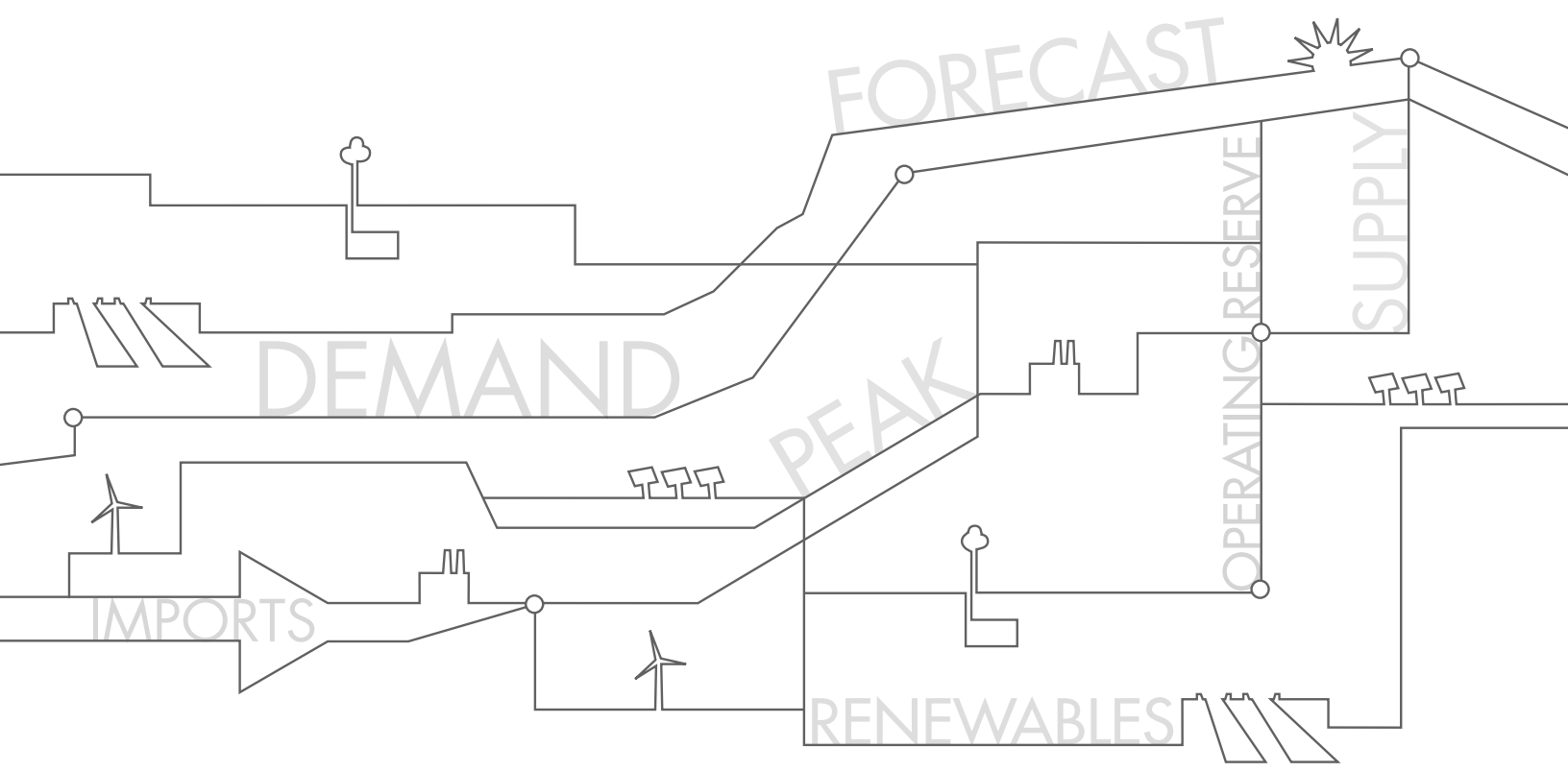


# 2012

## SUMMER LOADS AND RESOURCES ASSESSMENT

March 15, 2012



**California ISO**  
Shaping a Renewed Future

Prepared by: Market & Infrastructure Development  
Grid Assets Department  
Version: 1

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## I. EXECUTIVE SUMMARY

The *2012 Summer Loads and Resources Assessment* provides an analysis of the upcoming summer supply and demand outlook in the California Independent System Operator balancing authority. The ISO works with generation, transmission owners, load serving entities and other balancing authorities to formulate the summer forecast and identify any concerns regarding upcoming operating conditions. The hydrologic situation, renewable expansion and economic impact on demand are of particular interest in 2012 and are addressed in this report.<sup>1</sup>

This report projects an adequate supply for summer 2012 to handle a broad range of operating conditions. The probability of involuntary load curtailment in 2012 is lower than that in 2010 and 2011 assuming moderate import levels. Under normal peak demand conditions, both the planning reserve margin and the operating reserve margin are projected to be greater than the California Public Utility Commission's 15% resource adequacy requirement. The operating reserve margins from 2005 to 2012 are shown in *Figure 1*.

The summer 2012 supply and demand outlooks are shown in Tables 1 through 3. Under the normal peak demand scenario, the planning reserve margin are expected to be 32.7% for the ISO system as a whole, 28.9% for southern California (SP26) and 36.7% for northern California (NP26).<sup>2</sup> The operating reserve margins are expected to be 22.5% for the ISO system, 21.5% for SP26 and 23.7% for NP26. The normal scenario for operating reserves is defined as moderate net imports to the ISO system, 1-in-2 year generation and transmission outages, and 1-in-2 year peak demand. A 1-in-2 year event means the event has a probability of occurring once in two years.

Under an extreme peak demand scenario, operating reserve margins are projected to drop to 9.3% for the ISO system, 2.8% for SP26 and 9.1% for NP26. The operating reserve margins for SP26 is below the firm load shedding threshold of 3%. The extreme scenario is defined as low imports, 1-in-10 generation and transmission outages, and 1-in-10 peak demand. The probability of the extreme scenario is very low.

The expected probability of experiencing involuntary load curtailments because of low operating reserve margins in summer 2012 is extremely low at 0.54 for ISO system, 0.50% for SP26 and 0.14% for NP26, assuming moderate imports (*Figure 2*). The decrease in the probability of the ISO system experiencing a 3% or less operating reserve margin in 2012 is mainly attributed to a generation additions outpacing projected peak demand growth due to the continuing economic downturn.

The ISO peak demand is projected to reach 46,352 MW during summer 2012 1-in-2 conditions, which is 923 MW more than the actual peak 45,429 MW recorded in 2011, but less than the 2011 1-in-2 forecast. The decrease in ISO peak demand forecast is a result

<sup>1</sup> *Economic Outlook*, website: <http://www.ebudget.ca.gov/pdf/BudgetSummary/EconomicOutlook.pdf>

<sup>2</sup> SP26 and NP26 refer to geographic zones south and north of transmission Path 26 in the ISO control area, respectively. Path 26 is composed of three 500 kV transmission lines that cross the service territory boundaries between SCE and PG&E. The NP26 zone represents the entire PG&E service territory. The SP26 zone represents the service territories of SCE and SDG&E.

in a more conservative economic recovery forecast for 2012 from Moody's Analytics as compared to their 2011 economic base case forecast.<sup>3</sup>

**Figure 1**

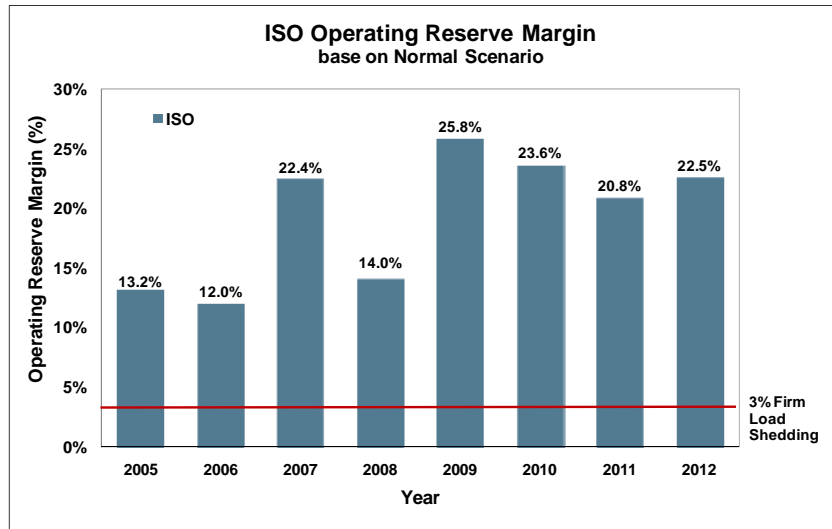


Figure 1 shows that the 2012 forecast indicates ISO operating reserve margin since 2005, under the normal scenario, followed a gradual decline since 2009 and increased in 2012.

**Figure 2**

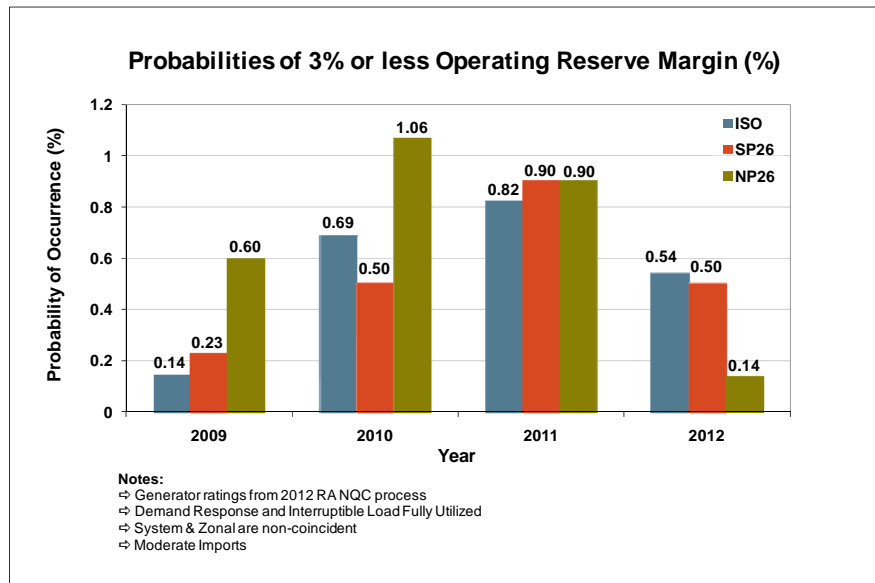


Figure 2 shows that the probabilities of triggering 3% firm load shedding threshold have increased since 2009 for ISO, SP26 and NP26, but it dropped significantly in 2012 because of generation additions outpacing projected peak demand growth due to the continuing economic downturn.

<sup>3</sup> The load forecast intended for use in resource planning decisions.

They are not

**Table 1**  
**Planning Reserve Margins**

<b>Summer 2012 Supply &amp; Demand Outlook</b>			
<b>Resource Adequacy Planning Conventions</b>	<b>ISO</b>	<b>SP26</b>	<b>NP26</b>
Existing Generation	49,867	24,066	25,801
Retirements (known/expected)	(452)	(452)	0
High Probability CA Additions	926	240	686
Hydro Derates	(1,137)	(267)	(870)
Net Interchange (Moderate)	10,000	10,000	2,100
<b>Total Net Supply (MW)</b>	<b>59,204</b>	<b>33,588</b>	<b>27,716</b>
DR & Interruptible Programs	2,296	1,721	576
Demand (1-in-2 Summer Temperature)	46,352	27,399	20,702
<b>Planning Reserve Margin<sup>4</sup></b>	<b>32.7%</b>	<b>28.9%</b>	<b>36.7%</b>

**Table 2**  
**Normal Scenario Operating Reserve Margins**

<b>Summer 2012 Outlook - Normal Scenario</b>			
<b>1-in-2 Demand, 1-in-2 Generation &amp; Transmission Outage and Moderate Imports</b>			
<b>Resource Adequacy Conventions</b>	<b>ISO</b>	<b>SP26</b>	<b>NP26</b>
Existing Generation <sup>5</sup>	49,867	24,066	25,801
Retirements (Known/Expected)	(452)	(452)	0
High Probability CA Additions	926	240	686
Hydro Derates	(1,137)	(267)	(870)
Outages (1-in-2 Generation & Transmission) <sup>6</sup>	(4,698)	(2,033)	(2,677)
Moderate Net Interchange <sup>7</sup>	10,000	10,000	2,100
<b>Total Net Supply (MW)</b>	<b>54,506</b>	<b>31,555</b>	<b>25,039</b>
DR & Interruptible Programs <sup>8</sup>	2,296	1,721	576
Demand (1-in-2 Summer Temperature) <sup>9</sup>	46,352	27,399	20,702
<b>Operating Reserve Margin<sup>10</sup></b>	<b>22.5%</b>	<b>21.5%</b>	<b>23.7%</b>

<sup>4</sup> Planning Reserve Margin = (Total Net Supply + Demand Response + Interruptible) / Demand -1  
Total Net Supply = Existing Generation + High Probability Generation Additions – Retirements + Net Interchange

<sup>5</sup> refer to Table 8

<sup>6</sup> refer to Table 9. Outages of ISO, SP26 and NP26 are not coincident.

<sup>7</sup> refer to Table 10. Net Interchanges of ISO, SP26 and NP26 are not coincident.

<sup>8</sup> refer to Table 11

<sup>9</sup> refer to Table 12

<sup>10</sup> Operating Reserve Margin = (Total Net Supply + Demand Response + Interruptible) / Demand -1  
Total Net Supply = Existing Generation + High Probability Generation Additions – Retirements - Outages + Net Interchange

**Table 3**  
**Extreme Scenario Operating Reserve Margins**

<b>Summer 2012 Outlook - Extreme Scenario</b>			
<b>1-in-10 Demand, 1-in-10 Generation &amp; Transmission Outage and Low Imports</b>			
<b>Resource Adequacy Conventions</b>	<b>ISO</b>	<b>SP26</b>	<b>NP26</b>
Existing Generation	49,867	24,066	25,801
Retirements (Known)	(452)	(452)	0
High Probability CA Additions	926	240	686
Hydro Derates	(1,137)	(267)	(870)
High Outages (1-in-10 Generation & Transmission)	(6,844)	(3,872)	(3,616)
Net Interchange	8,600	8,800	1,400
Total Net Supply (MW)	50,960	28,515	23,401
DR & Interruptible Programs	2,296	1,721	576
High Demand (1-in-10 Summer Temperature)	48,744	29,414	21,977
<b>Operating Reserve Margin</b>	<b>9.3%</b>	<b>2.8%</b>	<b>9.1%</b>

The ISO projects that 50,341 MW of net qualifying capacity (NQC) will be available for summer 2012, which covers the addition of 283 MW from June 1, 2011 to January 9, 2012, along with an additional 926 MW of anticipated new generation and 452 MW of expected retirements from the January 9, 2012 to September 1, 2012 timeframe. The striking thing about the 926 MW of generation additions is that 49% of the capacity comes from renewable resources such as solar and wind generation.

The NQC is the maximum capacity eligible and available for meeting the CPUC resource adequacy requirement counting process. The ISO determines the qualifying capacity by testing and verification. This effort includes applying performance criteria and deliverability restrictions as outlined in the ISO tariff and the applicable business practice manual.

A hydro derate for 2012 was estimated to be 1,137 MW. Current statewide snow water content, as measured on March 1, 2012, was 30% of the April 1 average. The runoff forecasts in the early summer months are well below average for all the basins. As of the date of this report California is facing one of lowest snowpack levels in historical records. While key reservoir levels are currently not of concern and the estimated hydro derate will be less than the estimate during the early part of the summer season, the 1,137 MW derate could become a reality during late August and September, particularly if California experiences extended hot weather.<sup>11</sup>

The 2012 summer imports are projected to vary from 8,600 MW to 11,400 MW for the ISO, 8,800 MW to 11,300 MW for SP26, and 1,400 MW to 3,400 MW for NP26. The projected 2012 moderate import for the ISO is 10,000 MW, which is 300 MW more than last year. Actual ISO, SP26 and NP26 imports in 2011 increased from 2010 because of

<sup>11</sup> <http://www.water.ca.gov/news/newsreleases/2012/022812snow.pdf>

higher generation and transmission outages at the peak time. Having sufficient energy imports are essential in maintaining system reliability under extreme conditions.

An estimated 2,296 MW of demand response and interruptible load programs will be available to deploy during summer 2012. Demand response can reduce summer peak demands and provide grid operators with additional system flexibility during periods of limited supply. Demand response can provide economic day-ahead and real-time energy and ancillary service.

In conclusion, this report projects an adequate supply for summer 2012 to handle a broad range of potential peak demand conditions. It also projects a very low probability of involuntary load curtailments. These favorable findings are the result of an anticipated addition of 926 MW of net dependable generation capacity from January 9, 2012 to September 1, 2012 and reduced peak demand projections due to the continuing economic downturn.

Producing this report and presenting its results to stakeholders is one of many activities the ISO undertakes each year to prepare for the summer operations. Other activities include coordinating meetings on summer preparedness with the WECC, Cal Fire, state fire fighters, natural gas providers and neighboring balancing authorities. The ongoing relationships help ensure everyone is ready during times of system stress.

It is important for new generation investment to keep pace with future anticipated load growth when economic conditions improve and future anticipated generation retirements. A noteworthy challenge in this area will be the roughly 17,500 MW of capacity subject to once-through-cooling regulations, which will require those power plants to be retired or repowered over the next 10 years. The ISO is working closely with state agencies and plant owners in evaluating the reliability impacts of implementing these regulations to ensure it does not compromise electric grid reliability.

## II. SUMMER 2011 REVIEW

### Demand

The 2011 summer peak demand reached 45,429 MW on September 7, 2011. This was a decrease of 1,698 MW, or 3.6% when compared with 2010 summer peak demand of 47,127 MW. The SP26 summer peak demand of 27,631 MW was coincident with the ISO summer peak. NP26 peaked with 19,704 MW on June 21, 2011.

Fig 3 shows ISO, SP26 and NP26 actual monthly peak demand from 2006 to 2011. The ISO summer peak dropped each year from 50,085 MW in 2006, which was high because of extreme weather conditions, to 45,809 MW in 2009 as demand moderated during the recession and rose to 47,127 MW in 2010 and fell to 45,429 MW in 2011. The ISO, SP26 and NP26 daily peaks from June to September 2011 are shown in *Appendix A: 2011 Summer Peak Load Summary Graphs*.

Figure 3

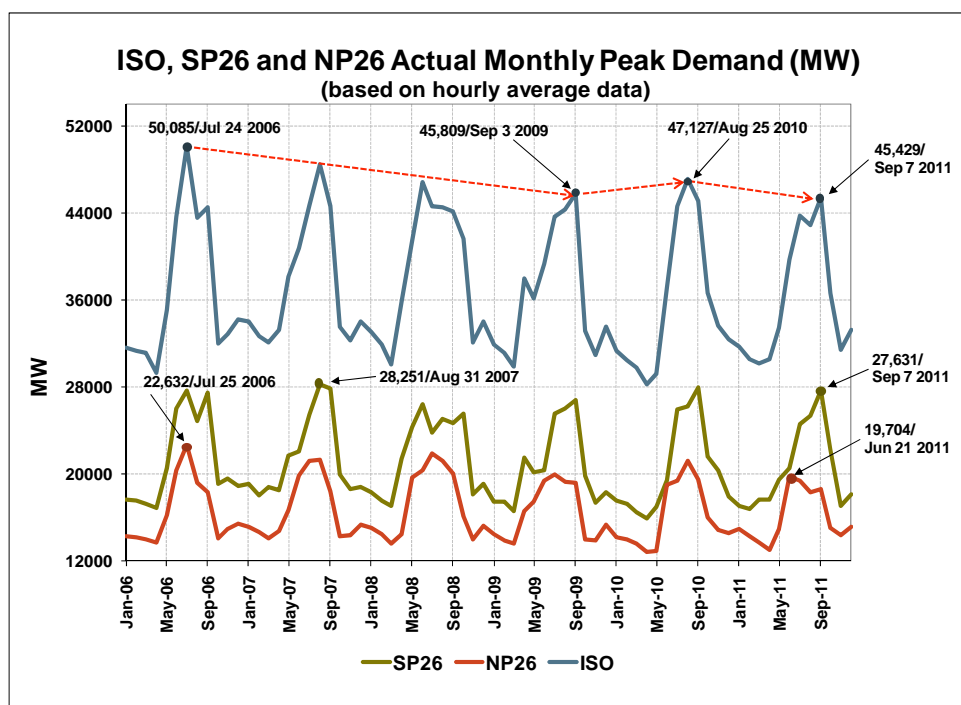


Figure 3 shows the ISO balancing authority system peak as well as peaks for Northern and Southern CA and the utility service territories, all of which follow the similar trend. Starting in 2006, the summer peaks declined because of economic conditions, but began jumping up in 2010 and dropped down in 2011.

Table 4 shows the difference between 2011 actual peak demands and 1-in-2 peak demand forecasts. The ISO peak demand in 2011 was categorized as approximately the 24th percentile or 1-in-1.3 temperature event. The 24th percentile represents a point at which 24 percent of the probable outcomes will be equal to or less than this value.

The NP26 peak demand was the 12th percentile or 1-in-1.13 temperature event and the SP26 peak demand was the 52th percentile or 1-in-2.1 temperature event. Even though



the actual temperature event of 1-in-2.1 in Southern California was essentially equivalent to 1-in-2, the actual economic growth in Southern California was less than Moody's forecast. Consequently, the actual SP26 peak demand was 553 MW lower than the 1-in-2 SP26 peak demand forecast. The mild temperatures in Northern California and ISO balancing authority was the main contributor to the actual peak demands being lower than 1-in-2 forecast peak demands for the ISO and NP26. Another contributor was slower than forecast economic growth in 2011.

**Table 4**

<b>2011 ISO Actual Peak Demand vs. Forecasts</b>				
	1-in-2 Forecast	Actual	Difference from 1-in-2 Forecast	
	MW	MW	MW	%
ISO	47814	45429	-2386	-5.0%
SP26	28184	27631	-553	-2.0%
NP26	21360	19704	-1655	-7.7%

### Generation

As of January 9, 2012, the net dependable capacity (NDC) was 58,458 MW, including 27,649 MW in SP26 and 30,809 MW in NP26. The NDC is the maximum capacity units modified for seasonal limitations over a specified period less the units' capability used for station service or auxiliaries. It includes the capability of units that may be temporarily inoperable because of maintenance, forced outage or other reasons, or only operable at less than full output. It excludes power required for plant operation and emergency power for unit startup and shutdown.

Generation in the ISO balancing authority is primarily fueled by natural gas (63%), followed by 14% large hydro, 13% renewables portfolio standard (RPS) resources, 8% nuclear and a small amount of oil and coal. The ISO used the California Public Utilities Commission methodology for determining the components of the renewables portfolio standard generation.<sup>12</sup> The conventional resources included natural gas, nuclear, oil and coal (*Appendix B: 2012 ISO NDC and RPS by Fuel Type*).

The 8,027 MW of renewables generation is composed of 48% wind, 19% geothermal, 14% small hydro, 8% biomass, 7% solar and 4% biogas. Because California has relatively large share of natural gas generation, a shortage of natural gas could create reliability issues on the power grid. Greater fuel diversity through integration of renewable energy resources can help mitigate this risk.

<sup>12</sup>*Renewable Energy and RPS Eligibility*; website:  
<http://www.cpuc.ca.gov/PUC/energy/Renewables/FAQs/01REandRPSeligibility.htm>

### Generation Outages

The average generation outages in 2011 were higher than in 2010. ISO average generation outage from June 2011 to September 2011 was 6,060 MW or 1,528 MW higher than in 2010. SP26 average outage was 2,990 MW, or 658 MW higher than in 2010. NP26 average outage was 3,070 MW or 870 MW higher than in 2010.

Graphs in *Appendix C: 2008 – 2011 Summer Generation Outage Graphs* show the weekday hour-ending 1600 forced and planned outage amounts during the summer peak days from June 15 through September 30 for the 2008, 2009, and 2011 summer peak load periods (excluding holidays). The graphs do not include ambient and normal outages as these amounts are accounted for in the NQC listing, based on most likely summer peak weather conditions.

### Imports

Figure 4 shows the 2011 ISO peak and the net interchange over the weekday summer peak load period. There are numerous factors that determine to the level of interchange between the ISO and other balancing authorities at any given point in time.

The average imports at peak increased in 2011. The ISO average import at the peak increased from 8,023 MW in 2010 to 10,395 MW in 2011. The NP26 import at its peak increased from 659 MW in 2010 to 2,819 MW in 2011. The SP26 import at its peak increased from 10,264 MW in 2010 to 11,300 MW in 2011. These increases were due in part to higher generation and transmission outages in 2011. (*Appendix D: 2012 ISO Summer On-Peak NQC Fuel Type*)

Figure 4

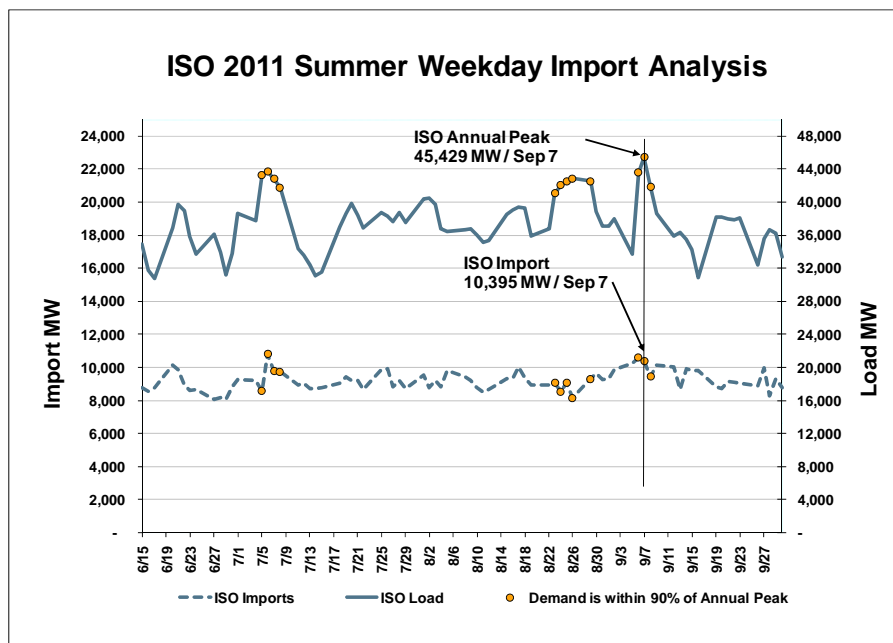


Figure 4 shows the amount of imports needed at ISO system peaks.

### III. SUMMER 2012 ASSESSMENT

#### Generation

Total ISO generation NQC for 2012 summer peak is estimated to be 50,341 MW, a 757 MW increase from June 1, 2011. This addition amount will help meet 923 MW load growth in this summer. The NQC is the maximum capacity eligible and available for meeting the CPUC resource adequacy requirement counting process. The ISO determines the qualifying capacity by testing and verification. This effort includes applying performance criteria and deliverability restrictions as outlined in the ISO tariff and the applicable business practice manual.

The largest generation resource is natural gas generation covering 67.5% with hydro generation contributing about 16.0%. Nuclear generation is expected to account for 8.9%. Non-hydro renewables from geothermal, biogas, biomass, wind and solar units make up about 7.8%, while coal and oil generation provide 1.3%. On-peak NQC by fuel type is shown in *Appendix E: 2009 – 2011 Summer Imports Summary Graphs*

#### Generation Additions

*Table 5* shows that a total of 283 MW of NQC came on line in the ISO balancing authority from June 1, 2011 to January 9, 2012. This new NQC included 222 MW in SP26 and 61 MW in NP26. After January 9, 2012, 926 MW of additional qualifying capacity generation is expected to come on line by July 1, 2012 as shown in *Table 6*, with 240 MW in SP26 and 686 MW in NP26. New generation with zero NQC are not listed in *Table 5 and 6*. It is worth noticing that among the total 926 MW generation additions, 49% of generation additions come from renewable resources. These renewable resources will help fulfill California's 33% Renewable Portfolio Standard.

**Table 5**

<b>New Generating Capacity (MW)</b> <b>(Generation that achieved commercial operation from 6/1/ 2011 to 1/9/2012)</b>					
<b>Project Name</b>	<b>COD</b>	<b>NDC</b>	<b>NQC (est)</b>	<b>Fuel Type</b>	<b>Area</b>
Canyon Power Plant Unit 3	30-Jul-11	49.5	48.0	NATURAL GAS	SCE
Canyon Power Plant Unit 4	30-Jul-11	49.5	49.4	NATURAL GAS	SCE
Avenal Park Solar Project	05-Aug-11	6.0	2.8	SUN	PGAE
Sun City Solar Project	05-Aug-11	20.0	9.2	SUN	PGAE
Sand Drag Solar Project	05-Aug-11	19.0	8.7	SUN	PGAE
Ontario RT Solar	25-Aug-11	5.5	2.5	SUN	SCE
Lake Hodges Pump Station 1 - Unit 1	08-Sep-11	20.0	20.0	WATER	SDGE
Westside Solar Station	13-Sep-11	15.0	6.9	SUN	PGAE
Canyon Power Plant Unit 1	16-Sep-11	49.5	49.4	NATURAL GAS	SCE
Canyon Power Plant Unit 2	16-Sep-11	49.5	48.0	NATURAL GAS	SCE
SF State Fuel Cell Station	27-Sep-11	1.8	0.5	NATURAL GAS	PGAE
CSUEB Fuel Cell Station	27-Sep-11	1.6	0.5	NATURAL GAS	PGAE
CM10 Pseudo-Tie	03-Oct-11	10.0	4.6	SUN	SCE
Stroud Solar Station	04-Oct-11	20.0	9.2	SUN	PGAE
Five Points Solar Station	07-Oct-11	15.0	6.9	SUN	PGAE
Three Forks Water Power Project	01-Nov-11	1.6	0.4	WATER	PGAE
Shiloh III - Phase A	22-Dec-11	100.0	16.0	WIND	PGAE
Total		433	283	ISO	
		233	222	SP26	
		200	61	NP26	

**Table 6**

<b>High Probability Generation Additions Expected (MW)</b> from Jan 10, 2012 to July 1, 2012							
Project Name	Project Type	Estimated Parallel Date	Actual Parallel Date	Estimated COD	NDC	NQC (est)	Fuel Type
Wind Project	Re-Power	12/28/2011		2/26/2012	22.5	3.6	Wind
Wind Project	New	11/17/2011	11/18/2011	3/16/2012	150.0	24.0	Wind
Wind Project	New	11/17/2011	11/21/2011	3/16/2012	150.0	24.0	Wind
Biomass Project	Re-Power	1/20/2012		3/20/2012	22.5	13.7	Biomass
Wind Project	New	1/23/2012		3/23/2012	49.0	7.8	Wind
Solar Project	New	12/13/2011	12/13/2011	4/11/2012	170.0	145.1	Solar
Wind Project	New	12/30/2011	1/27/2012	4/28/2012	120.0	19.2	Wind
Wind Project	New	2/24/2012		6/23/2012	102.0	16.3	Wind
Natural Gas Project	New	3/24/2012		7/1/2012	280.0	280.0	Natural Gas
Natural Gas Project	New	4/1/2012		7/1/2012	195.5	195.5	Natural Gas
Solar Project	New	4/1/2012		7/1/2012	210.0	179.3	Solar
Solar Project	New	6/1/2012		7/1/2012	20.0	17.1	Solar
<b>Total</b>					728	686	NP26
					764	240	SP26
					1492	926	ISO

**Generation Retirements**

Table 7 shows 452 MW in NP26 will be retired from January 9, 2011 to July 1, 2012 with the entire amount from once-through cooling technology units.

**Table 7**

<b>Generating Resources Expected to Retire (MW)</b> (from Jan 10, 2012 to July 1, 2012)					
Resource	NDC	NQC	Classification	Fuel Type	Zone
Natural Gas Unit	225	225	Steam Turbine	Natural Gas	SP26
Natural Gas Unit	227	227	Steam Turbine	Natural Gas	SP26
Total	452	452	ISO		
	452	452	SP26		
	0	0	NP26		

Table 8 shows the total generation capacity changes within the ISO since June 1, 2011 and expected by July 1, 2012.

**Table 8**

<b>Total Expected Generation change (MW) from Jun 1, 2011 to July 1, 2012</b>				
	Additions COD	Additions Expected	Retirements Expected	Total Expected Change
	from Jun 1, 2011 to Jan 9, 2012	from Jan 10, 2012 to July 1, 2012	from Jan 10, 2012 to July 1, 2012	for 2012 Summer
ISO	283	926	(452)	757
SP26	222	240	(452)	10
NP26	61	686	0	747

The current on line generation shown in *Table 9* was developed using the final NQC list that was used for the California Public Utilities Commission resource adequacy program for compliance year 2012, which the ISO posted to its website on Oct 28, 2011.<sup>13</sup> Generators who chose not to participate in the NQC process were added using the ISO Master Control Area Generating Capability List, which is also posted on the ISO website.<sup>14</sup>

This assessment uses all capacity available within the ISO balancing authority regardless of contractual arrangements to evaluate resource adequacy to better understand how the system will respond under contingencies. Although some resources may not receive contracts under the resource adequacy program, and may contract with entities outside the ISO for scheduled short-term exports, these resources are still under consideration by the ISO.

The NQC values for wind and solar have been adjusted based on actual output at time of peak over a three-year period. If the ISO balancing authority experiences extreme weather conditions beyond what is considered by the NQC 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 9**

<b>Total Expected Generation for 2012 Summer (MW)</b>				
	As of Jan 9, 2012	from Jan 10, 2012 to July 1, 2012		for 2012 summer
	Existing	Additions	Retirements	Total Expected
ISO	49,867	926	(452)	50,341
SP26	24,066	240	(452)	23,854
NP26	25,801	686	0	26,487

### Generation outages

The estimated 1-in-2 generation outages during 2012 summer peak demand for the ISO, SP26 and NP26 are 4,698 MW, 2,033 MW and 2,677 MW, respectively. The estimated 1-in-10 generation outages for the ISO, SP26 and NP26 are 6,844 MW, 3,872 MW and 3,616 MW, respectively (*Table 10*). The last three years of generation outages during the peak demand period 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.

<sup>13</sup> *Net Qualifying Capacity (NQC)*. Retrieved from website: <http://www.caiso.com/1796/179688b22c970.html>

<sup>14</sup> *Master Control Area Generating Capability List* website : <http://www.caiso.com/participate/Pages/Generation/Default.aspx>

Table 10

<b>Generation and Transmission Outages for Summer 2012(MW)</b>			
	ISO	SP26	NP26
1-in-2	4,698	2,033	2,677
1-in-10	6,844	3,872	3,616

### Hydrologic conditions

Hydrologic conditions for 2012 are well below average. The snowpack water content is categorized as one of the driest years in historical records. The northern Sierra precipitation was 51% of the average for March 1, and southern San Joaquin was 43% of the average. The runoff forecasts in the early summer were well below average for all the basins. The state's precipitation, snow water content were much lower than average. *Figure 5* shows the California snow water content as of March 1, 2012 and indicates that statewide snowpack was 30% that of April 1, 34% for the northern area, 28% for central area and 29% for southern area.

Snowpack is the best indicator of conditions for a large portion of the hydro generation within the ISO balancing authority. The hydro derate for 2012 summer peak was projected to be 1,137 MW for ISO, 266 MW for SP26 and 870 MW for NP26, respectively. Additional charts are provided in *Appendix F: 2012 California Hydrologic Conditions* that show the year-to-date precipitation as well as references to key historical annual trends

The amount of water available for hydro generation during summer 2012 will depend on weather conditions between March 1, 2012 and the summer. There is always a possibility that little additional accumulation of snowpack over the remainder of the snowpack season, or unusually warm conditions could accelerate snowpack melting that decreases runoff in early summer. While key reservoir levels are currently not of concern and the estimated hydro derate will be less than the estimate during the early part of the summer season, the 1,137 MW derate could become a reality during late August and September, particularly if California experiences extended hot weather.

Figure 5

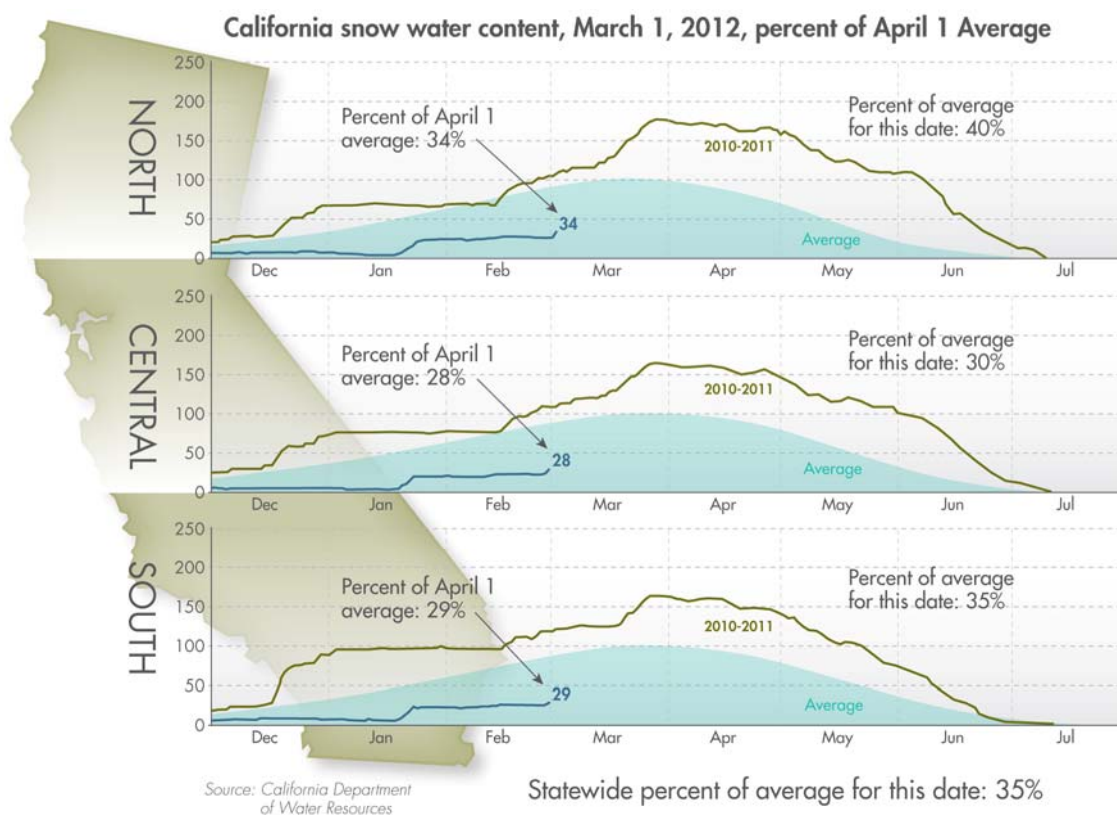


Figure 5 shows that the current snow water content is below average. This includes northern, southern and central.

### Imports

Numerous factors contribute to the level of interchange between the ISO and other balancing authorities. Conditions for any given year and on any given day can affect just a local area to regional areas or the entire Western Interconnection. These factors typically include market dynamics, demand within various areas, and accuracy of day-ahead forecasts, generation availability, transmission congestion and hydro conditions. The degree can vary greatly to which any one of these interrelated factors influence import levels on any given day.

Two types of contingencies may cause the system to need more than normal imports to meet peak demands. One type of contingency is a weather event that is forecasted in advance, or a forced outage that extends over multiple days that allow system operators to plan ahead and line up needed imports.

Another type of contingency is the real-time event that occurs in real-time operation after running the day ahead and real-time markets, such as loss of a significant amount of generation or transmission, or a significantly under-forecasted peak demand. Under these circumstances, it may be too late to use the capabilities of other balancing authorities to deal with these types of contingencies.



It is beyond the scope of this report to model the complex dynamics that lead to a given import level on any given day or for any given set of contingencies. 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 the deterministic and probabilistic analysis: high, moderate and low.

*Table 11* shows the amounts of imports used for the high, moderate and low import scenarios for the 2012 assessment. Graphs of actual imports during summer 2008 to 2011 peak operating hours for the ISO system and the SP26 and NP26 zones are included in *Appendix E: 2009 – 2011 Summer Imports Summary Graphs*. The sum of NP26 and SP26 is not equal to ISO system because zonal analysis for ISO, NP26 and SP26 is on a non-coincidental basis.

**Table 11**

<b>2012 Summer Outlook - Import Scenarios (MW)</b>			
	<b>ISO</b>	<b>SP26</b>	<b>NP26</b>
High Net Interchange	11,400	11,300	3,400
Moderate Net Interchange	10,000	10,000	2,100
Low Net Interchange	8,600	8,800	1,400

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

Demand response and interruptible load programs reduce the end-user loads during times of system need, such as high peak demand. They play an important role to meet electric power demand and provide system operators with additional flexibility in operating the system during periods of limited supply. Demand response programs are price response load curtailments whereas interruptible load programs are triggered by operation conditions such as low operating reserve margins.

The California Energy Commission provided the amounts available for demand response and interruptible load programs for the three California investor-owned utilities. The California Public Utilities Commission approved these amounts for the 2012 resource adequacy program period. *Table 12* shows these amounts for summer 2012 based on resource adequacy criteria on weighted average of monthly summer amounts.

**Table 12**

<b>Demand Response and Interruptible Programs for Summer 2012</b> (based on weighted average of monthly summer amounts)			
	Demand Response Programs	Interruptible Load Programs	Total Program Amounts
ISO	860	1,437	2,296
SP26	555	1,166	1,721
NP26	305	271	576

### **Demand**

The 1-in-2 peak demand for 2012 is forecasted to be 46,352 MW, which is 2.0% above the actual 2011 summer peak demand. The 2.0% increase represents a modest economic recovery over 2011 based on the economic base case forecast from Moody's Analytics.

The ISO uses Itron's MetrixND to develop ISO, SP26 and NP26 regression load forecast models, which produce the daily peak loads. The inputs to the models are historical peak loads, calendar information, economic and demographic data, and weather data. The weather data are maximum, minimum and average temperatures, cooling degree days, heat index, relative humidity, solar radiation indexes, as well as the 631 index.

A cooling degree day is the average of a day's high and low subtracting 65. The heat index combines air temperature and relative humidity to determine the human-perceived equivalent temperature. The 631 index is a weighted average of a weather variable calculated as 60% of a given day, 30% of prior day and 10% of two days prior. The historical load data used was from December 1, 2003 through December 31, 2011.

Peak load data is based on 60-minute average peak demands. Pump loads were not included in the forecast models as they 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 information came from 24 weather stations located throughout the large population centers within the ISO balancing authority. Weather data used in the model includes temperature data, cooling degree-days, heating degree-days, heat index, relative humidity, solar radiation and temperature buildup indexes such as the 631 index.

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 week days. 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 2011 historical weather was used, which produces 119 weather scenarios. The scenarios helped develop a range of load forecasts for the probability analysis using a random number generation process. This distribution is used in developing 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. Other models that forecast various sub-regions have similar weather characteristics. Each time a new forecast is made, the models are updated by adding in the latest historical load, weather and operational data. The models also use historical and forecasts of gross domestic product and population as independent inputs for growth trends and for base load levels. Furthermore, the models use gross domestic product as an indicator of weather driven cooling load levels.

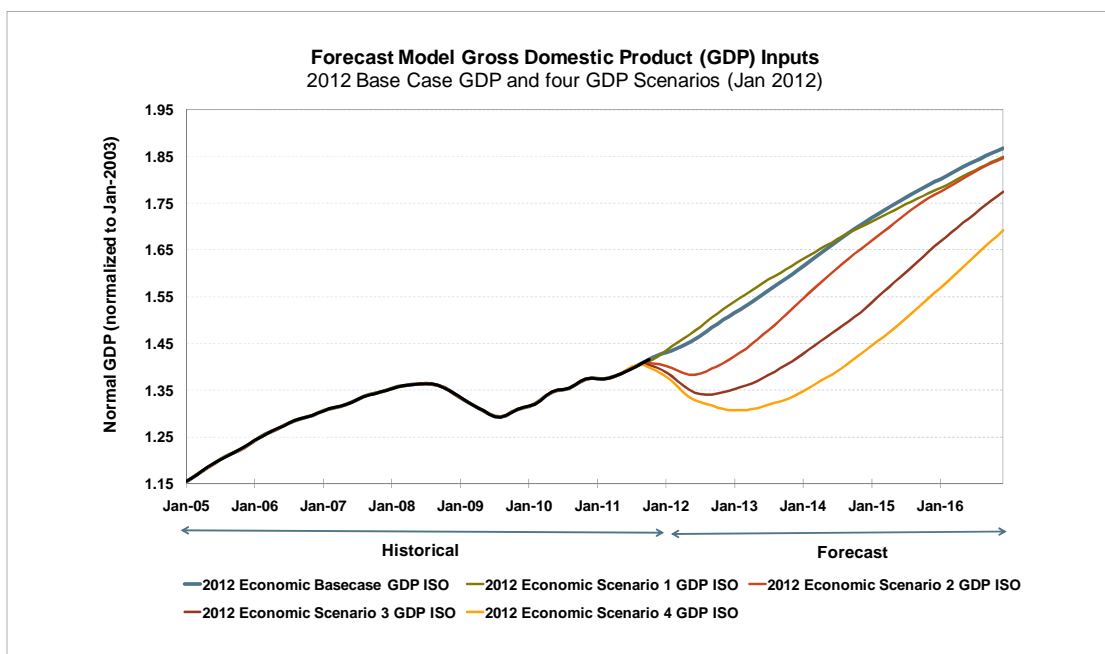
A base case forecast model is developed using baseline economic forecast data. The models are then trained with these new data. Five load forecast scenarios were developed using five economic scenario forecasts representing different outlooks of how the economy will perform based on different assumptions such as consumer confidence and 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 as the economic indicator for the models.

*Figure 6* shows the historical and five gross domestic product forecasts that represent five different projections for how the current economics will play out. It is more difficult to accurately forecast future gross domestic product during the uncertain economic conditions California is experiencing. While officially the United States no longer in a recession, the economy has a potential to experience a new downturn as shown in Moody's more pessimistic scenario forecasts.

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

- Scenario 1 is a stronger recovery in the 2012 scenario where economics 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.
- 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.
- 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.
- 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.

Figure 6



Source: Macroeconomic Outlook Alternative Scenarios – Dec 2011

Figure 6 shows that under the most likely scenario (base case) the economy will experience a modest recovery this year.

In Figure 6, 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 began October 1, 2011.

It is important to note that these forecasts are based on the Moody's gross domestic product forecasts released in December 2011. The gross domestic product forecasts are updated monthly and will change as the economic conditions evolves over the months ahead and new information becomes available. Currently, the gross domestic product data reflects actual historical data through 2010 (January 2011 and later historical data are estimated). Consequently, this forecast is based on data available at that time. Figure 7 shows a comparison of Moody's 2011 GDP forecast to their 2012 GDP forecast. Moody's 2012 forecast is a more conservative economic recovery forecast as compared to their 2011 economic base case forecast where the forecast for August 2012 GDP decreased 4.2% from 2011 to 2012.

Figure 7

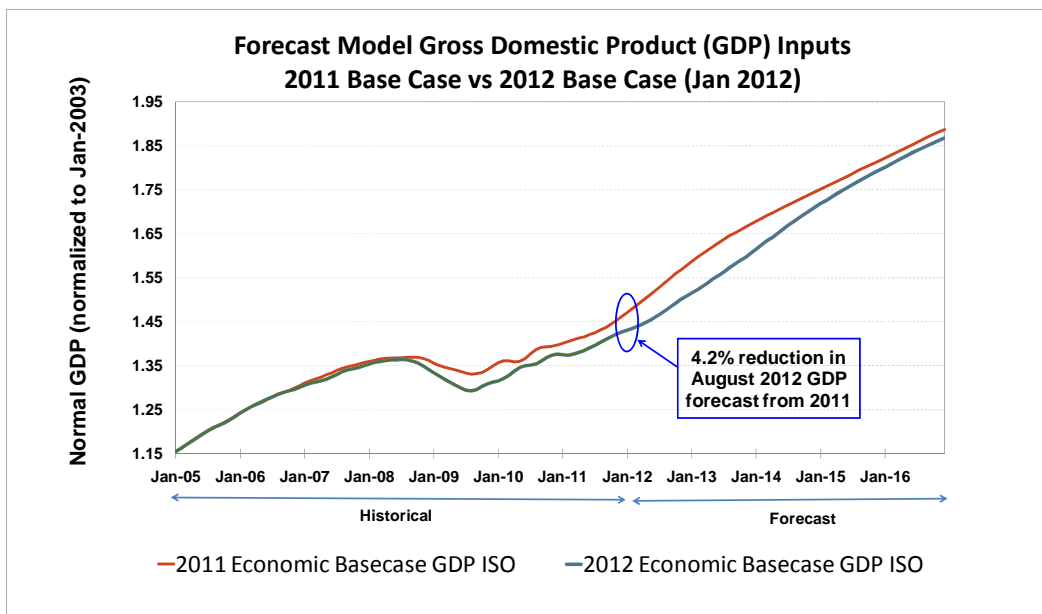


Figure 7 shows the difference between 2011 Economic base case GDP ISO and 2012 Economic base case GDP ISO.

Figure 8 shows ISO 1-in-2 peak demand forecasts based on the five economic scenarios from Moody's. The 2012 base case peak demand forecast and the scenario 1 forecasts by area are provided in Table 13 and Table 14, respectively. The forecasted 1.5% increase in ISO demand represents a moderate level of economic recovery over 2011. 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.

Figure 8

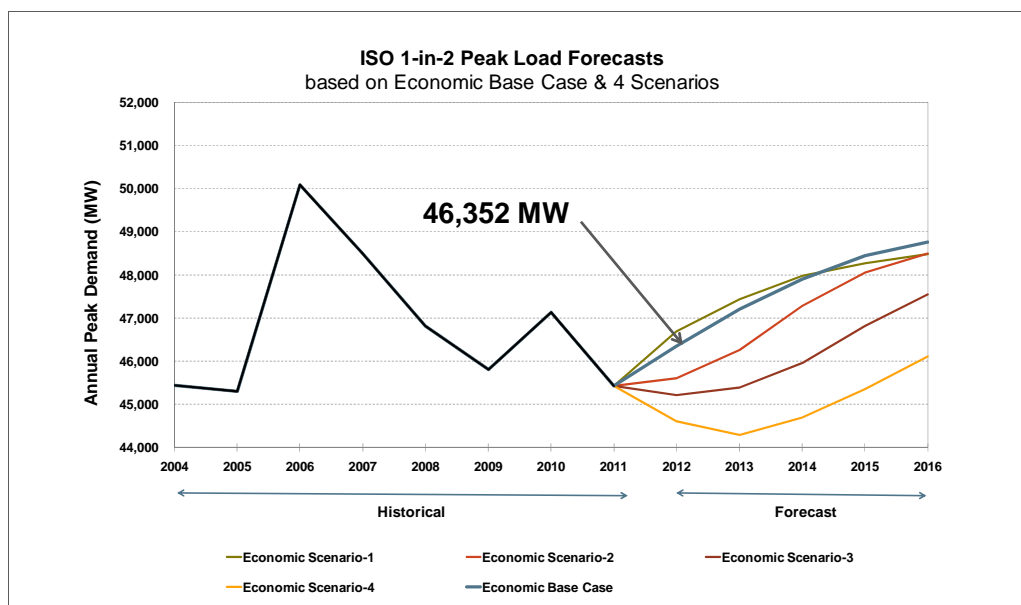


Figure 8 shows that as the economy improves in 2012 (see Figure 6) the ISO annual peak demand will increase in close parallel with base case.

Table 13

2012 Peak Demand Forecast vs. 2011 Actual Peak Demand					
2012 Peak Demand Forecast based on 2012 economic base case					
	Probability	Percentile	2012 Forecast	2011 Actual	% Change
ISO	1-in-2	50 <sup>th</sup>	46,352	45,429	2.0%
SP26	1-in-2	50 <sup>th</sup>	27,399	27,631	-0.8%
NP26	1-in-2	50 <sup>th</sup>	20,702	19,704	5.1%

Table 14 shows the peak demand forecasts associated with the economic scenario 1 economic forecast. While Moody's 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 14

2012 Peak Demand Forecast vs. 2011 Actual Peak Demand					
2012 Peak Demand Forecast based on 2012 economic scenario-1					
	Probability	Percentile	2012 Forecast	2011 Actuals	% Change
ISO	1-in-2	50 <sup>th</sup>	46,639	45,429	2.7%
SP26	1-in-2	50 <sup>th</sup>	27,610	27,631	-0.1%
NP26	1-in-2	50 <sup>th</sup>	20,806	19,704	5.6%

Table 15 and Table 16 provided a comparison of 1-in-2, 1-in-10 and 1-in-20 probability peak demand forecasts based on the 2012 economic base case and the 2012 economic scenario 1, using the 2011 peak demand forecasts from the 2011 economic base case as a point of reference.

Table 15

<b>2012 Peak Demand Forecast vs. 2011 Peak Demand Forecast</b>					
2012 Peak Demand Forecast based on 2012 economic base case					
2011 Peak Demand Forecast based on 2011 economic base case					
	Probability	Percentile	2012 Forecast	2011 Forecast	% Change
<b>ISO</b>	1-in-2	50 <sup>th</sup>	46,352	47,814	-3.1%
	1-in-10	90 <sup>th</sup>	48,744	50,428	-3.3%
	1-in-20	95 <sup>th</sup>	50,719	52,625	-3.6%
<b>SP26</b>	1-in-2	50 <sup>th</sup>	27,399	28,184	-2.8%
	1-in-10	90 <sup>th</sup>	29,414	30,246	-2.8%
	1-in-20	95 <sup>th</sup>	29,766	30,834	-3.5%
<b>NP26</b>	1-in-2	50 <sup>th</sup>	20,702	21,360	-3.1%
	1-in-10	90 <sup>th</sup>	21,977	22,837	-3.8%
	1-in-20	95 <sup>th</sup>	22,641	24,200	-6.4%

Table 16

<b>2012 Peak Demand Forecast vs. 2011 Peak Demand Forecast</b>					
2012 Forecast based on 2012 economic scenario-1					
2011 Forecast based on 2011 economic base case					
	Probability	Percentile	2012 Forecast	2011 Forecast	% Change
<b>ISO</b>	1-in-2	50 <sup>th</sup>	46,639	47,814	-2.5%
	1-in-10	90 <sup>th</sup>	49,085	50,428	-2.7%
	1-in-20	95 <sup>th</sup>	51,384	52,625	-2.4%
<b>SP26</b>	1-in-2	50 <sup>th</sup>	27,610	28,184	-2.0%
	1-in-10	90 <sup>th</sup>	29,680	30,246	-1.9%
	1-in-20	95 <sup>th</sup>	30,010	30,834	-2.7%
<b>NP26</b>	1-in-2	50 <sup>th</sup>	20,806	21,360	-2.6%
	1-in-10	90 <sup>th</sup>	22,075	22,837	-3.3%
	1-in-20	95 <sup>th</sup>	22,771	24,200	-5.9%

**Transmission**

The WECC sets the operating transfer capability limits on transmission paths on a seasonal basis. The critical transmission paths for the ISO are Path 66 – California-Oregon Intertie (COI), Path 65 – Pacific Direct Current Intertie (PDCI), Path 15 – Midway-Los Banos, and Path 26 – Midway-Vincent. The Southern California Import Transmission (SCIT) is composed of five separate paths: Path 65 — PDCI, Path 26 — Midway-Vincent, Path 27 — Intermountain Power Project DC (IPP DC), Path 46 — West-of-River, and North-of-Lugo. The COI, PDCI and SCIT operating transfer capabilities govern import levels into the ISO balancing authority. Path 45 defines import capability into SDG&E from Comision Federal de Electricidad in Mexico. Path 15 delineates operating transfer capability of the flow within PG&E while the Path 26 defines operating transfer capability on the Midway-Vincent lines between SCE and PG&E areas. The historical record indicates that these paths' limits will not be exceeded during 2012 summer operation season and no lines or equipment will operate above their normal thermal ratings.



### Deterministic analysis

*Table 17* is the supply and demand outlook for the 2012 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 because of the economic downturn's continued impact on electric loads. The generation shown is based on current generation in service along with the generation expected to go on line and retire prior to the 2012 summer. The import amounts are based on the high, moderate and low import levels from *Table 11*.

**Table 17**  
**Planning Reserve Margins**

<b>Summer 2012 Supply &amp; Demand Outlook</b>			
<b>Resource Adequacy Planning Conventions</b>	<b>ISO</b>	<b>SP26</b>	<b>NP26</b>
Existing Generation	49,867	24,066	25,801
Retirements (known/expected)	(452)	(452)	0
High Probability CA Additions	926	240	686
Hydro Derates	(1,137)	(267)	(870)
Net Interchange (Moderate)	10,000	10,000	2,100
Total Net Supply (MW)	59,204	33,588	27,716
DR & Interruptible Programs	2,296	1,721	576
Demand (1-in-2 Summer Temperature)	46,352	27,399	20,702
<b>Planning Reserve Margin</b>	<b>32.7%</b>	<b>28.9%</b>	<b>36.7%</b>

Operating reserve margins transition from the planning perspective (*Table 17*) to a real-time perspective (*Table 18*) by adding in generation and transmission outages. The import amounts are based on the three import scenarios shown in *Table 11*. The total ISO system, and particularly SP26, is highly dependent on imports to meet peak demand, especially during the summer high load periods.

*Table 18* shows how the import assumption impacts the operating reserve amounts 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 17* but with 1-in-2 outage levels added. *Table 19* 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 scenarios portrayed in *Table 19* rarely happen.

Table 18

## Summer 2012 Loads and Resources Outlook

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

<b>Summer 2012 Outlook - High Imports</b>			
<b><u>Resource Adequacy Conventions</u></b>	<b>ISO</b>	<b>SP26</b>	<b>NP26</b>
Existing Generation	49,867	24,066	25,801
Retirements (Known)	(452)	(452)	0
High Probability CA Additions	926	240	686
Hydro Derates	(1,137)	(267)	(870)
Outages (1-in-2 Generation & Transmission)	(4,698)	(2,033)	(2,677)
Net Interchange	11,400	11,300	3,400
<b>Total Net Supply (MW)</b>	<b>55,906</b>	<b>32,855</b>	<b>26,339</b>
DR & Interruptible Programs	2,296	1,721	576
Demand (1-in-2 Summer Temperature)	46,352	27,399	20,702
<b>Operating Reserve Margin</b>	<b>25.6%</b>	<b>26.2%</b>	<b>30.0%</b>

<b>Summer 2012 Outlook - Moderate Imports</b>			
<b><u>Resource Adequacy Conventions</u></b>	<b>ISO</b>	<b>SP26</b>	<b>NP26</b>
Existing Generation	49,867	24,066	25,801
Retirements (Known)	(452)	(452)	0
High Probability CA Additions	926	240	686
Hydro Derates	(1,137)	(267)	(870)
Outages (1-in-2 Generation & Transmission)	(4,698)	(2,033)	(2,677)
Net Interchange	10,000	10,000	2,100
<b>Total Net Supply (MW)</b>	<b>54,506</b>	<b>31,555</b>	<b>25,039</b>
DR & Interruptible Programs	2,296	1,721	576
Demand (1-in-2 Summer Temperature)	46,352	27,399	20,702
<b>Operating Reserve Margin</b>	<b>22.5%</b>	<b>21.5%</b>	<b>23.7%</b>

<b>Summer 2012 Outlook - Low Imports</b>			
<b><u>Resource Adequacy Conventions</u></b>	<b>ISO</b>	<b>SP26</b>	<b>NP26</b>
Existing Generation	49,867	24,066	25,801
Retirements (Known)	(452)	(452)	0
High Probability CA Additions	926	240	686
Hydro Derates	(1,137)	(267)	(870)
Outages (1-in-2 Generation & Transmission)	(4,698)	(2,033)	(2,677)
Net Interchange	8,600	8,800	1,400
<b>Total Net Supply (MW)</b>	<b>53,106</b>	<b>30,355</b>	<b>24,339</b>
DR & Interruptible Programs	2,296	1,721	576
Demand (1-in-2 Summer Temperature)	46,352	27,399	20,702
<b>Operating Reserve Margin</b>	<b>19.5%</b>	<b>17.1%</b>	<b>20.4%</b>

Table 19

**Summer 2012 Loads and Resources Outlook**

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

<b>Summer 2012 Outlook - High Imports</b>			
<b><u>Resource Adequacy Conventions</u></b>	<b>ISO</b>	<b>SP26</b>	<b>NP26</b>
Existing Generation	49,867	24,066	25,801
Retirements (Known)	(452)	(452)	0
High Probability CA Additions	926	240	686
Hydro Derates	(1,137)	(267)	(870)
High Outages (1-in-10 Generation & Transmission)	(6,844)	(3,872)	(3,616)
Net Interchange	11,400	11,300	3,400
Total Net Supply (MW)	53,760	31,015	25,401
DR & Interruptible Programs	2,296	1,721	576
High Demand (1-in-10 Summer Temperature)	48,744	29,414	21,977
<b>Operating Reserve Margin</b>	<b>15.0%</b>	<b>11.3%</b>	<b>18.2%</b>

<b>Summer 2012 Outlook - Moderate Imports</b>			
<b><u>Resource Adequacy Conventions</u></b>	<b>ISO</b>	<b>SP26</b>	<b>NP26</b>
Existing Generation	49,867	24,066	25,801
Retirements (Known)	(452)	(452)	0
High Probability CA Additions	926	240	686
Hydro Derates	(1,137)	(267)	(870)
High Outages (1-in-10 Generation & Transmission)	(6,844)	(3,872)	(3,616)
Net Interchange	10,000	10,000	2,100
Total Net Supply (MW)	52,360	29,715	24,101
DR & Interruptible Programs	2,296	1,721	576
High Demand (1-in-10 Summer Temperature)	48,744	29,414	21,977
<b>Operating Reserve Margin</b>	<b>12.1%</b>	<b>6.9%</b>	<b>12.3%</b>

<b>Summer 2012 Outlook - Low Imports</b>			
<b><u>Resource Adequacy Conventions</u></b>	<b>ISO</b>	<b>SP26</b>	<b>NP26</b>
Existing Generation	49,867	24,066	25,801
Retirements (Known)	(452)	(452)	0
High Probability CA Additions	926	240	686
Hydro Derates	(1,137)	(267)	(870)
High Outages (1-in-10 Generation & Transmission)	(6,844)	(3,872)	(3,616)
Net Interchange	8,600	8,800	1,400
Total Net Supply (MW)	50,960	28,515	23,401
DR & Interruptible Programs	2,296	1,721	576
High Demand (1-in-10 Summer Temperature)	48,744	29,414	21,977
<b>Operating Reserve Margin</b>	<b>9.3%</b>	<b>2.8%</b>	<b>9.1%</b>

Figures 8 and 9 provide graphical representations in percentage and MW, respectively, of the deterministic analysis results based on the inputs from Tables 18 and 19. They show operating reserve margins under both the normal scenario and the extreme scenario.

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.

These figures show that no firm load shedding would be needed under the extreme scenario. All of the zonal analysis for NP26 and SP26 are on a non-coincidental basis. Figure 9 shows that the operating reserve margins for SP26 drop to 2.8% in the extreme scenario, which is slightly below the firm load shedding threshold of 3%.

Figure 10 shows the reserve margins in MW for ISO, NP26 and SP26 in the normal and extreme scenario. The extreme scenario is by nature a low probability event. The ISO prepares contingency plans to deal with extreme events that could lead to firm load shedding.

Figure 9

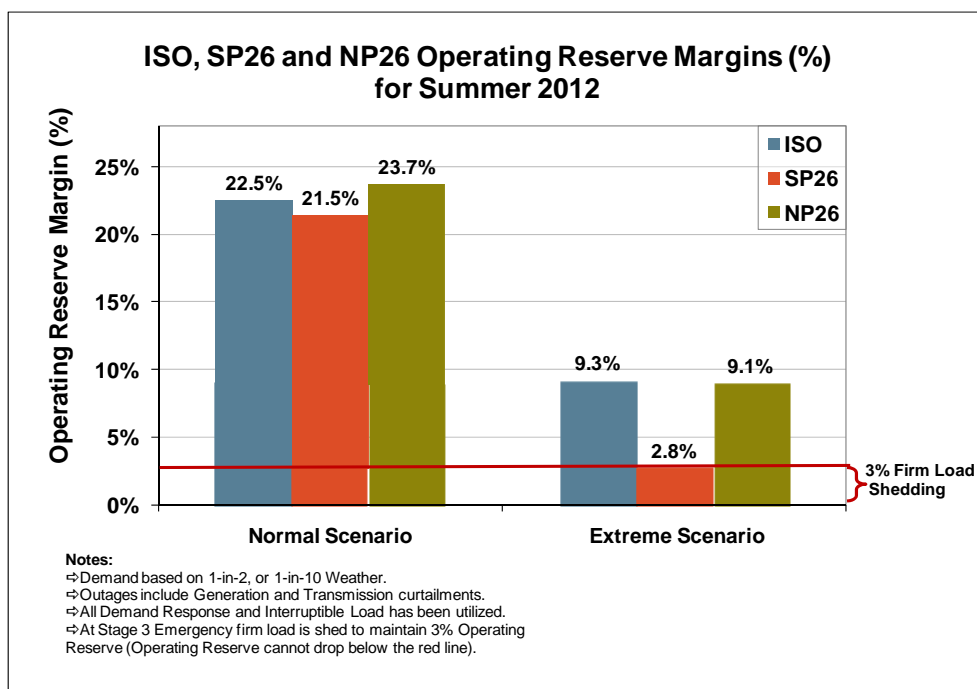


Figure 9 shows operating reserve forecast margins have a solid cushion under the normal scenario. However, the SP26 margins in the extreme scenario fall short of the 3% operating reserve requirement although ISO and NP26 remain above the firm load-shedding threshold.

Figure 10

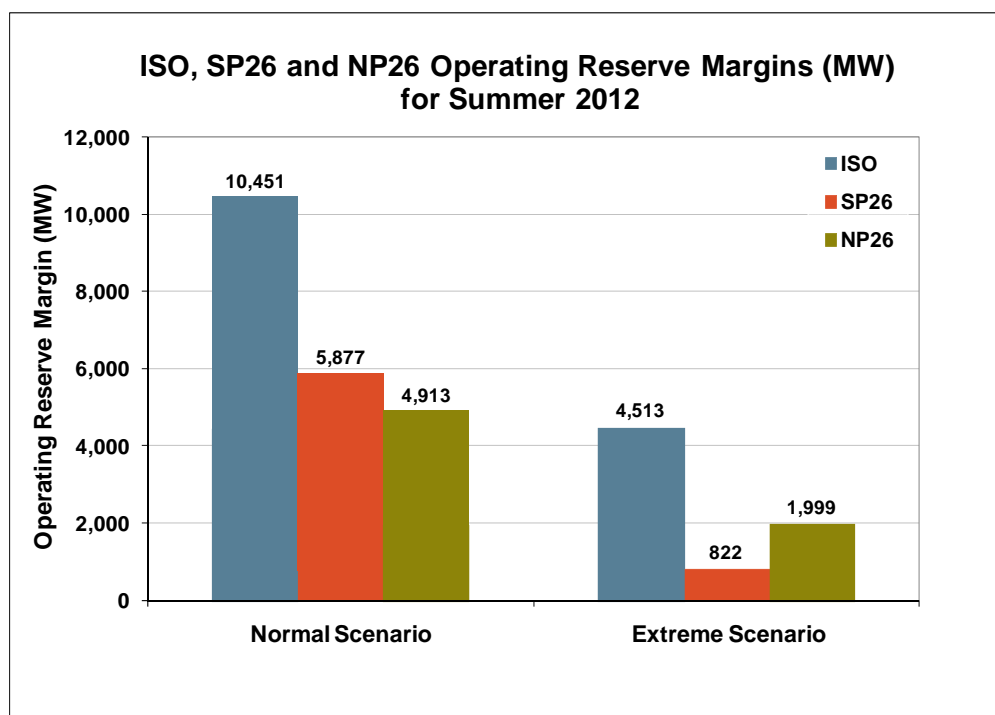


Figure 10 complements Figure 8 and reflects operating reserve margins in megawatts. Under the normal scenario, Southern California has nearly a 5,877 MW margin although that falls to almost 822 MW under the extreme scenario.

### Probabilistic analysis

A probabilistic model is used to understand the likelihood of experiencing operating conditions when operating reserves drop to 3% or lower, which is the point where firm load shedding would begin. Existing generation, known retirements, high probability additions, 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 18.

The randomly generated forced and planned generation outages and curtailments are based on actual occurrences as shown in graphs in Appendix C: 2008 – 2011 Summer Generation Outage Graphs. They were used to develop a range of inputs of probable generation outage amounts.

The range of demand inputs were developed using the process described in the Demand section. After the model develops the range of operating reserves, the analysis focuses on the lower operating reserve margin range where the probability of having operating reserves margin drop to 3% or less is determined.

The moderate import scenario associated with different demand ranges were studied in this assessment. Low probability events, such as low imports over the full range of high demand conditions, were not considered under this assessment.

Figure 11 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 2008, 2009 and 2011 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 economic conditions continue to cause peak demand loads to be below historical levels.

**Figure 11**

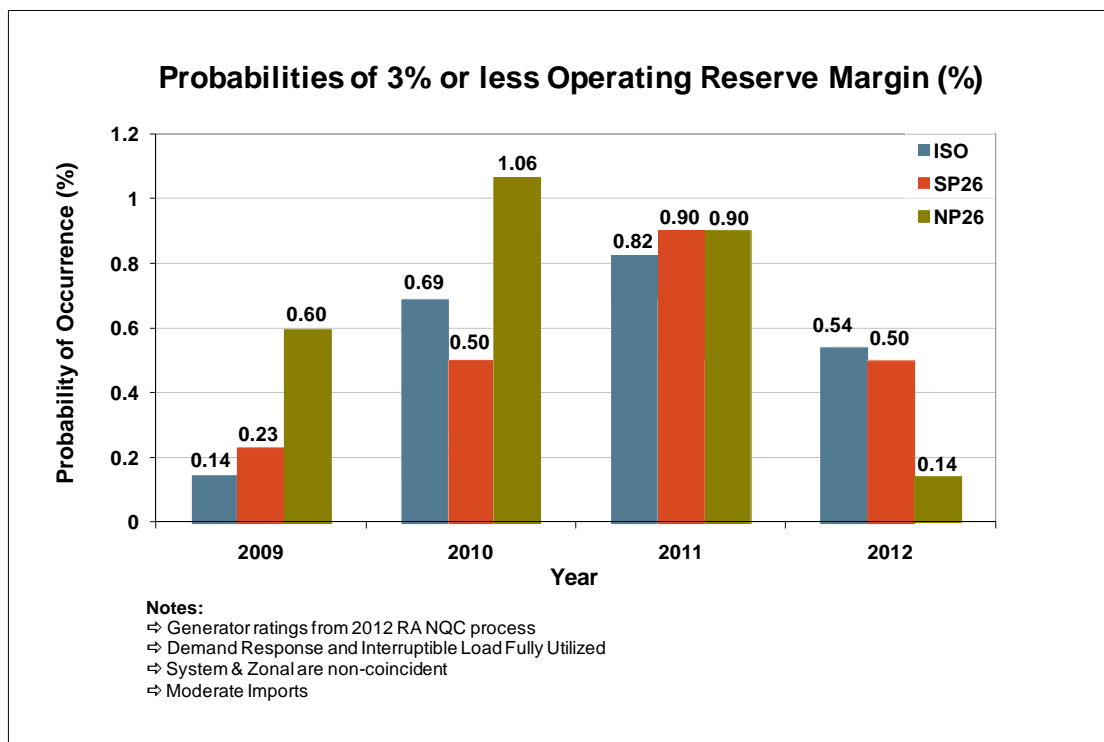


Figure 11 shows that the probabilities of triggering 3% load shedding threshold have been less than 1% since 2009 for ISO, SP26 and NP26 except 1.06% for NP26 in 2010.

## Conclusion

The assessment of various operating scenarios along with the probabilities of shedding firm load indicates that the ISO has an adequate supply for summer 2012 to meet a broad range of expected peak demand and a very low probability of involuntary load curtailments. The slow economic recovery, which resulted in a moderate peak load projection and the additions of 926 MW of NQC in 2012 are the primary reasons for this positive outcome.

The ISO continually trains their grid operators to be prepared for system events, and understanding operating procedures and utility practices. The ISO, in conjunction with the California Electric Training Advisory Committee, sponsors annual summer preparedness workshops to train grid operators. This year's workshop theme will be preparing for and analyzing system disturbances.

Furthermore, the ISO meets with WECC, Cal Fire, gas companies, and neighboring balancing authorities to discuss and coordinate on key areas. The ISO fosters ongoing relationships with these organizations to ensure reliable operation of the market and grid during normal and critical periods.

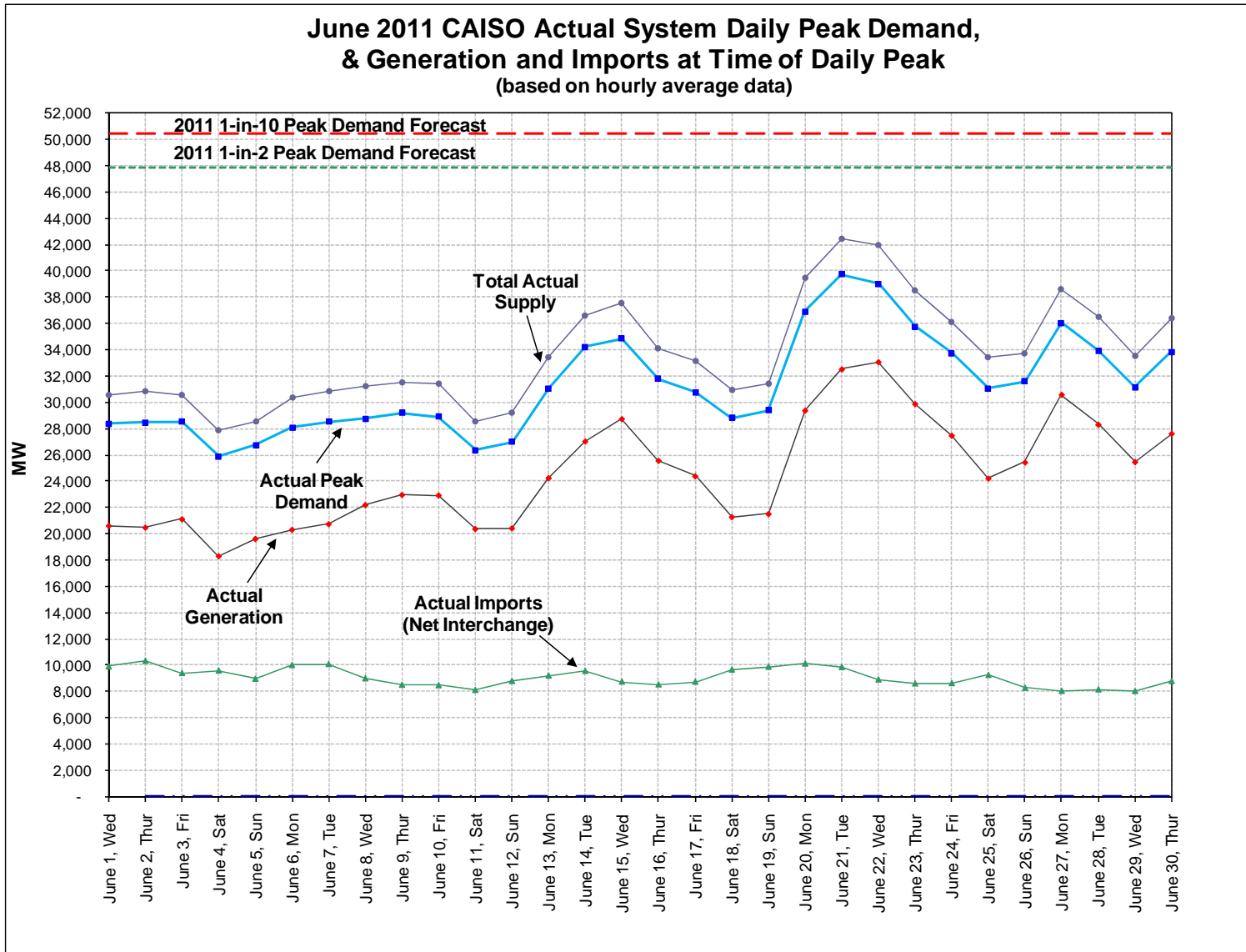
Looking beyond 2012, it will be critical for new generation additions to keep pace with anticipated load growth and generation retirements. This will be particularly challenging in light of approximately 17,500 MW of generation capacity that is subject to once-through-cooling regulations, which requires this capacity to be retired or repowered over the next 10 years. The ISO will be working closely with the relevant state agencies to evaluate the reliability impacts of complying with these and other environmental requirements to ensure that compliance is achieved in such a way that does not compromise electric grid reliability.

## **IV. APPENDICES**

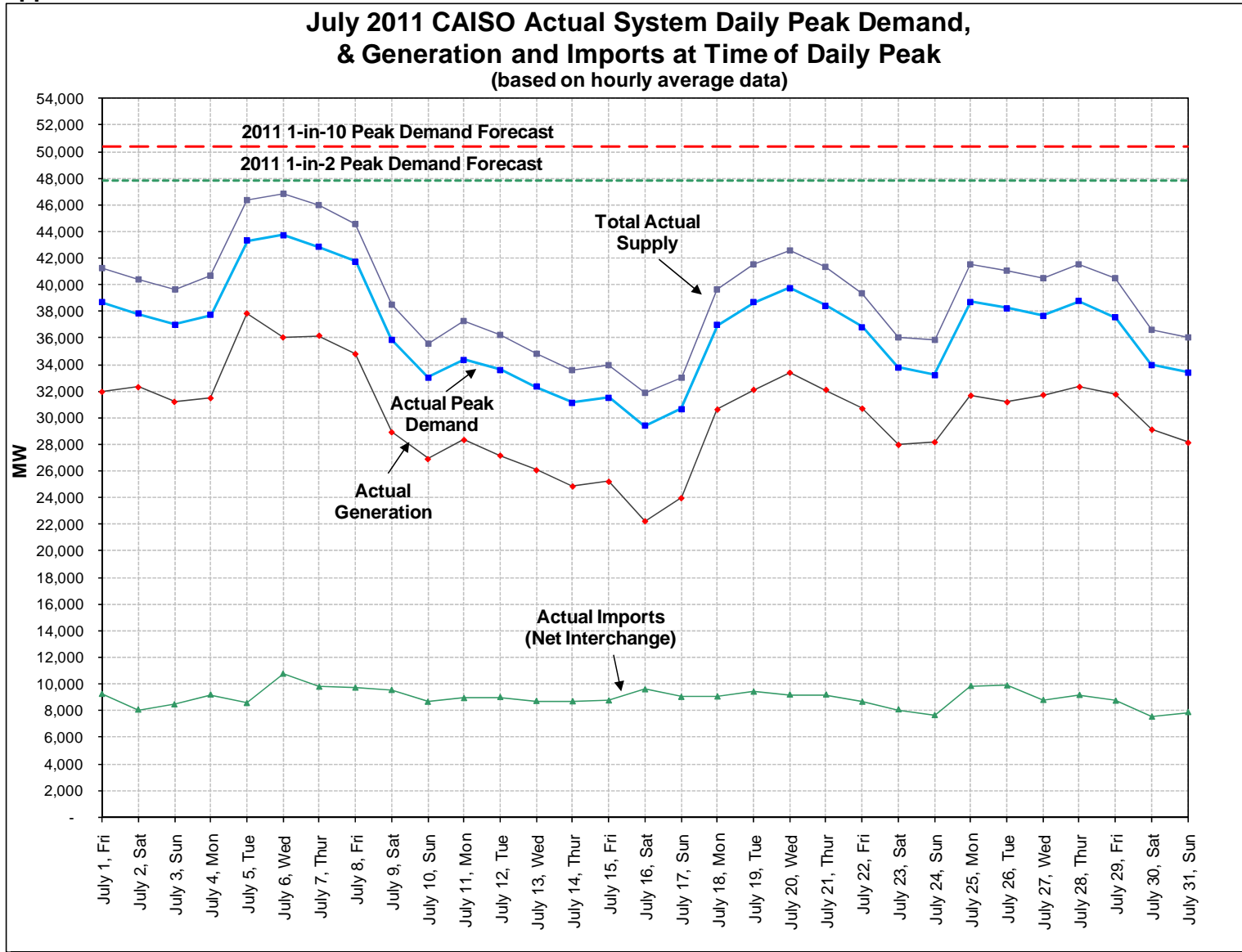
- A. 2011 Summer Peak Load Summary Graphs
- B. 2012 ISO NDC and RPS by Fuel Type
- C. 2009 – 2011 Summer Generation Outage Graphs
- D. 2012 ISO Summer On-Peak NQC Fuel Type
- E. 2009 – 2011 Summer Imports Summary Graphs
- F. 2012 California Hydrologic Conditions



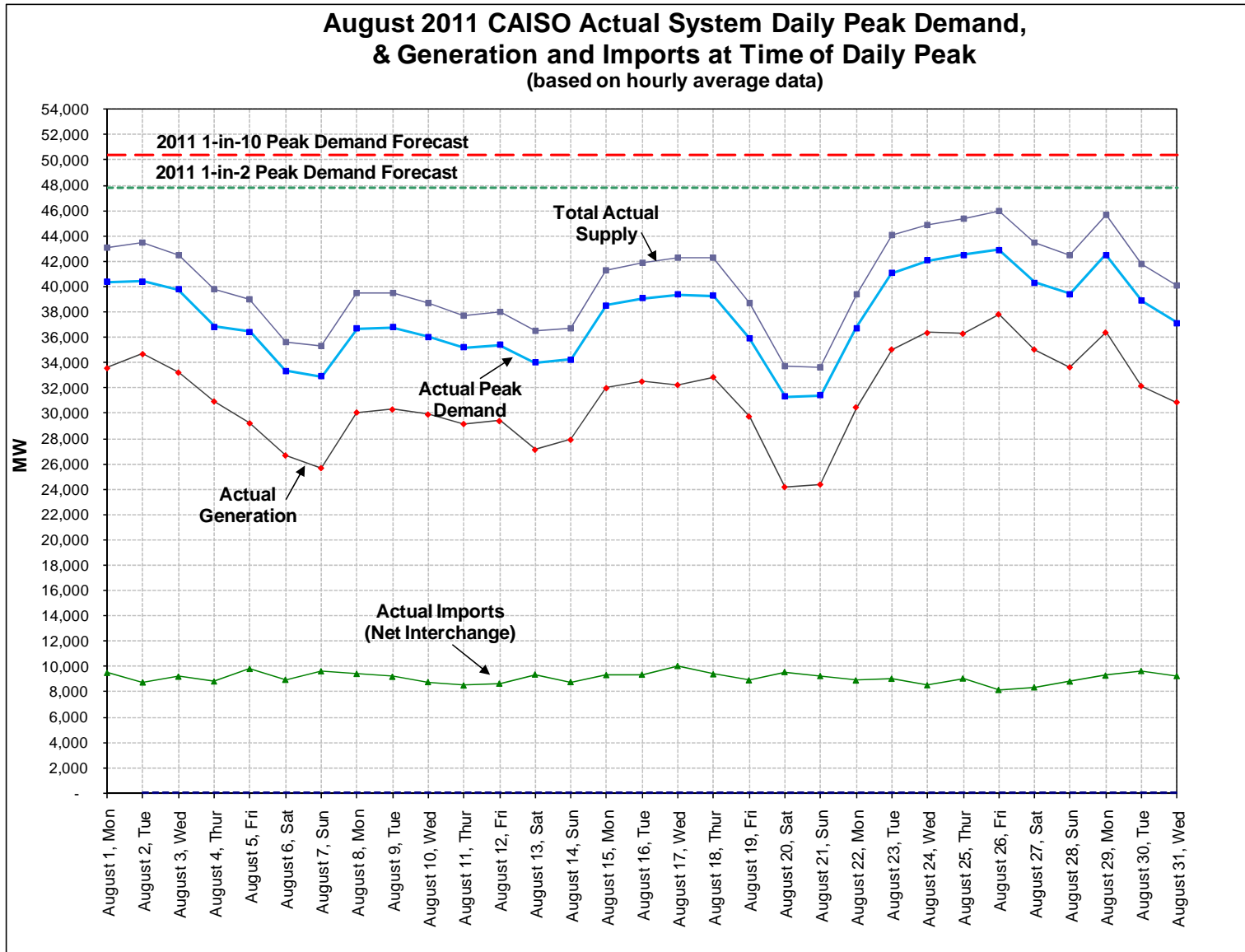
Appendix A: 2011 Summer Peak Load Summary Graphs



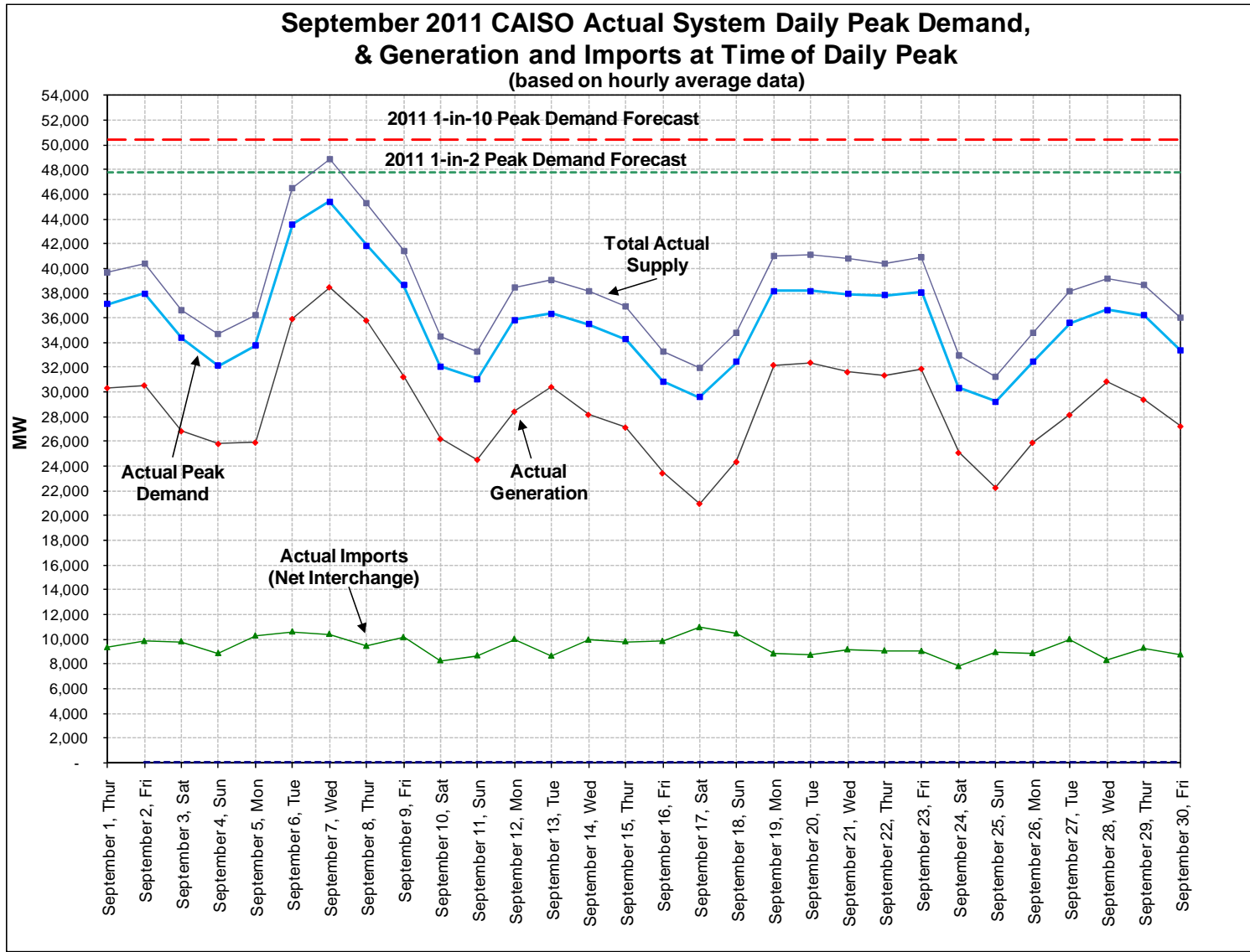
Appendix A – Continued



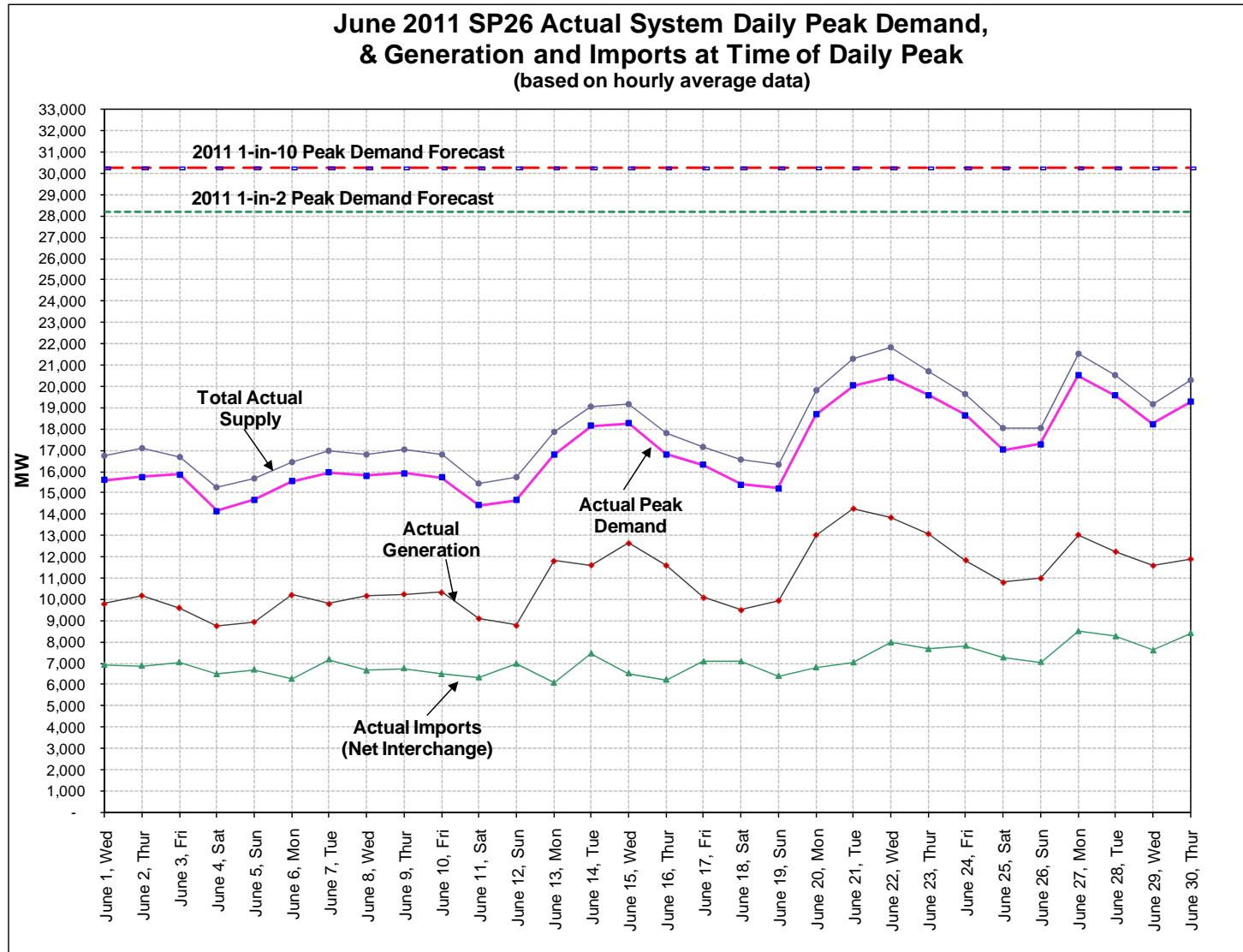
Appendix A – Continued



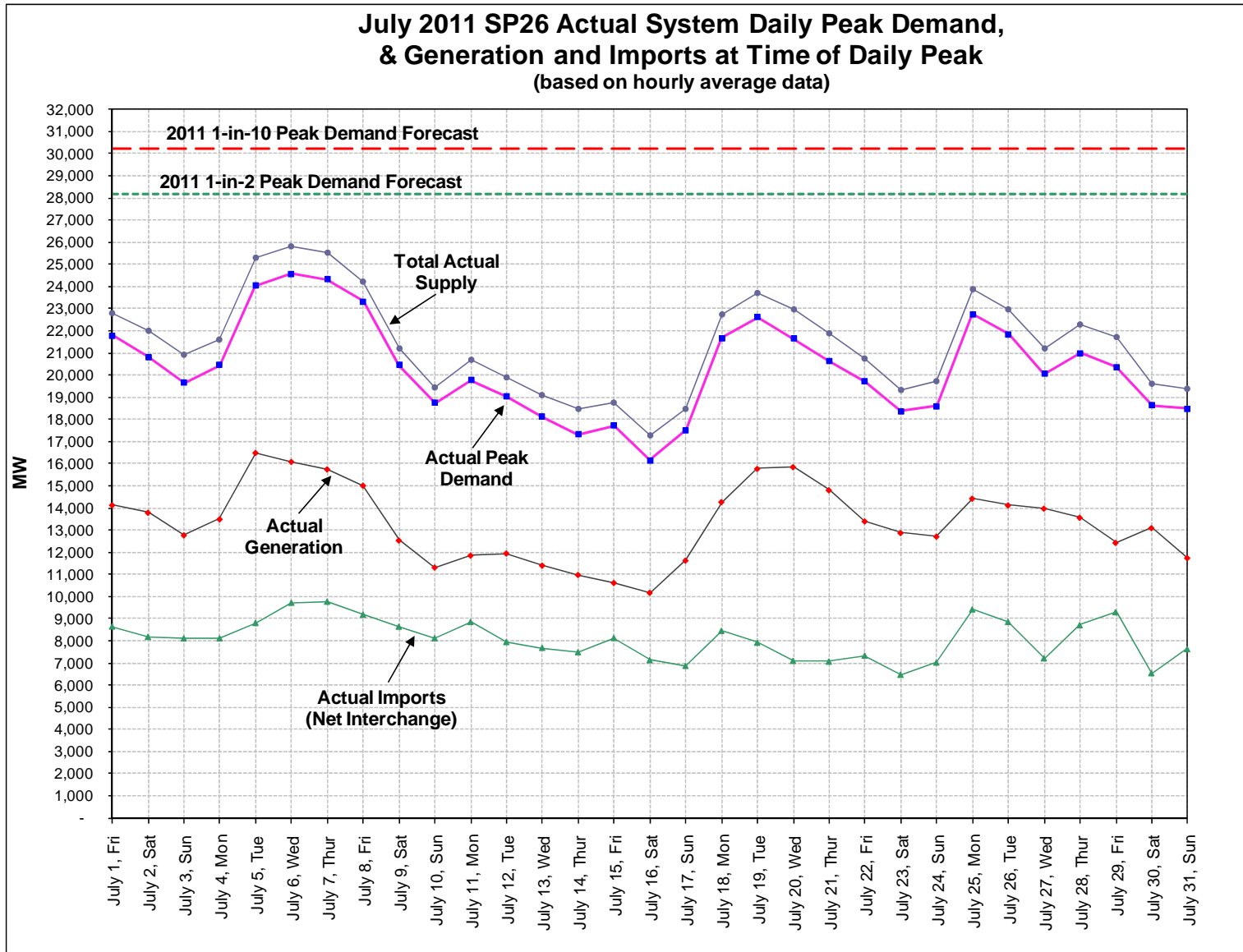
Appendix A – Continued



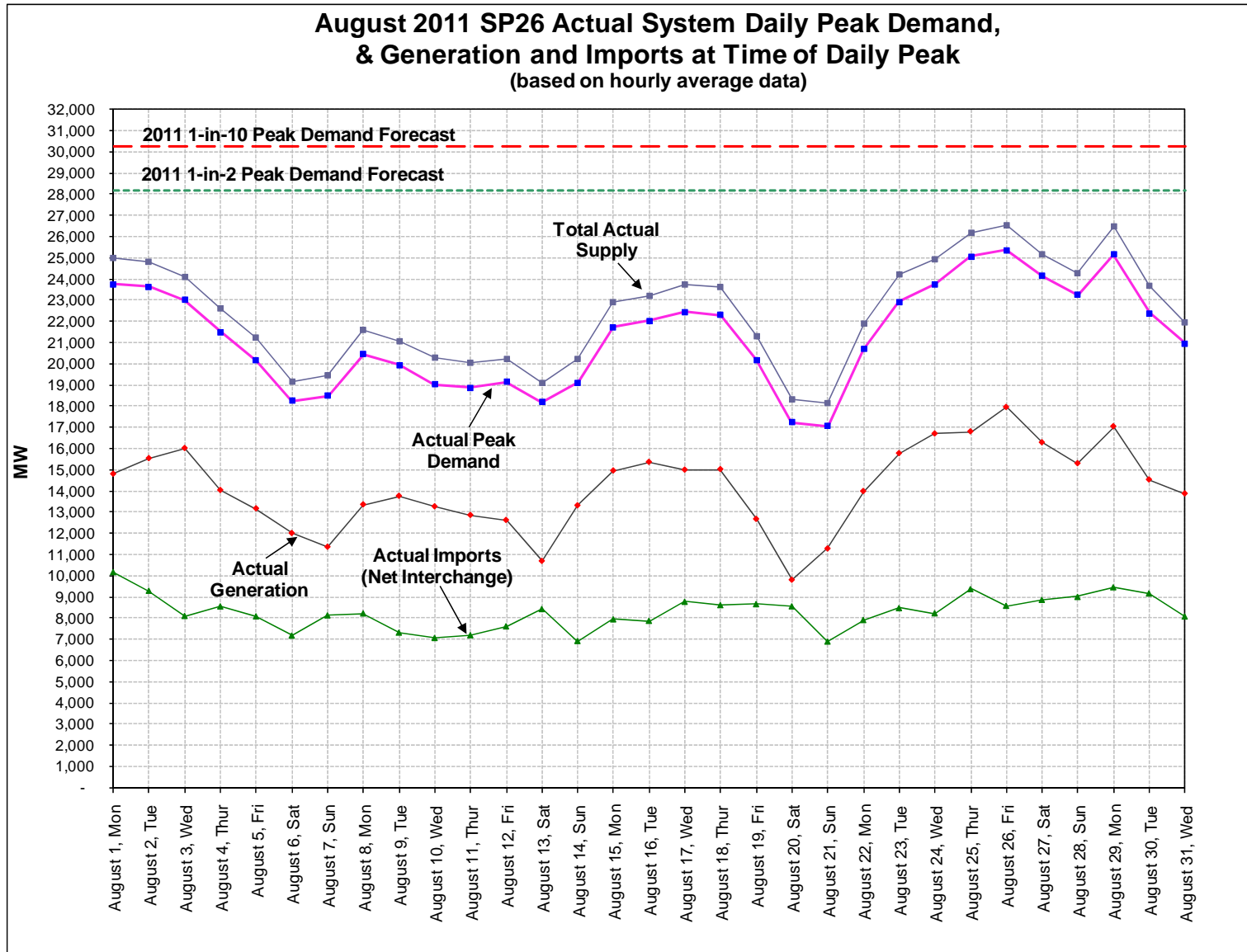
Appendix A – Continued



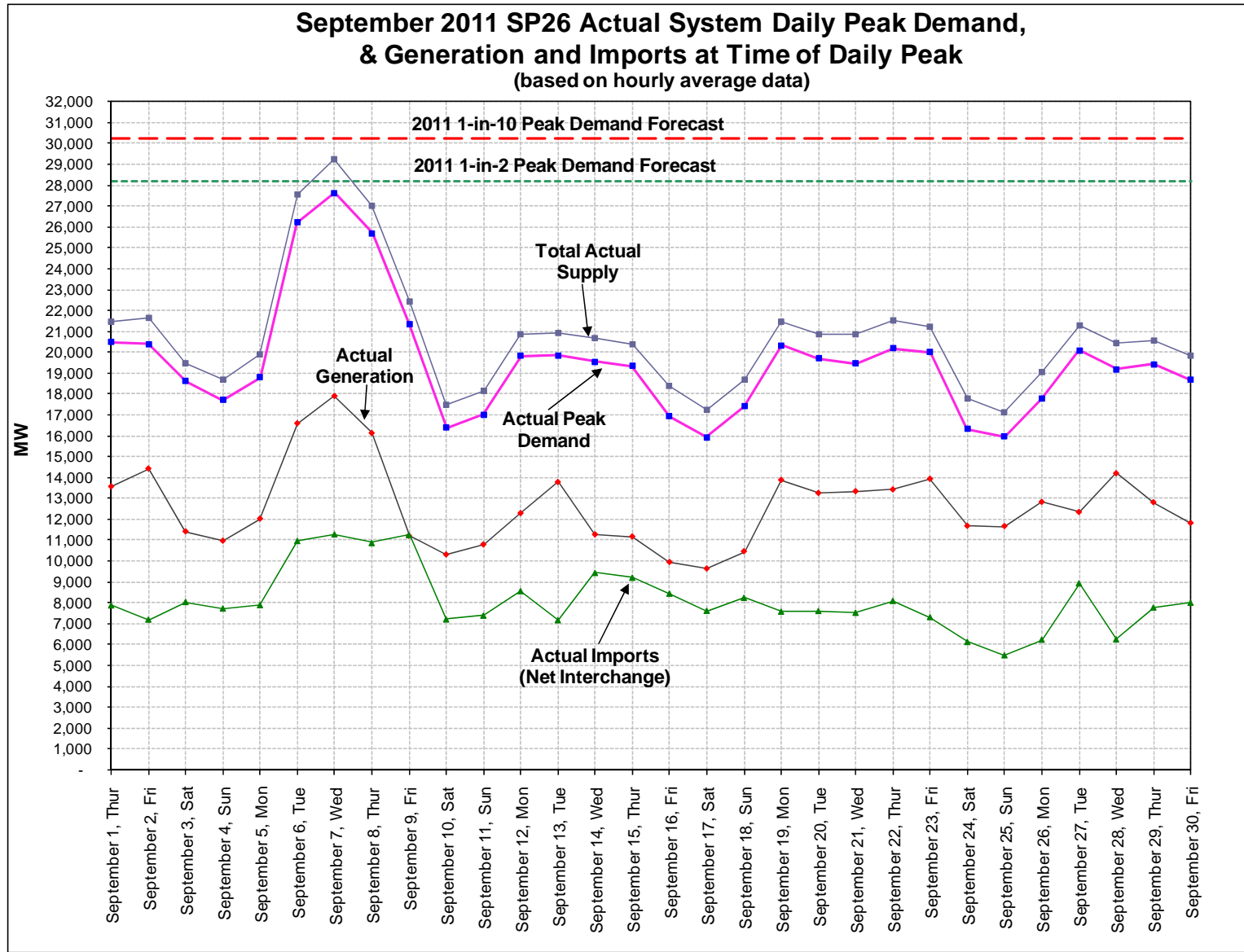
Appendix A – Continued



Appendix A – Continued

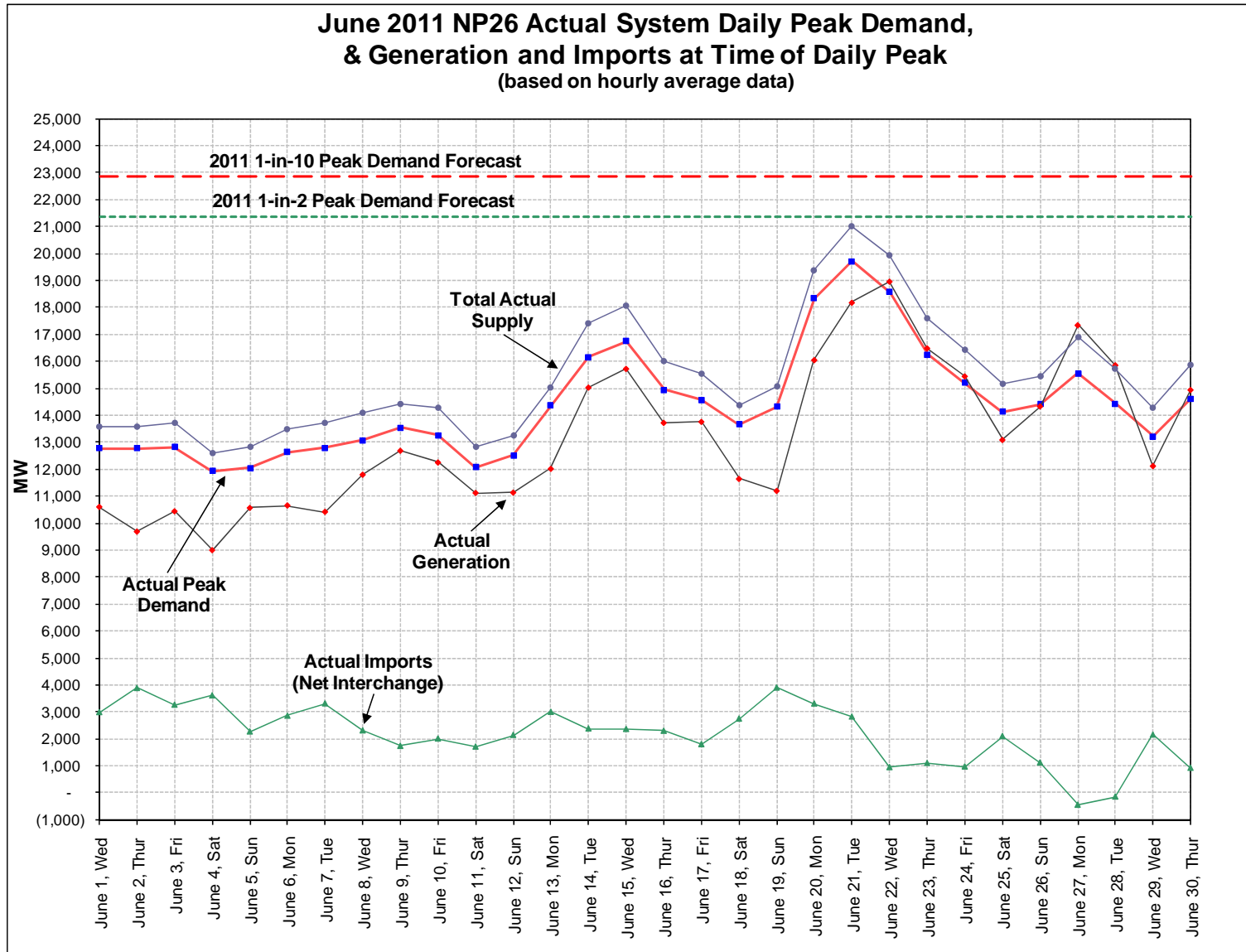


Appendix A – Continued

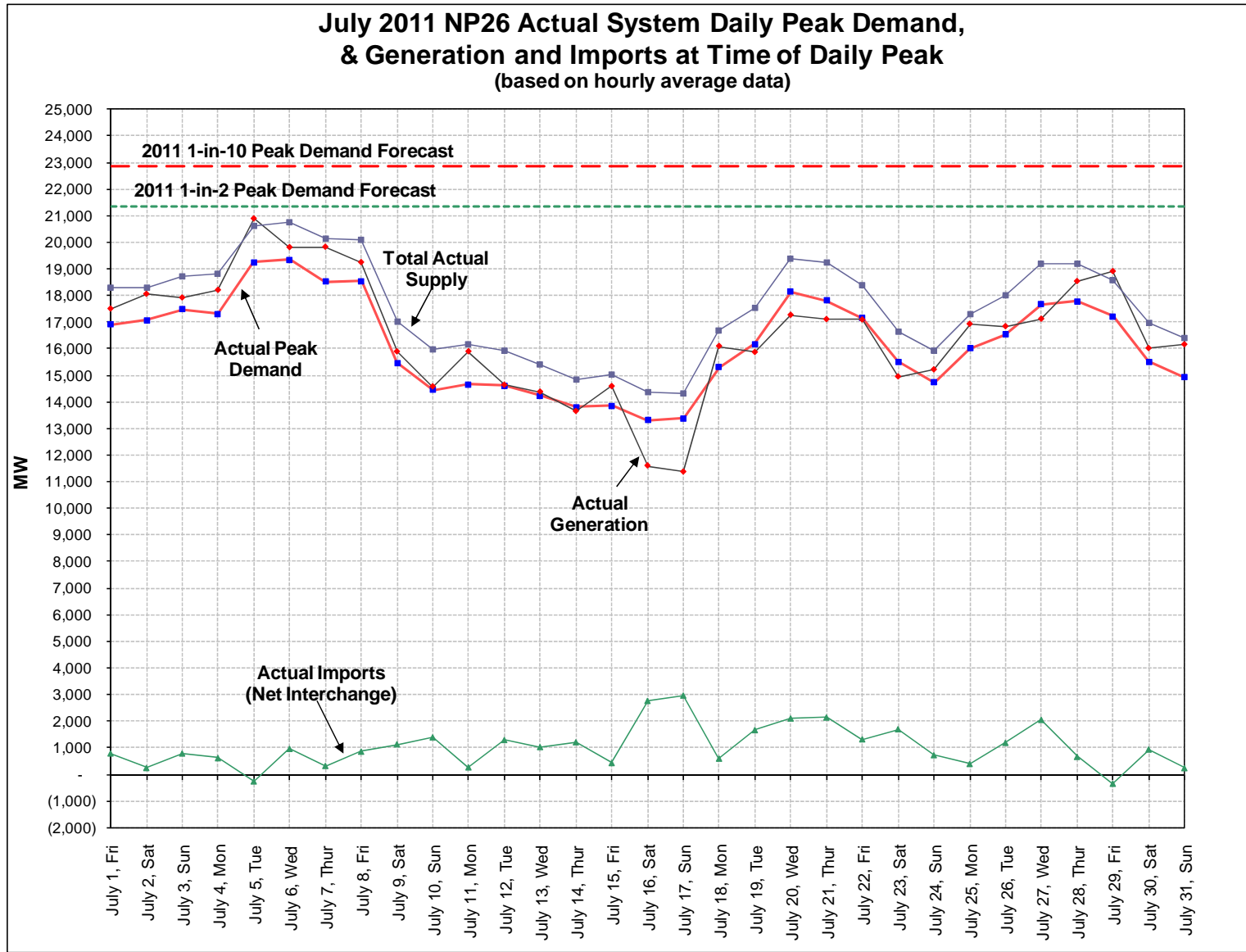




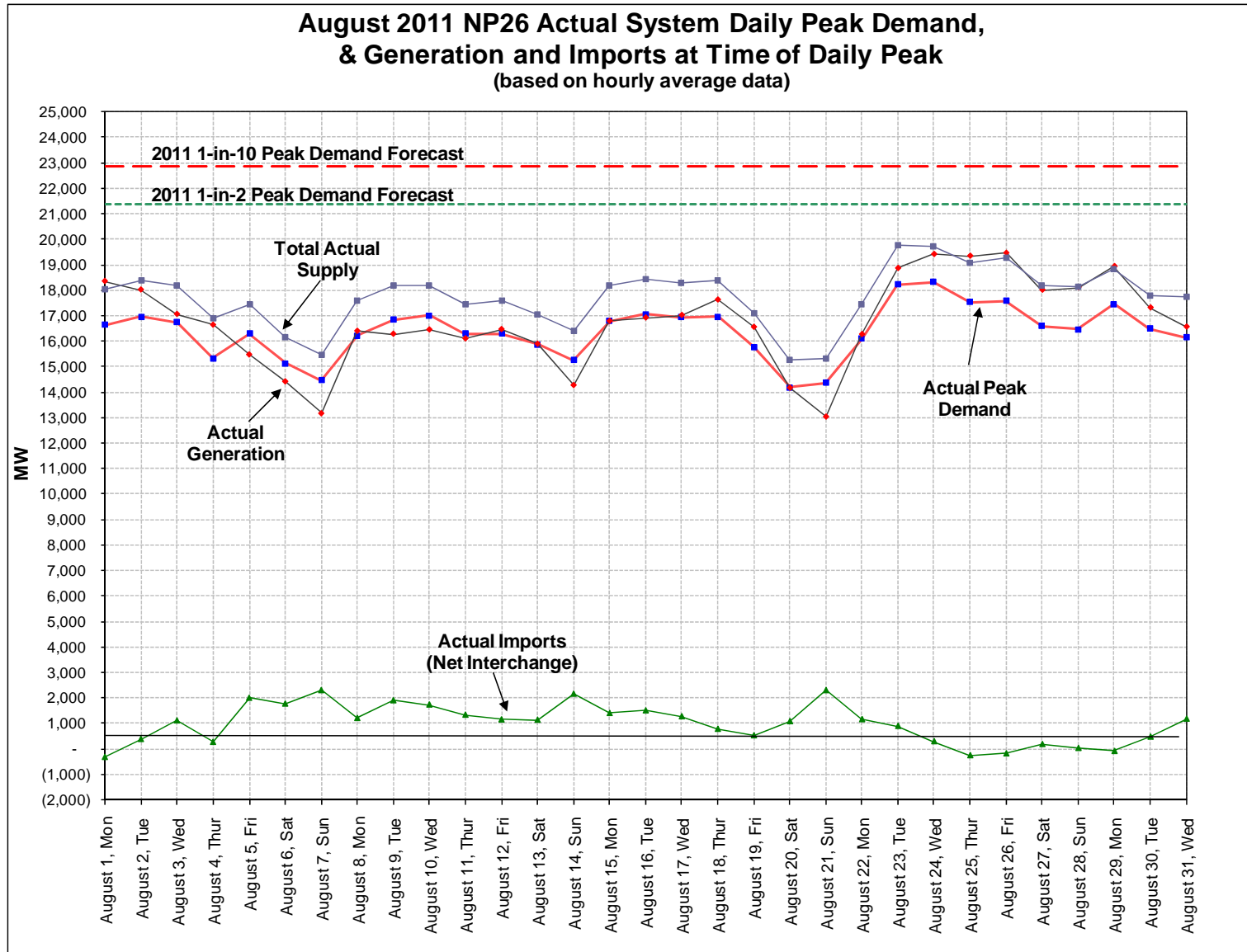
Appendix A – Continued



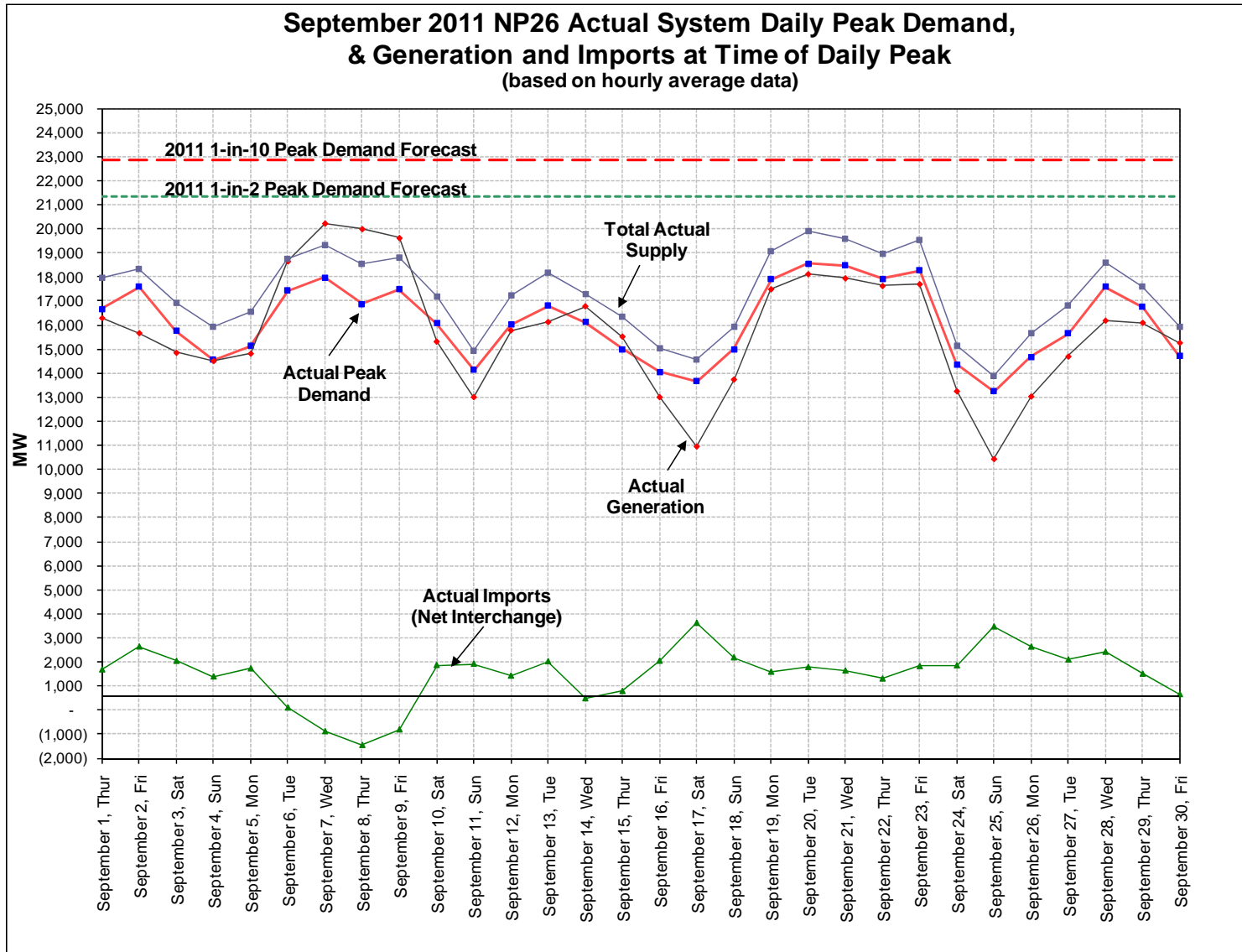
Appendix A – Continued



Appendix A – Continued



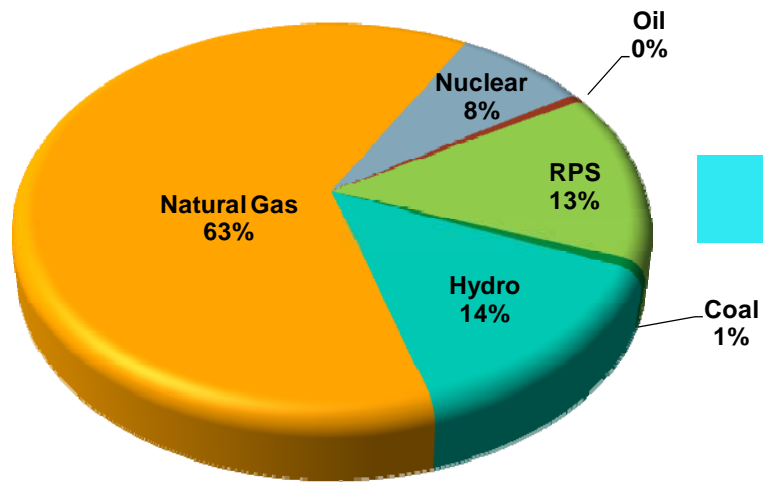
Appendix A – Continued



Appendix B: 2012 ISO NDC and RPS by Fuel Type

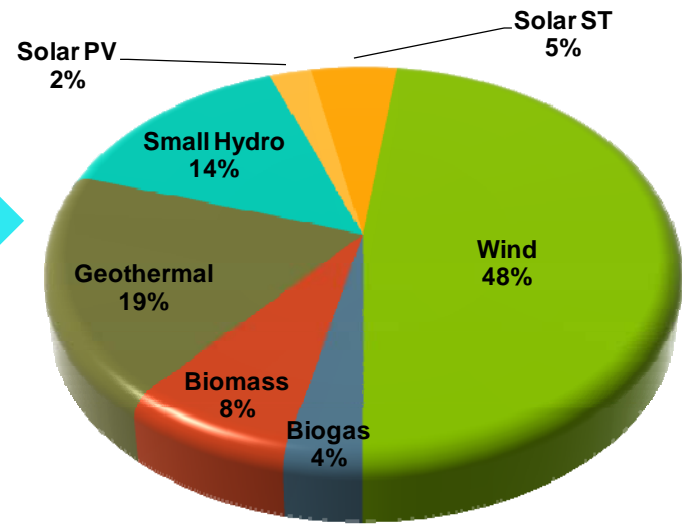
2012 ISO NDC by Fuel Type

As Jan 9, 2012

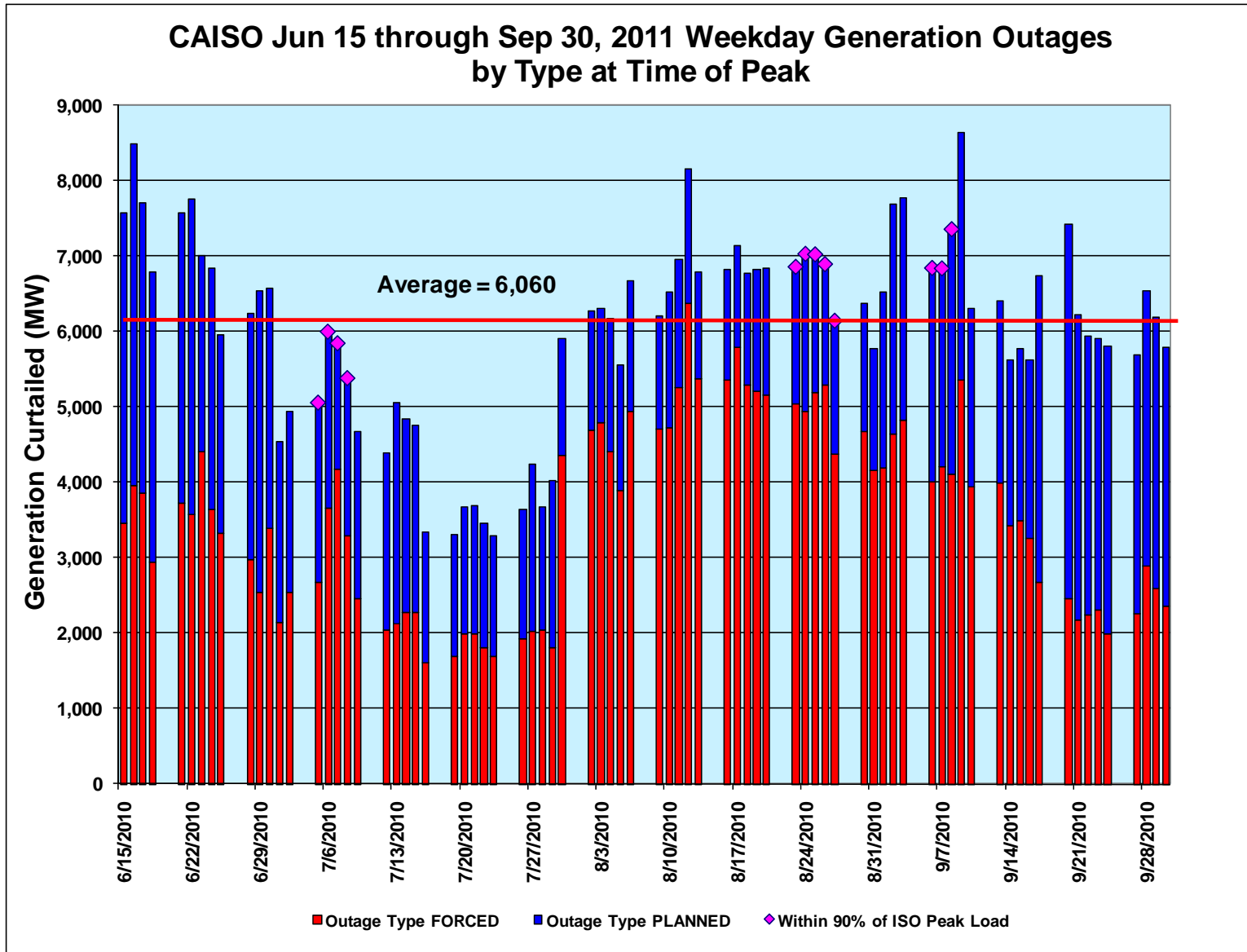


2012 ISO RPS by Fuel Type

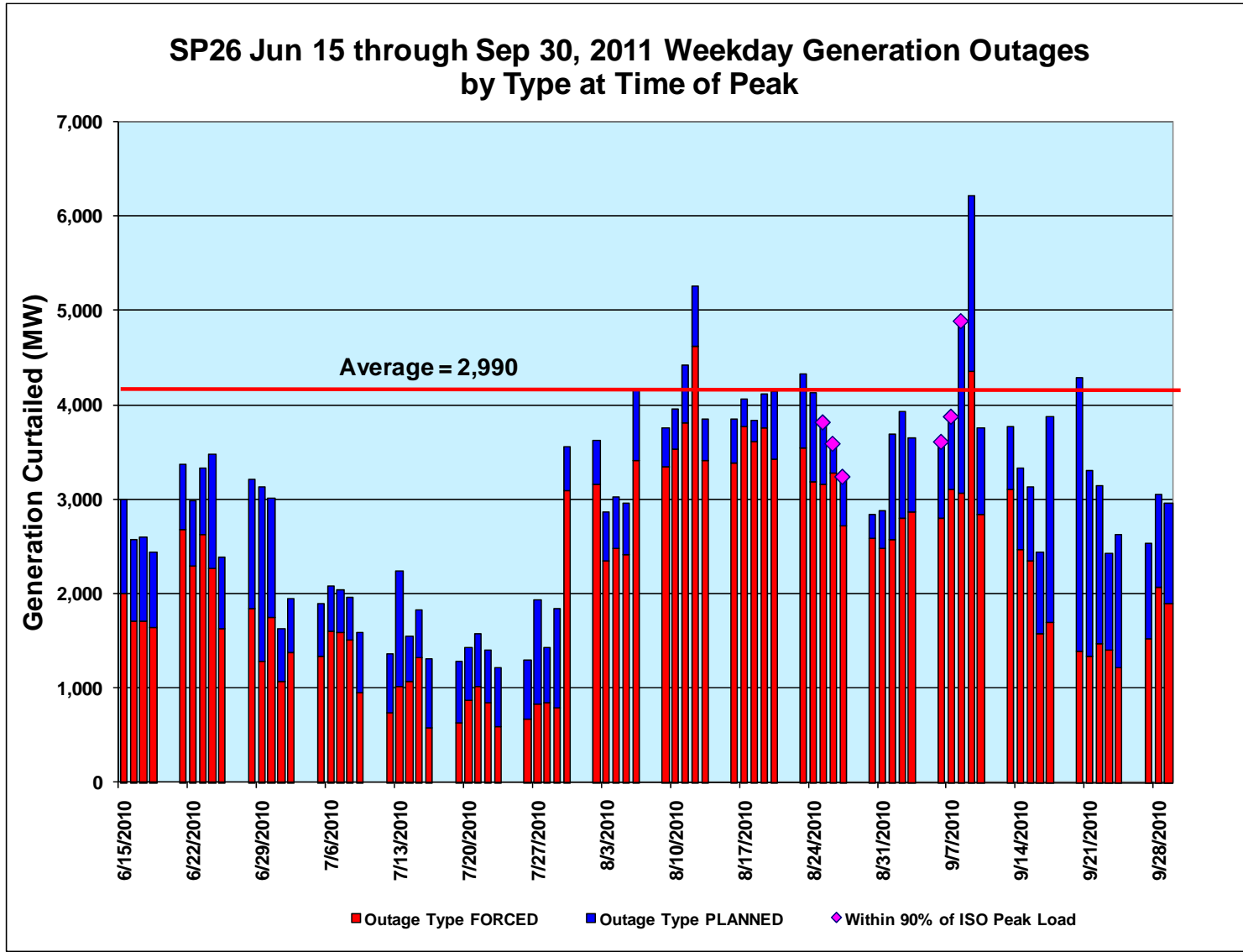
As of Jan 9, 2012



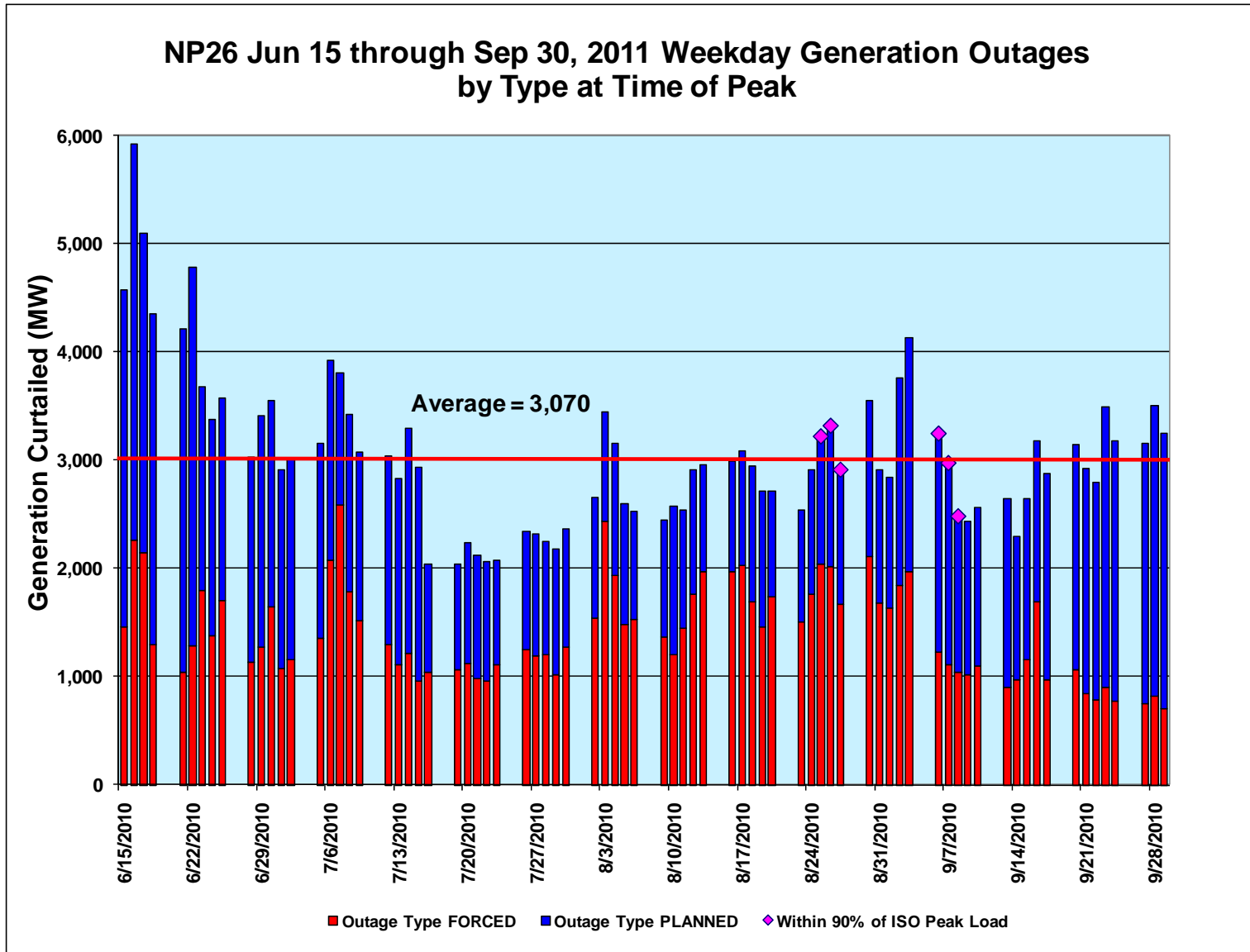
Appendix C: 2009 – 2011 Summer Generation Outage Graphs



Appendix C: Continued

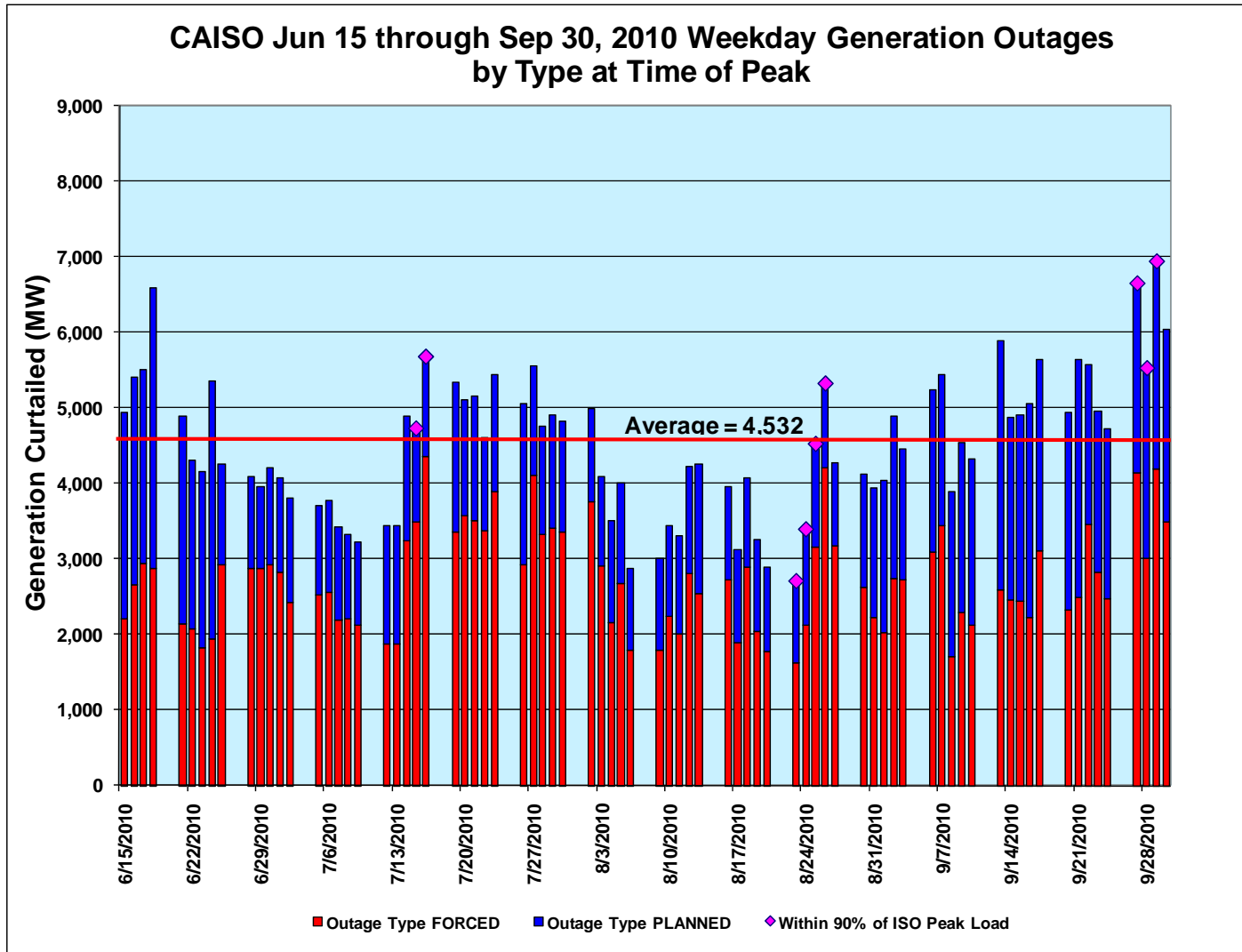


Appendix C: Continued

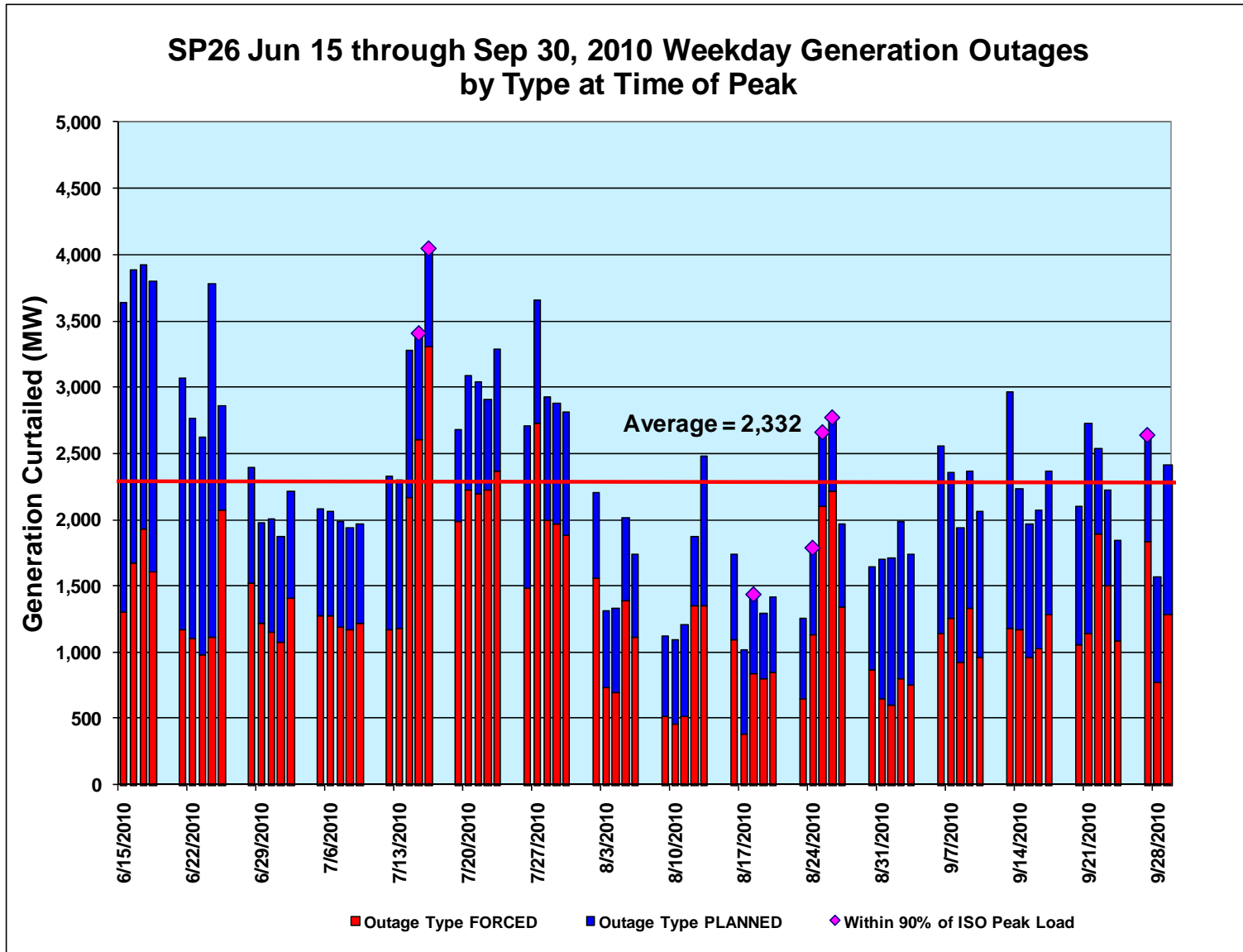




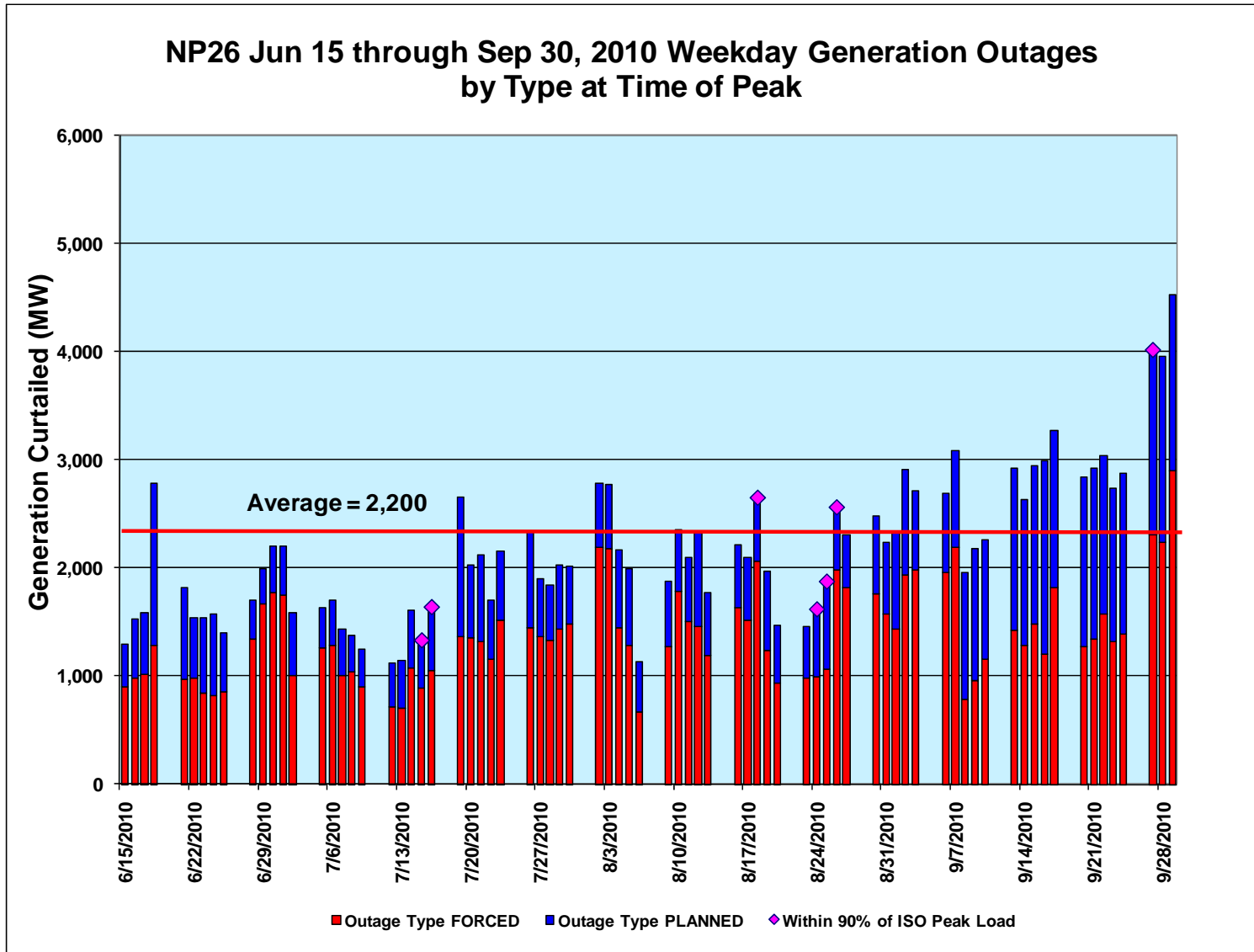
Appendix C: Continued



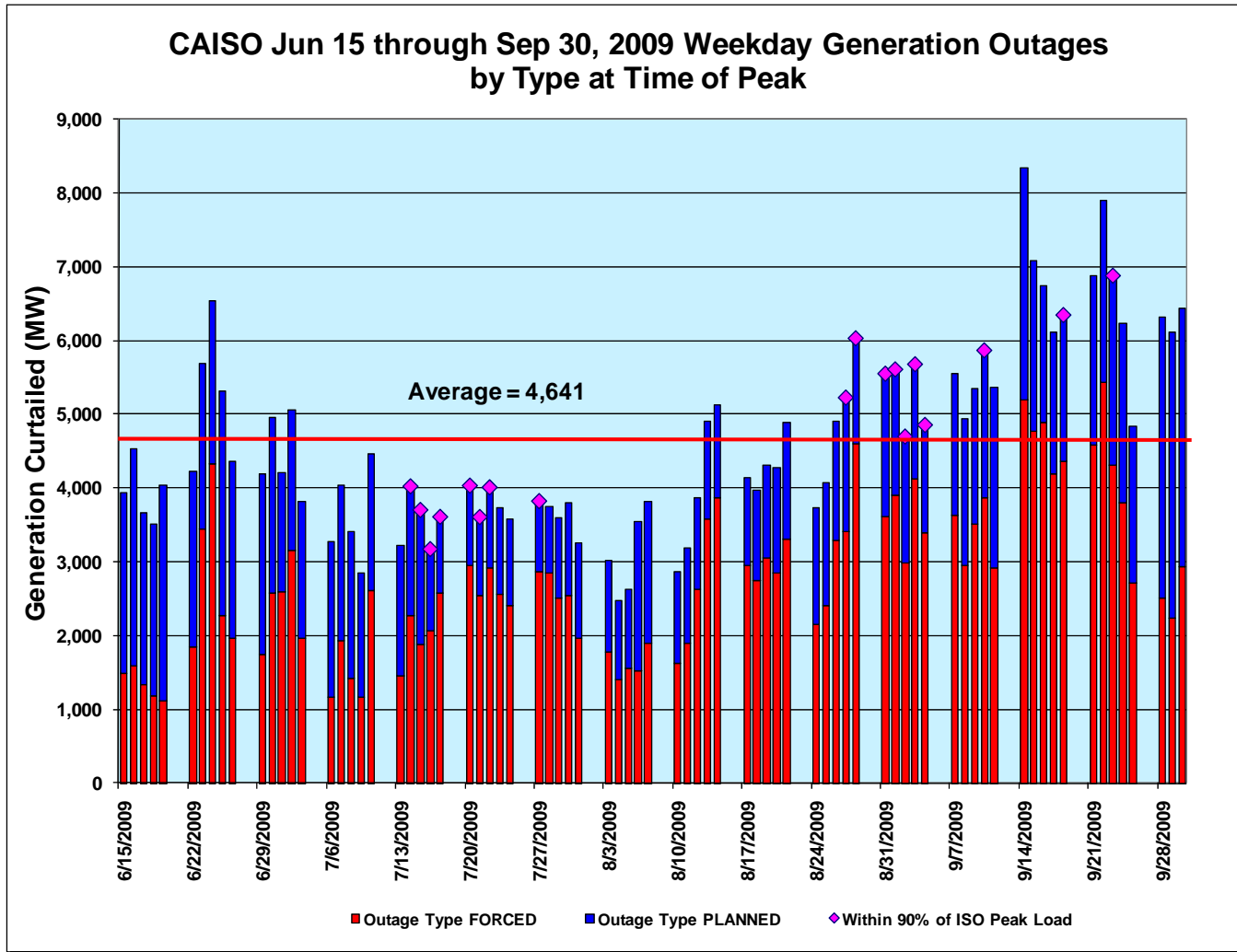
Appendix C: Continued



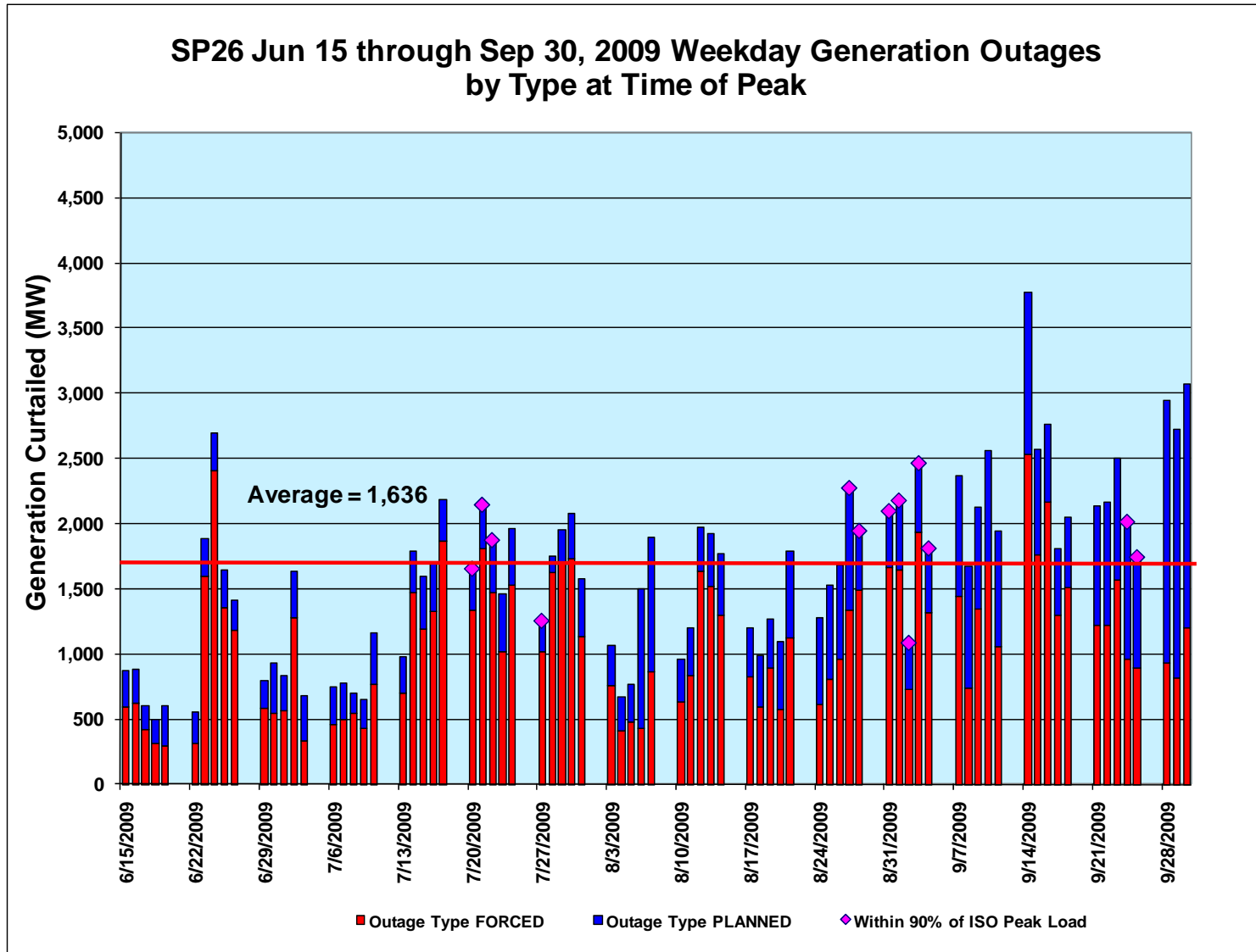
Appendix C – Continued



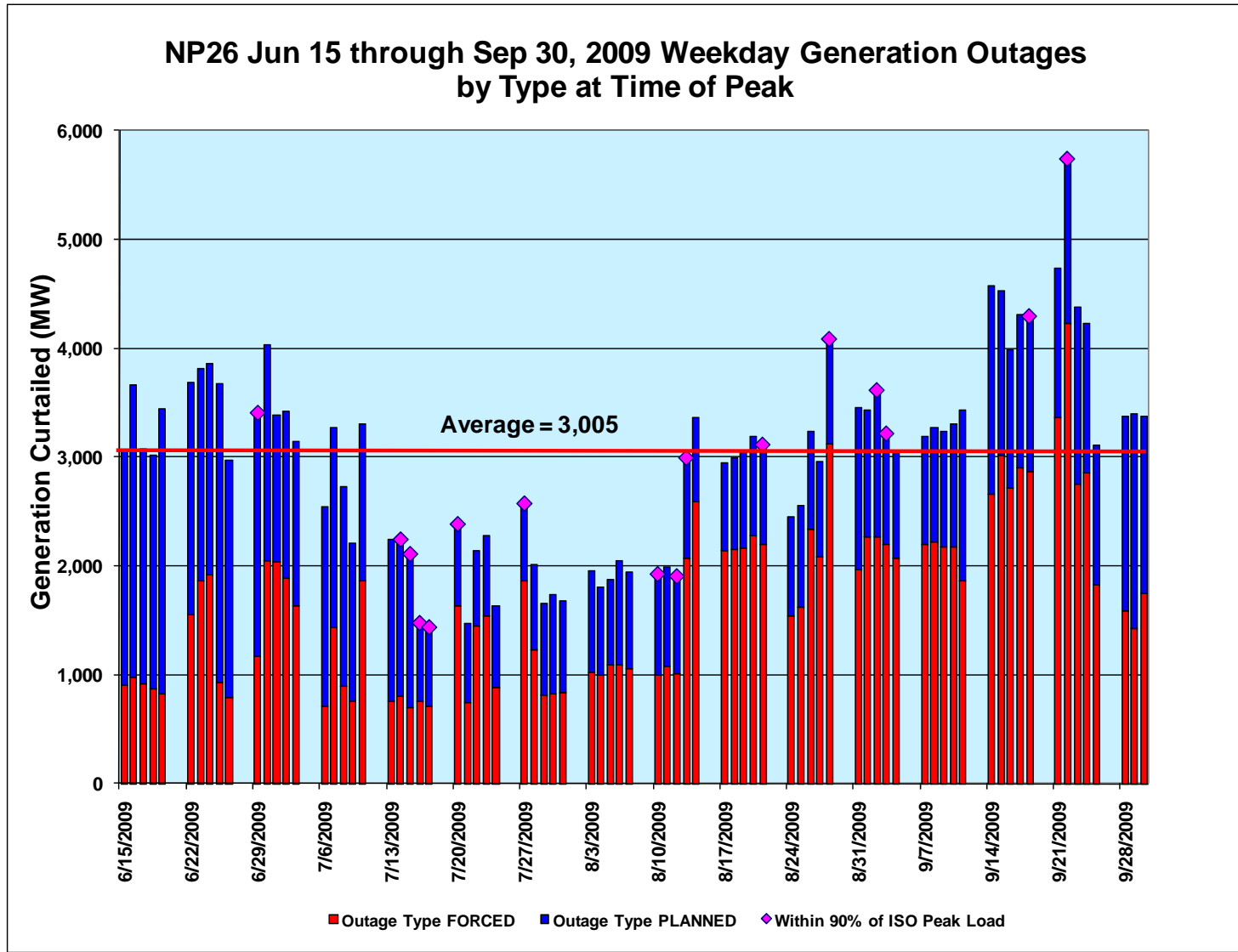
Appendix C – Continued



Appendix C – Continued

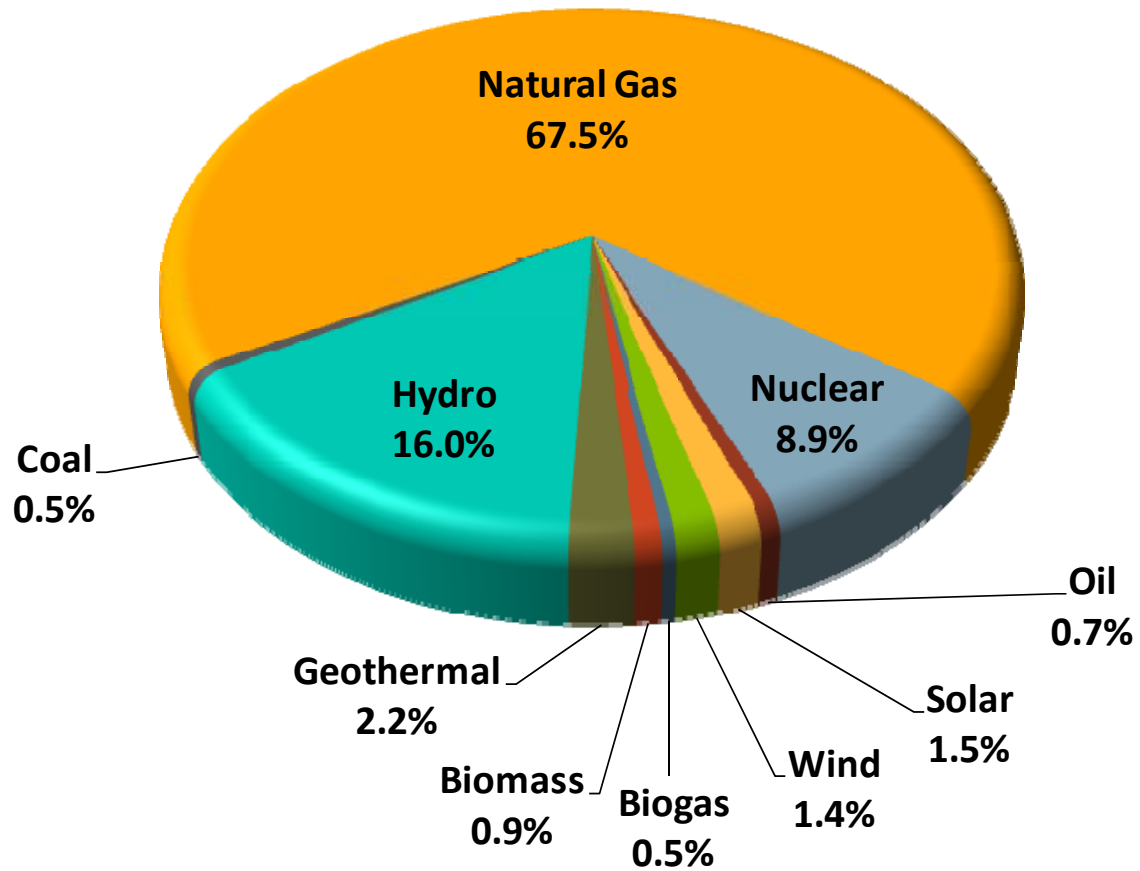


Appendix C – Continued

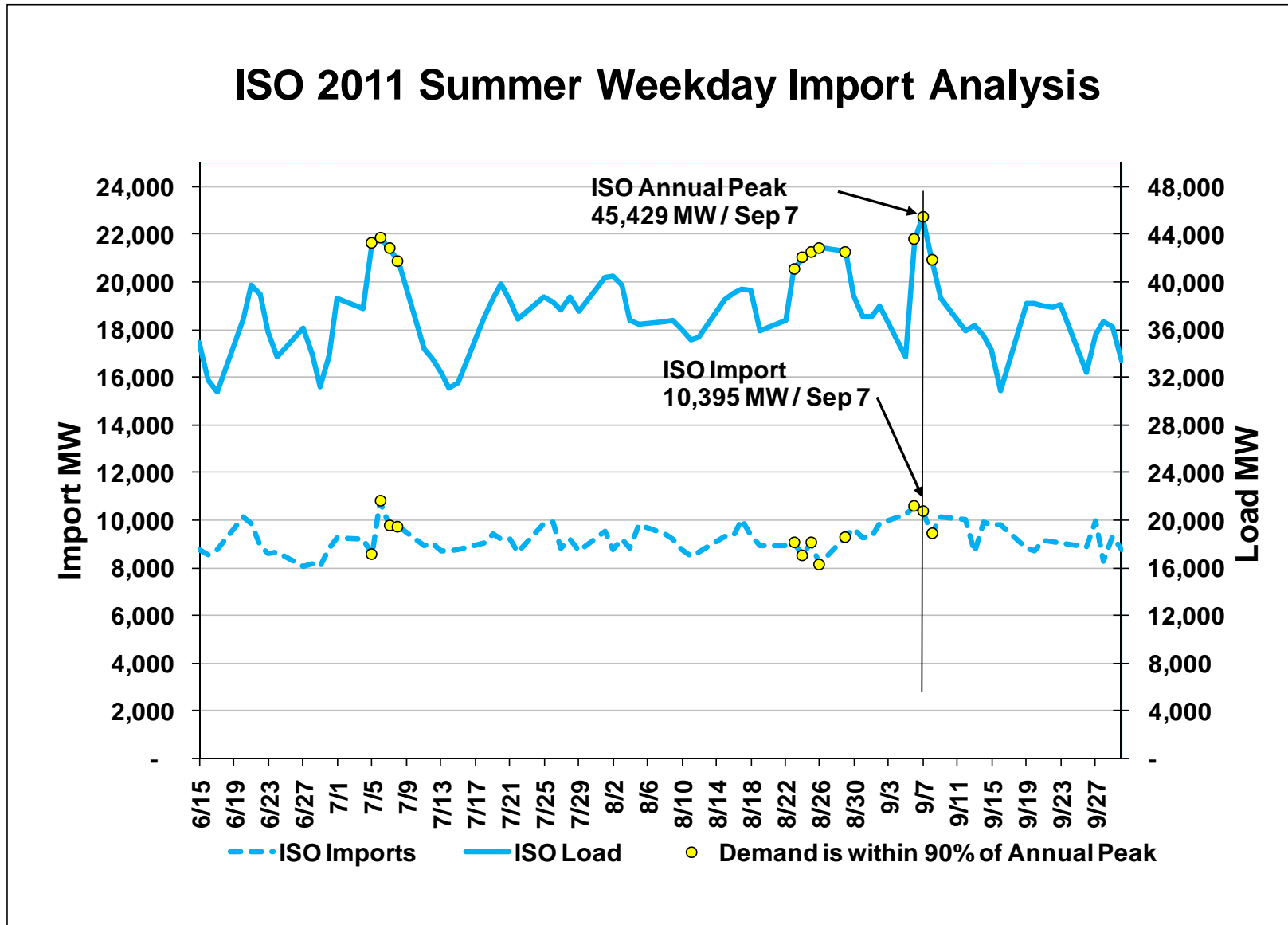


Appendix D: 2012 ISO Summer On-Peak NQC Fuel Type

### 2012 ISO Summer On-Peak NQC by Fuel Type

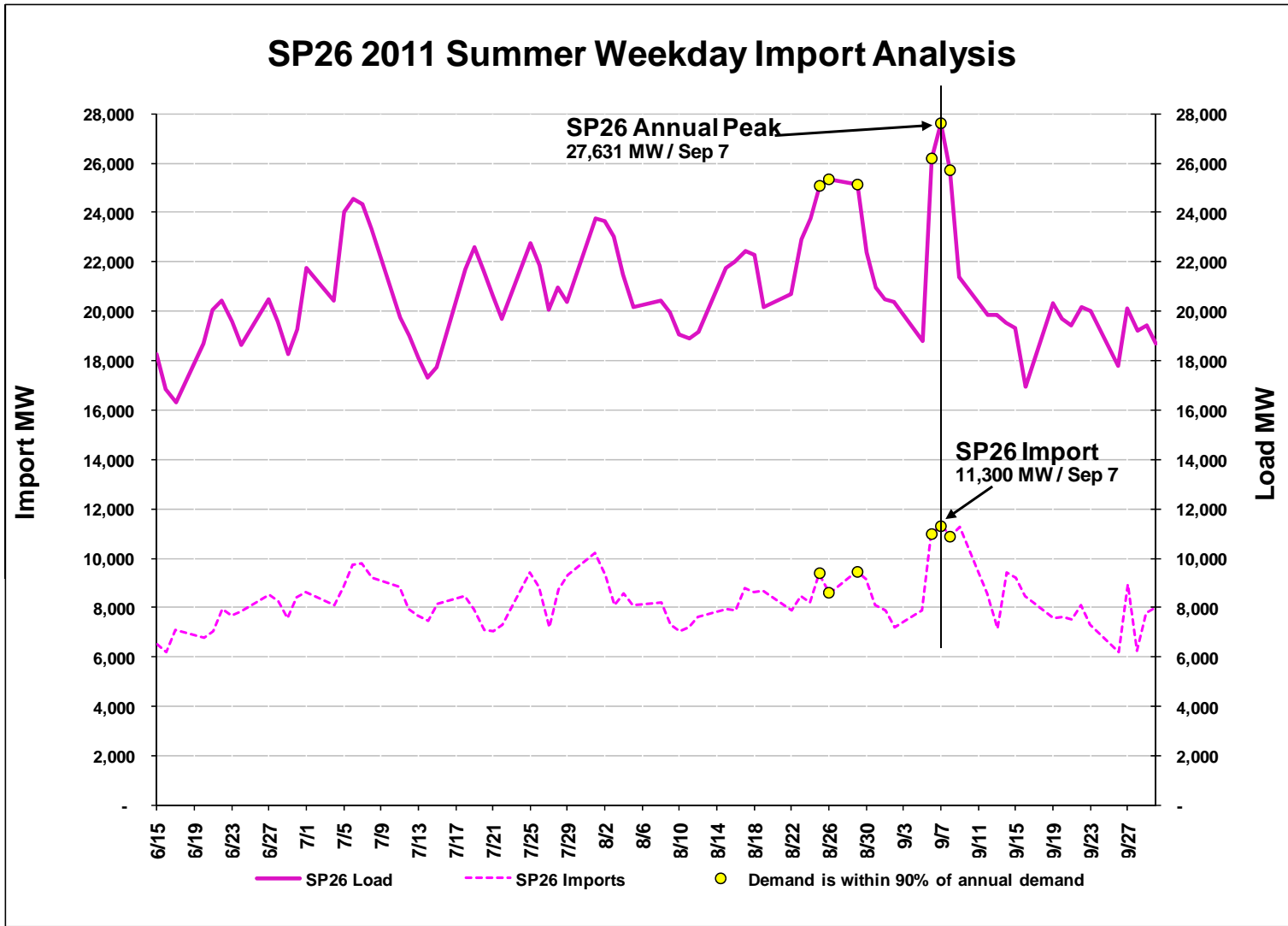


Appendix E: 2009 – 2011 Summer Imports Summary Graphs

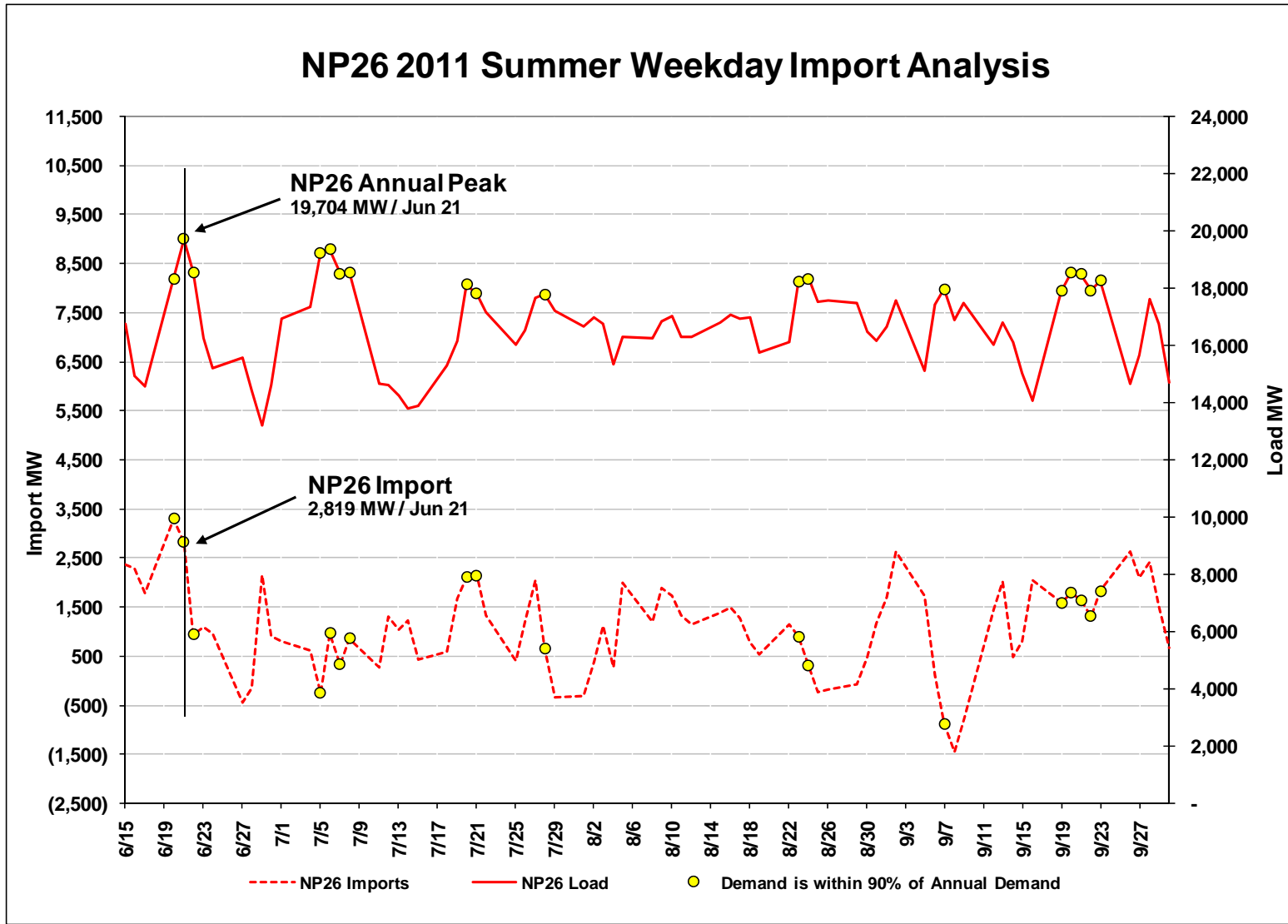




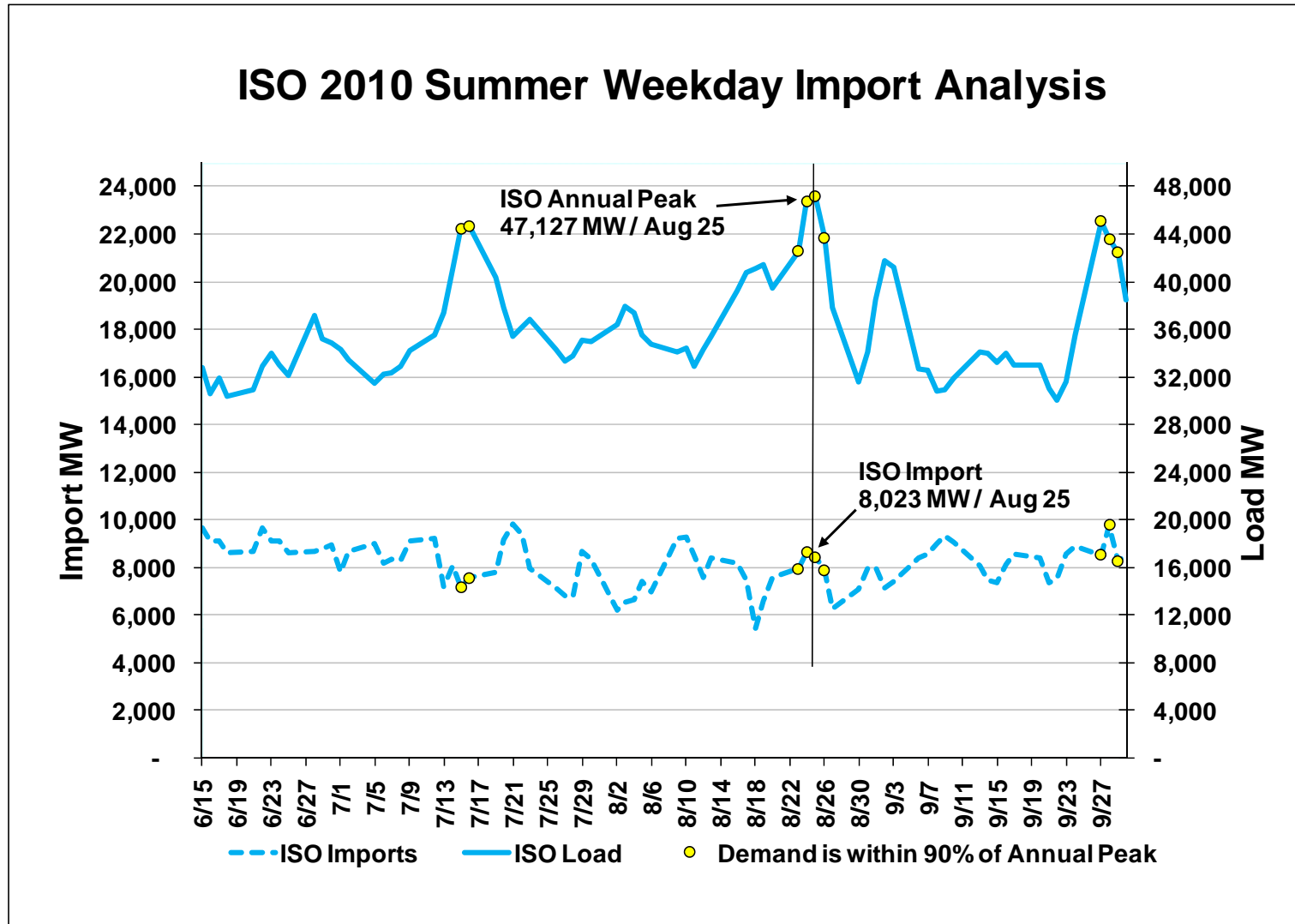
Appendix E – Continued



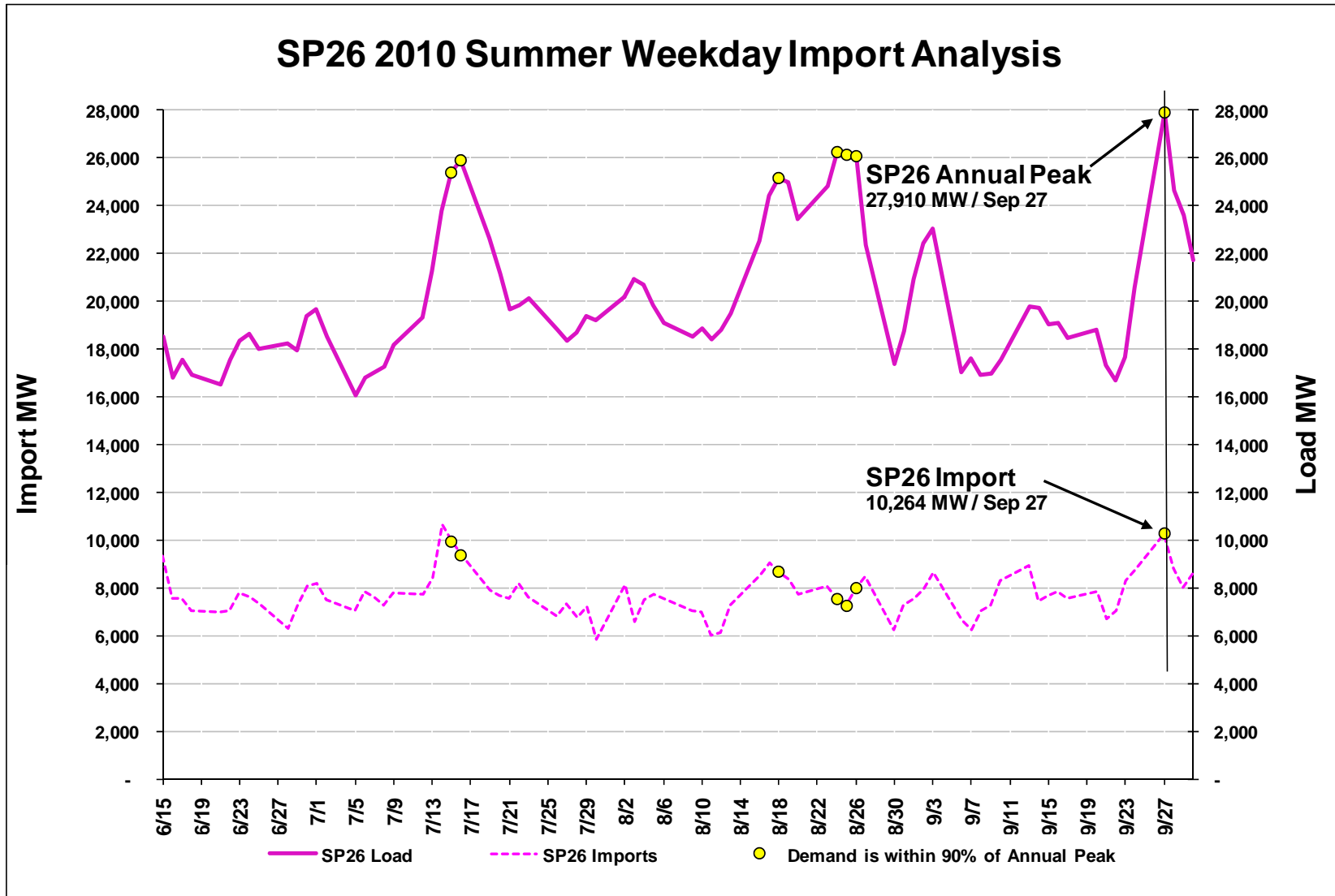
Appendix E – Continued



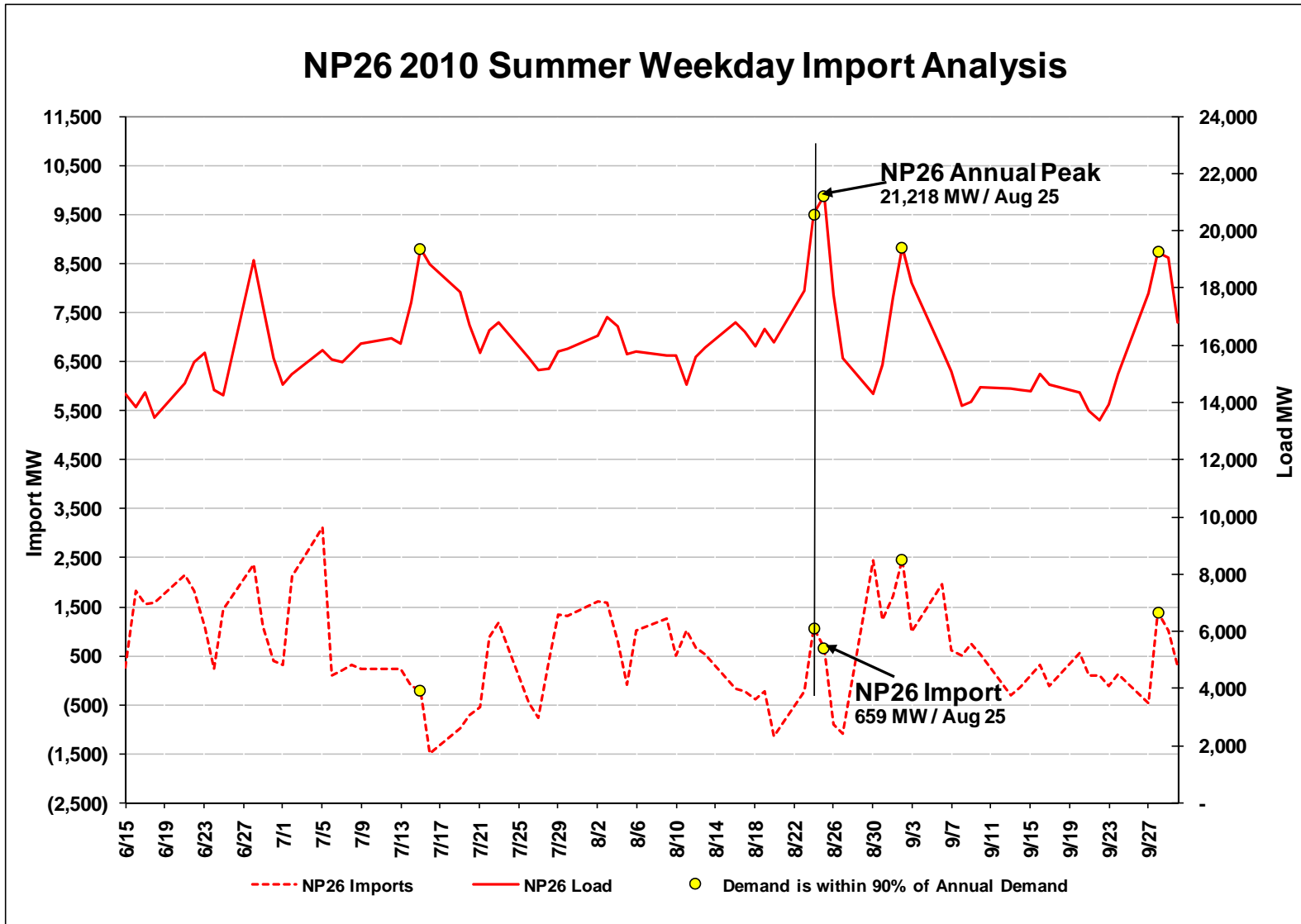
Appendix E – Continued



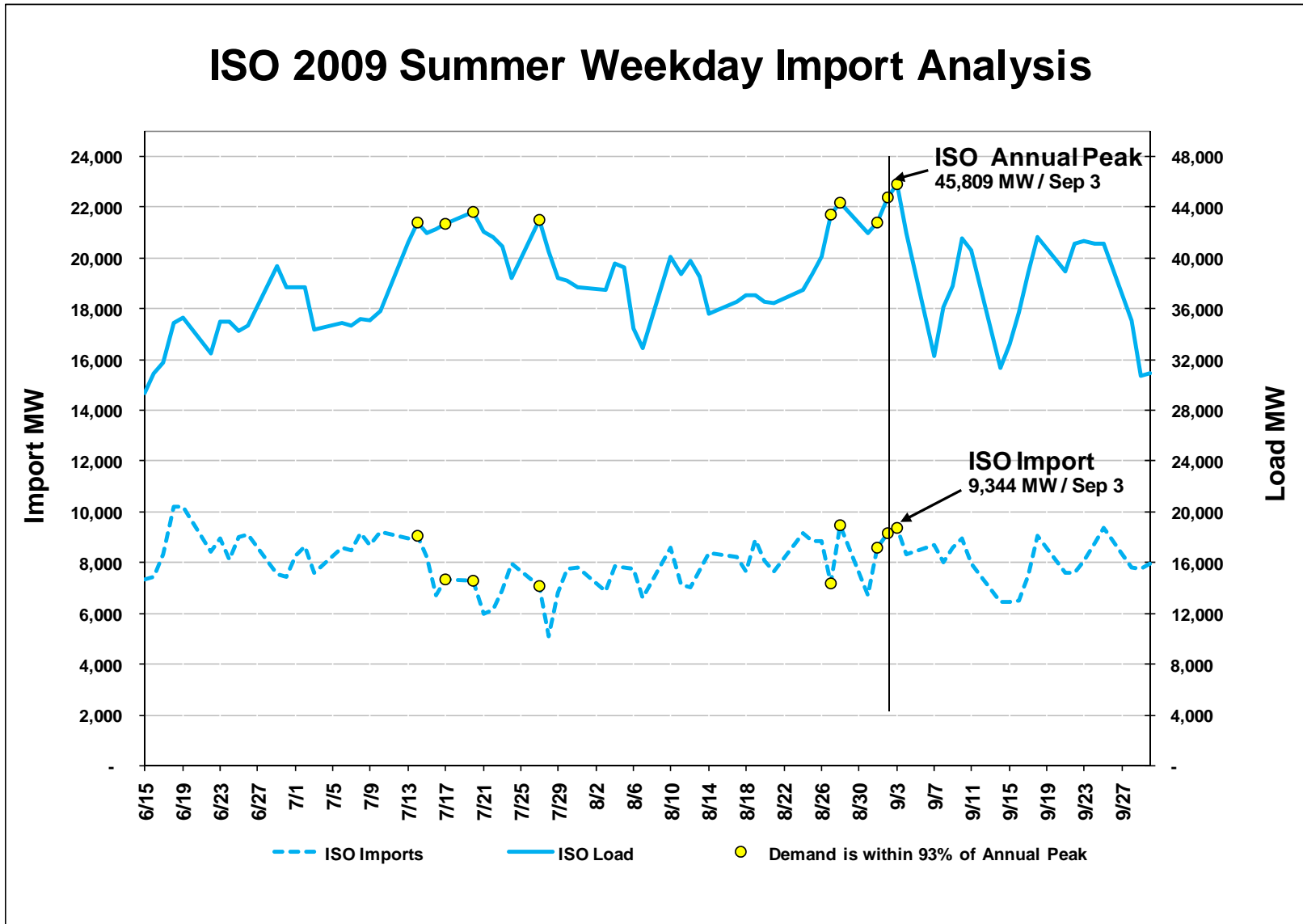
Appendix E – Continued



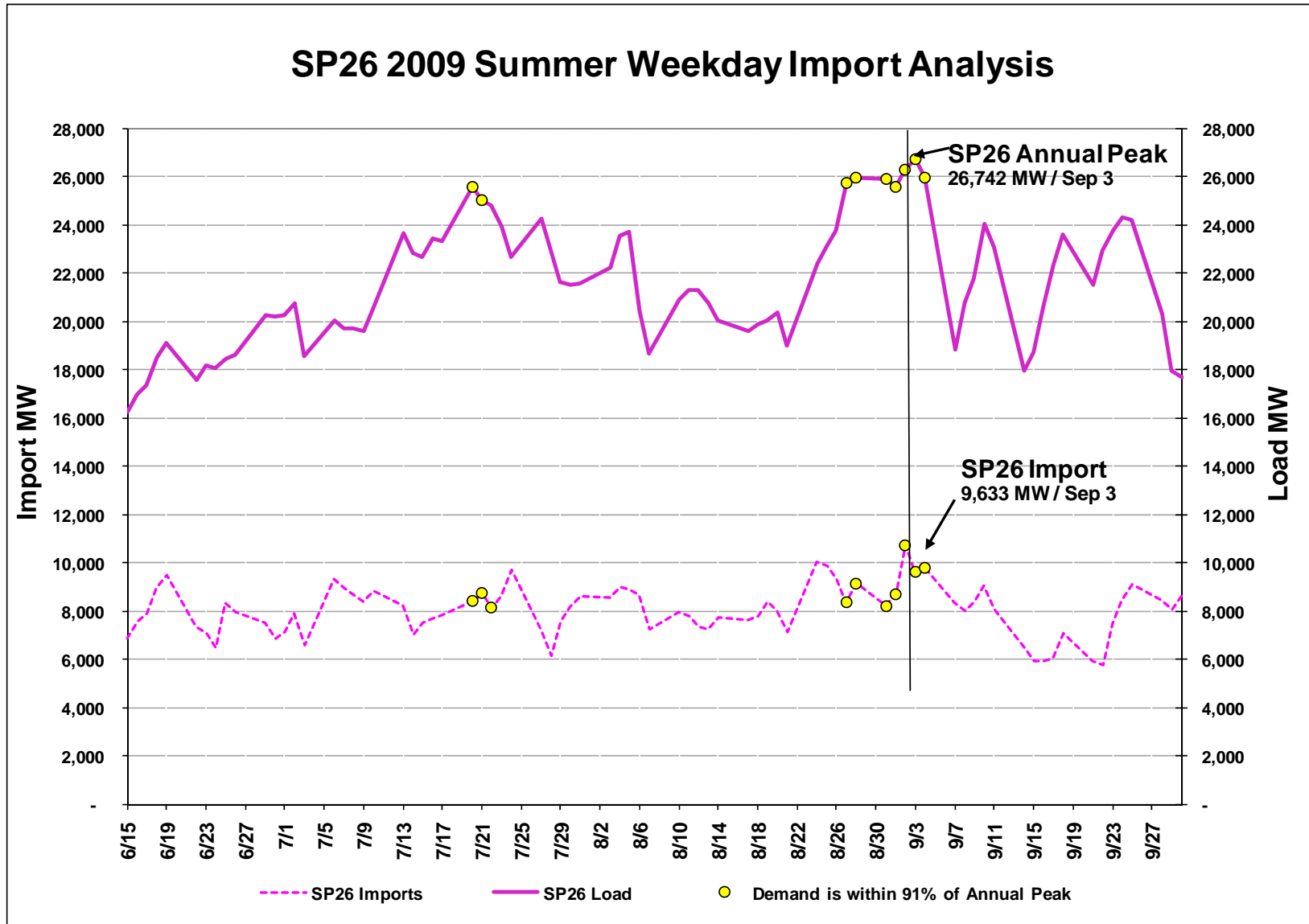
Appendix E – Continued



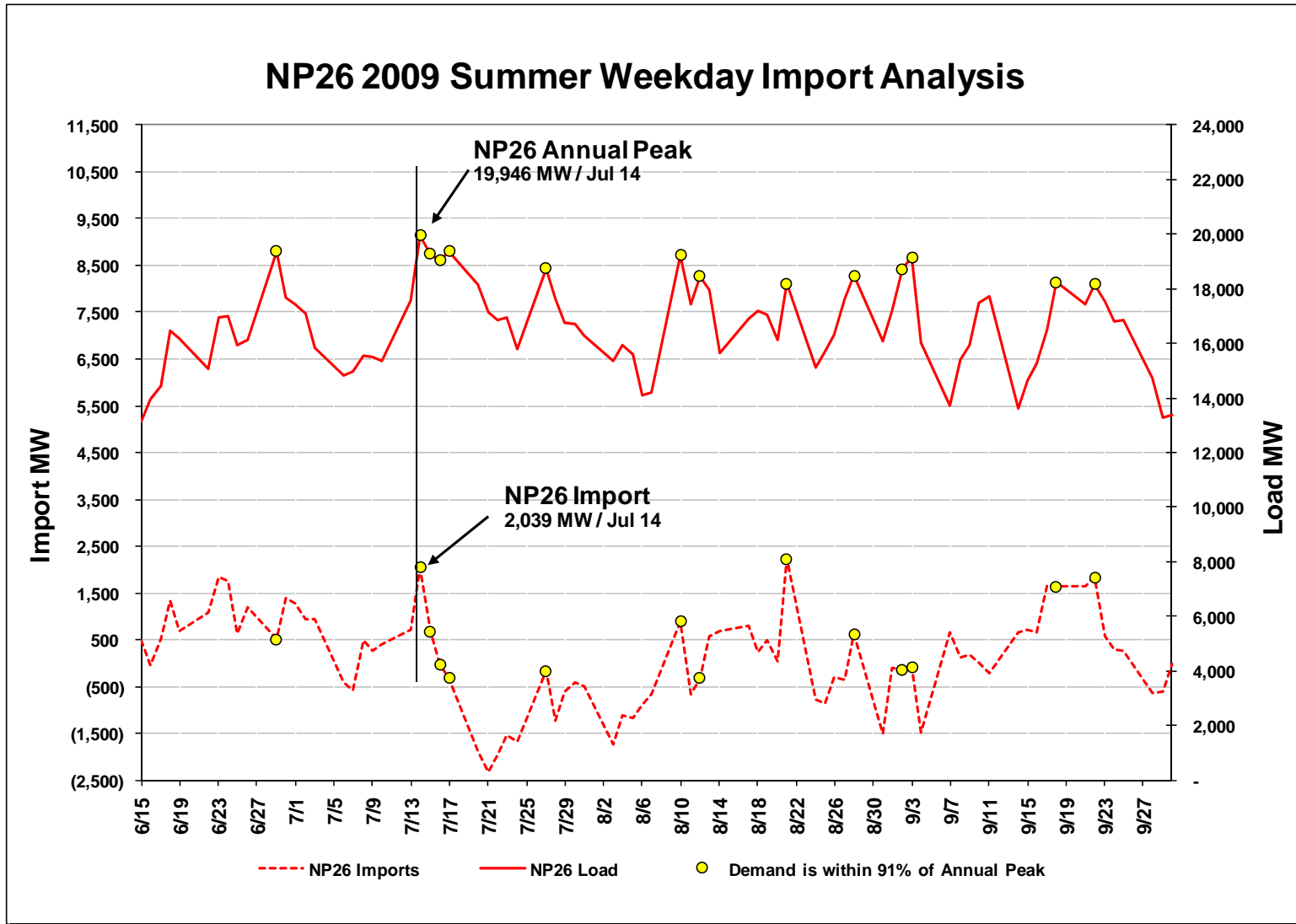
Appendix E – Continued



Appendix E – Continued



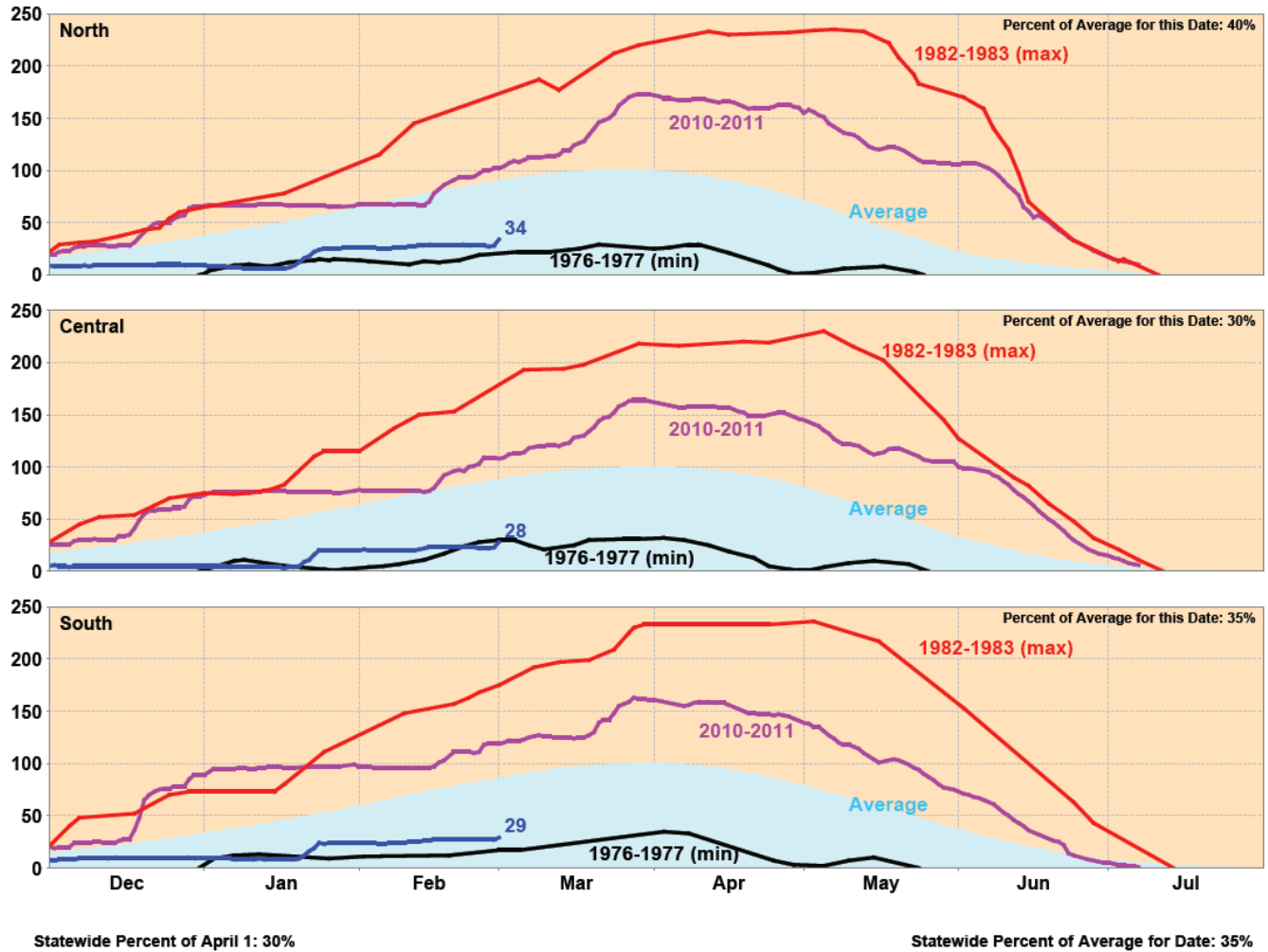
Appendix E – Continued





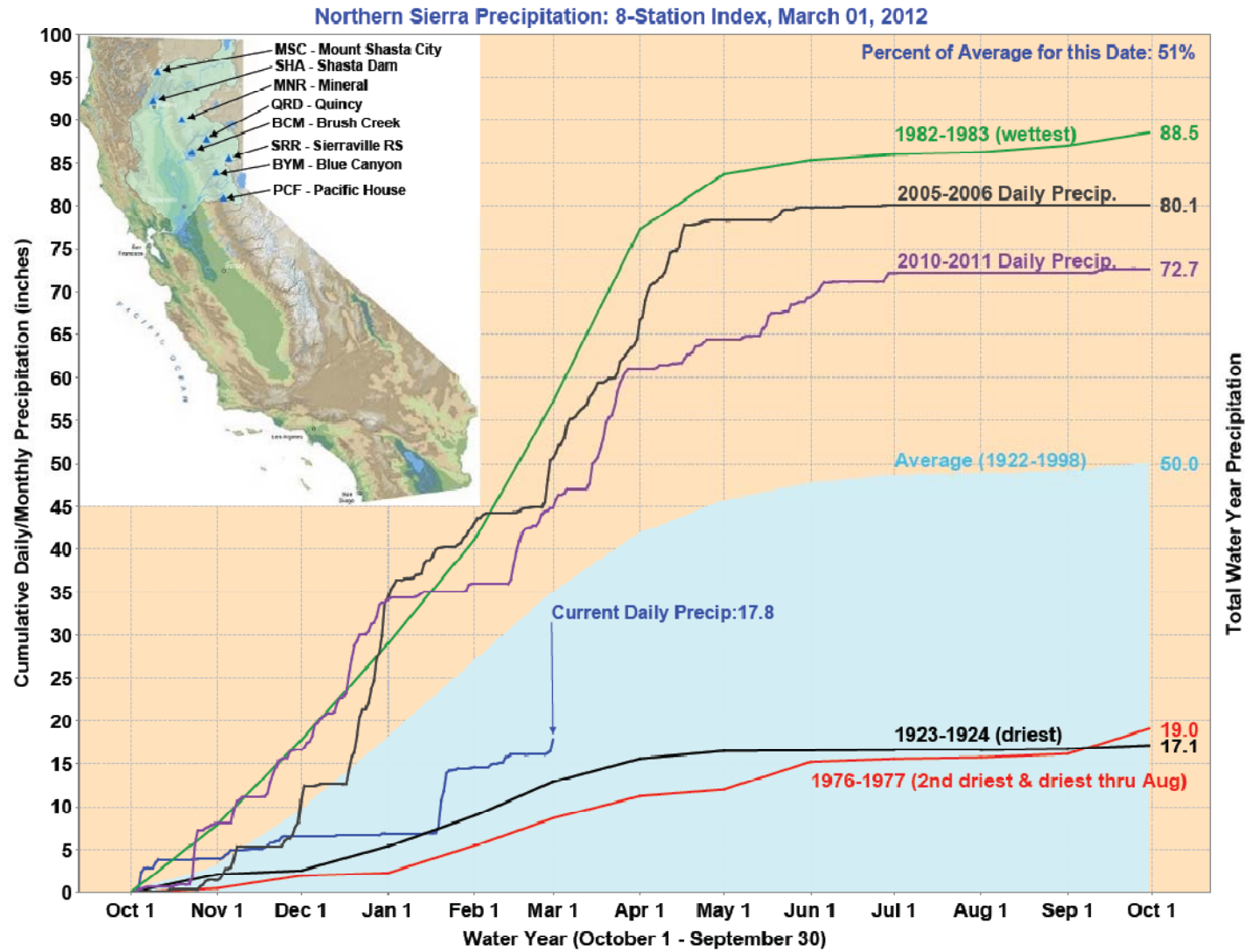
**Appendix F: 2012 California Hydrologic Conditions**

**California Snow Water Content, March 1, 2012, Percent of April 1 Average**



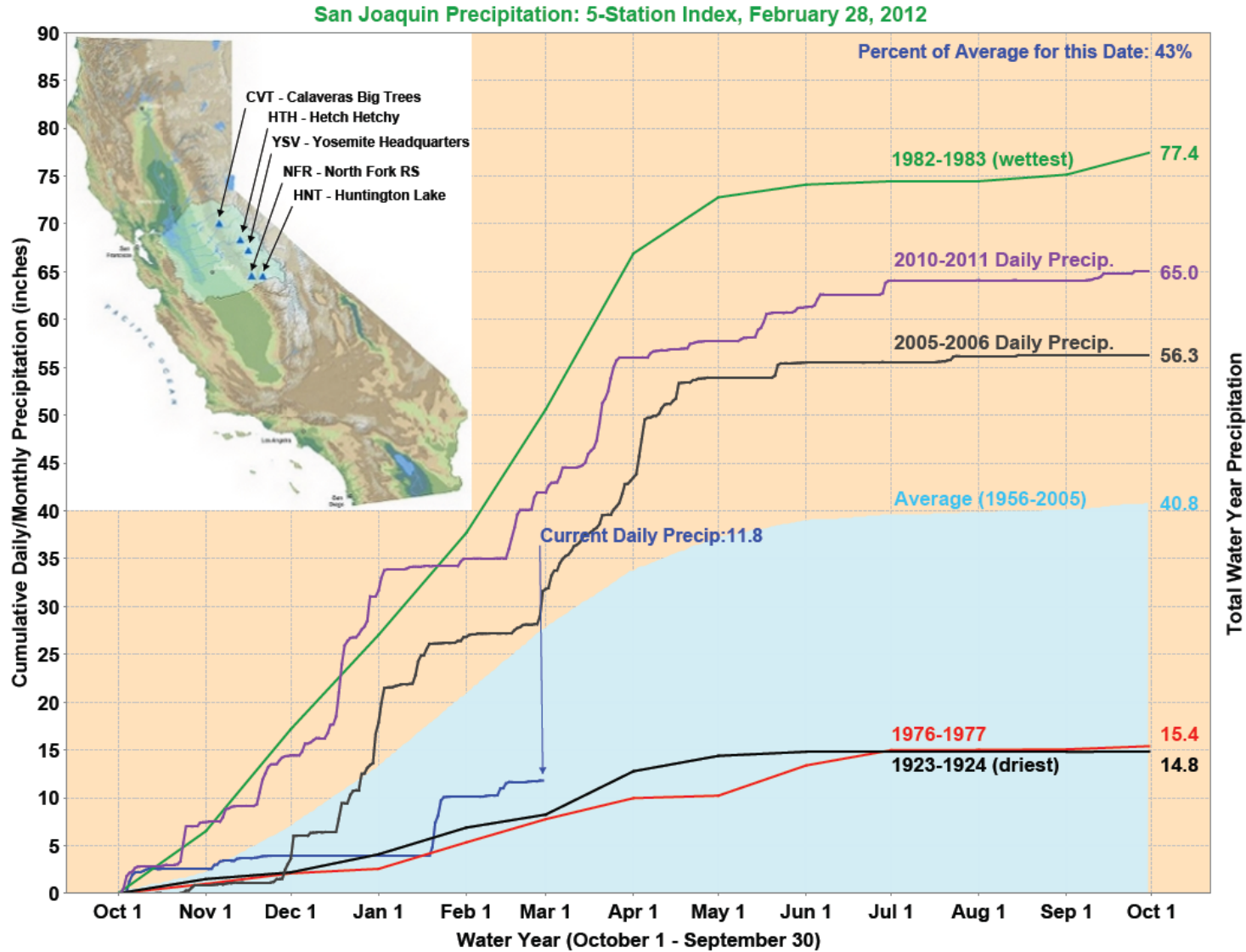
Source: California Department of Water Resources

Appendix F – Continued



Source: California Department of Water Resources

Appendix F – Continued



Source: California Department of Water Resources

