inputs for growth trends and for base load levels. The models also use gross domestic product as an indicator of weather driven cooling load levels. A base case forecast model is developed using baseline economic forecast data. The model is then tuned with this new data.

Five load forecast scenarios were developed using five economic scenario forecasts representing different economic outlooks of how the economy will perform based on different assumptions in categories such as consumer confidence/household spending, labor markets and credit conditions. The ISO uses gross domestic product for the metropolitan statistical areas within the ISO, developed by Moody's Economy.com, as the economic indicator for the models. *Figure 8* (on the next page) shows the historical and five gross domestic product forecasts that represent five different projections for how the current recession will play out. It is very difficult to accurately forecast future gross domestic product during a recession. Characteristics of a recession, such as the depth and duration and when a recession will (or has) bottomed out, are very difficult to predict and the current recession has the potential to be more severe and longer lasting than the baseline economic forecast projects. These five forecasts, represented by a baseline forecast and four different scenario forecasts, are used to capture the range of possible outcomes of how the recession will play out.

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 Economy.com.

- *Scenario 1* is a stronger recovery in 2010 scenario where confidence rebounds. It is 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.[3]

[3] This information has been reprinted and reproduced with permission from Moody's Economy.com.

- *Scenario 2* is a weaker recovery scenario in which a second, relatively mild, downturn develops. 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 more severe second recession scenario in which a more severe second downturn develops. It is designed so that 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 complete collapse 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]

**Figure 8**

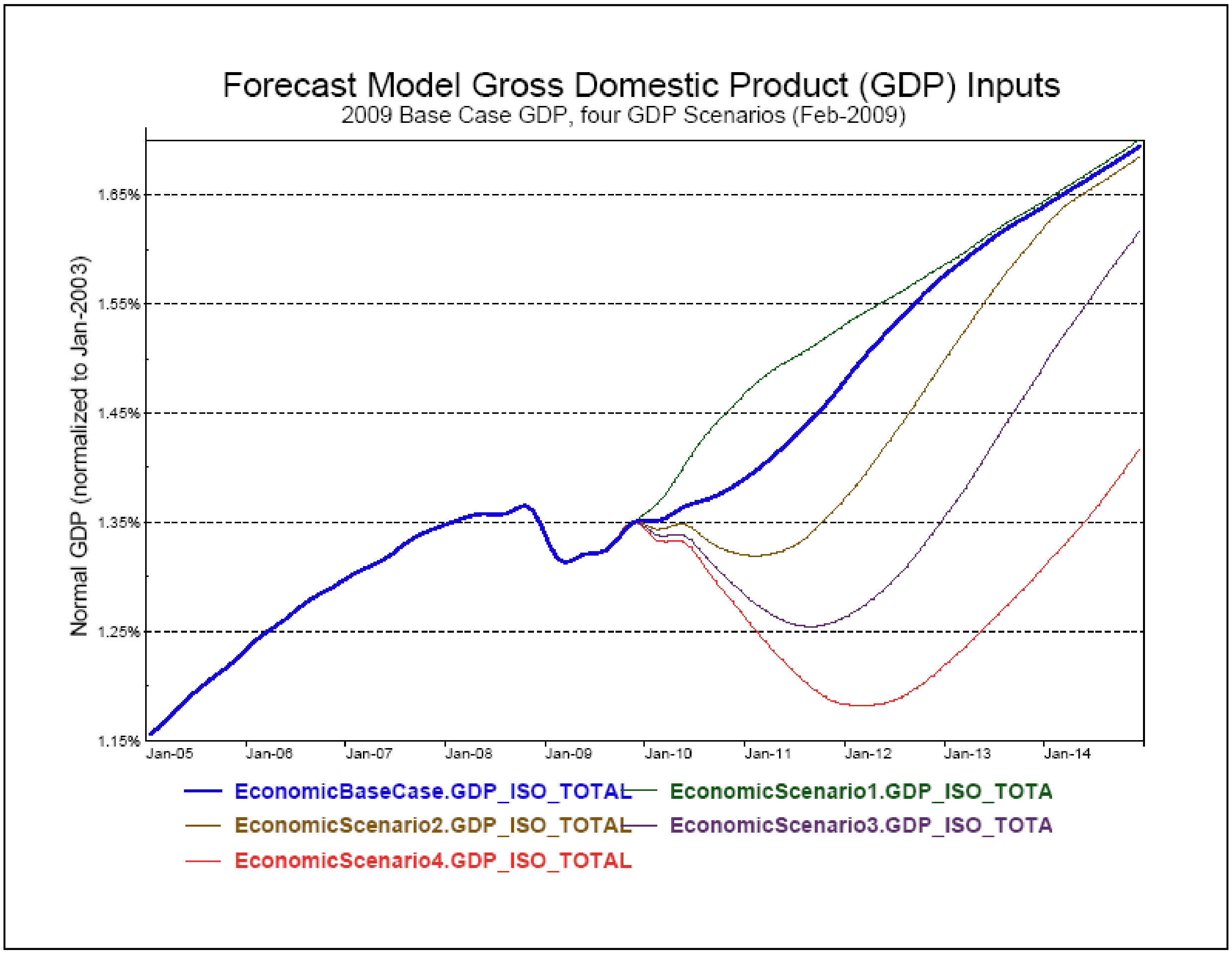



*Figure 9* shows the results of the forecast process for the ISO through 2013. Scenario 1 is more optimistic than the base case forecast while scenarios 2 through 4 are progressively more pessimistic. The range of divergence between the various scenarios has increased from that of the 2009 load forecast.

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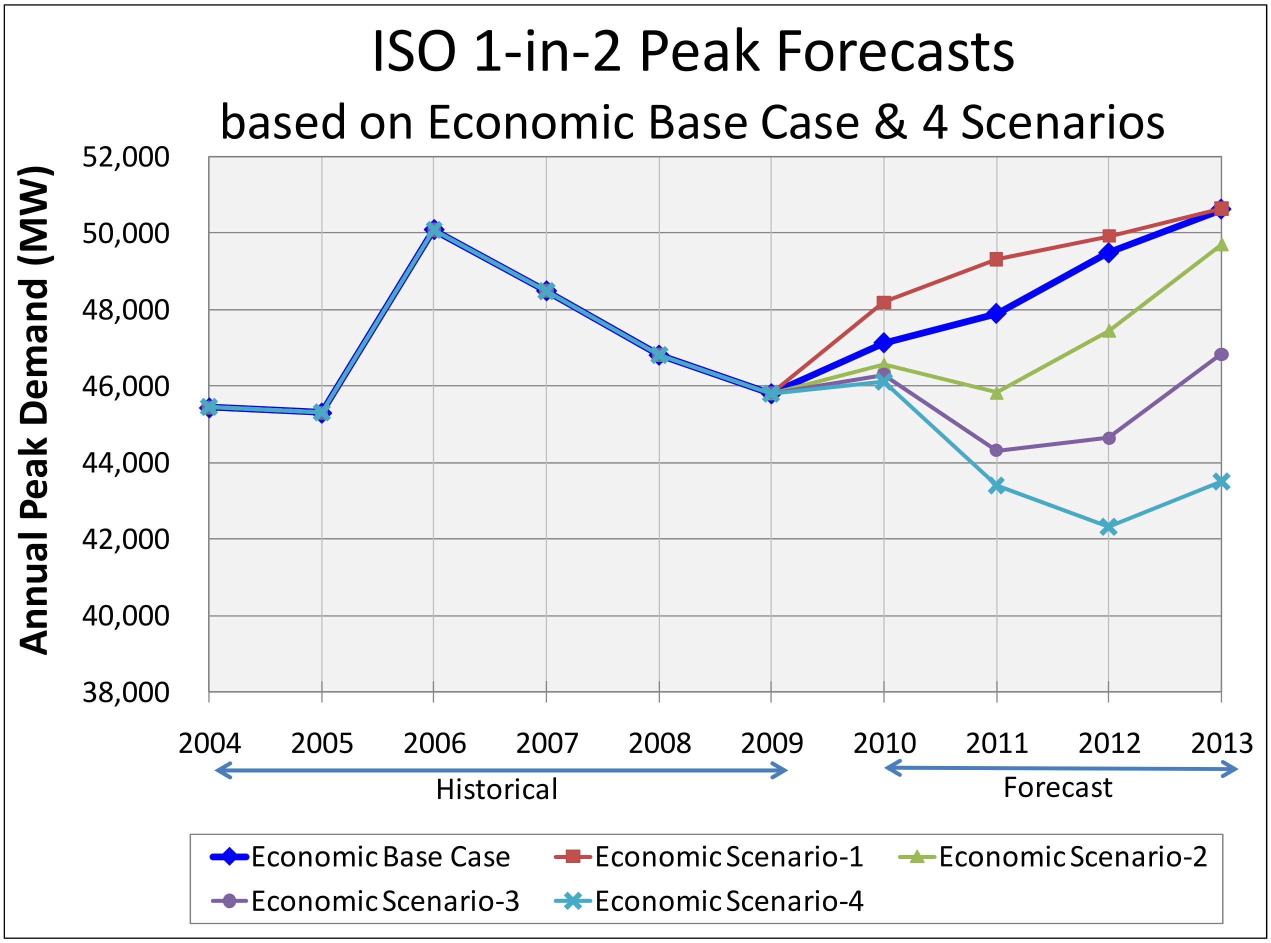
Source: Macroeconomic Outlook Alternative Scenarios – February 2010.

It is important to note that these forecasts are based on the Economy.com gross domestic product forecasts released in February 2010. The gross domestic product forecasts are updated monthly and will change as the recession evolves over the months ahead and new information becomes available. Currently the gross domestic product data reflects actual historical data through 2008 (January 2009 and later historical data are estimated) with actual 2009 monthly data scheduled to be incorporated into their data in June 2010. Also, this forecast was made prior to the 2010 summer weather related cooling load season with the most recent cooling loads coming at the end of summer 2009. Consequently, this forecast is based on what is known at the date of its release.

**Figure 9**




The 2010 1-in-2 base case peak demand forecasts and the scenario 1 forecasts are provided by area in *Table 10* and *Table 11.* The forecasted 2.9% increase in ISO demand represents some level of economic recovery over 2009 and increased water pumping during 2010 peak periods compared to 2009 due to increased water availability in 2010. The details of scenarios 2 through 4 load forecasts are not presented in this report as the operating risks associated with these lower load forecasts are of lesser concern than the operating risks associated with the higher loads related to the base case and scenario 1 forecasts.

**Table 10**

| 2010 Peak Demand Forecasts | | | | |
|---|---|---|---|---|
| **Economic Base Case vs. 2009 Actual Peak Demand** | | | | |
| **ISO** | | | | |
| Probability | Percentile | 2010 Forecast | 2009 Actuals | Increase over 2009 Peak |
| 1-in-2 | 0.5 | 47,139 | 45,809 | 2.9% |
| **NP26** | | | | |
| Probability | Percentile | 2010 Forecast | 2009 Actuals | Increase over 2009 Peak |
| 1-in-2 | 0.5 | 21,154 | 19,946 | 6.1% |
| **SP26** | | | | |
| Probability | Percentile | 2010 Forecast | 2009 Actuals | Increase over 2009 Peak |
| 1-in-2 | 0.5 | 27,198 | 26,742 | 1.7% |

*Figure 10* is the same as *Figure 5* presented previously in the 2009 Demand discussion in *Section II* of this Assessment. It is presented here again to provide explanation for the higher increase in the NP26 load forecast and the lower increase in SP26 load forecast over 2009 actual loads. *Figure 10* shows the 2009 maximum daily-maximum heat index 631 heat buildup during the peak period rated against historical values for this weather parameter. The weather during the NP26 peak period in July was below 1-in-2 weather conditions and is reflected in the actual load being below the 1-in-2 forecast. The weather during the SP26 peak period in September (coincident with the ISO peak) was hotter than 1-in-2 weather conditions for SP26 and is reflected in the actual SP26 load being higher than the 1-in-2 forecast. The weather in NP26 during the ISO peak in September was even milder than during the NP26 July peak period. This mild NP26 weather combined with the hotter weather in SP26 produced combined ISO weather conditions slightly above 1-in-2. This diversity is common due to California's long north-to-south configuration.

**Figure 10**

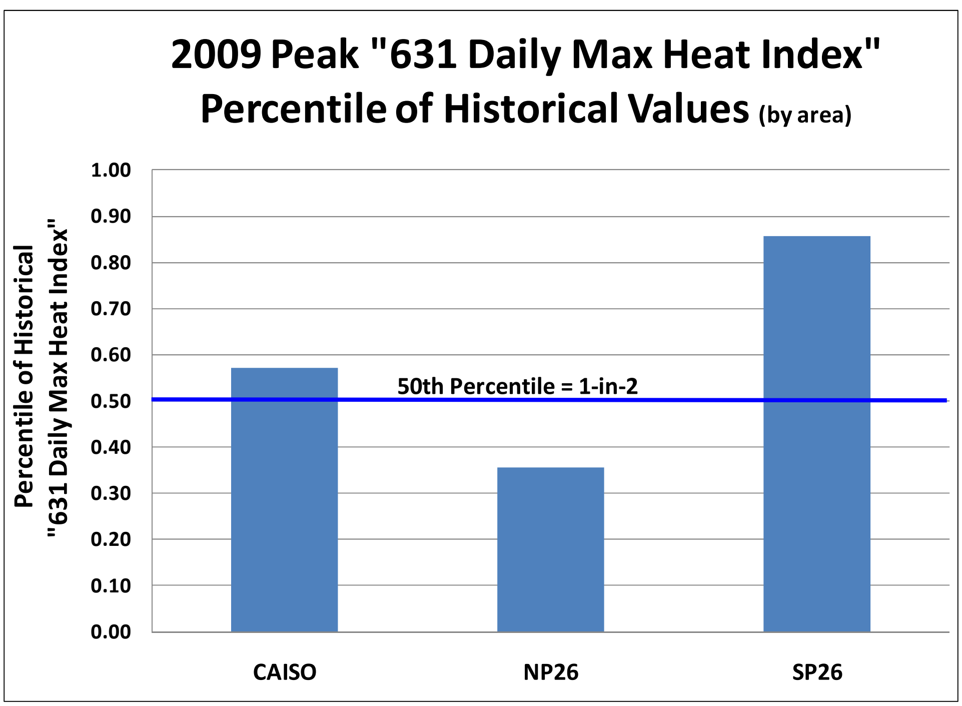


*Table 11* shows the peak demand forecasts associated with the economic scenario 1 economic forecast. While Economy.com indicates the probability of this scenario is less than the base case, it is worth showing due to its potential impact on system reliability.

**Table 11**

**2010 Peak Demand Forecasts**

**Economic Scenario-1 vs. 2009 Actual Peak Demand**

| Probability | Percentile | 2010 Forecast | 2009 Actuals | Increase over 2009 Peak |
|---|---|---|---|---|
| **ISO** | | | | |
| Probability | Percentile | 2010 Forecast | 2009 Actuals | Increase over 2009 Peak |
| 1-in-2 | 0.5 | 48,101 | 45,809 | 5.0% |
| **NP26** | | | | |
| Probability | Percentile | 2010 Forecast | 2009 Actuals | Increase over 2009 Peak |
| 1-in-2 | 0.5 | 21,508 | 19,946 | 7.8% |
| **SP26** | | | | |
| Probability | Percentile | 2010 Forecast | 2009 Actuals | Increase over 2009 Peak |
| 1-in-2 | 0.5 | 27,952 | 26,742 | 4.5% |

*Table 12* and *Table 13* provide a comparison of 1-in-2, 1-in-10 and 1-in-20 probability peak demand forecasts for the 2010 economic base case and the 2010 economic scenario 1 forecasts, using the 2009 Assessment forecasts as a point of reference.

**Table 12**

**2010 Peak Demand Forecasts**

**Economic Base Case Compared to 2009 Forecast**

| Probability | Percentile | 2010 Forecast | 2009 Forecast | % Change 2009 Forecast |
|---|---|---|---|---|
| **ISO** | | | | |
| Probability | Percentile | 2010 Forecast | 2009 Forecast | % Change 2009 Forecast |
| 1-in-2 | 0.5 | 47,139 | 45,379 | 3.9% |
| 1-in-10 | 0.9 | 49,455 | 48,524 | 1.9% |
| 1-in-20 | 0.95 | 52,009 | 49,459 | 5.2% |
| **NP26** | | | | |
| Probability | Percentile | 2010 Forecast | 2009 Forecast | % Change 2009 Forecast |
| 1-in-2 | 0.5 | 21,154 | 21,370 | -1.0% |
| 1-in-10 | 0.9 | 22,436 | 22,756 | -1.4% |
| 1-in-20 | 0.95 | 24,080 | 23,152 | 4.0% |
| **SP26** | | | | |
| Probability | Percentile | 2010 Forecast | 2009 Forecast | % Change 2009 Forecast |
| 1-in-2 | 0.5 | 27,198 | 25,412 | 7.0% |
| 1-in-10 | 0.9 | 29,371 | 27,638 | 6.3% |
| 1-in-20 | 0.95 | 29,809 | 28,202 | 5.7% |

**Table 13**

| 2010 Peak Demand Forecasts | | | | |
|---|---|---|---|---|
| Economic Scenario-1 Compared to 2009 Forecast | | | | |
| **ISO** | | | | |
| Probability | Percentile | 2010 Forecast | 2009 Forecast | % Change 2009 Forecast |
| 1-in-2 | 0.5 | 48,101 | 45,379 | 6.0% |
| 1-in-10 | 0.9 | 50,717 | 48,524 | 4.5% |
| 1-in-20 | 0.95 | 53,322 | 49,459 | 7.8% |
| **NP26** | | | | |
| Probability | Percentile | 2010 Forecast | 2009 Forecast | % Change 2009 Forecast |
| 1-in-2 | 0.5 | 21,508 | 21,370 | 0.6% |
| 1-in-10 | 0.9 | 22,834 | 22,756 | 0.3% |
| 1-in-20 | 0.95 | 24,348 | 23,152 | 5.2% |
| **SP26** | | | | |
| Probability | Percentile | 2010 Forecast | 2009 Forecast | % Change 2009 Forecast |
| 1-in-2 | 0.5 | 27,952 | 25,412 | 10.0% |
| 1-in-10 | 0.9 | 30,187 | 27,638 | 9.2% |
| 1-in-20 | 0.95 | 30,706 | 28,202 | 8.9% |

These forecasts are intended to gain an understanding of the expected loads for the 2010 summer period. These forecasts are not intended to be used for resource planning decisions and should not be used for that purpose.

***Transmission additions***

The East-of-River and Southern California Import Transmission Nomogram has increased by 236 MW for the summer 2010 due to transmission and generation additions and improvements that were completed over the past year. For the purposes of this assessment the impact of this change further justifies the import scenarios for 2010 to remain unchanged, even with the lower hydro conditions in the Northwest (see *Imports* below).

***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, and 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 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 and lining up needed imports, such as a weather event that is forecast in advance, or a forced outage that extends for multiple days. 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 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 report. 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 are developed for both the deterministic and probabilistic analysis: high, moderate and low.

Some of the current issues that will impact the level of imports into California from neighboring areas include:

- The *Current hydro conditions* section of this report states that April-September Columbia River flows are projected to be 65% of normal at The Dalles Dam, resulting in less than normal hydro generated energy flowing to California from the Pacific Northwest this spring and summer. This will cause California generation to run more hours this spring and summer. However, due to reduced loads in the Northwest as a result of the recession, there should be adequate surplus generation in the Northwest during California peak load periods
- The East-of-River and Southern California Import Transmission Nomogram has increased by 236 MW for the summer 2010 due to transmission and generation additions and improvements that were completed over the past year.
- Loads throughout the Western Interconnect continuing to be below historic levels.
- Generation additions throughout the Western Interconnect continue to reach operational status, even while peak demands are at temporary reduced levels.

The combined consequence of these issues are that ample capacity margins in neighboring areas are available for summer 2010 imports to be reach the levels observed during the 2008 summer when higher imports were used to meet the peak demands experience that summer.

*Table 14* shows the amounts of imports used for the high, moderate and low import scenarios for the 2010 Assessment, which are unchanged from the 2009 Assessment. Graphs of actual import levels during summer 2006 to 2009 peak operating hours for the ISO system and the SP26 and NP26 zones are included in *Appendix B*.

**Table 14**

**2010 Summer Outlook - Import Scenarios**

| | ISO | 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 |

***Summer 2010 deterministic analysis summary***

*Table 15* is the supply and demand outlook for the 2010 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. The planning reserve margins are robust due to the ongoing recession's impact on electric loads. The generation shown is based on current generation in service along with the generation expected to go commercial and retire prior to the 2010 summer. The import amounts are based on the moderate import levels from *Table 14*, which are unchanged from last year's report.

**Table 15**

**Summer 2010 Supply & Demand Outlook**

| Resource Adequacy Planning Conventions | ISO | SP26 | NP26 |
|---|---|---|---|
| Existing Generation[1] | 49,807 | 23,326 | 26,481 |
| Retirements (known/expected)[2] | (6) | 0 | (6) |
| High Probability CA Additions | 1,086 | 1,057 | 29 |
| Hydro Derates | 0 | 0 | 0 |
| Net Interchange (Moderate) | 10,100 | 9,200 | 2,050 |
| Total Net Supply (MW) | 60,988 | 33,583 | 28,555 |
| Demand (1-in-2 Summer Temperature) | 47,139 | 27,198 | 21,154 |
| DR & Interruptible Programs[3] | 2,403 | 1,668 | 734 |
| **Planning Reserve[4]** | **34.5%** | **29.6%** | **38.5%** |

[1] as of 3/22/2010 (refer to Table 8)
[2] as of 3/22/2010 (refer to Table 8)
[3] (refer to Table 9)
[4] Planning Reserve calculation (Total Net Supply + Demand Response + Interruptibles)/ Forecast Demand)-1.

*Table 16* and *Table 17* transition from the planning perspective to a real-time perspective by adding in generation and transmission outages and curtailments, and by considering demand scenarios greater than the 1-in-2 used in *Table 15*. The import amounts in *Tables 16* and *17* are based on the three import scenarios shown in *Table 14*. The ISO and particularly SP26 are highly dependent on imports to meet peak demand, especially during the summer high load periods.

*Table 16* shows how the import assumption impacts the operating reserve amount using 1-in-2 level generation and transmission outage and curtailment levels. The middle section of this table representing moderate imports corresponds to the same conditions as *Table 15* but with 1-in-2 outage levels added. *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 and 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 16* and *17*. 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 16**

# Summer 2010 Loads and Resources Outlook

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

### Summer 2010 Outlook - High Imports

| Resource Adequacy Planning Conventions | ISO | SP26 | NP26 |
|---|---|---|---|
| Existing Generation | 49,807 | 23,326 | 26,481 |
| Retirements (Known) | (6) | 0 | (6) |
| High Probability CA Additions | 1,086 | 1,057 | 29 |
| Hydro Derates | 0 | 0 | 0 |
| **Net Interchange** | 11,400 | 10,400 | 3,300 |
| **Outages (1-in-2 Generation & Transmission)** | -5,103 | -2,030 | -3,176 |
| Total Net Supply (MW) | 57,184 | 32,753 | 26,629 |
| Demand (1-in-2 Summer Temperature) | 47,139 | 27,198 | 21,154 |
| DR & Interruptible Programs3 | 2,403 | 1,668 | 734 |
| **Operating Reserve[1]** | **26.4%** | **26.6%** | **29.4%** |

### Summer 2010 Outlook - Moderate Imports

| Resource Adequacy Planning Conventions | ISO | SP26 | NP26 |
|---|---|---|---|
| Existing Generation | 49,807 | 23,326 | 26,481 |
| Retirements (Known) | (6) | 0 | (6) |
| High Probability CA Additions | 1,086 | 1,057 | 29 |
| Hydro Derates | 0 | 0 | 0 |
| **Net Interchange** | 10,100 | 9,200 | 2,050 |
| **Outages (1-in-2 Generation & Transmission)** | -5,103 | -2,030 | -3,176 |
| Total Net Supply (MW) | 55,884 | 31,553 | 25,379 |
| Demand (1-in-2 Summer Temperature) | 47,139 | 27,198 | 21,154 |
| DR & Interruptible Programs3 | 2,403 | 1,668 | 734 |
| **Operating Reserve[1]** | **23.6%** | **22.1%** | **23.4%** |

### Summer 2010 Outlook - Low Imports

| Resource Adequacy Planning Conventions | ISO | SP26 | NP26 |
|---|---|---|---|
| Existing Generation | 49,807 | 23,326 | 26,481 |
| Retirements (Known) | (6) | 0 | (6) |
| High Probability CA Additions | 1,086 | 1,057 | 29 |
| Hydro Derates | 0 | 0 | 0 |
| **Net Interchange** | 8,800 | 8,000 | 800 |
| **Outages (1-in-2 Generation & Transmission)** | -5,103 | -2,030 | -3,176 |
| Total Net Supply (MW) | 54,584 | 30,353 | 24,129 |
| Demand (1-in-2 Summer Temperature) | 47,139 | 27,198 | 21,154 |
| DR & Interruptible Programs3 | 2,403 | 1,668 | 734 |
| **Operating Reserve[1]** | **20.9%** | **17.7%** | **17.5%** |

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

**Table 17**

# Summer 2010 Loads and Resources Outlook

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

## Summer 2010 Outlook - High Imports

| Resource Adequacy Planning Conventions | ISO | SP26 | NP26 |
|---|---|---|---|
| Existing Generation | 49,807 | 23,326 | 26,481 |
| Retirements (Known) | (6) | 0 | (6) |
| High Probability CA Additions | 1,086 | 1,057 | 29 |
| Hydro Derates | 0 | 0 | 0 |
| **Net Interchange** | 11,400 | 10,400 | 3,300 |
| **High Outages (1-in-10 Generation & Transmission)** | -7,238 | -3,291 | -4,504 |
| Total Net Supply (MW) | 55,049 | 31,493 | 25,302 |
| **High Demand (1-in-10 Summer Temperature)** | 49,455 | 29,371 | 22,436 |
| DR & Interruptible Programs3 | 2,403 | 1,668 | 734 |
| **Operating Reserve[1]** | **16.2%** | **12.9%** | **16.0%** |

## Summer 2010 Outlook - Moderate Imports

| Resource Adequacy Planning Conventions | ISO | SP26 | NP26 |
|---|---|---|---|
| Existing Generation | 49,807 | 23,326 | 26,481 |
| Retirements (Known) | (6) | 0 | (6) |
| High Probability CA Additions | 1,086 | 1,057 | 29 |
| Hydro Derates | 0 | 0 | 0 |
| **Net Interchange** | 10,100 | 9,200 | 2,050 |
| **High Outages (1-in-10 Generation & Transmission)** | -7,238 | -3,291 | -4,504 |
| Total Net Supply (MW) | 53,749 | 30,293 | 24,052 |
| **High Demand (1-in-10 Summer Temperature)** | 49,455 | 29,371 | 22,436 |
| DR & Interruptible Programs3 | 2,403 | 1,668 | 734 |
| **Operating Reserve[1]** | **13.5%** | **8.8%** | **10.5%** |

## Summer 2010 Outlook - Low Imports

| Resource Adequacy Planning Conventions | ISO | SP26 | NP26 |
|---|---|---|---|
| Existing Generation | 49,807 | 23,326 | 26,481 |
| Retirements (Known) | (6) | 0 | (6) |
| High Probability CA Additions | 1,086 | 1,057 | 29 |
| Hydro Derates | 0 | 0 | 0 |
| **Net Interchange** | 8,800 | 8,000 | 800 |
| **High Outages (1-in-10 Generation & Transmission)** | -7,238 | -3,291 | -4,504 |
| Total Net Supply (MW) | 52,449 | 29,093 | 22,802 |
| **High Demand (1-in-10 Summer Temperature)** | 49,455 | 29,371 | 22,436 |
| DR & Interruptible Programs3 | 2,403 | 1,668 | 734 |
| **Operating Reserve[1]** | **10.9%** | **4.7%** | **4.9%** |

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

*Figures 11* and *12* provide graphical representations of the deterministic analysis results based on the inputs from *Tables 16* and *17*, including 1-in-2 and 1-in-10 generation and transmission outages and curtailments, and 1-in-2 and 1-in-10 peak demand scenarios for the ISO, NP26 and SP26. These scenarios show the operating reserve margin after using all demand response programs. Analyzing the more extreme conditions frames the electric system challenges and identifies the magnitude of operating reserves during these conditions, which helps to focus efforts on measures that will minimize impacts.

Two deterministic scenarios are presented, the normal 1-in-2 operating scenario and the extreme 1-in-10 operating scenario with low imports. These figures show that no firm load shedding would be needed in the extreme 1-in-10 operating scenario with low imports scenarios. All of the zonal analysis for NP26 and SP26 are on a noncoincidental basis and *Figure 11* shows that the operating reserve margins for NP26 and SP26 drop to 5% in the extreme scenario.

**Figure 11**

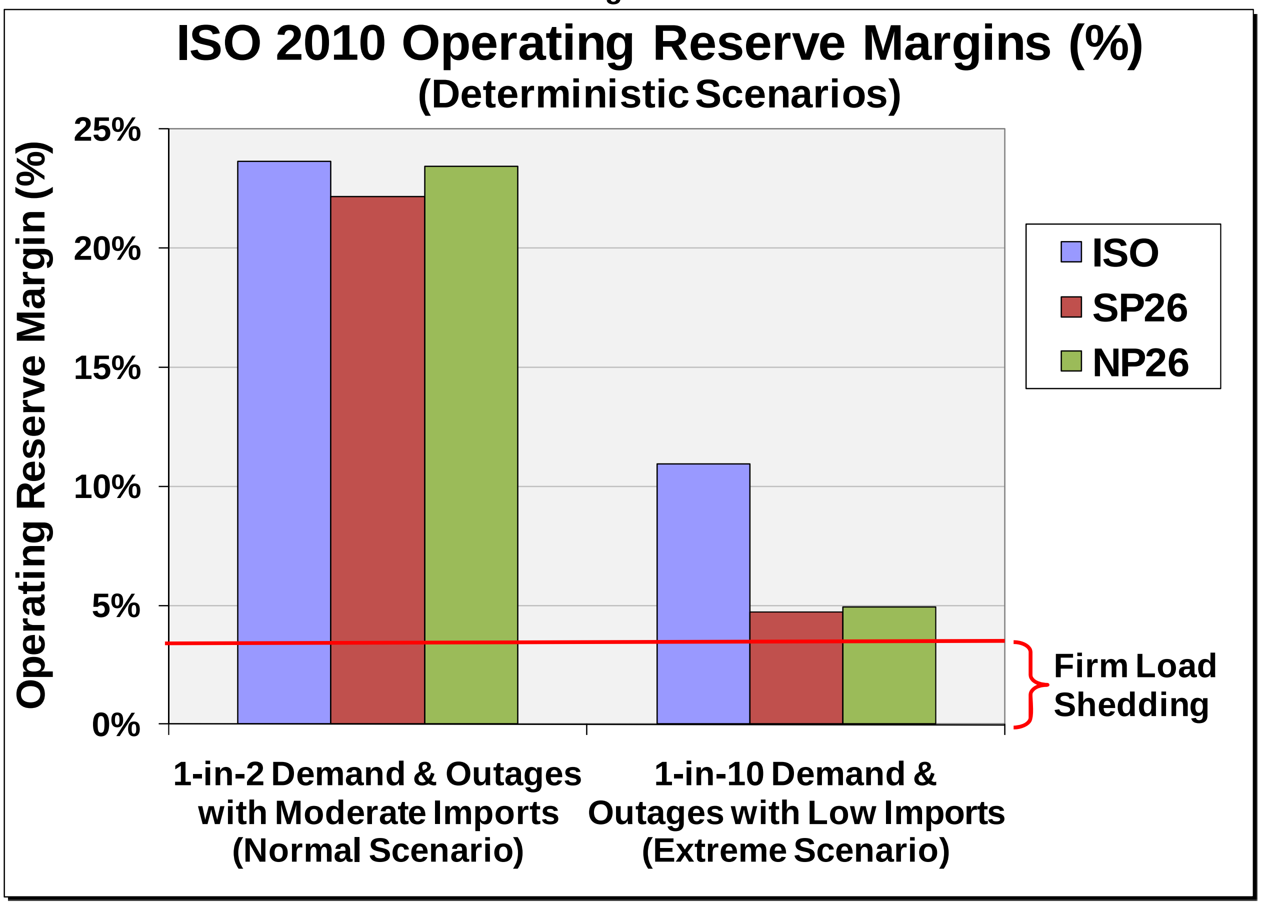
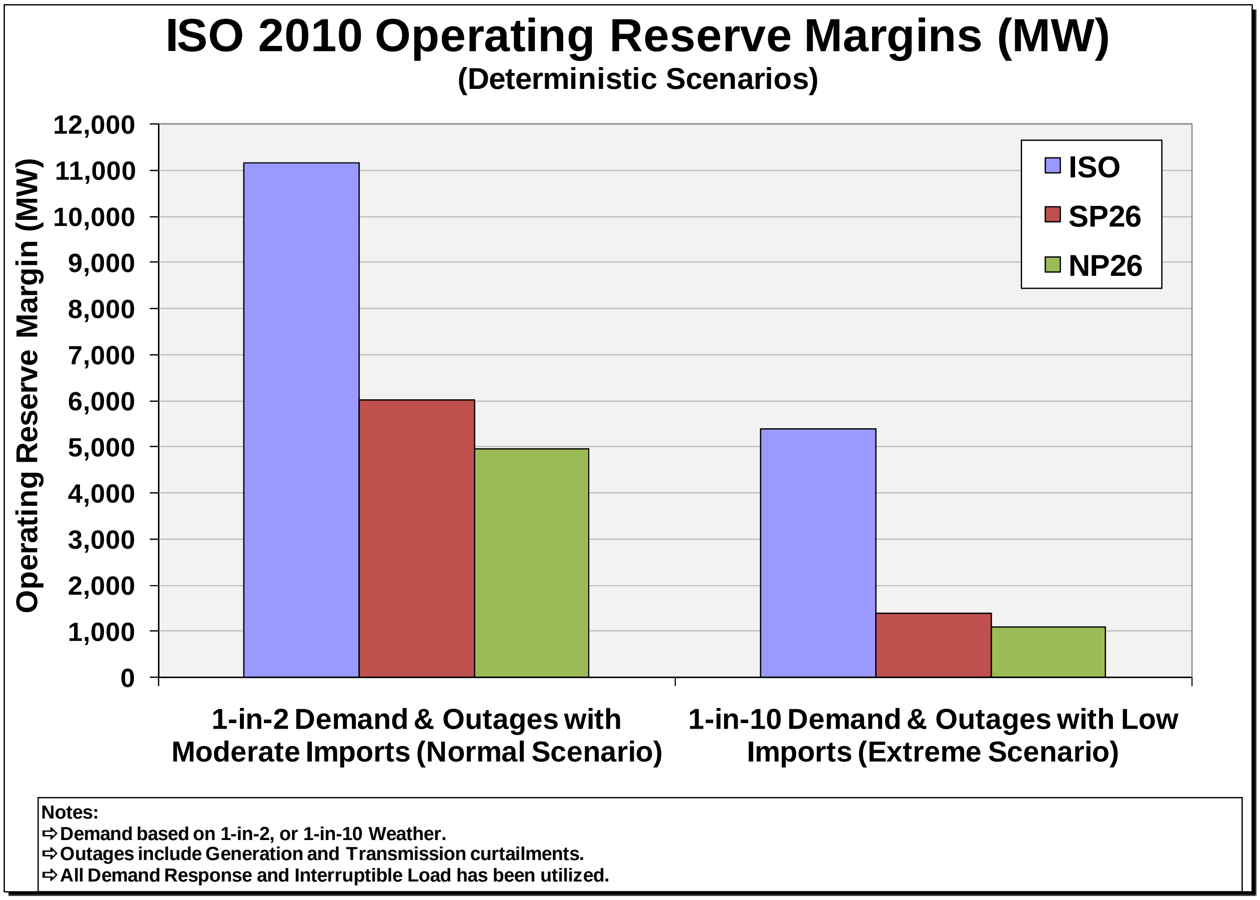


*Figure 12* shows that the reserve margins for NP26 and SP26 approach 1,000 MW in the extreme scenario. While the extreme scenario is by nature a low probability event, it shows that the ISO must continue to be prepared to deal with extreme events that could lead to firm load shedding.

**Figure 12**

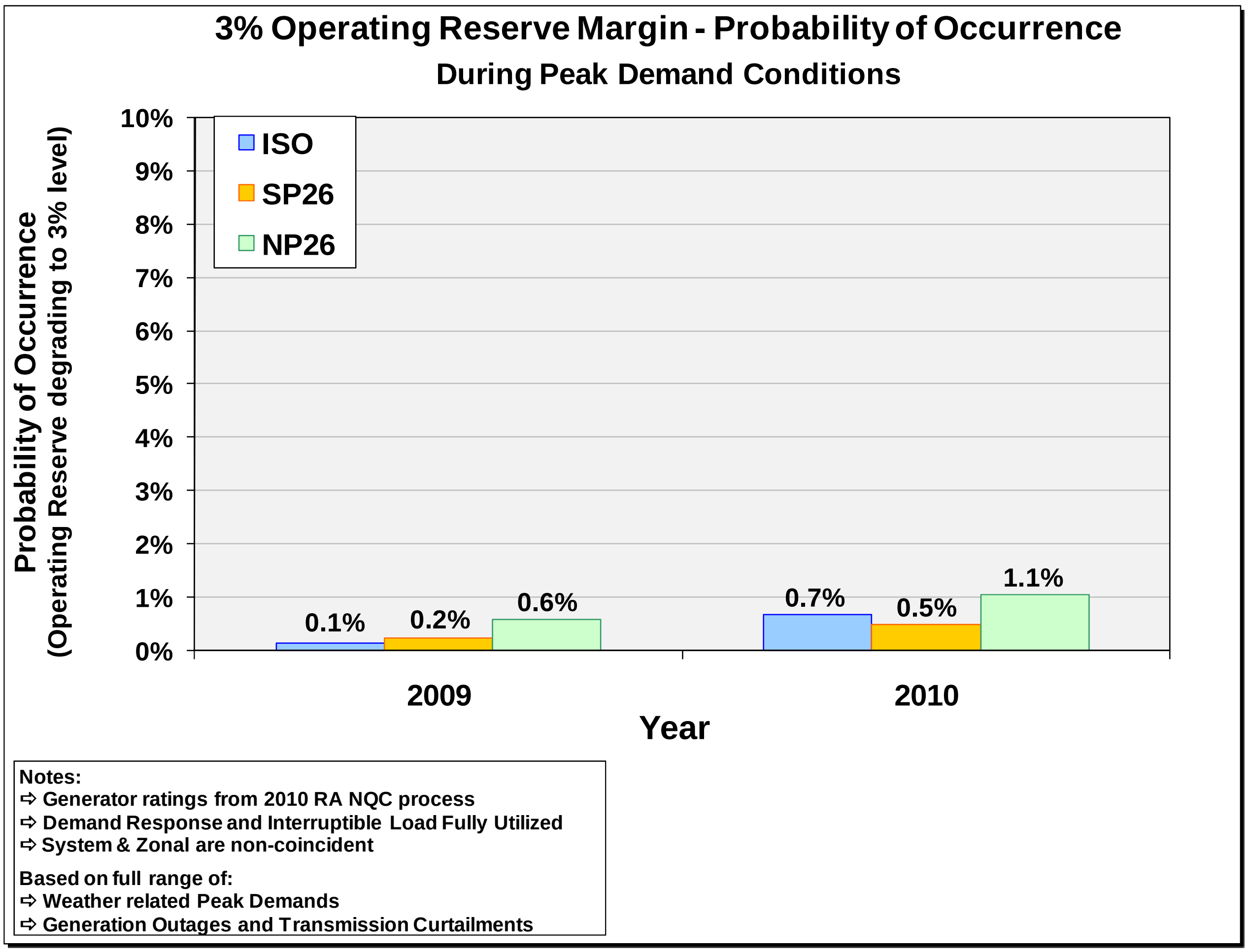



### *Probabilistic analysis*

A probabilistic model is used to understand the likelihood of experiencing operating conditions where the operating reserves drop to 3% or lower, which is where firm load shedding would begin. Existing generation, known retirements, high probability additions and demand response and interruptible load programs are fixed single value inputs to the model and are shown in the previous deterministic tables such as *Table 16*. 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 were developed using the process described in the *Demand forecast* section of *Section III*. 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 approximately 3% and firm load shedding is needed or imminent to maintain adequate operating reserves. The three import scenarios use 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 13* represents probabilities for having the operating reserve margin fall to 3% or less, for the ISO as a whole and for the SP26 and NP26 zones. The probabilities projected for 2009 are shown for reference purposes. As with the deterministic analysis the probabilities shown are based on full utilization of all demand response programs. The probability for firm load shedding remains at low levels as the recession continues to reduce peak demand loads.

**Figure 13**




The assessment of normal to extreme conditions on a deterministic basis along with the probabilities of having to shed firm load allows the ISO to frame the electric system challenges and focus management efforts on measures that will minimize possible impacts. The analyses of this report are based on the assumption that imports will reach levels experienced during the 2008 summer if extreme conditions arise this summer. Scheduling coordinators must continue to practice diligence during severe conditions if they occur. In addition, these analyses show the operating reserve margin after using all available demand response programs. Under typical operating scenarios where demand response is used the programs are utilized in increments to maintain required operating reserve margins. Under the extreme conditions when all of the programs are called on some of the programs are likely to be used as the last option before shedding firm load. Consequently it is critical that these programs operate in the time frame and to the levels expected when called on.

Identifying issues of concern is one of the primary purposes of the Assessment in order to focus summer preparations on the conditions and contingencies that pose the greatest reliability risk. Informing market participants of concerns and making sure programs, such as demand response, are tested and confirmed ready prior to the summer season are part of this process. This helps the ISO to be better prepared and to work with others to be prepared to manage the system under identified conditions and minimize the chances of load shedding. All analyses show the risk of firm load shedding is low this summer. Nevertheless, it is the ISO's job to manage the risks associated with extreme weather and other conditions, as was done successfully during the extreme heat wave of July 2006.

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

# IV. APPENDICES

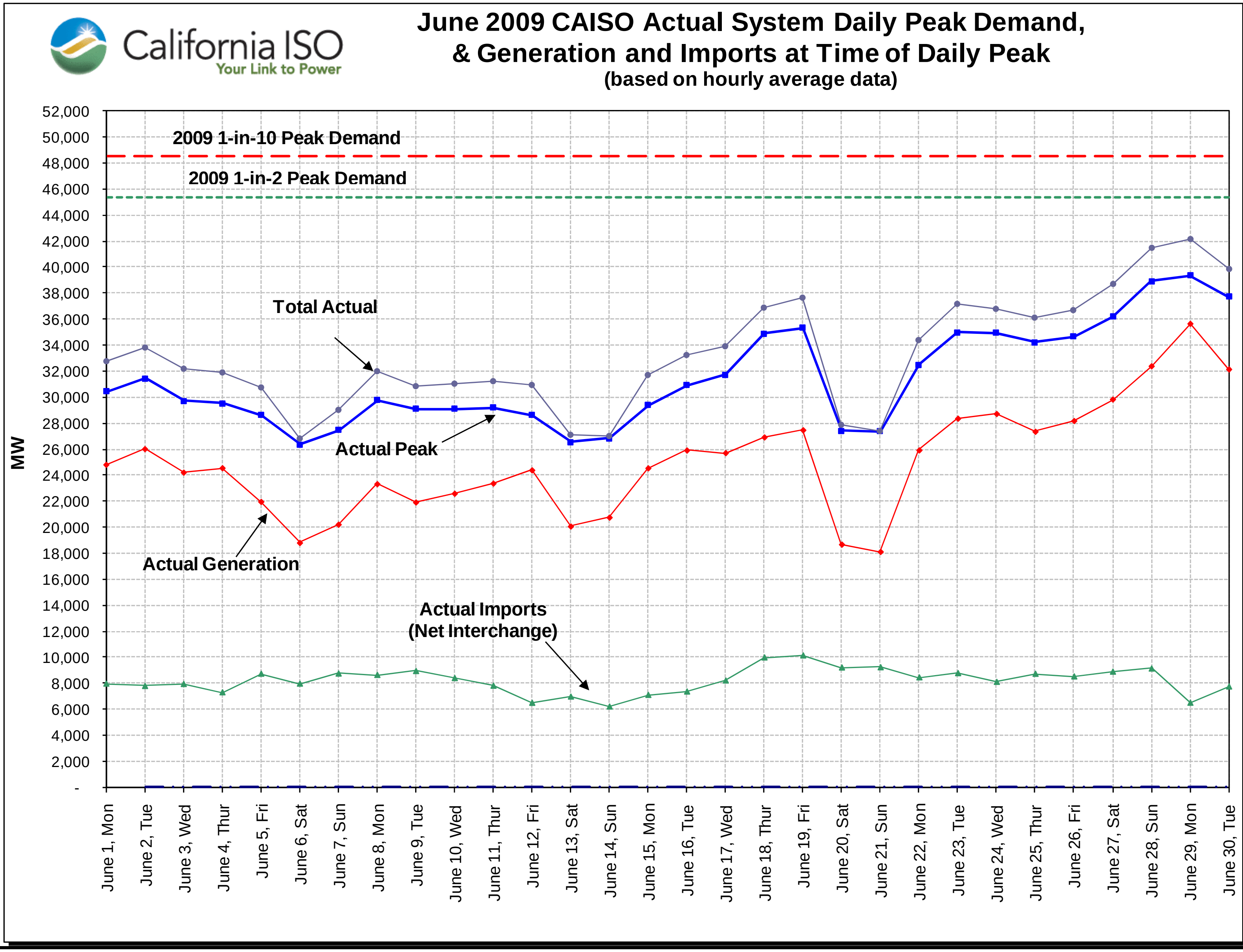
A. 2009 Summer Peak Load Summary Graphs

B. 2009 – 2006 Summer Imports Summary Graphs

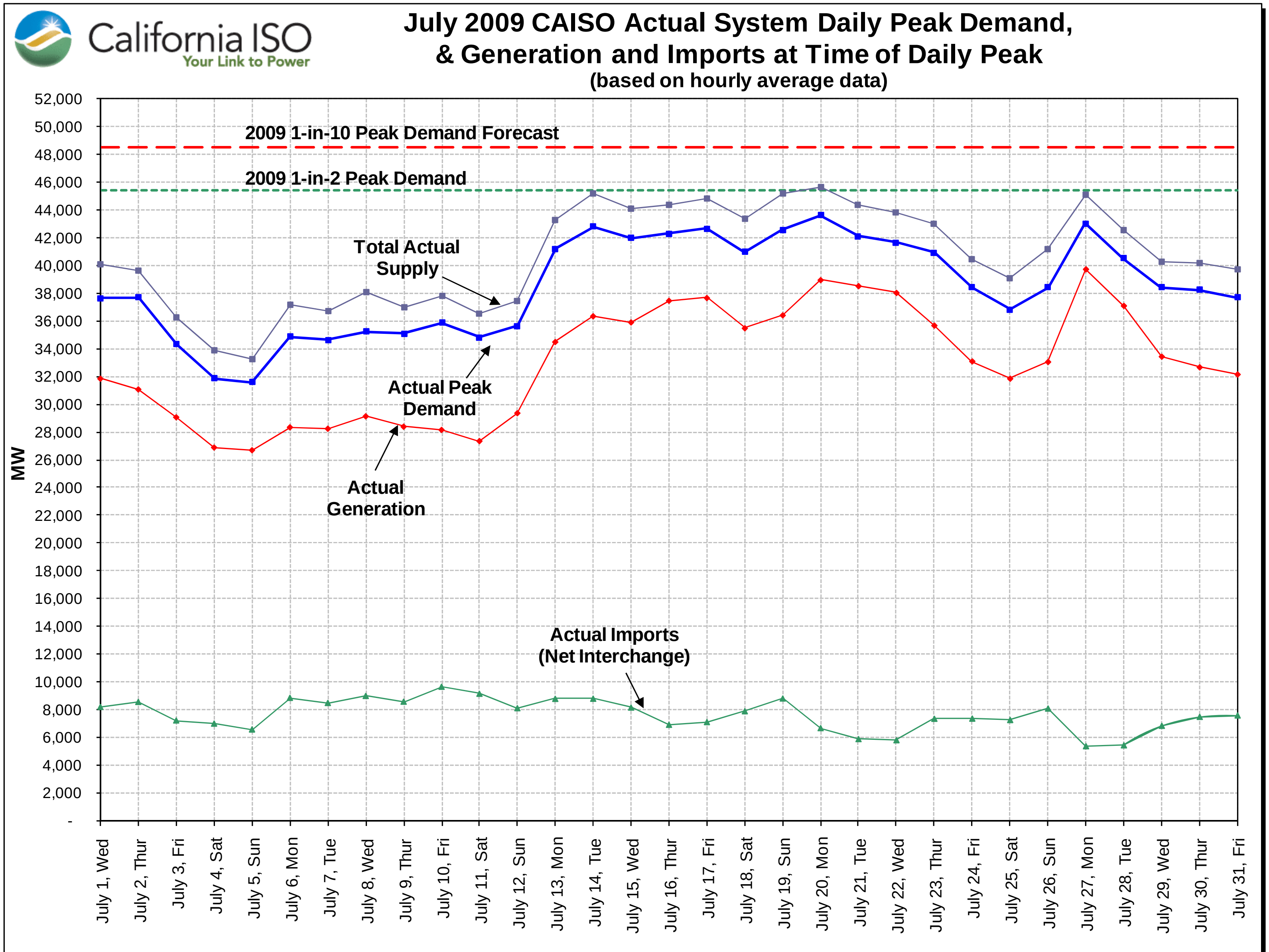
C. 2009 – 2007 Summer Generation Outage Graphs

D. 2010 California Hydro Conditions

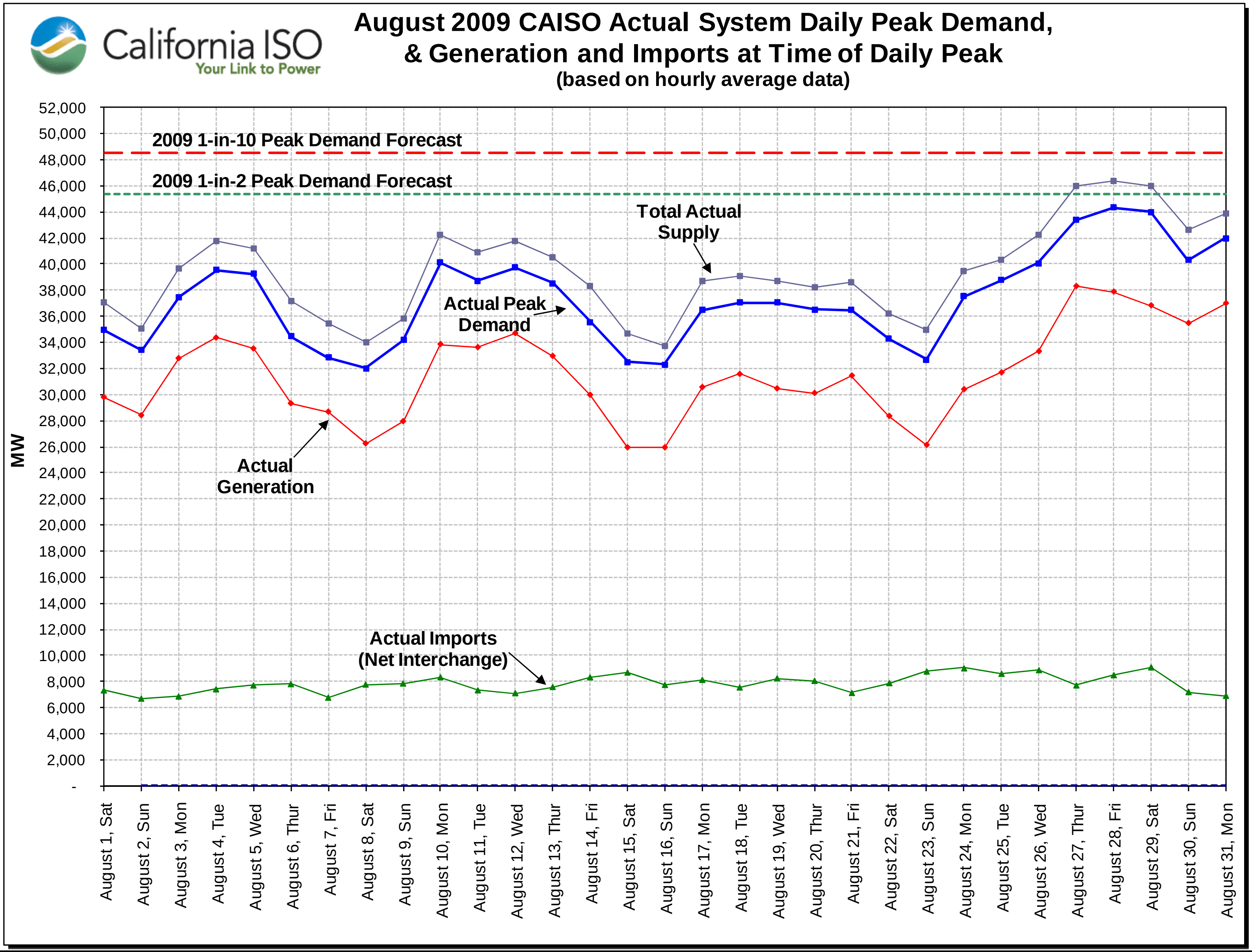
## *Appendix A: 2009 Summer Peak Load Summary Graphs*



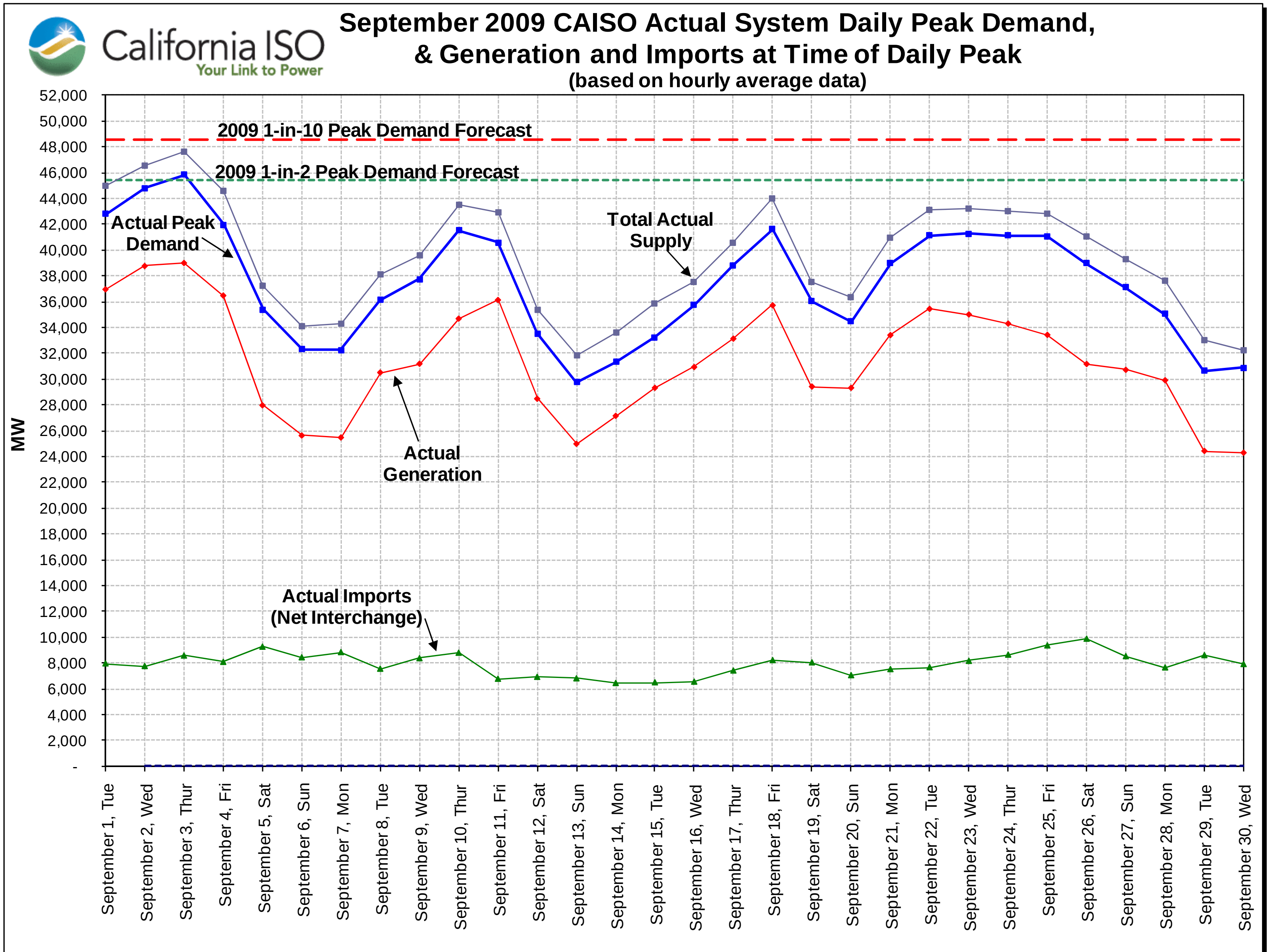
***Appendix A – Continued***



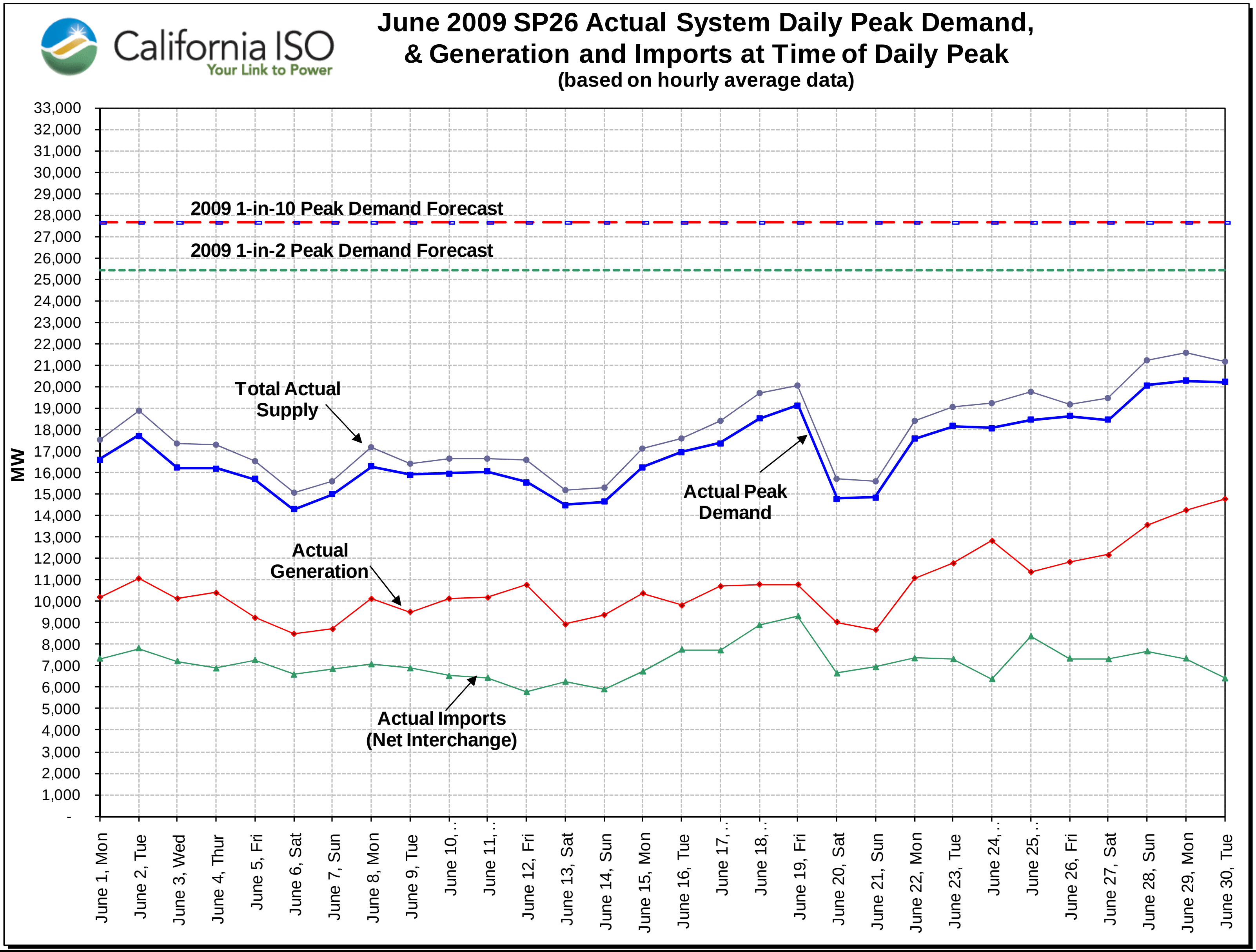
***Appendix A – Continued***



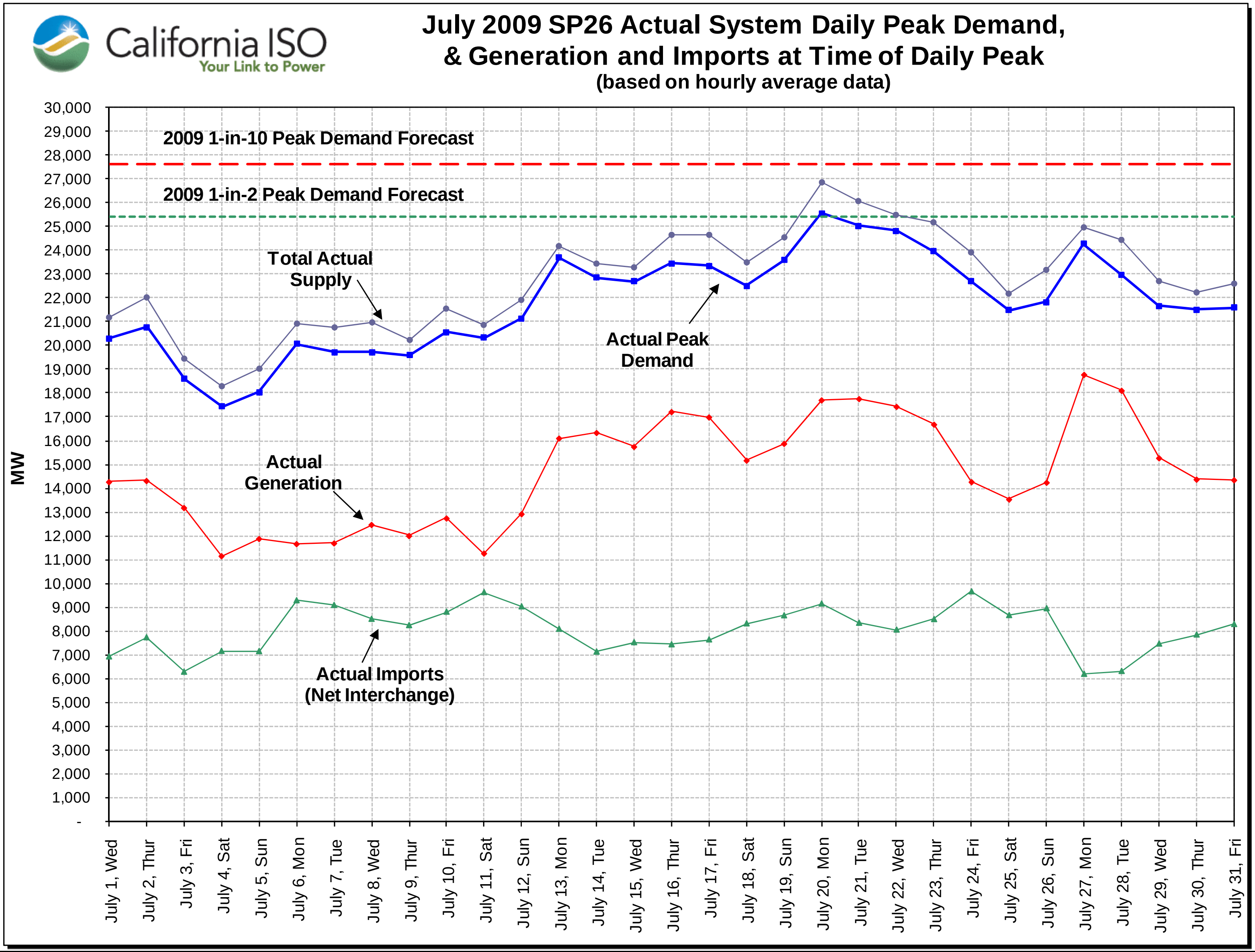
***Appendix A – Continued***



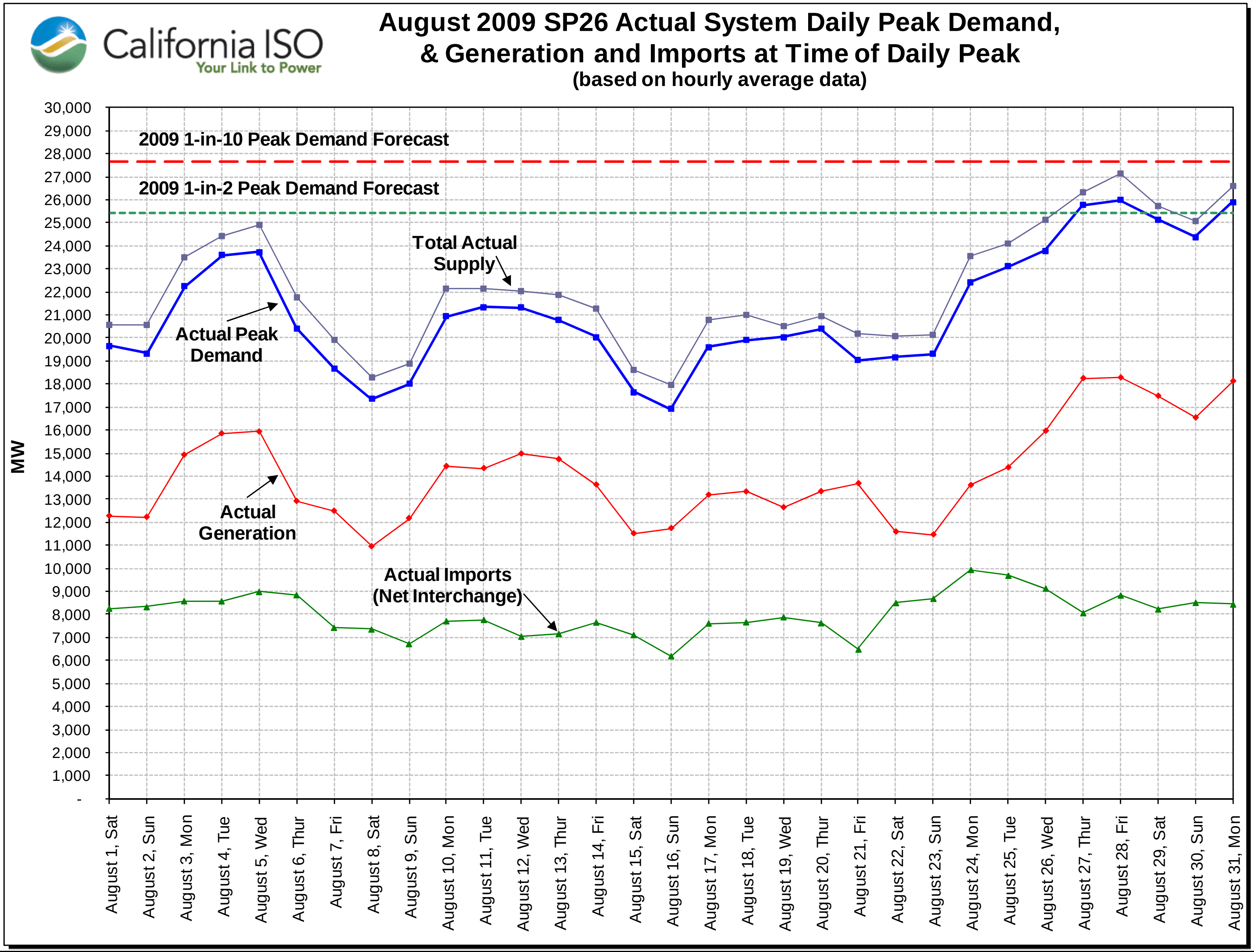
***Appendix A – Continued***



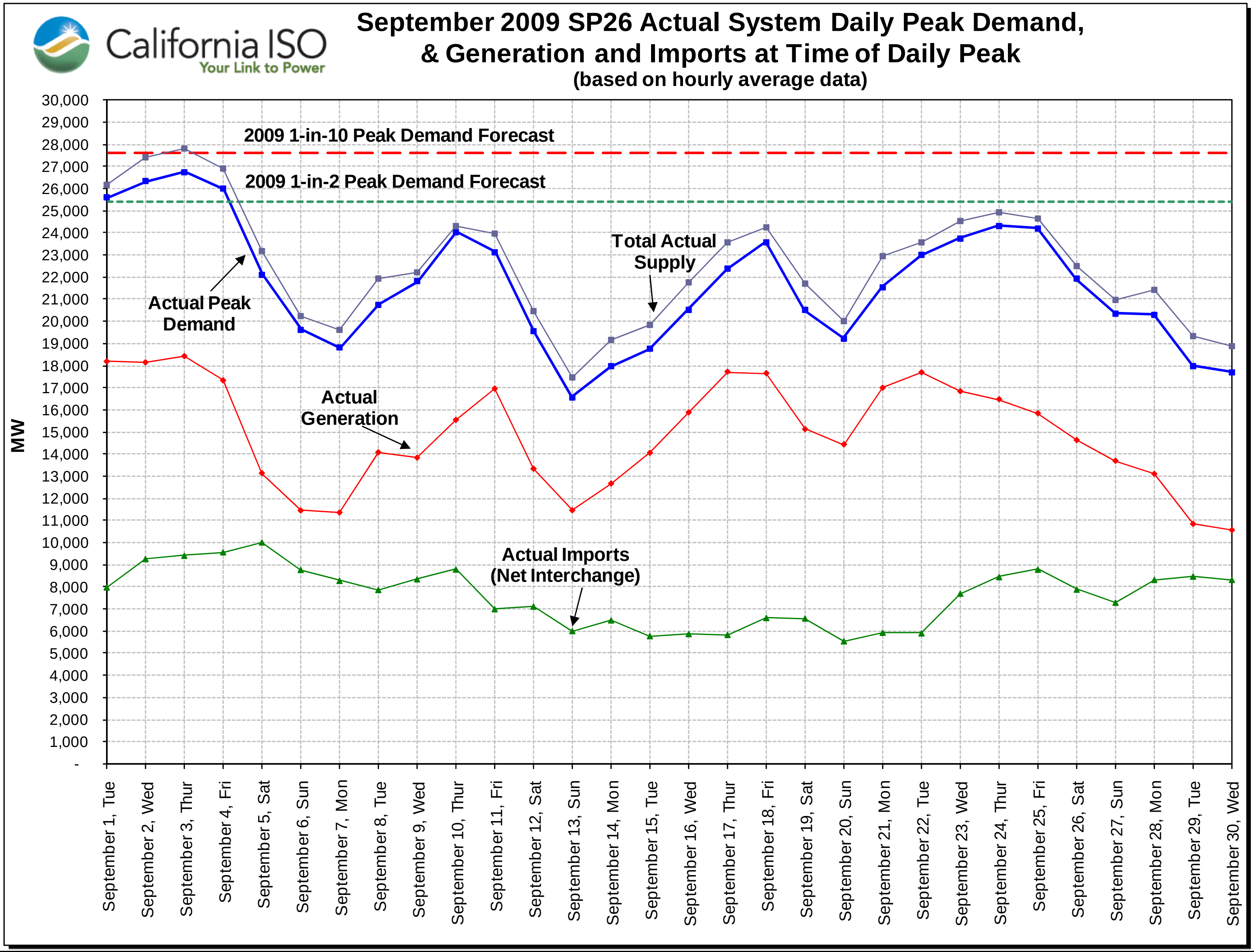
***Appendix A – Continued***



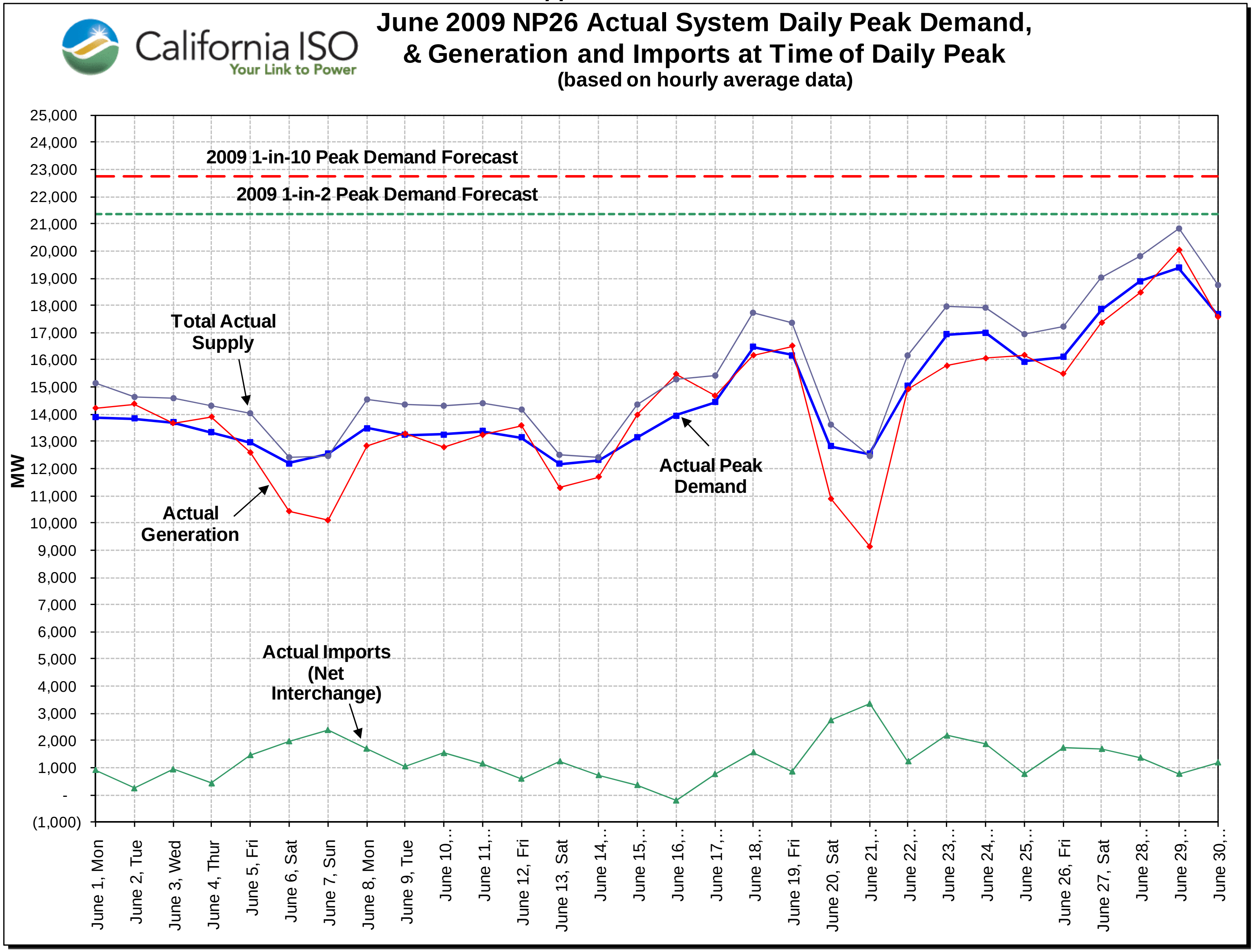
***Appendix A – Continued***



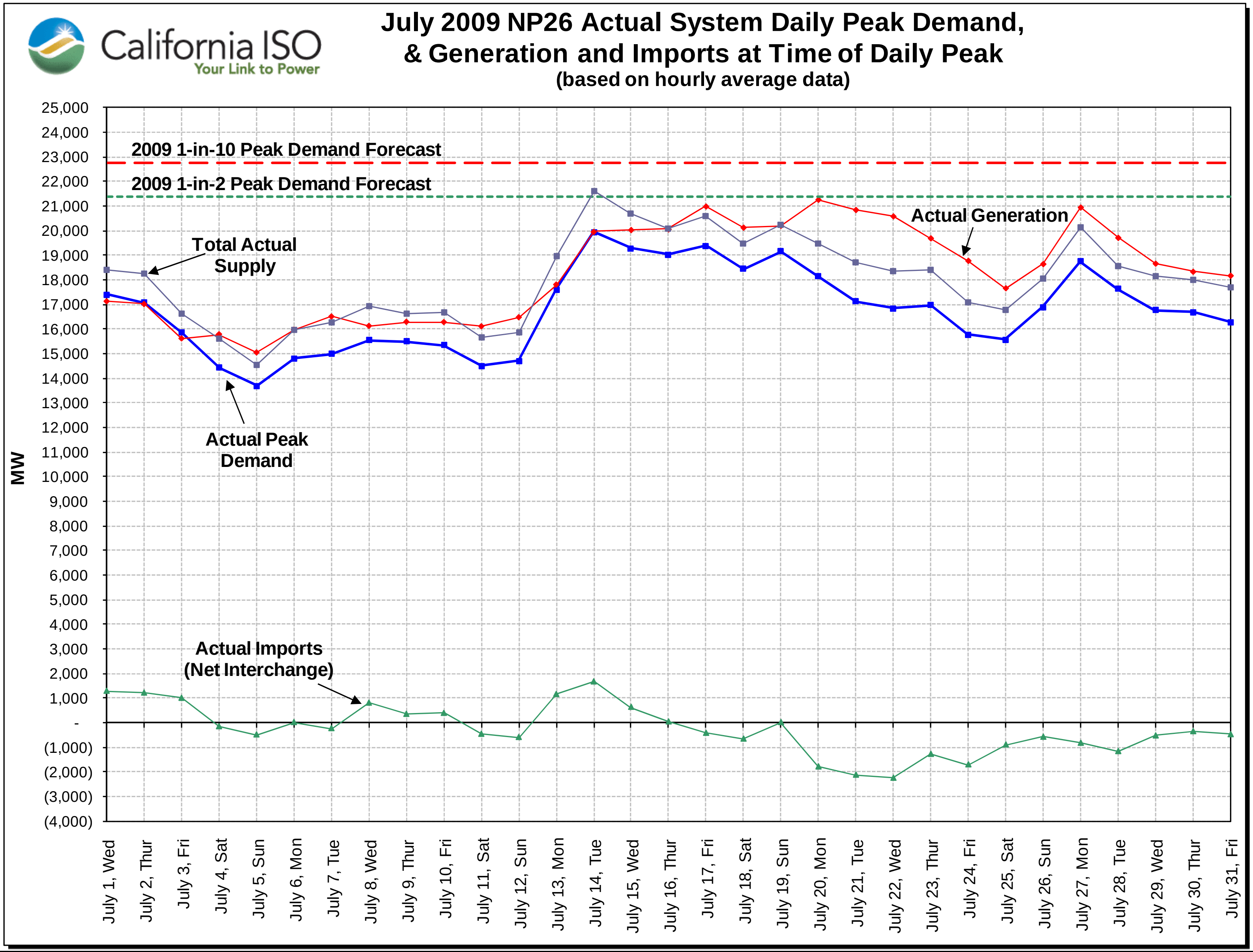
## *Appendix A – Continued*



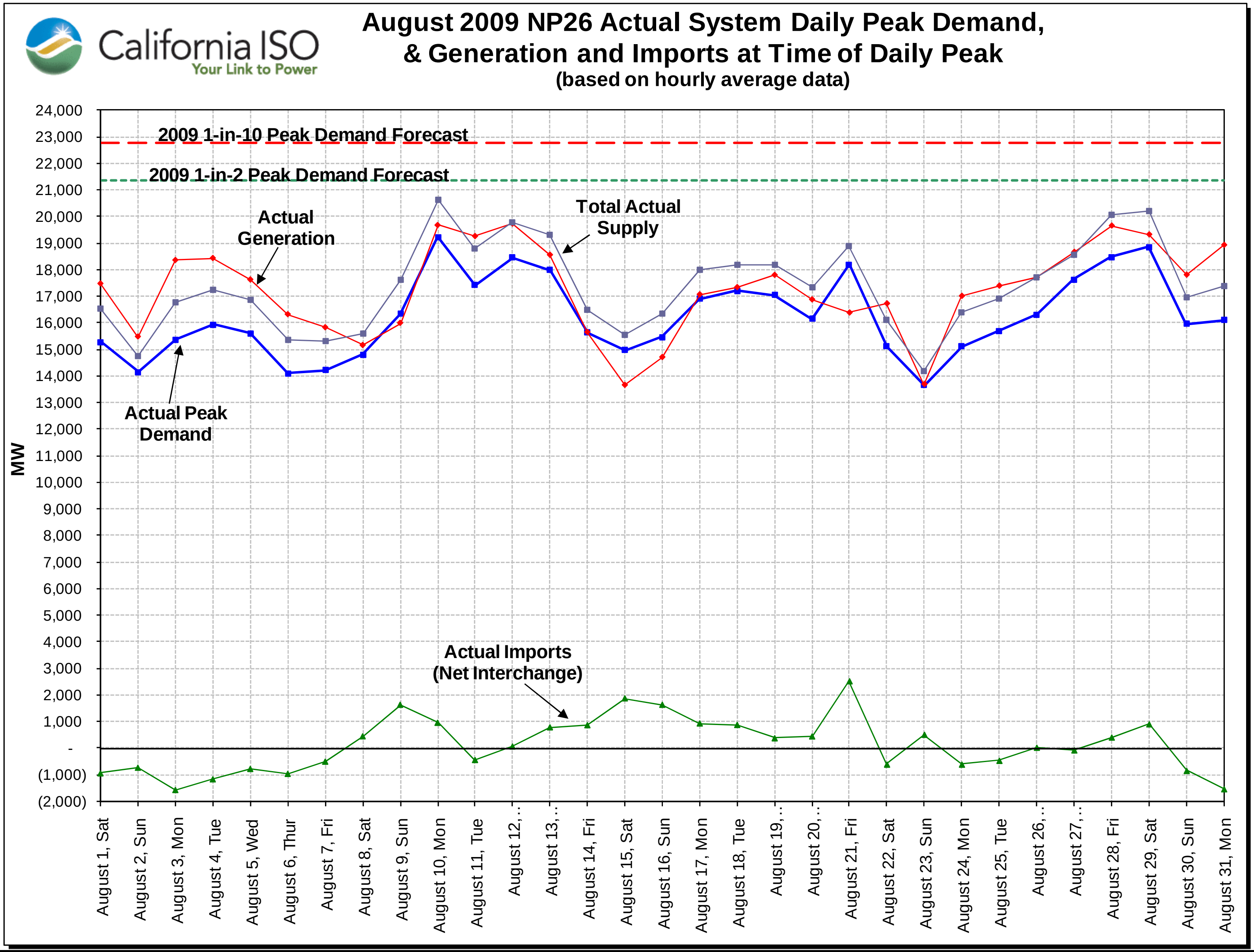
***Appendix A – Continued***



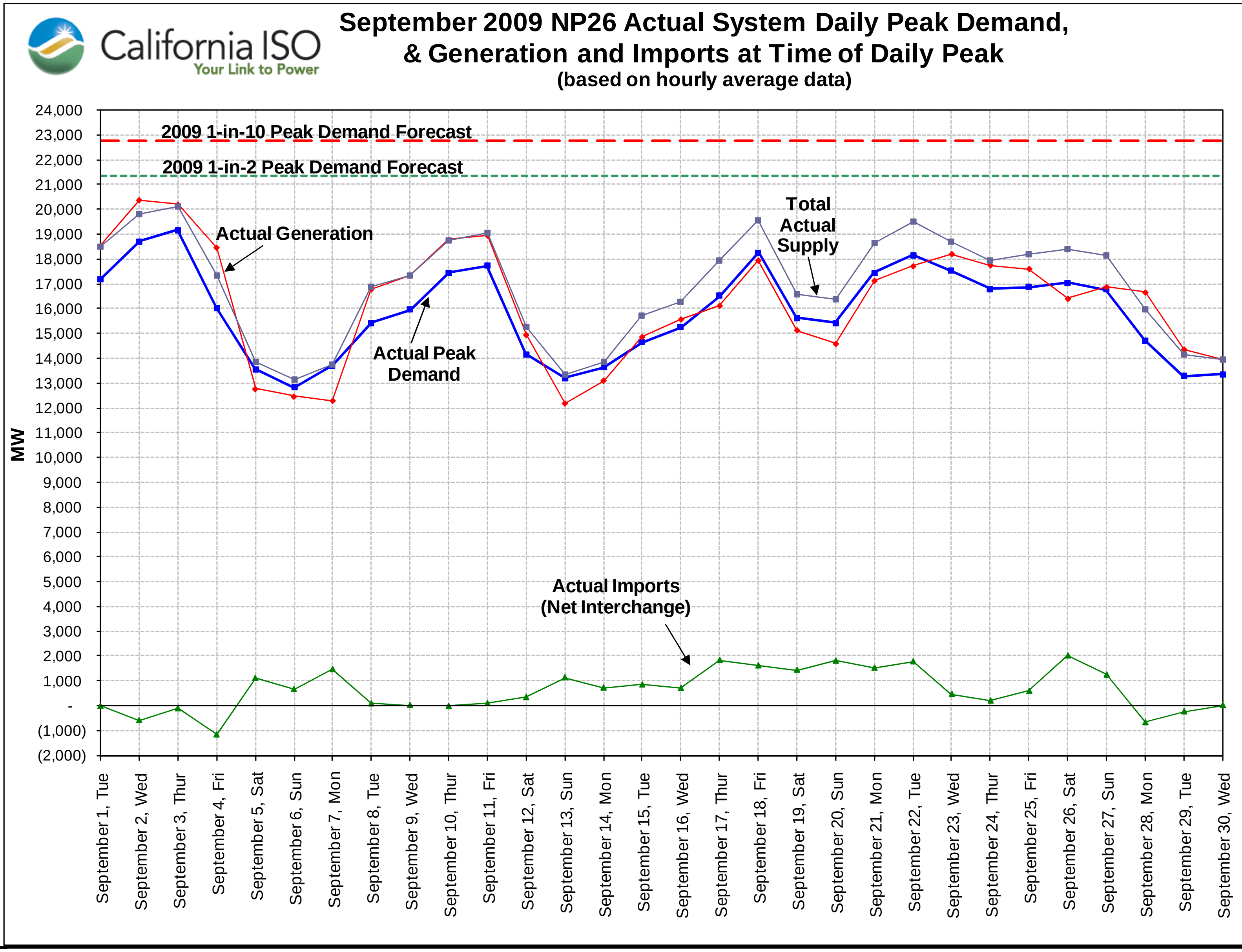
***Appendix A – Continued***



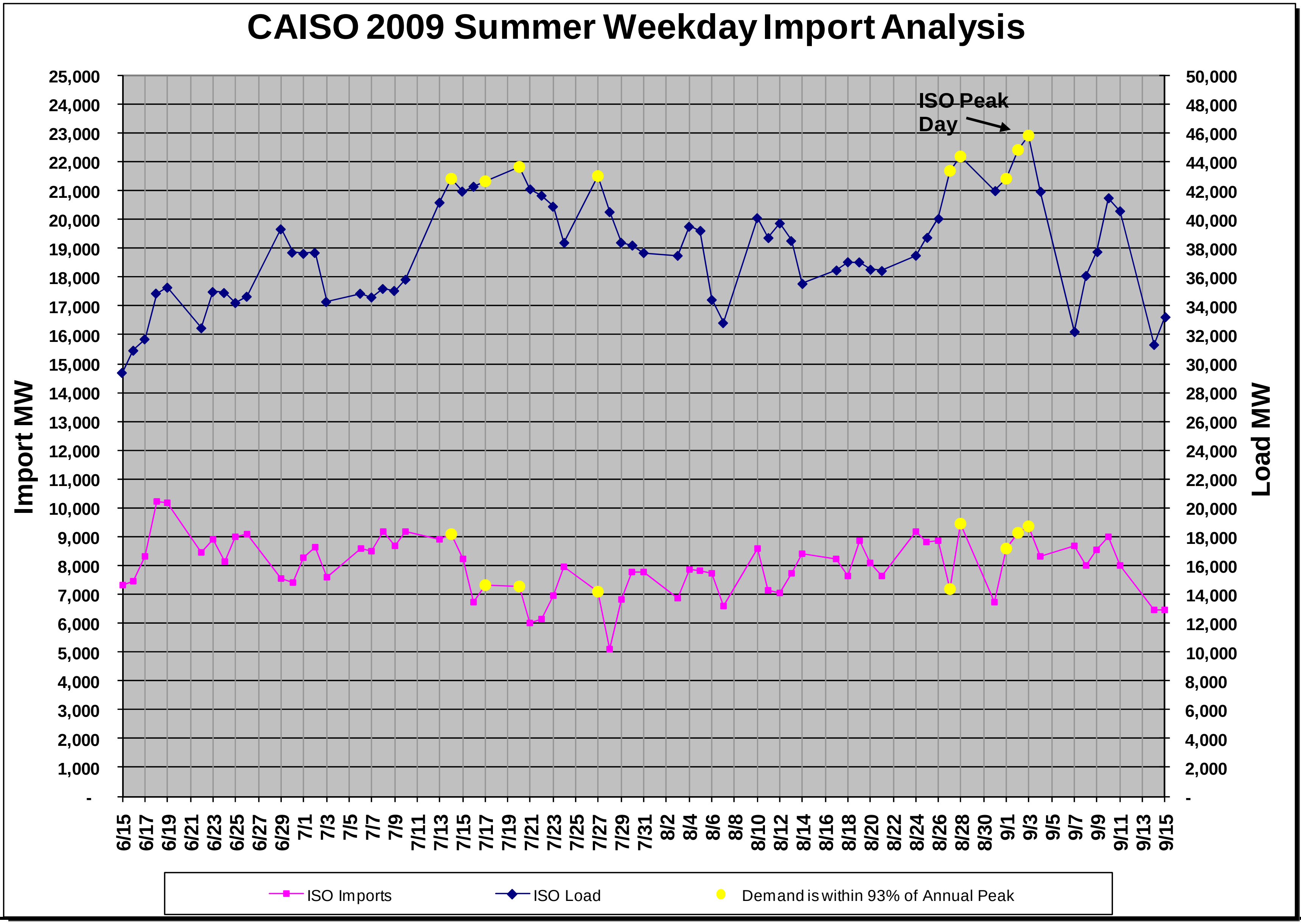
***Appendix A – Continued***



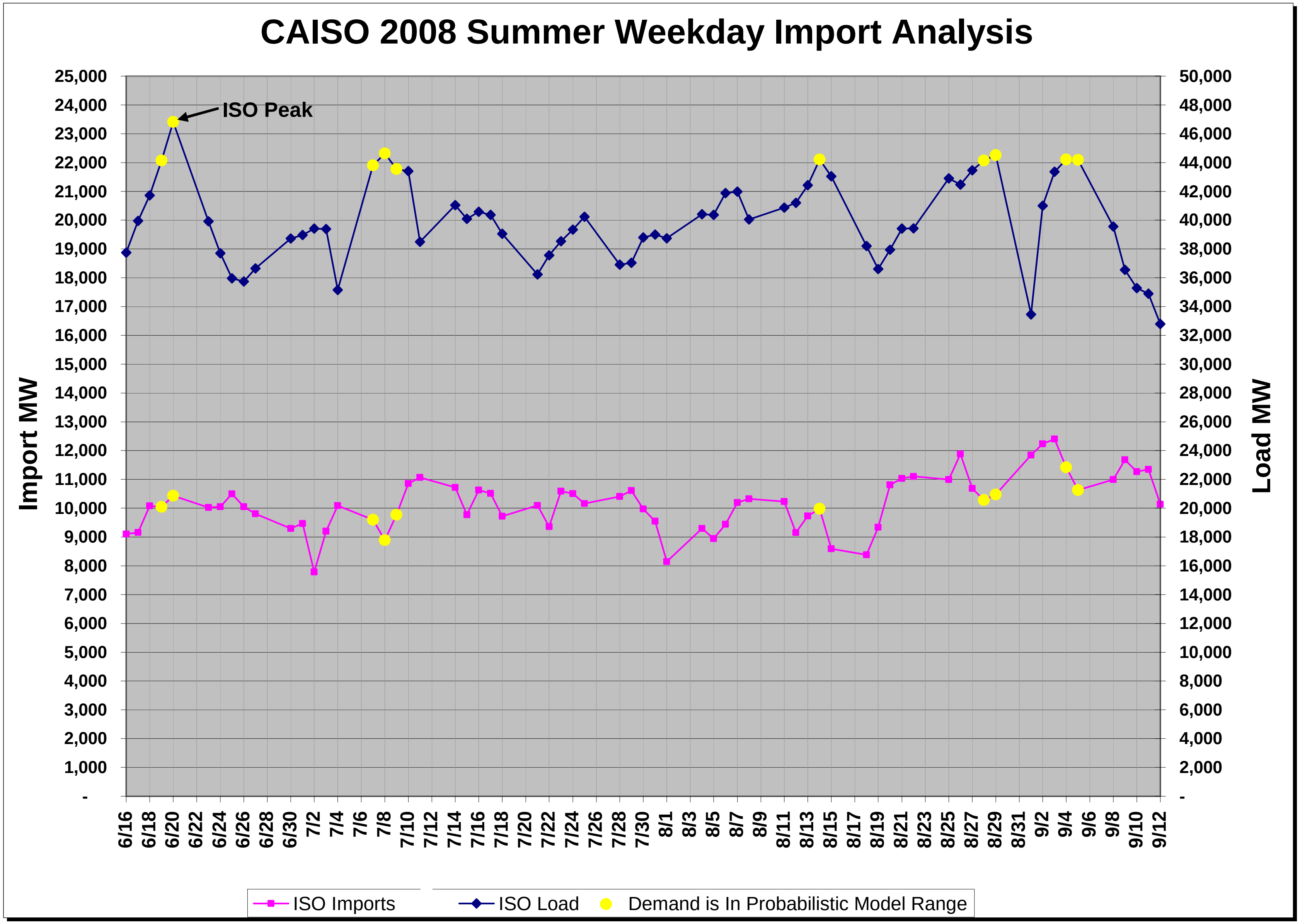
***Appendix A – Continued***



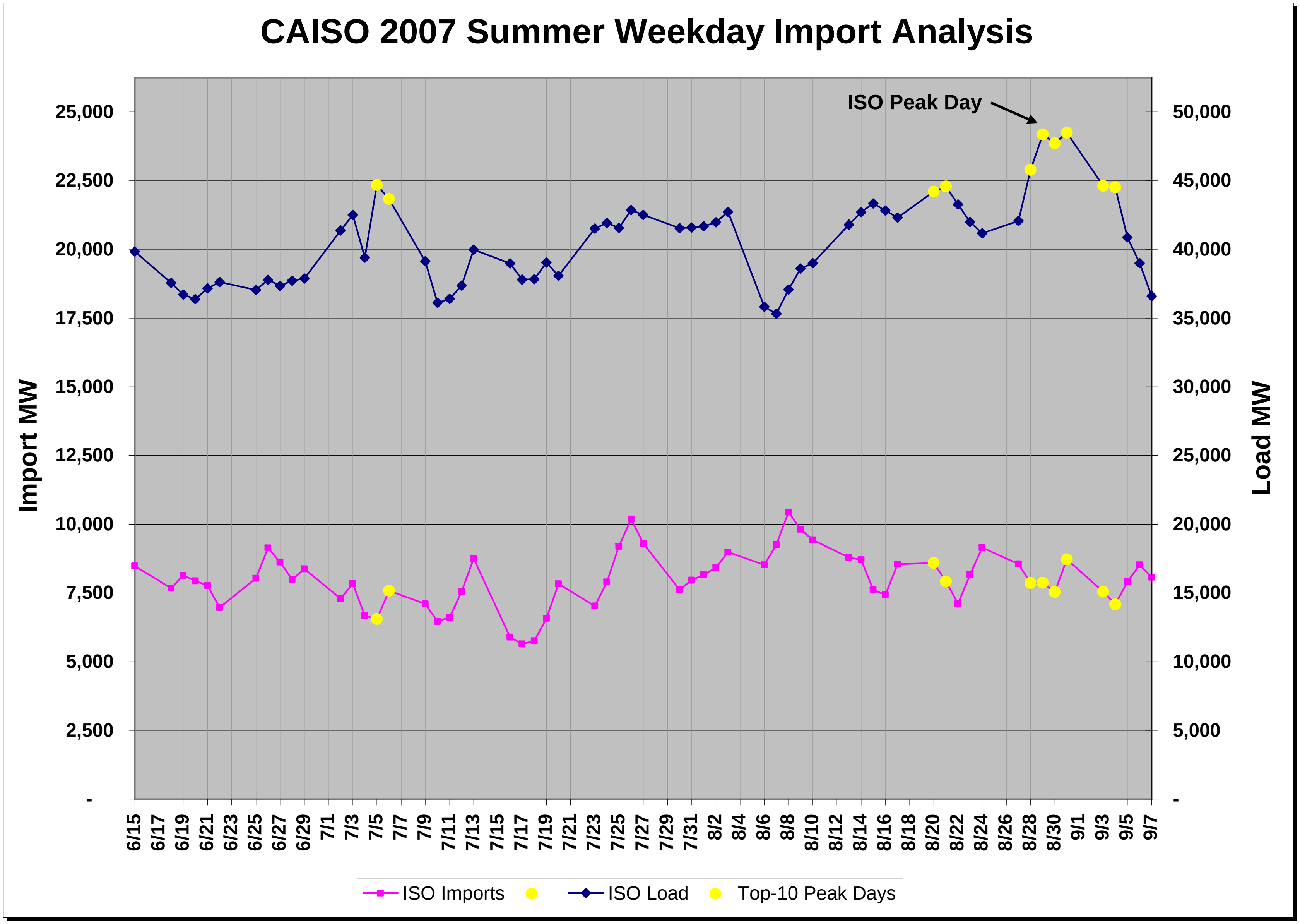
***Appendix B: 2009 – 2006 Summer Imports Summary Graphs***



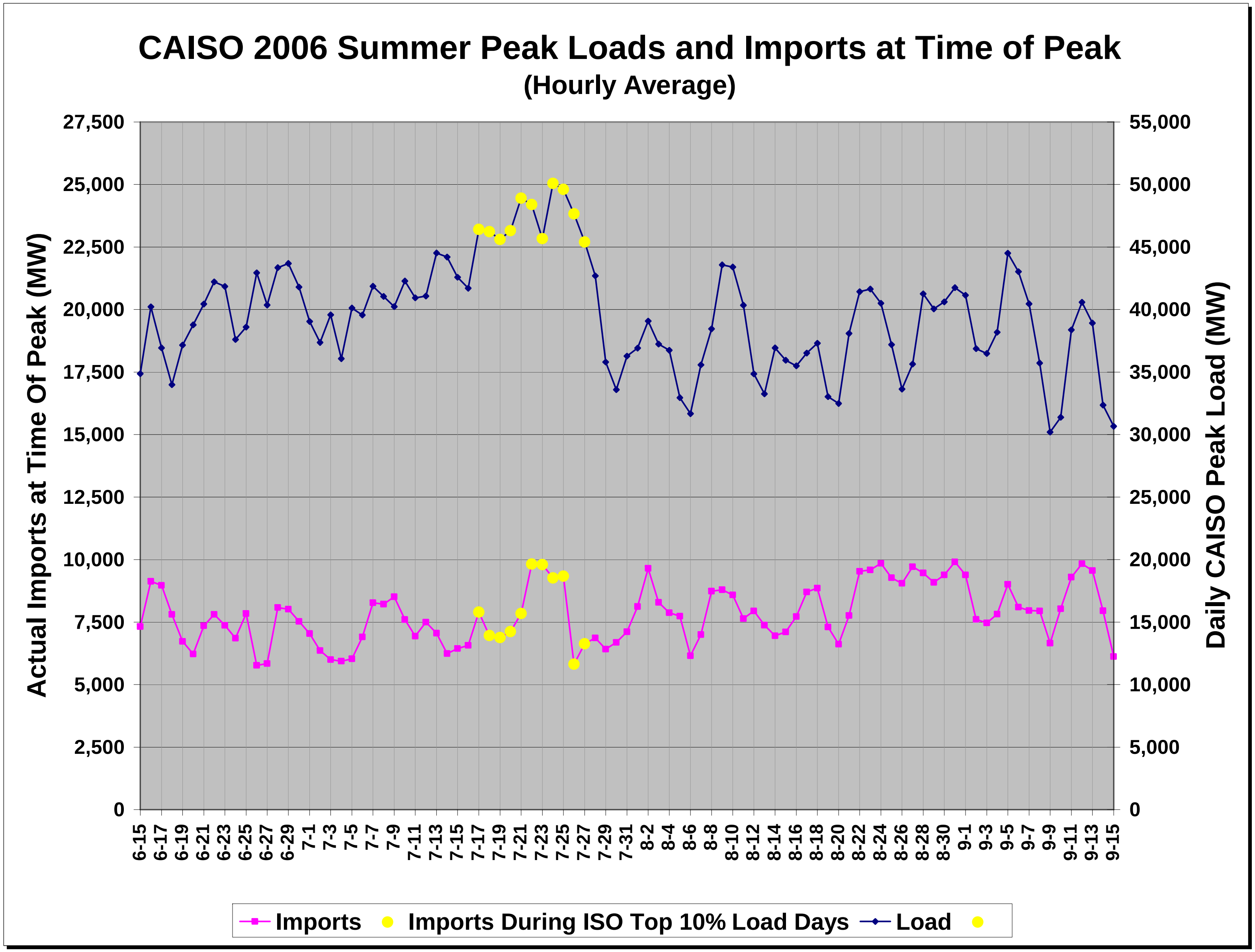
***Appendix B – Continued***



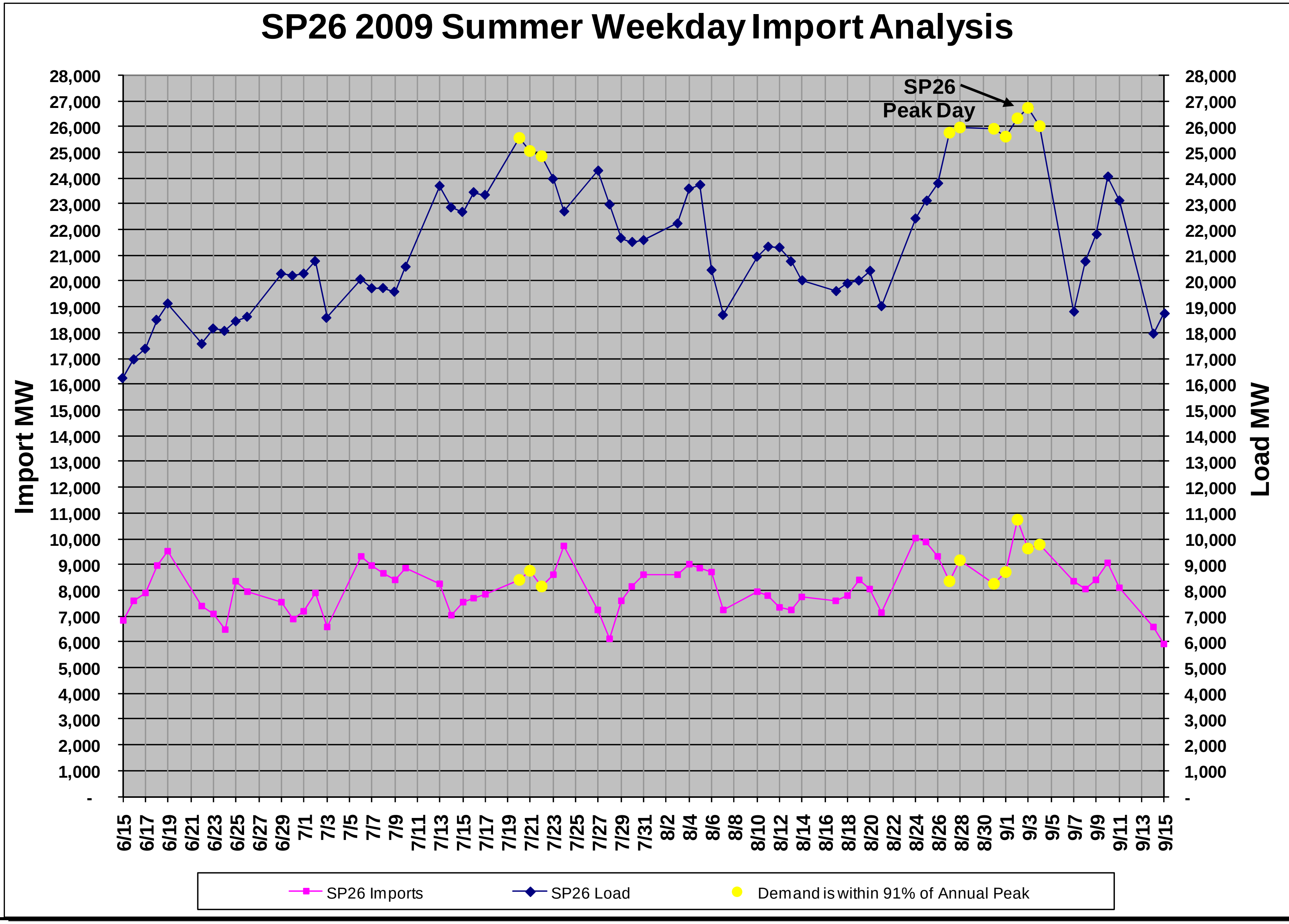
***Appendix B – Continued***



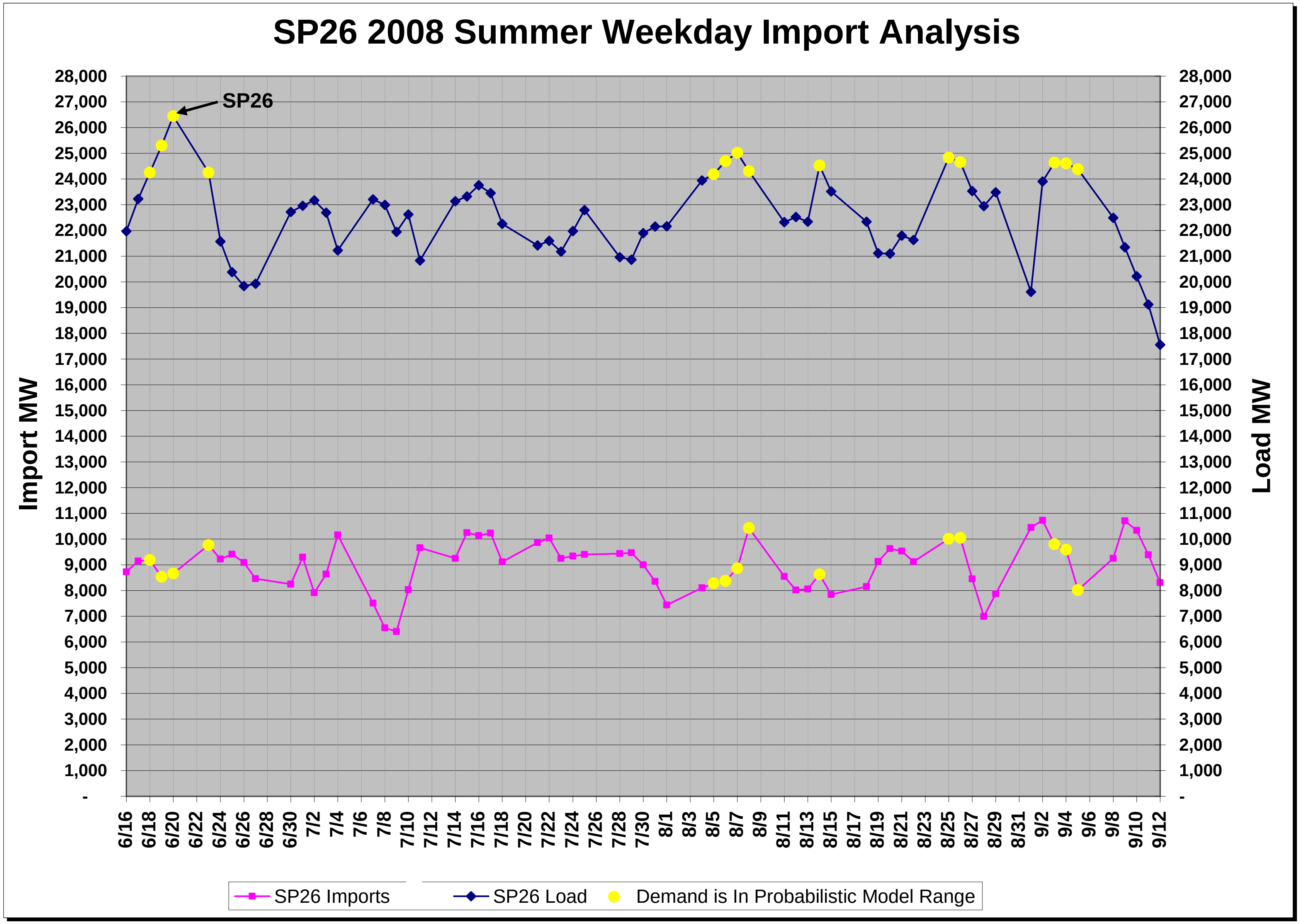
***Appendix B – Continued***



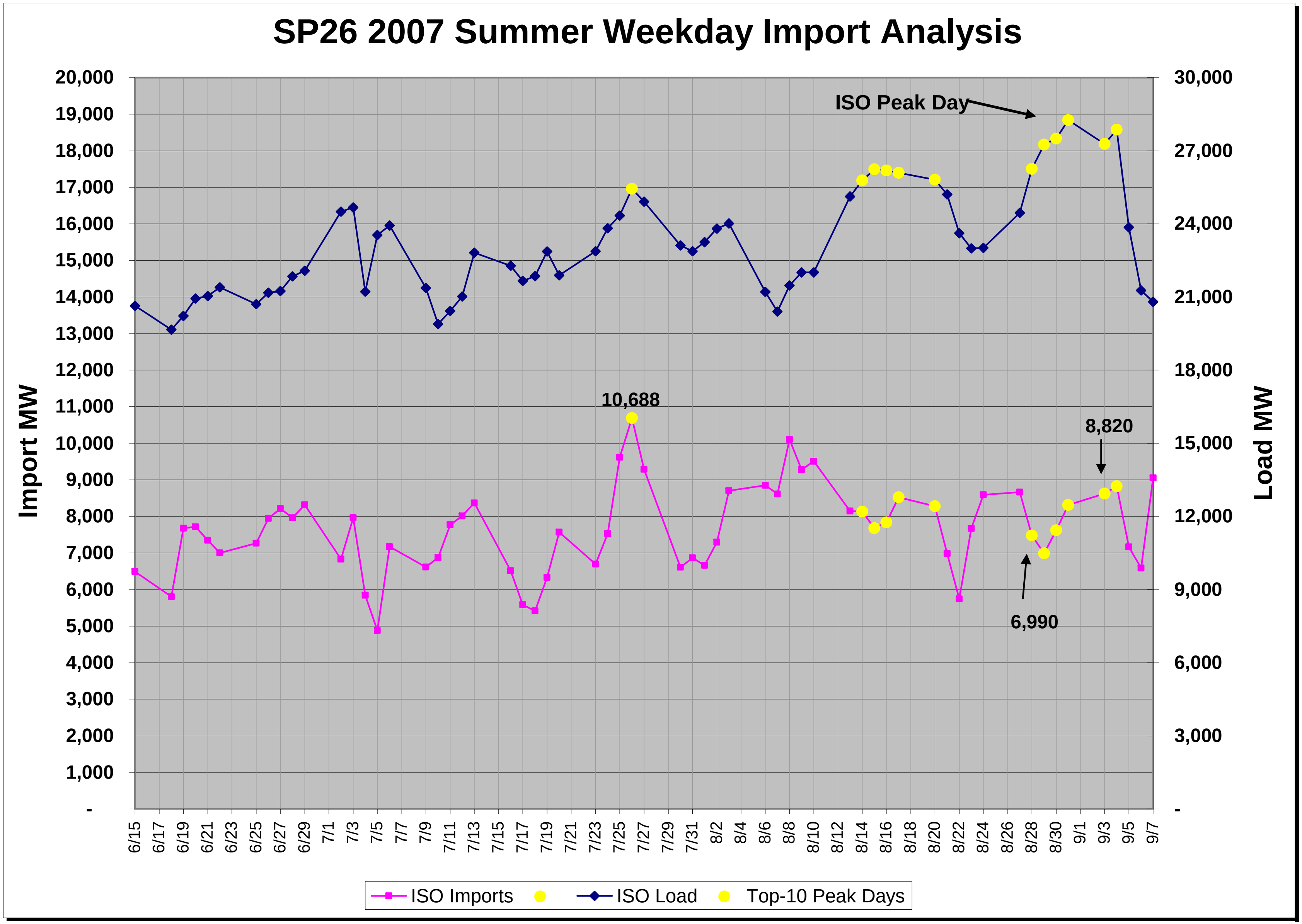
***Appendix B – Continued***



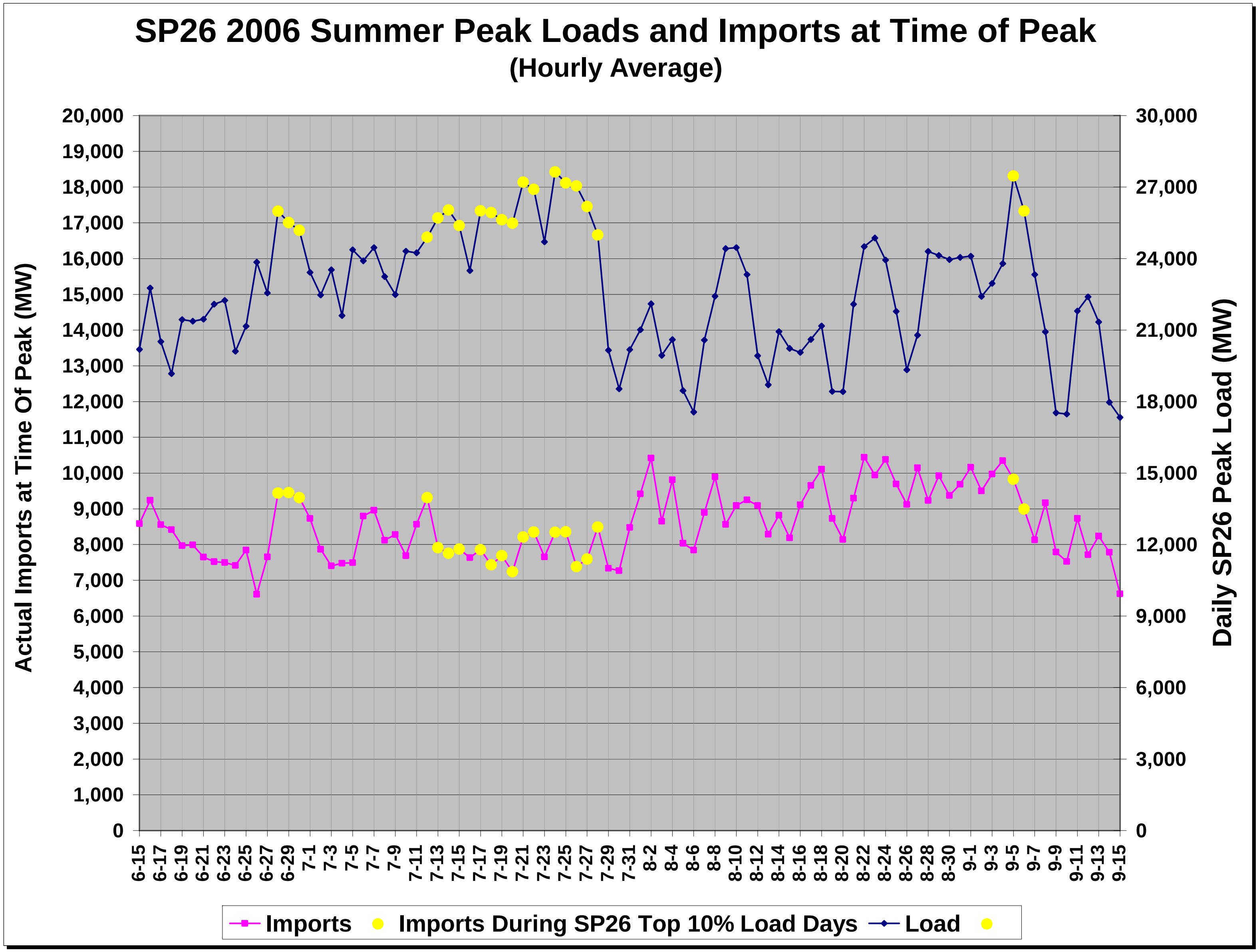
***Appendix B – Continued***



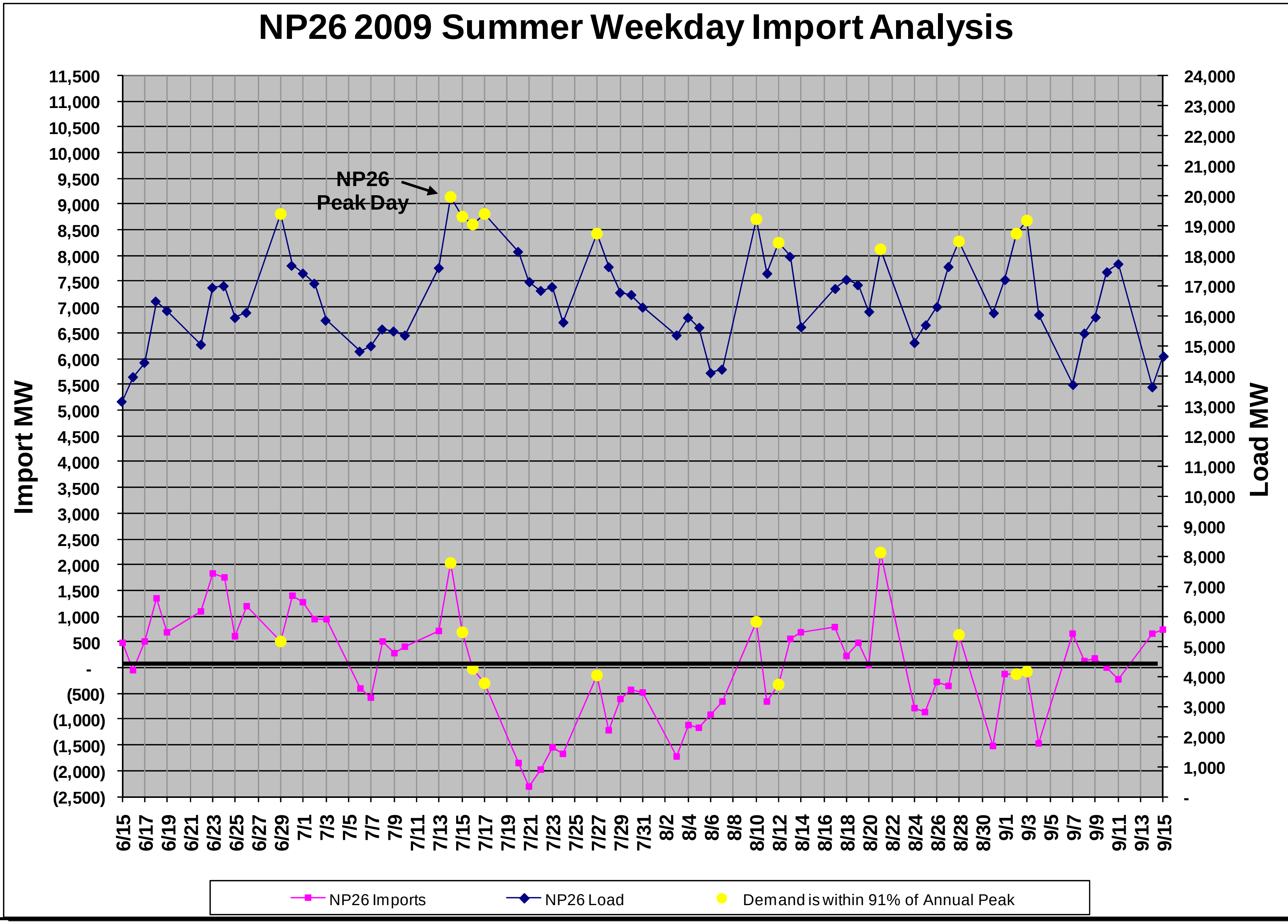
***Appendix B – Continued***



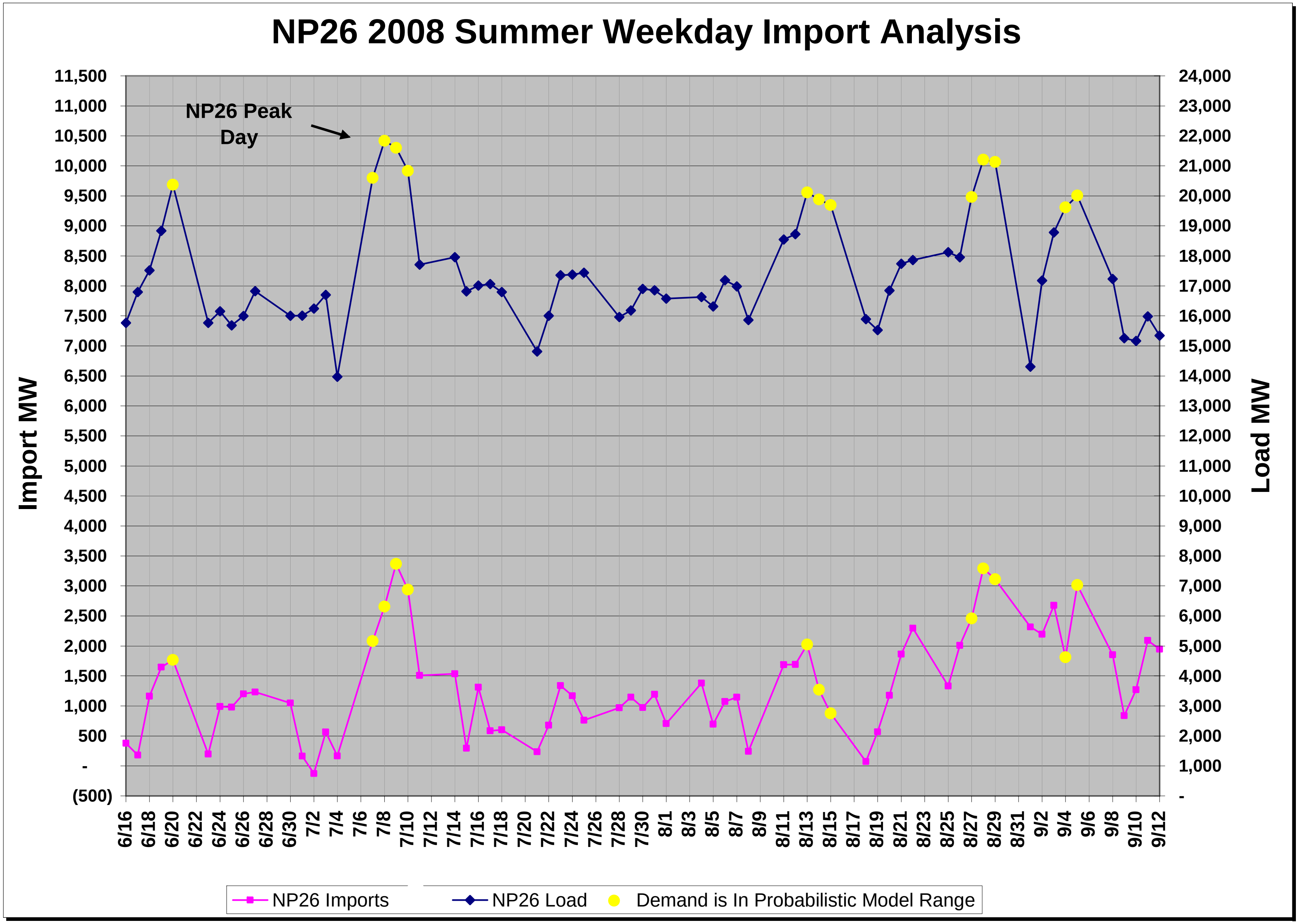
***Appendix B – Continued***



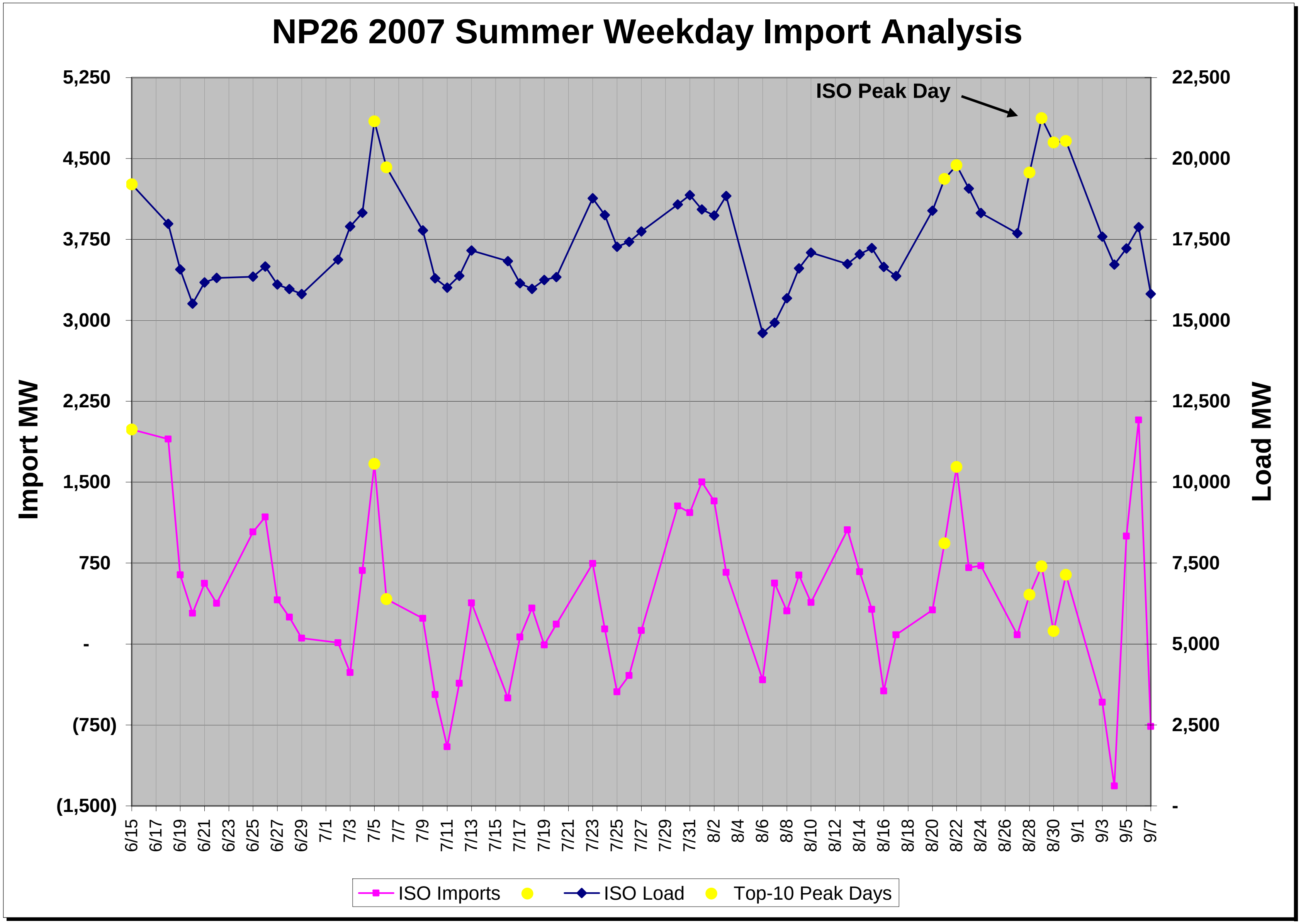
***Appendix B – Continued***



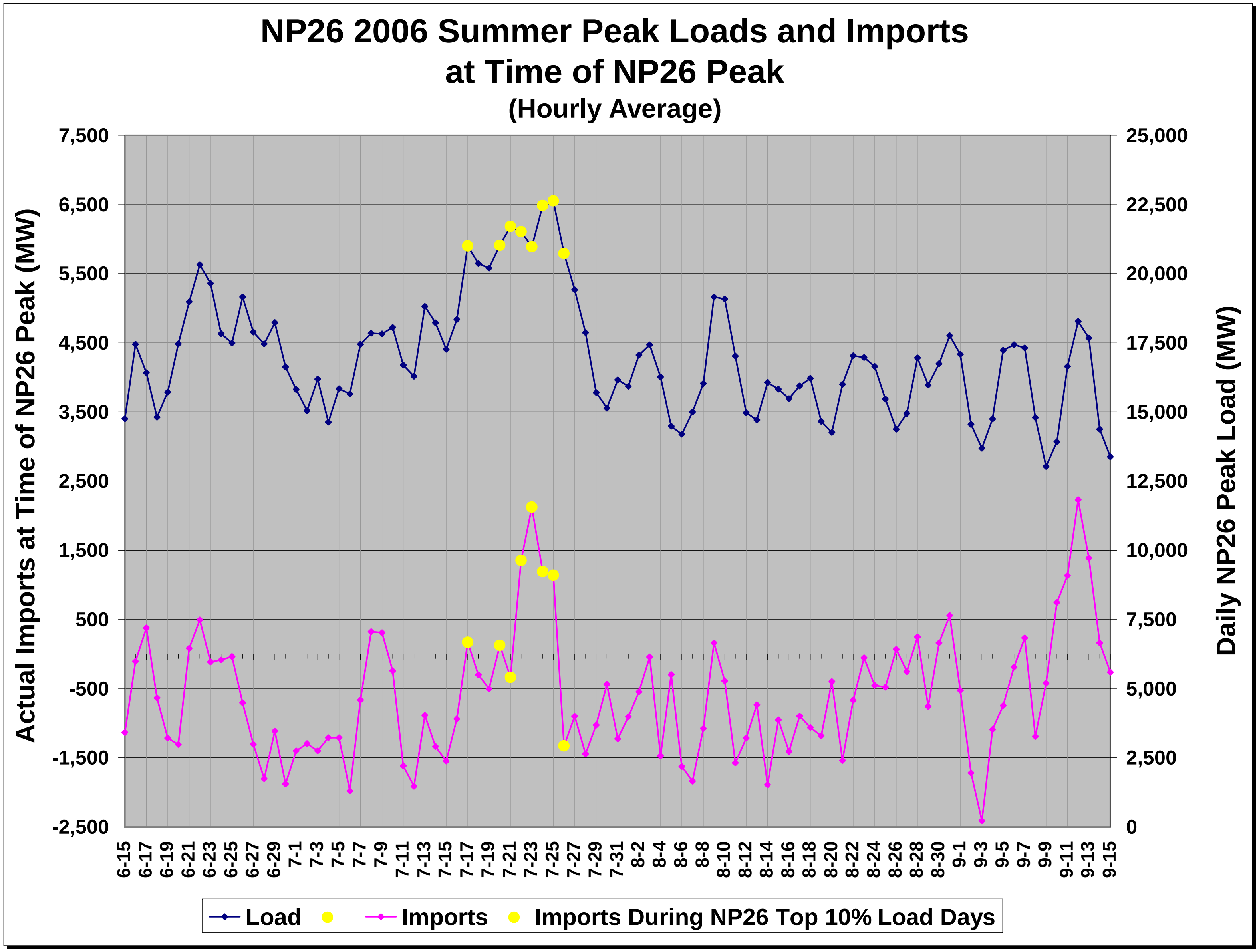
***Appendix B – Continued***



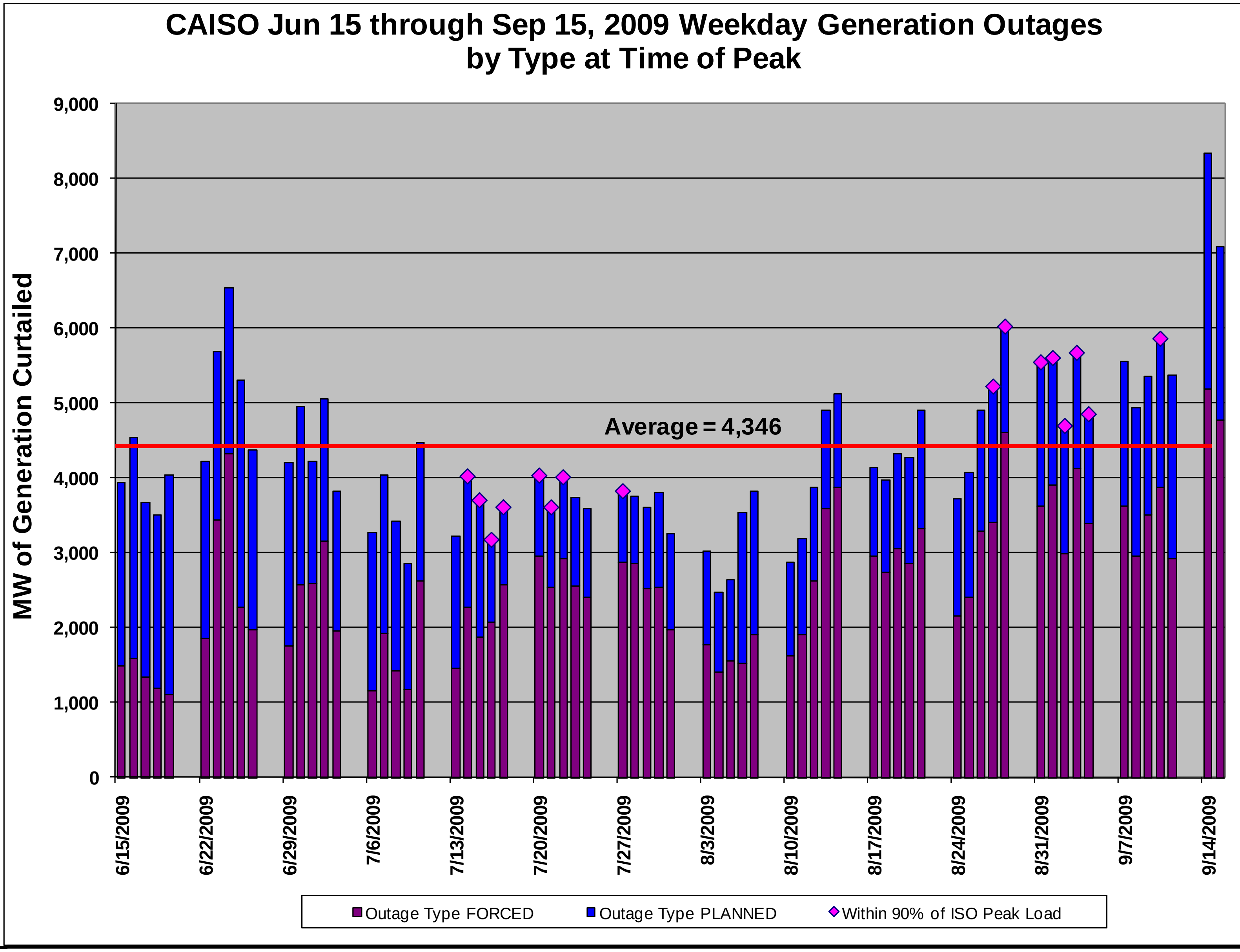
***Appendix B – Continued***



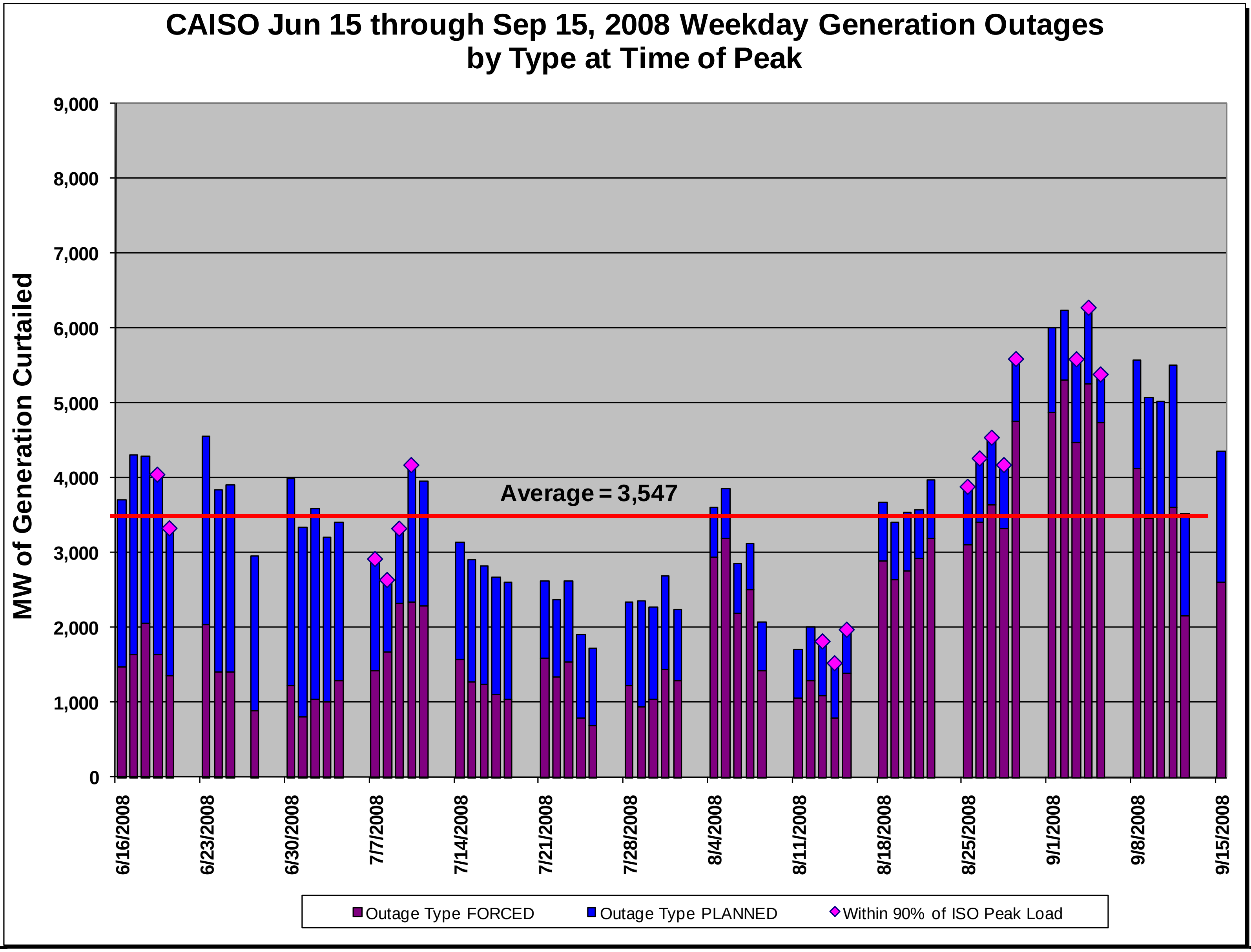
***Appendix B – Continued***



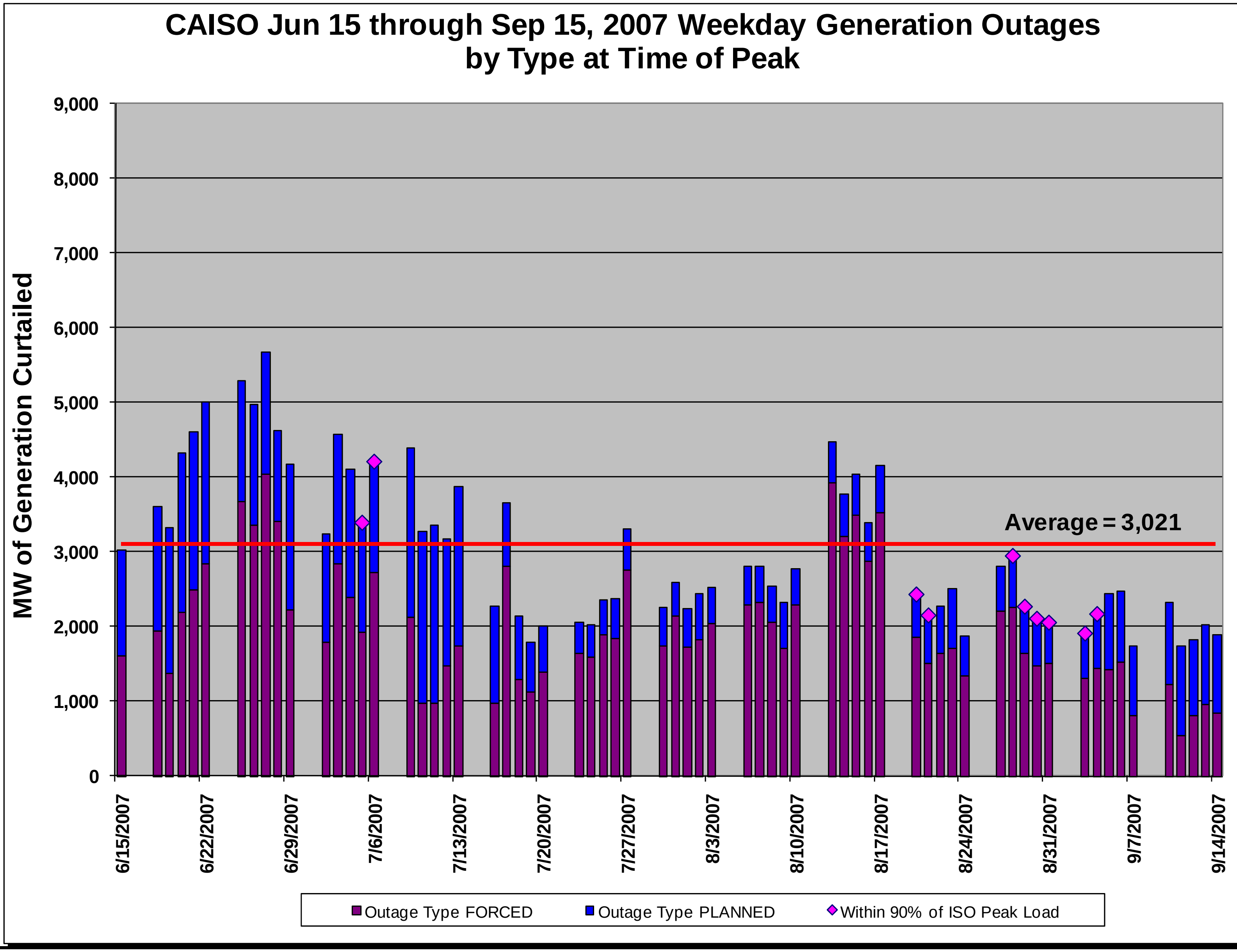
## *Appendix C: 2009 – 2007 Summer Generation Outage Graphs*



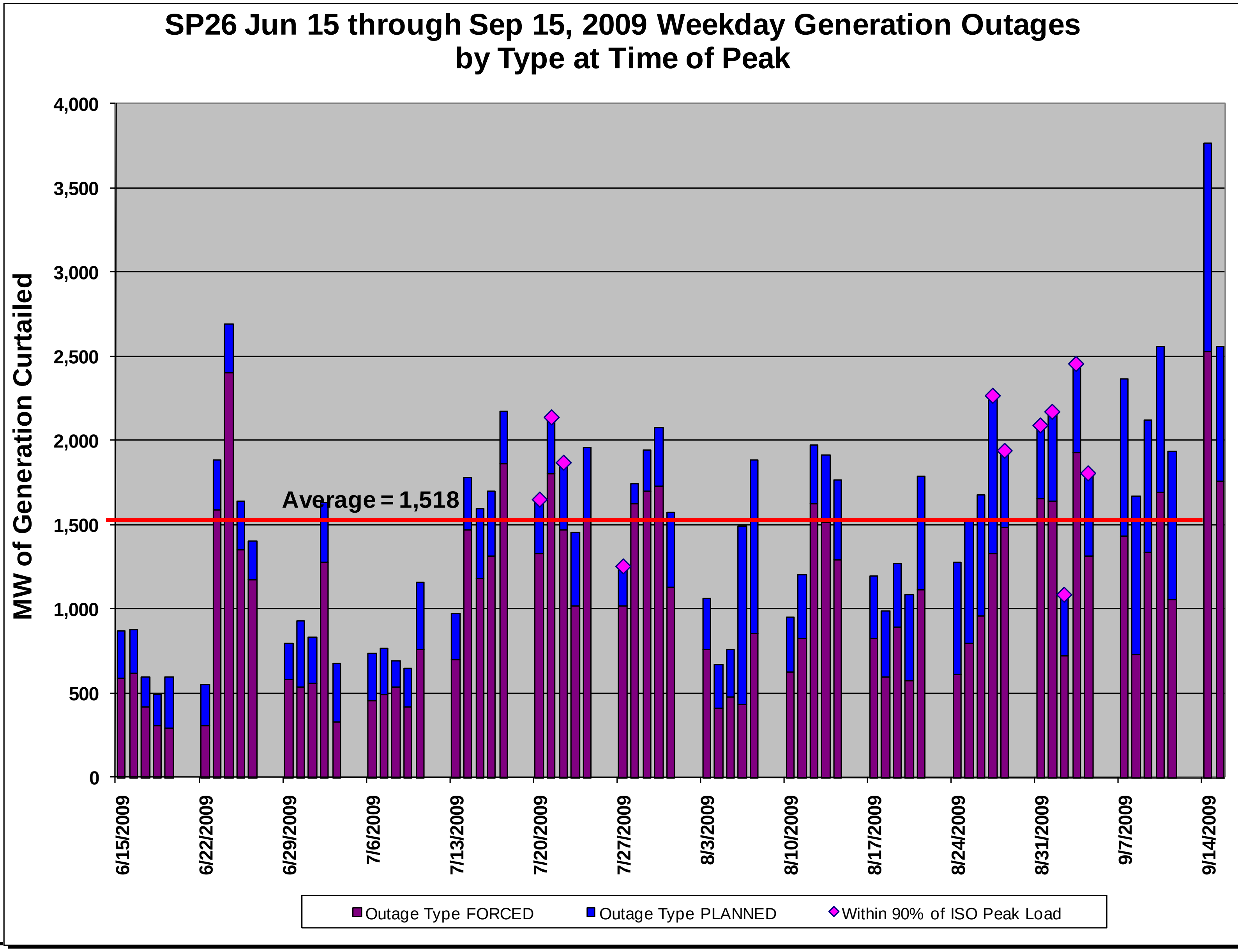
***Appendix C – Continued***



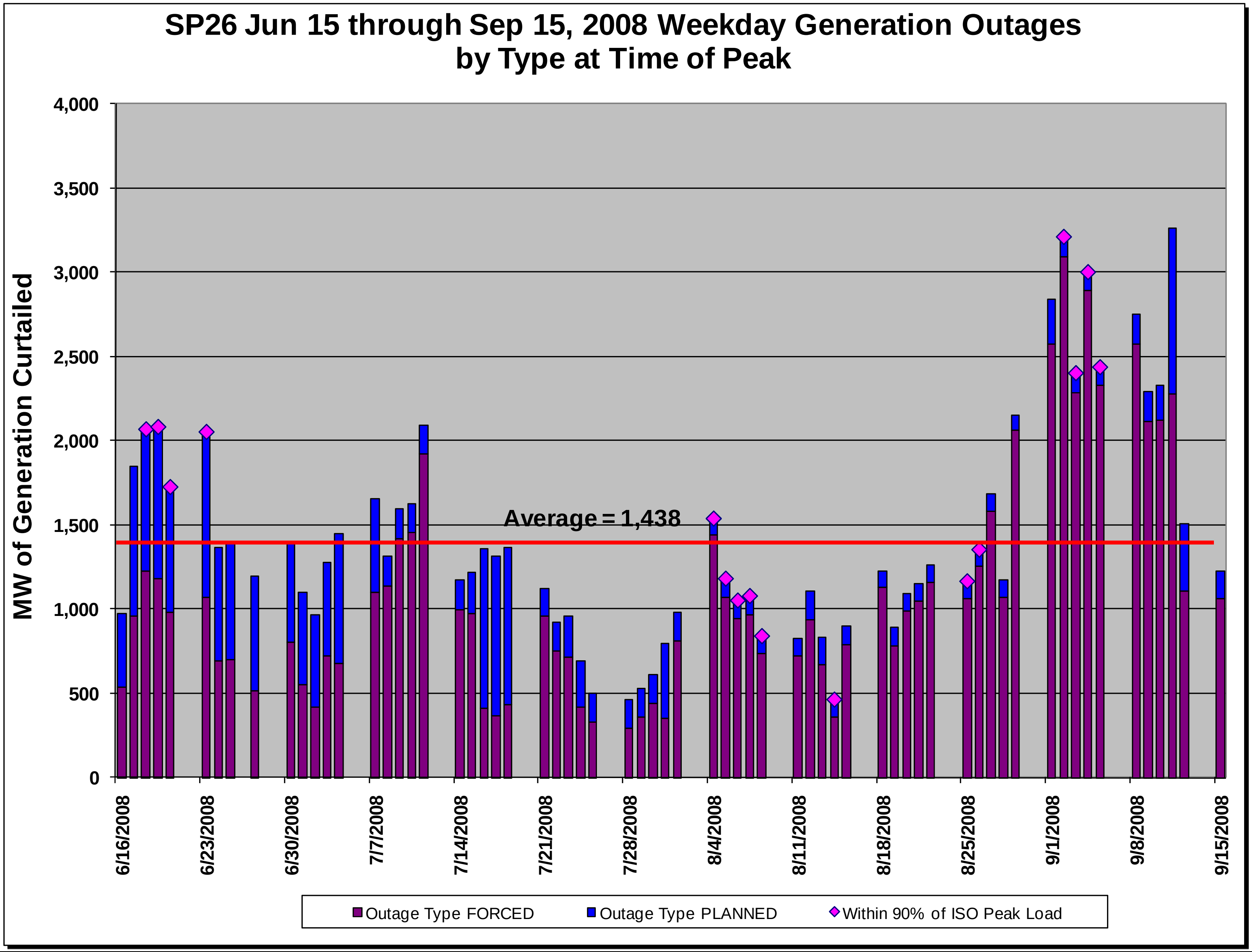
***Appendix C – Continued***



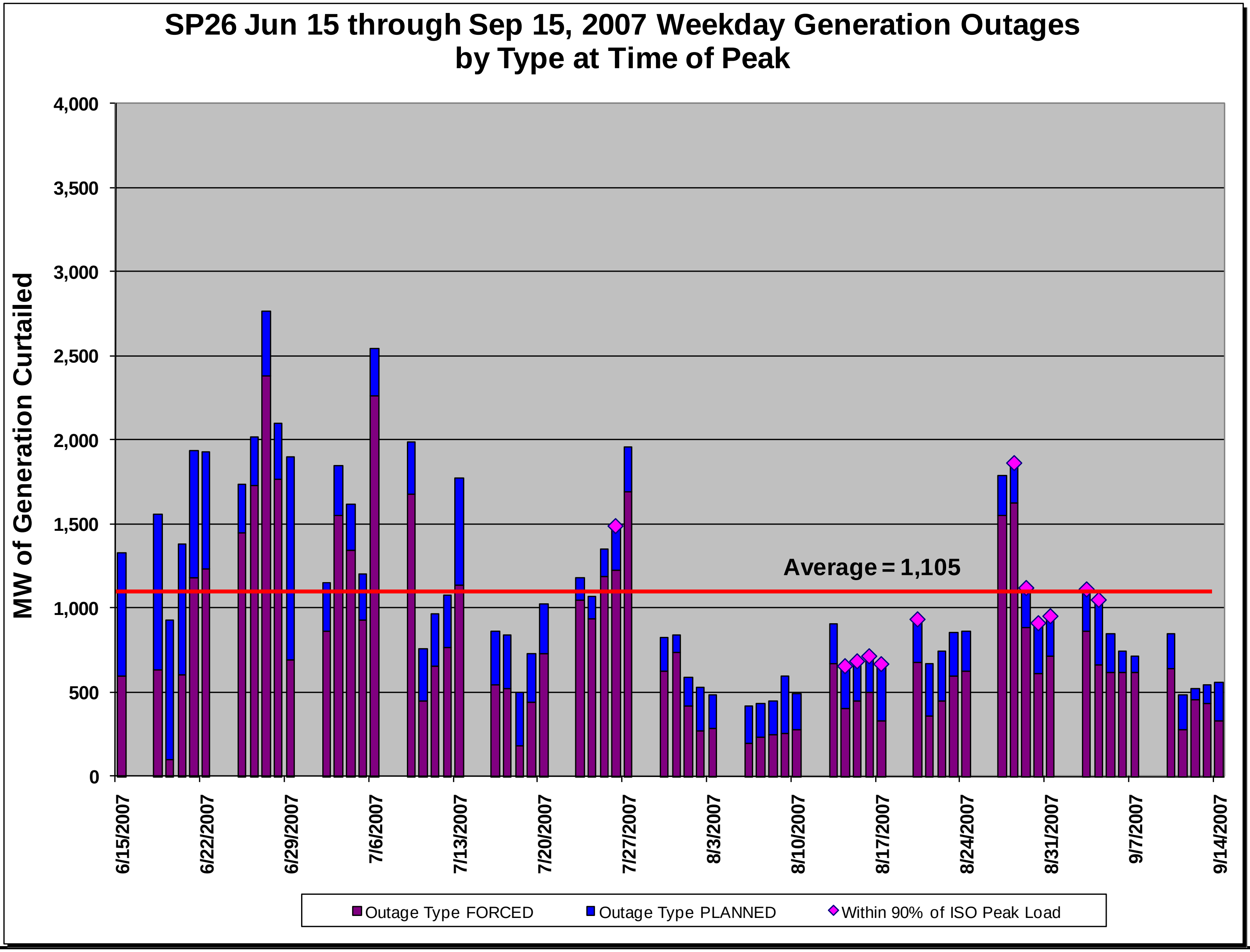
***Appendix C – Continued***



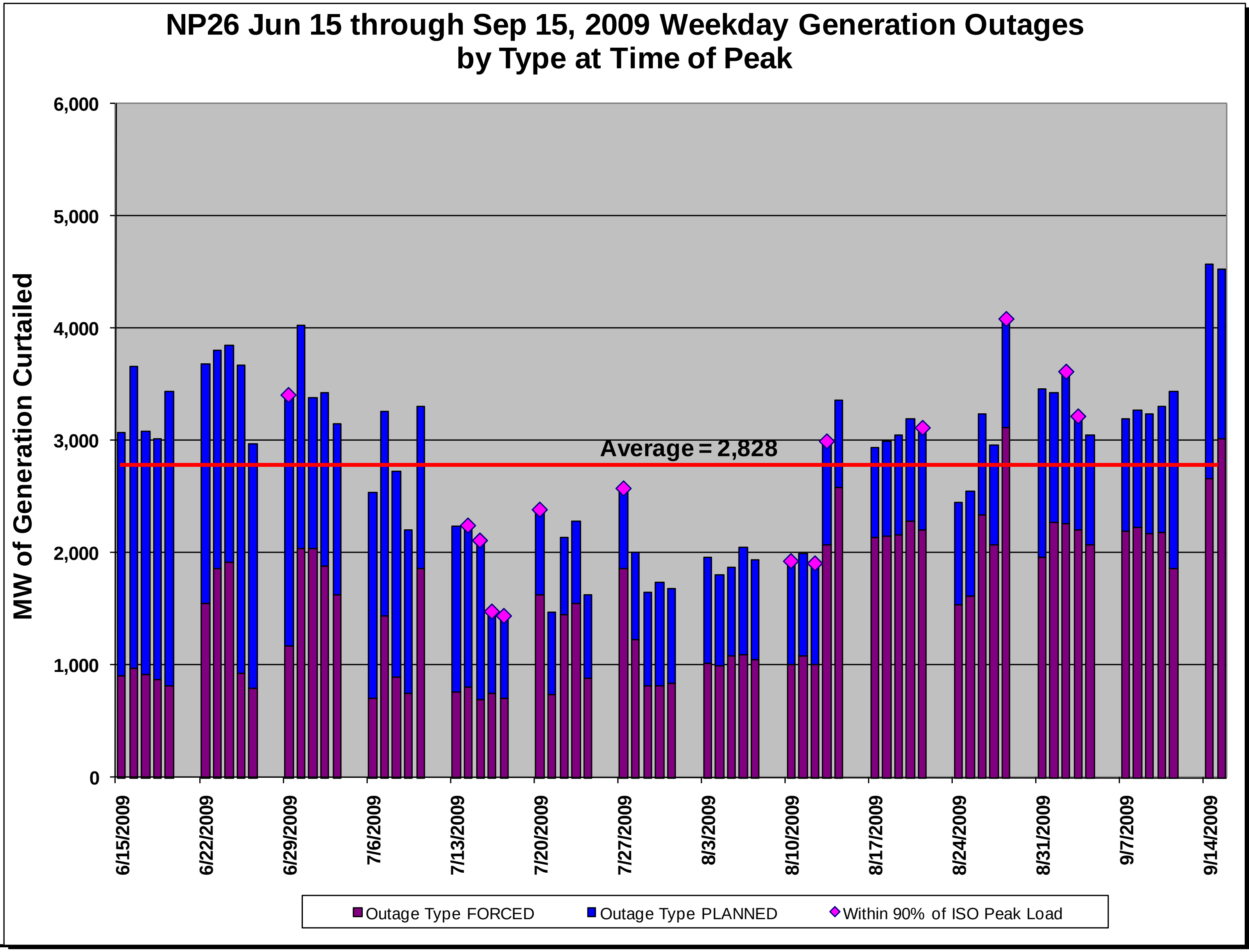
***Appendix C – Continued***



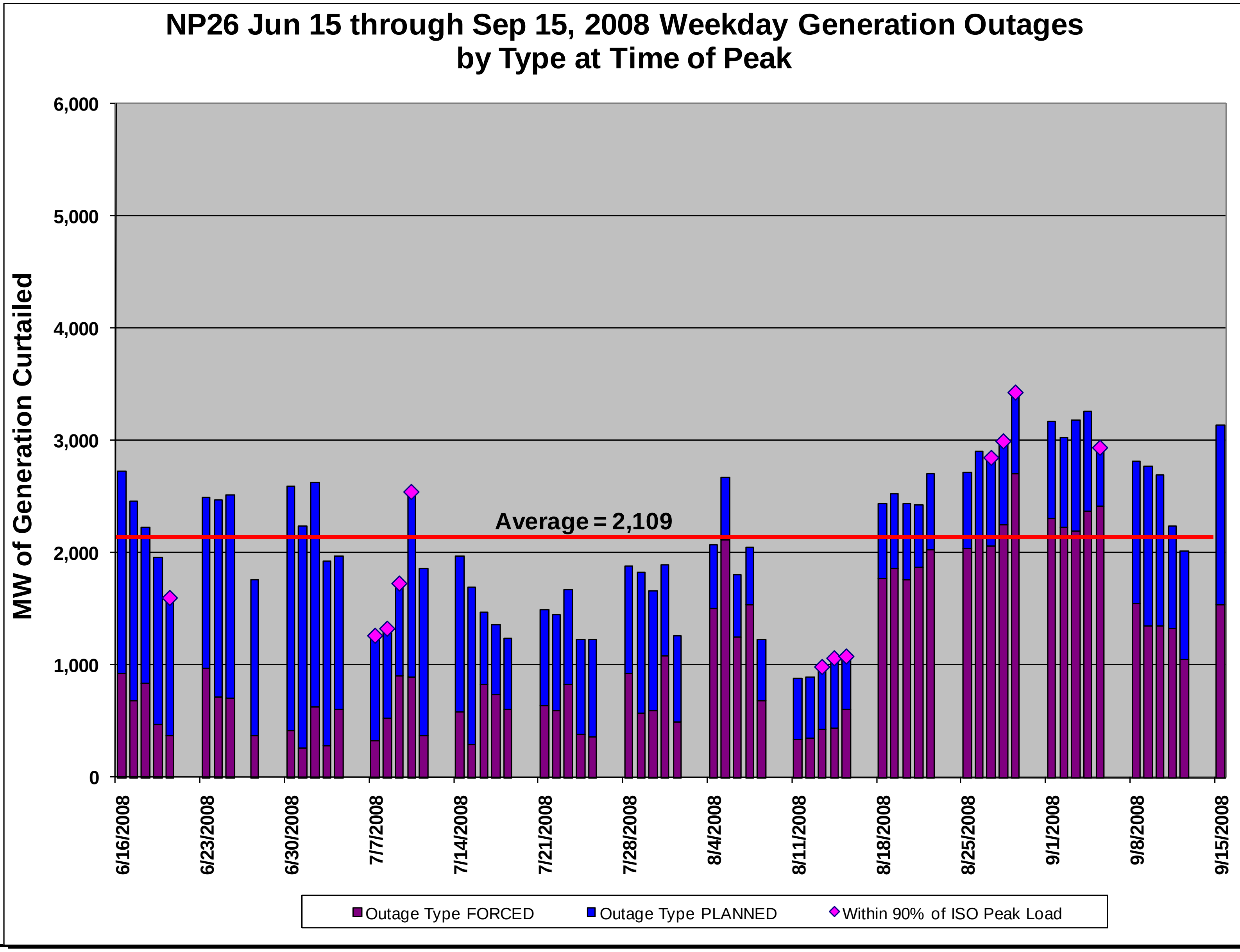
***Appendix C – Continued***



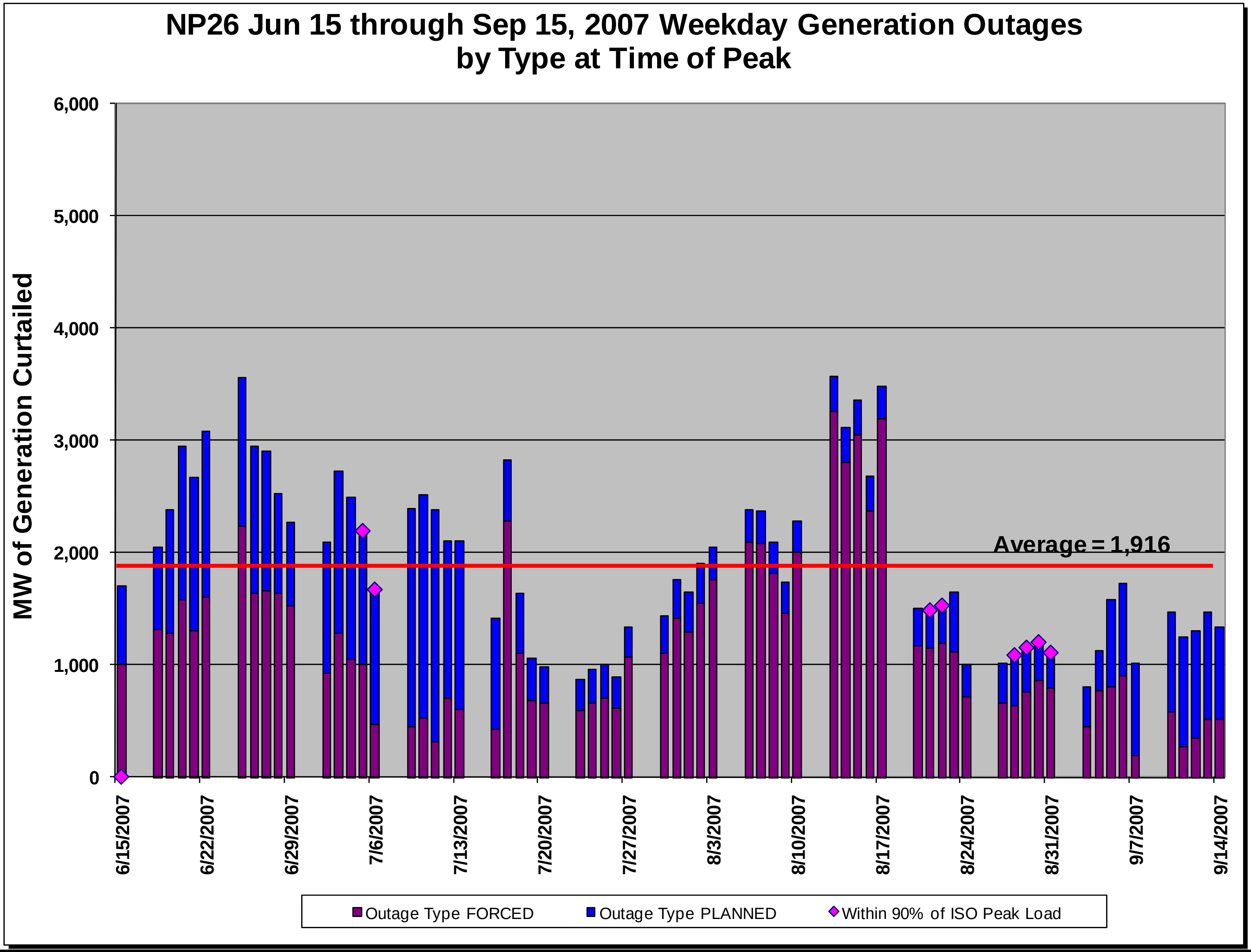
***Appendix C – Continued***



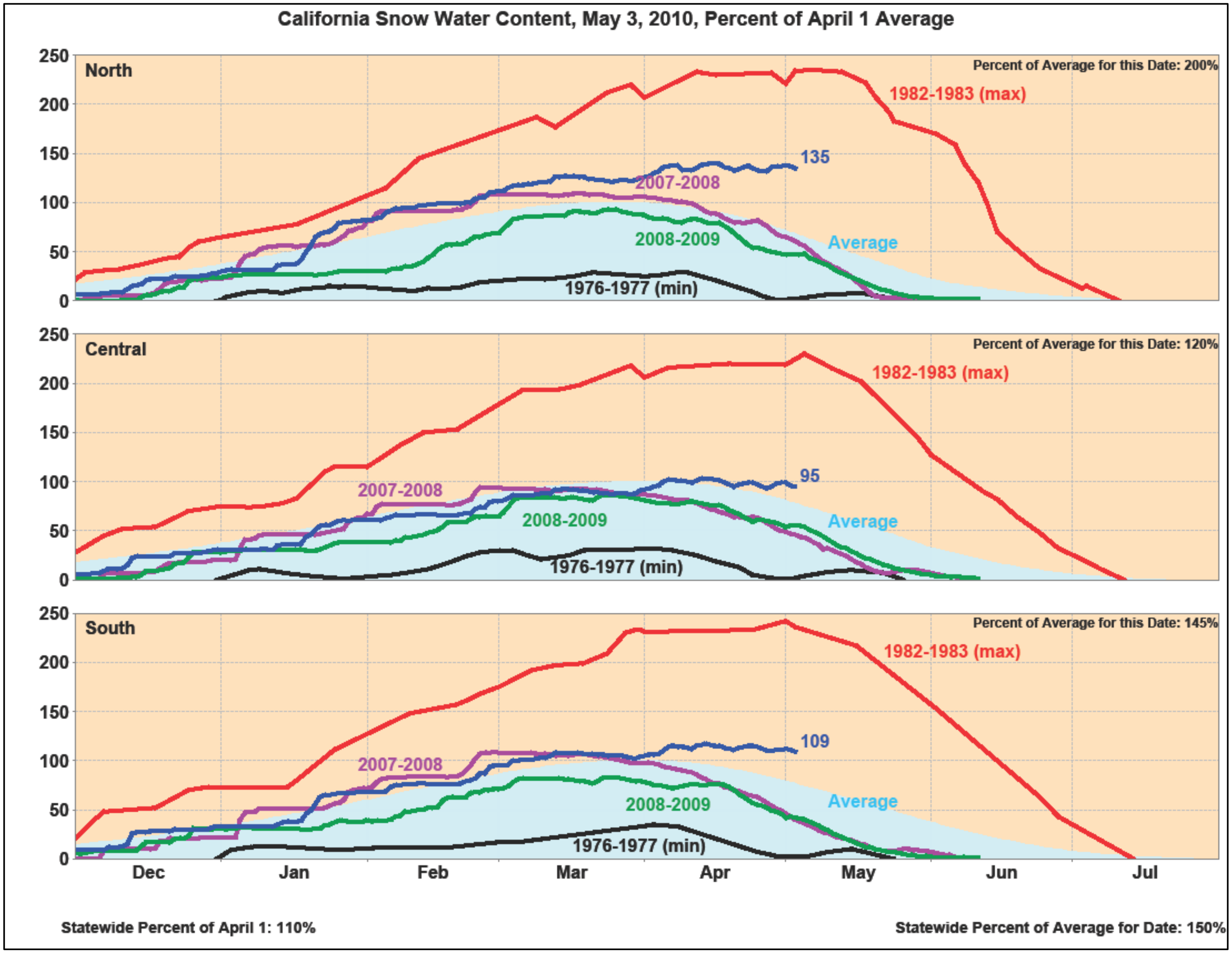
***Appendix C – Continued***



***Appendix C – Continued***

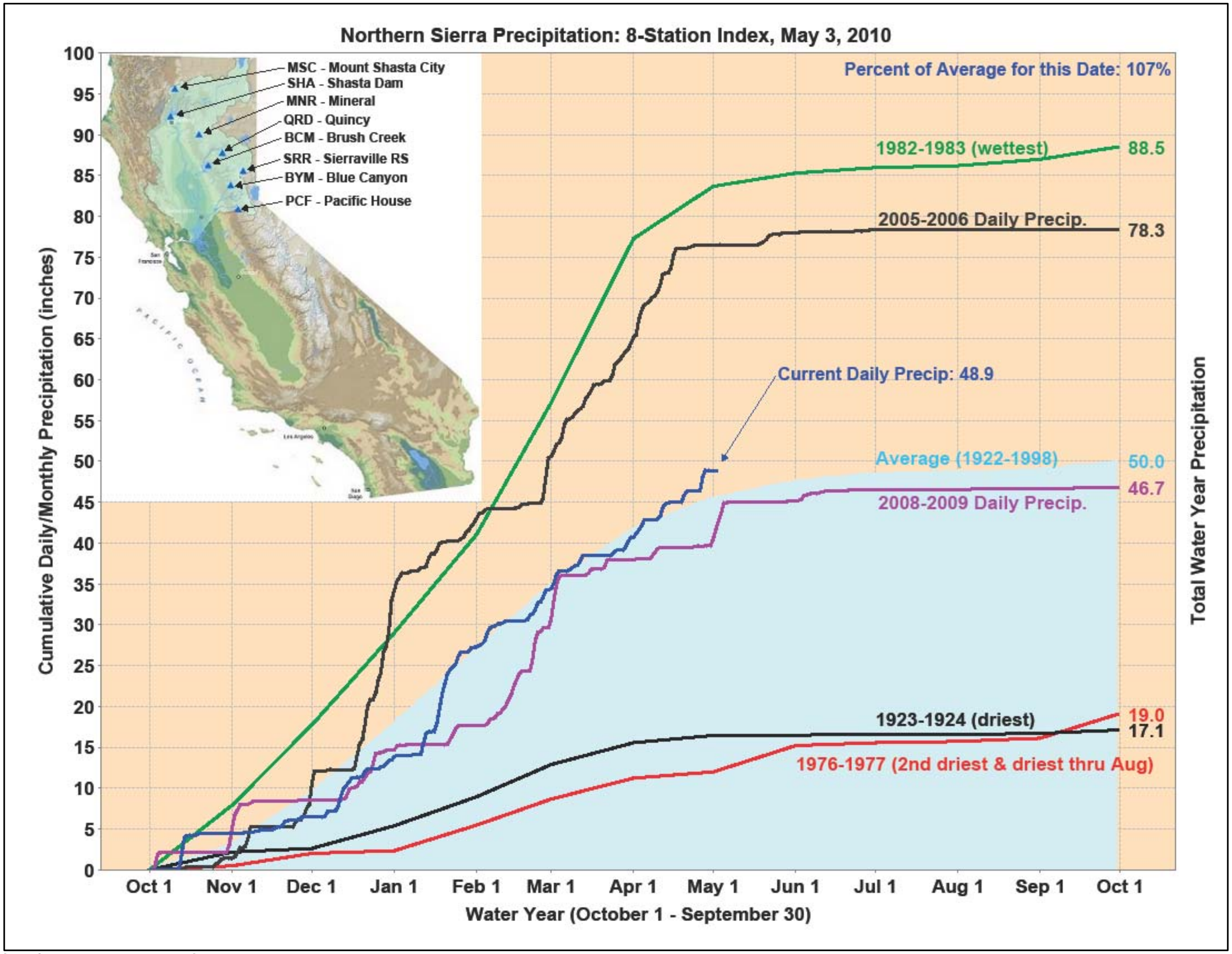


## *Appendix D: 2010 California Hydro Conditions*



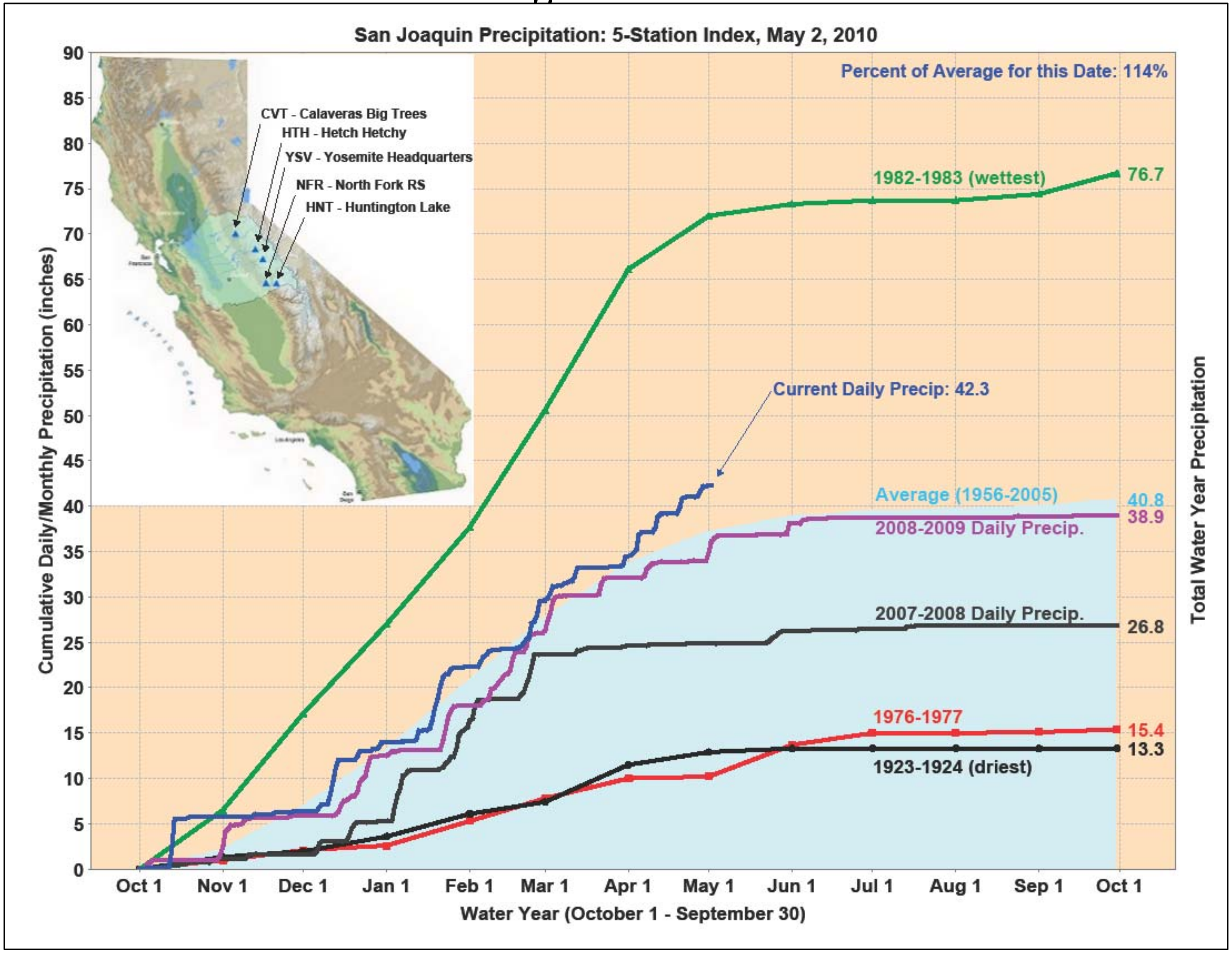

Source: California Department of Water Resources

***Appendix D – Continued***




Source: California Department of Water Resources

***Appendix D – Continued***




Source: California Department of Water Resources