2013
SUMMER LOADS & RESOURCES ASSESSMENT

May 6, 2013

California ISO

Shaping a Renewed Future

Prepared by: Interconnection Resources

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I. EXECUTIVE SUMMARY

The *2013 Summer Loads and Resources Assessment* provides an analysis of the upcoming summer supply and demand outlook in the California Independent System Operator balancing authority area. The ISO works with generation, transmission owners, load serving entities and other balancing authorities to formulate the summer forecast and identify any issues regarding upcoming operating conditions. Typically, the loads and resources assessment considers the conditions across the entire ISO balancing authority area as a whole (representing about 80 percent of California), and then further considers the conditions in the Northern California zone (North of Path 26 or NP26) and the Southern California zone (South of Path 26 or SP26) separately.

This year all of the analyses provided in this report are based on the assumption that both SONGS units are unavailable for this summer. Besides being a significant system generation resource in the SP26 zone, SONGS has played a key role in supporting the electric reliability of southern Orange County and San Diego more specifically. Therefore, this report goes beyond the traditional balancing authority and zonal analysis to address the local reliability concerns for southern Orange County and San Diego. The reliability concerns related to the SONGS outage and measures being taken to help mitigate the absence of SONGS capacity are discussed below.

Overall, the system and zonal results presented in this report are fairly similar to last year's report. Peak demand is forecast to be 2.3 percent higher than the 2012 forecast, but generation additions have kept pace with load growth. However, reliability concerns in specific areas of Southern California are expected to be marginally more challenging as a result of the continuing shutdown of the San Onofre Nuclear Generation Station (SONGS), the largest supplier of electricity in the region. Once again, areas facing reliability risks during heat waves and other adverse conditions continue to be southern Orange County and San Diego.

Local Reliability Concerns due to SONGS Outage

The increased concern for southern Orange County and San Diego is most notably due to the conversion this year of Huntington Beach units 3 & 4 from 452 megawatts (MW) of generation capacity available last summer to reactive support devices (i.e., synchronous condensers) for this summer. These synchronous condensers coupled with the additional reactive support being installed on the SCE system in the vicinity of SONGS, largely offset the local support lost by the retirement of the Huntington Beach units 3 & 4 as generators. However, additional load growth in the LA Basin, which adds to the peak demand, accounts for why local reliability conditions in the south Orange and San Diego counties are likely to be marginally more challenging this summer compared to last.

If critical high-voltage transmission lines are out of service, due to wildfires or other conditions, deficient voltage levels may occur under peak load conditions that could trigger localized customer outages. Furthermore, the absence of SONGS results in potential overloading of local transmission lines under certain contingencies. The following actions are underway to assist in mitigating these reliability risks.

- **Conversion of Huntington Beach Units 3 & 4 to Synchronous Condensers –** Converting these retired generating units to synchronous condensers will provide voltage support in the vicinity of SONGS. This conversion is underway and expected to be completed by June 26.
- **Installation of additional reactive support devices near SONGS -** SCE is in the process of completing installation of 80 MVAR capacitors at each of the Santiago and Johanna substations and two 80 MVAR capacitors at the Viejo substation. The transmission upgrades should be on line by June 1, 2013.
- **Barre-Ellis reconfiguration -** SCE is in the process of reconfiguring the Barre - Ellis 220 kilovolt (kV) lines from the existing two circuits to four. This work is expected to be completed by June 15, 2013**.**

While these mitigation steps and new inland power plant generation will lower the reliability risks as a result of not having SONGS available, southern Orange County and San Diego remain susceptible to reliability concerns and will require close attention during summer operations – particularly during critical peak days and in the event of wildfires that could potentially force transmission lines out of service.

During these types of conditions, both demand response programs and *Flex Alert* conservation appeals will likely be used to lessen the strain on the grid.

Overall ISO System-wide and Zonal Reliability

Beyond the local concerns, the summer assessment projects adequate supply for meeting 2013 summer peak conditions for the ISO grid at the system wide level and for the NP26 and SP26 regions taken as a whole. This projection is based on examining both planning reserve margins (total supply margins no plant outages) and operating reserve margins (planning reserves adjusted for expected/historical generation outages)

The summer 2013 supply and demand outlook for the entire ISO system and the NP26 (Northern California) and SP26 (Southern California) zones are shown in Tables 1 through 3. Planning reserve margins under the normal peak demand scenario are expected to be 33.3% for the ISO system, 31.0% for SP26, and 38.8% for NP26 (*Table 1*).

Operating reserve margins under normal summer conditions are expected to be 20.4% for the ISO system, 23.3% for SP26 and 21.1% for NP26 (*Table 2* and *Figure 1)*. Both the planning reserve margin and the normal operating reserve margin are projected to be greater than the California Public Utility Commission's 15% resource adequacy requirement for planning reserves. The operating reserve margins for the normal scenarios from 2005 to 2013 are shown in *Figure 2*. The normal scenario for operating reserves is defined for system and zonal conditions as moderate net imports, 1-in-2 generation outages, and 1-in-2 peak demand. A 1-in-2 event means the event has an equal probability of the outcome falling below the forecast value or exceeding the forecast value.

Under an extreme peak demand and generation outage scenario, operating reserve margins are projected to drop to 10.4% for the ISO system, 6.2% for SP26 and 7.1% for NP26 (*Table 3* and *Figure 1*), which are above the firm load shedding threshold of 3%. The extreme scenario is defined as low imports, 1-in-10 generation outages, and 1-in-10 peak demand. A 1-in-10 event means the event has a 90% probability of the outcome being less than or equal to the forecast value, or conversely, a 10% probability of the outcome being greater than or equal to the forecast value.

Table 1

Planning Reserve Margins

Summer 2013 Supply & Demand Outlook (Planning Reserve Margins)			
Resource Adequacy Planning Conventions	**ISO**	**SP26**	**NP26**
Existing Generation[1]	50,177	23,380	26,797
Retirement	0	0	0
High Probability Addition[2]	891	735	156
Net Interchange (Moderate)[3]	9,800	9,800	2,100
Total Net Supply (MW)[4]	60,868	33,915	29,053
DR & Interruptible Programs[5]	2,322	1,781	541
Demand (1-in-2 Summer Temperature)[6]	47,413	27,253	21,328
Planning Reserve Margin[7]	**33.3%**	**31.0%**	**38.8%**

The ISO peak demand is projected to reach 47,413 MW during summer 2013 1-in-2 weather conditions, which is 738 MW more than the actual peak 46,675 MW recorded in 2012. The increase in the ISO peak demand forecast is a result of a moderate economic recovery forecast for 2013 from Moody's Analytics as compared to their 2012 economic base case forecast.

[1] Refer to Table 7
[2] Refer to Table 6
[3] Refer to Table 9. Net Interchanges of ISO, SP26 and NP26 are not coincident
[4] Total Net Supply = Existing Generation + High Probability Additions – Retirements + Net Interchange
[5] Refer to Table 10
[6] Refer to Table 11
[7] Planning Reserve Margin = [(Total Net Supply + Demand Response + Interruptible) / Demand] – 1

Table 2

Normal Scenario Operating Reserve Margins

Summer 2013 Outlook - Normal Scenario 1-in-2 Demand, 1-in-2 Generation Outage and Moderate Imports			
Resource Adequacy Conventions	**ISO**	**SP26**	**NP26**
Existing Generation	50,177	23,380	26,797
Retirement	0	0	0
High Probability Additions	891	735	156
Hydro Derate[8]	(1,022)	(239)	(782)
Outages (1-in-2 Generation)[9]	(5,067)	(1,866)	(2,994)
Net Interchange (Moderate)	9,800	9,800	2,100
Total Net Supply (MW)[10]	54,779	31,809	25,277
DR & Interruptible Programs	2,322	1,781	541
Demand (1-in-2 Summer Temperature)	47,413	27,253	21,328
Operating Reserve Margin[11]	**20.4%**	**23.3%**	**21.1%**

Table 3

Extreme Scenario Operating Reserve Margins

Summer 2013 Outlook - Extreme Scenario 1-in-10 Demand, 1-in-10 Generation Outage and Low Imports			
Resource Adequacy Conventions	**ISO**	**SP26**	**NP26**
Existing Generation	50,177	23,380	26,797
Retirement	0	0	0
High Probability Additions	891	735	156
Hydro Derate[8]	(1,022)	(239)	(782)
High Outages (1-in-10 Generation)[9]	(6,704)	(3,500)	(4,132)
Net Interchange (Low)	8,600	9,200	1,300
Total Net Supply (MW)[10]	51,942	29,576	23,339
DR & Interruptible Programs	2,322	1,781	541
High Demand (1-in-10 Summer Temperature)	49,168	29,519	22,290
Operating Reserve Margin[11]	**10.4%**	**6.2%**	**7.1%**

[8] Hydro derates may increase if early runoff experienced in late April and early May continues

[9] refer to Table 8

[10] Total Net Supply = Existing Generation + High Probability Additions – Hydro Derate – Retirements – Outages + Net Interchange

[11] Operating Reserve Margin = [(Total Net Supply + Demand Response + Interruptible) / Demand] – 1

Figure 1

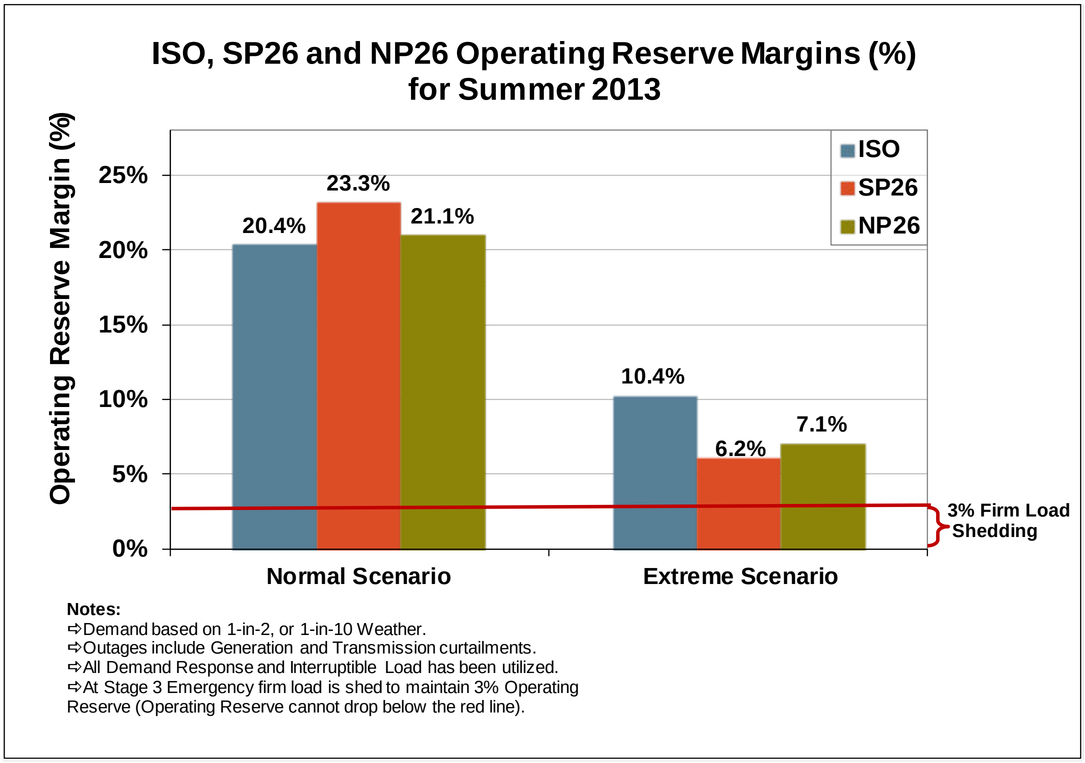

Figure 1 shows adequate operating reserve forecast margins under the normal and extreme scenarios. The operating reserve margins for ISO, SP26 and NP26 were above the 3% firm load shedding threshold in the extreme scenario.

Figure 2

Figure 2 shows forecasts of normal operating reserve margins have remained ample and fairly consistent since 2009.

The ISO projects that 51,068 MW of net qualifying capacity (NQC) will be available for summer 2013. A total of 3,393 MW of new generation since last year's report is included in the 51,068 MW. This 3,393 MW is made up of 2,502 MW that reached commercial operation during June 1, 2012 to April 1, 2013 and are therefore also included in current existing generation of 50,177 MW in Tables 1 – 3, and an additional 891 MW that is expected to reach commercial operation during the April 2, 2013 to June 1, 2013 timeframe. Natural gas generation occupies 90% of the expected 891 MW. The net qualifying capacity of 51,068 MW and the current existing generation of 50,177 MW do not include SONGS units 2 and 3 as these units are assumed to be unavailable during the summer and excludes Huntington Beach units 3 and 4 due to their retirement and ongoing conversion to synchronous condensers.

The NQC is the maximum capacity eligible and available for meeting the CPUC resource adequacy requirement counting process. The ISO determines the NQC 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 2013 summer derate of 1,022 MW was applied to the hydro resources in the ISO system, but could increase if the hotter than normal weather conditions persist. Current snow water content, as measured on May 2, 2013, was 17% of statewide normal, 16% for the north, 23% for central and 9% for south. The amount of water available during the summer for hydro generation depends on weather conditions and the estimated hydro derate will be less during the early part of the summer season. The 1,022 MW derate is likely to become a reality during late August and September, particularly if California experiences extended hot weather. Key reservoir levels could be of concern as some below normal reservoir levels are likely to impact pumped storage capabilities as water deliveries continue to draw down reservoir levels. It is important to note that hydro capability does not contribute to the Southern California local capacity needs and therefore the hydro derates will not directly impact the reliability concerns related to the SONGS outages.

The 2013 summer imports are projected to vary from 8,600 MW to 11,400 MW for the ISO, 9,200 MW to 11,300 MW for SP26, and 1,300 MW to 3,000 MW for NP26. The projected 2013 moderate import for the ISO is 9,800 MW, which is lower than last year. Actual ISO, SP26 and NP26 imports in 2012 decreased from 2011 because of higher in-state generation supply at the peak time. Having sufficient imports are essential in maintaining system reliability under extreme conditions.

An estimated 2,322 MW of demand response and interruptible load programs will be available to deploy during summer 2013. 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.

Summer Preparation Activities and Future Issues

Producing this report and publicizing its results 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, natural gas providers and neighboring balancing authorities. The ISO's ongoing relationships with these entities help to ensure everyone is prepared during times of system stress.

It is important for new generation investment to keep pace with future anticipated generation retirements and future anticipated load growth when economic conditions improve. Significant amounts of new renewable generation has reached commercial operation and this trend is expected to continue as new renewable generation comes online to meet the state's 33% renewables portfolio standard (RPS). A certain amount of flexible and fast responding resources will need to be maintained on the system to ensure the success of the 33% RPS goal. A noteworthy challenge in this area will be the roughly 10,832 MW of natural gas fired capacity subject to the once-through-cooling regulation, which will require coastal power plants that use ocean water for cooling to be retired, retrofitted or repowered. 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 2012 REVIEW

Demand

The 2012 summer peak demand reached 46,675 MW on August 13, 2012, an increase of 1,246 MW, or 2.7% over the 45,429 MW 2011 summer peak demand. The SP26 summer peak demand of 26,712 MW and NP26 peak demand of 20,136 MW were coincident with the ISO summer peak.

Figure 3 shows ISO, SP26 and NP26 actual monthly peak demand from 2006 to 2012. The ISO summer peak dropped each year from 50,085 MW in 2006, which was high because of extreme weather conditions and a stronger economy, to 45,809 MW in 2009 as demand moderated during the recession and rose to 47,127 MW in 2010, to 45,429 MW in 2011 and recovered to 46,675 MW in 2012. The ISO, SP26 and NP26 daily peaks from June to September 2012 are shown in Appendix A: 2012 Summer Peak Load Summary Graphs.

Figure 3

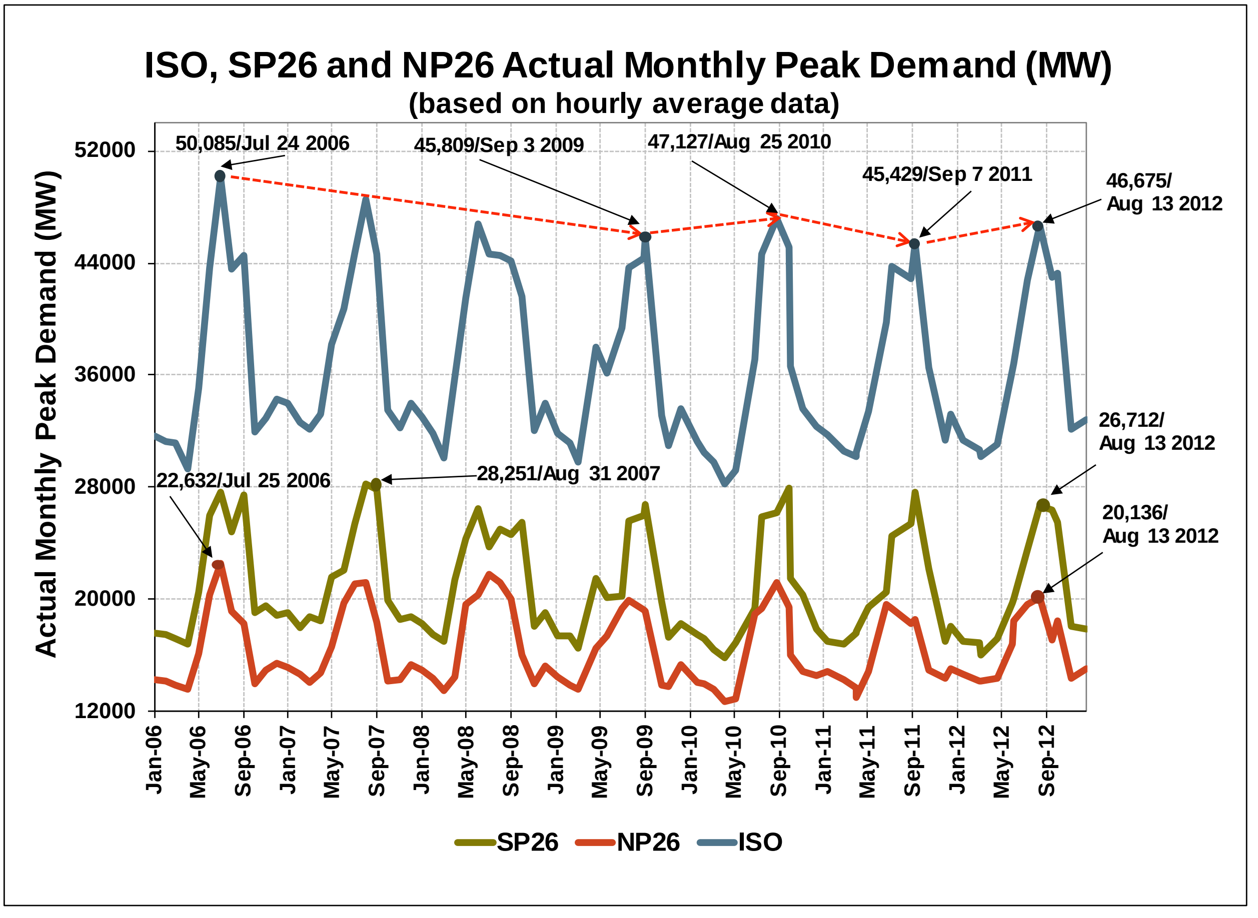

Figure 3 shows the ISO balancing authority system peak as well as peaks for Northern and Southern California. Starting in 2006, the summer ISO peak demand gradually declined to 2009, somewhat recovered in 2010, dropped in 2011, and rose in 2012.

Table 4 shows the difference between 2012 actual peak demands and 2012 1-in-2 peak demand forecasts. The ISO peak demand in 2012 was categorized as approximately the 62th percentile or 1-in-2.65 temperature event. The 62th percentile represents a point at which 62 percent of the probable outcomes will be equal to or less than this value.

The actual peak demand in Northern California was 566 MW lower than 1-in-2 forecast peak demand for NP26. The weather at the time of the NP26 peak demand was the 16th percentile or 1-in-1.19 temperature event. This mild temperature in Northern California was the main contributor to the actual peak demands being lower than 1-in-2 forecast peak demands for NP26. Other parameters in the load forecast model also contributed, including slower than forecast economic growth in 2012.

The actual peak demand in Southern California was 687 MW lower than the 1-in-2 forecast peak demand for SP26, despite the actual weather conditions reaching the 73th percentile or 1-in-3.75 temperature event. This anomalous result is because of differences in non-weather parameters in the load forecast model, including but not limited to the difference between the realized economic growth in Southern California and the assumptions incorporated into the forecast. The downward impact of these other variations from forecast more than offset the upward impact of higher than average temperatures.

Table 4

2012 ISO Actual Peak Demand vs. Forecasts				
	1-in-2 Forecast (MW)	Actual (MW)	Difference from 1-in-2 Forecast (MW)	Difference from 1-in-2 Forecast (%)
ISO	46,352	46,675	323	0.7%
SP26	27,399	26,712	-687	-2.5%
NP26	20,702	20,136	-566	-2.7%

Generation

Generation in the ISO balancing authority is primarily fueled by natural gas (62.9%), followed by 18.3% renewables portfolio standard (RPS) resources, 13.6% large hydro, 3.8% nuclear excluding SONGS units 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.[12] The conventional resources included natural gas, nuclear, oil and coal (*Appendix B: 2013 ISO NDC and RPS by Fuel Type*).

A total of 11,126 MW[13] of renewables generation has reach full commercial operation and is composed of 49.8% wind, 15.6% solar, 14.0% geothermal, 11.5% small hydro,

[12] Renewable Energy and RPS Eligibility; website: http://www.cpuc.ca.gov/PUC/energy/Renewables/FAQs/01REandRPSeligibility.htm

[13] The March 14, 2014 ISO briefing to its Board of Governors on renewables in the generator interconnection queue (link below) stated on page 4 that "The ISO currently has 11,922 MW of operating

5.5% biomass, and 3.6% 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 is helping to mitigate this risk.

Generation Outages

The average generation outages in 2012 were higher than in 2011, with a significant contribution being the SONGS outages. ISO average generation outage from June 2012 to September 2012 was 8,220 MW or 2,160 MW higher than that in 2011. SP26 average outage was 4,307 MW, or 1,317 MW higher than that in 2011. NP26 average outage was 3,913 MW or 843 MW higher than that in 2011.

Graphs in *Appendix C: 2010 – 2012 Summer Generation Outage Graphs* show the weekday hour-ending 16:00 forced and planned outage amounts during the summer peak days from June 15 through September 30 for the 2010, 2011, and 2012 (excluding holidays). A forced outage is the outage where the equipment is unavailable due to unanticipated failure. The removal from service availability of a generating unit, transmission line, or other facility is for emergency reasons. A planned outage is the outage where the shutdown of a generating unit, transmission line, or other facility, is for inspection or maintenance, in accordance with an advance schedule. 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. An ambient outage is a special type of outage where the cause is due to ambient conditions outside of the resource operator's control. The ambient conditions include geomagnetic disturbance, earthquake, catastrophe, lack of fuel, lack of water, low steam pressure or air permission limits. Normal outage is the outage when the unit cannot response to a dispatch due to designed operations.

Imports

Figure 4 shows the 2012 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 (refer to Imports section on page 16).

The average imports at peak decreased in 2012. The ISO average import at the peak decreased from 10,395 MW in 2011 to 9,199 MW in 2012. The SP26 import at its peak decreased from 11,300 MW in 2011 to 8,513 MW in 2012. The NP26 import at its peak decreased from 2,819 MW in 2011 to 997 MW in 2012. These decreases were due in part to higher in-state generation dispatch in 2012. *(Appendix D: 2010 – 2012 Summer Imports Summary Graph)*

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renewable generation within its footprint." This amount includes renewable generating facilities that are partially operational, but have not reached commercial operation. Non-commercial generation was not included in the 11,126 MW amount.
http://www.caiso.com/Documents/BriefingRenewableGenerationISO_GeneratorInterconnectionQueue-Memo-Mar2013.pdf

Figure 4

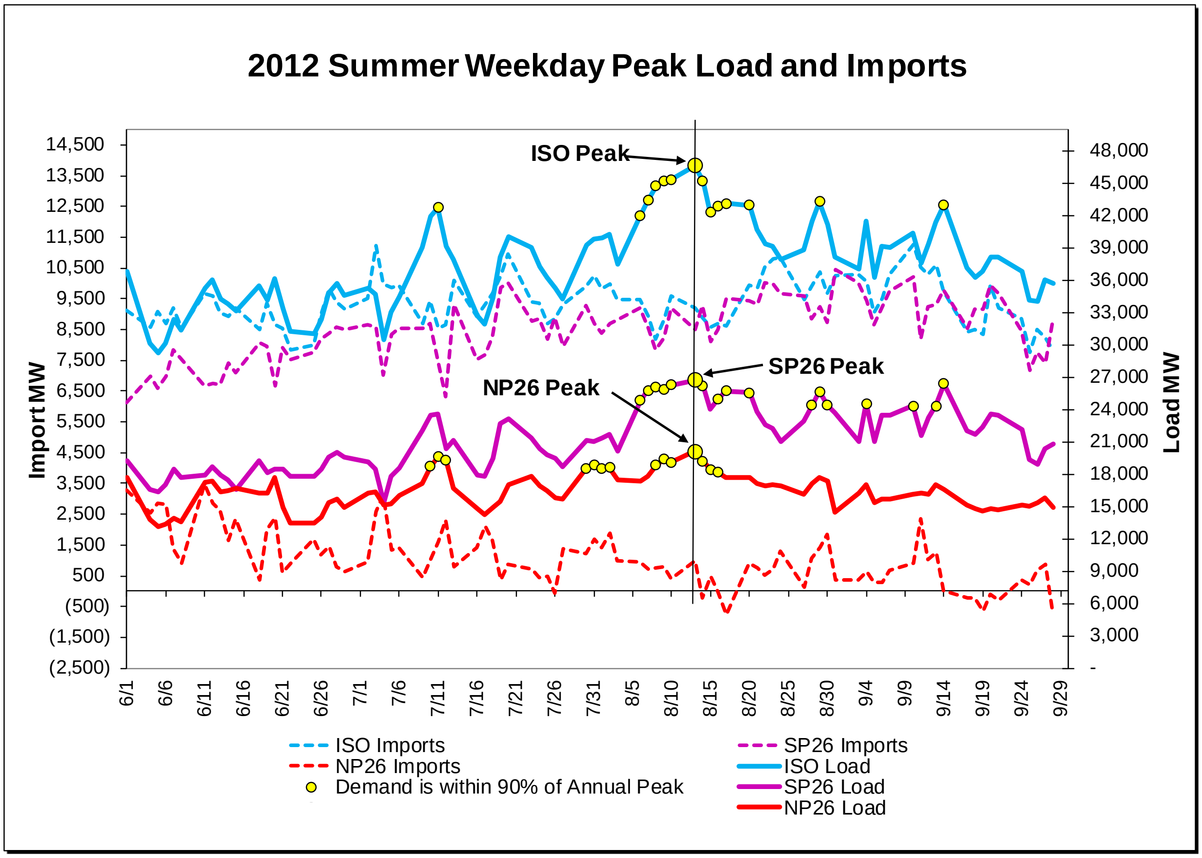


Figure 4 shows the amount of imports at ISO daily system peaks.

III. SUMMER 2013 ASSESSMENT

Generation

Total ISO generation NQC for 2013 summer peak is estimated to be 51,068 MW, a 3,393 MW increase from June 1, 2012. This additional amount will help meet an expected 738 MW of load growth forecast for this summer. The NQC is the maximum capacity eligible and available for meeting the CPUC resource adequacy requirement counting process. To account for the variable output of intermittent resources the NQC calculation process uses a three-year rolling average of historical production data to determine the NQC for each wind, solar, or other non-dispatchable resource. The NQC for dispatchable resources depends on its availability and deliverability. The ISO determines the net qualifying capacity by testing and verification as outlined in the ISO tariff and the applicable business practice manual.

The largest available generation resource type is natural gas generation accounting for 71.5% and the second largest generation type is hydro accounting for 15.3%. Non-hydro renewables including geothermal, biogas, biomass, wind and solar units make up about 7.7%. Nuclear generation accounts for 4.3% without both SONGS units while coal and oil generation provide 1.2%. On-peak NQC by fuel type is shown in *Appendix E: 2013 ISO Summer On-Peak NQC Fuel Type.*

Generation Addition

Table 5 shows that a total of 2,502 MW of NQC came on line in the ISO balancing authority from June 1, 2012 to April 1, 2013. This new NQC included 1,479 MW in SP26 and 1,023 MW in NP26. After April 2, 2013, 891 MW of additional net qualifying capacity generation is expected to come on line by June 1, 2013 as shown in *Table 6*, with 735 MW in SP26 and 156 MW in NP26. New generation with zero NQC are not listed in *Tables 5* and *6.*

Table 5

New Generating Capacity (MW) (Generation that achieved commercial operation from 6/1/ 2012 to 4/1/2013)					
Project Name	**COD**	**NDC**	**NQC (est)**	**Fuel Type**	**Area**
Desert Star Energy Center	18-Jun-12	494.6	419.3	NATURAL GAS	SCE
Pacific Wind Project	19-Jul-12	140.0	29.3	WIND	SDGE
Cantua Solar station	25-Jul-12	20.0	11.4	SUN	PGAE
Giffen Solar station	25-Jul-12	19.0	10.8	SUN	PGAE
Copper Mountain Solar 2	03-Aug-12	92.0	52.3	SUN	SCE
Lake Hodges Pumped Storage-Unit2	27-Aug-12	20.2	20.0	WATER	SDGE
Huron Solar Station	30-Aug-12	20.0	11.4	SUN	PGAE
Mariposa Energy Project	04-Sep-12	196.0	183.8	NATURAL GAS	PGAE
California Valley Solar Ranch-Phase A	19-Sep-12	210.0	119.4	SUN	PGAE
McGrath Beach Peaker	01-Nov-12	47.2	47.2	NATURAL GAS	SCE
Brea Power II	01-Nov-12	28.1	17.1	LANDFILL GAS	SCE
Tracy Combined Cycle Power Plant	01-Nov-12	332.3	299.4	NATURAL GAS	PGAE
North Palm Springs 4A Solar	02-Nov-12	4.1	2.3	SUN	SCE
SPVP018 Fontana RT Solar	24-Nov-12	1.5	0.9	SUN	SCE
SPVP005 Redlands RT Solar	24-Nov-12	2.5	1.4	SUN	SCE
SPVP007 Redlands RT Solar	24-Nov-12	2.5	1.4	SUN	SCE
SPVP042 Porterville Solar	24-Nov-12	5.0	2.8	SUN	SCE
Northern California Power Agency	27-Nov-12	280.0	280.0	Natural Gas	PGAE
Nickel 1 ("NLH1")	28-Nov-12	1.5	0.9	SUN	PGAE
North Sky River Wind Project	07-Dec-12	160.0	33.5	WIND	SCE
Shiloh IV Wind Project	08-Dec-12	100.0	20.9	WIND	PGAE
JAWBNE_2_SRWND	11-Dec-12	77.0	16.1	WIND	SCE
Kiara Anderson	12-Dec-12	6.8	4.1	WOOD WASTE	PGAE
Manzana Wind	20-Dec-12	189.0	39.6	WIND	SCE
WKN Wagner, LLC	21-Dec-12	6.0	1.3	WIND	SCE
Joya Del Sol	21-Dec-12	1.5	0.9	SUN	PGAE
SPVP044	30-Dec-12	2.5	1.4	SUN	SCE
Alta 2012 Alta Wind 7	01-Jan-13	168.0	35.2	WIND	SCE
CPC East Alta Wind IX	01-Jan-13	132.0	27.6	WIND	SCE
SPVP010	01-Jan-13	1.5	0.9	SUN	SCE
California Valley Solar Ranch-Phase B	08-Jan-13	40.0	22.7	SUN	PGAE
SPVP015	15-Jan-13	3.0	1.7	SUN	SCE
SPVP023	16-Jan-13	2.5	1.4	SUN	SCE
Wellhead Power Delano	16-Jan-13	49.0	49.0	NATURAL GAS	SCE
Alpine Solar	18-Jan-13	66.0	37.5	SUN	SCE
NRG Borrego Solar One	12-Feb-13	26.0	14.8	SUN	SDGE
Catalina Solar Project	15-Feb-13	50.0	28.4	SUN	SDGE
Alpaugh North PV Solar	08-Mar-13	20.0	11.4	SUN	PGAE
Alpaugh 50, LLC	08-Mar-13	50.0	28.4	SUN	PGAE
Atwell Island PV Solar	08-Mar-13	20.0	11.4	SUN	PGAE
Walnut Creek Energy Park	21-Mar-13	500.5	500.5	NATURAL GAS	SCE
TA-High Desert, LLC Antelope Power Plant	25-Mar-13	20.0	11.4	SUN	SCE
SOUTH SAN JOAQUIN ID (FRANKENHEIMER)	01-Apr-13	5.0	3.3	WATER	PGAE
SOUTH SAN JOAQUIN ID (WOODWARD)	01-Apr-13	2.9	1.4	WATER	PGAE
AV Solar Ranch 1, LLC	01-Apr-13	137.0	77.9	SUN	SCE
Trina Solar	01-Apr-13	2.5	1.4	SUN	PGAE
Mammoth Pacific	01-Apr-13	10.0	7.0	GEOTHERMAL	SCE
Total		3,765	2,502	ISO	
		2,438	1,479	SP26	
		1,327	1,023	NP26	

Table 6

High Probability Generation Additions Expected (MW) from 4/2/2013 to 6/1/2013					
Project Name	**Project Type**	**Estimated COD**	**NDC**	**NQC (est)**	**PTO**
Natural Gas Project	New	5/1/2013	800.0	800.0	SCE
Natural Gas Project	Replacement (Net)	5/1/2013	126.0	126.0	PG&E
Solar Project	New	5/31/2013	20.0	11.4	PG&E
Solar Project	New	6/1/2013	20.0	11.4	PG&E
Solar Project	New	6/1/2013	10.0	5.7	PG&E
Solar Project	New	6/1/2013	2.0	1.1	PG&E
Wind Project	New	6/1/2013	265.0	55.5	SDGE
Natural Gas Project	Replacement (Net)	6/1/2013	-120.0	-120.0	SCE
Total			1,123	891	ISO
			945	735	SP26
			178	156	NP26

Table 7 shows the total generation capacity changes within the ISO since June 1, 2012 and expected by June 1, 2013. The 3,393 MW of total expected generation additions consists of 24% renewable and 76% conventional generating technologies.

Table 7

Total Expected Generation change (MW) from June 1, 2012 to June 1, 2013							
	Existing	Online Additions	Retirements	Existing	High Probability Additions	Total Expected	Total of All Potential Additions
	As of 6/1/12	CODs 6/1/12 to 4/1/13	from 6/1/12 to 4/1/13	As of 4/1/13	from 4/2/13 to 6/1/13	for 2013 Summer	from 6/1/12 to 6/1/13
ISO	47,675	2,502	0	50,177	891	**51,068**	3,393
SP26	21,901	1,479	0	23,380	735	**24,115**	2,214
NP26	25,774	1,023	0	26,797	156	**26,953**	1,179

The existing commercial operation generation and expected generation for 2013 summer shown in *Table 7* was developed using the final NQC list that was used for the California Public Utilities Commission resource adequacy program for compliance year 2013, which the ISO posted to its website on March 13, 2013.[14] 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.[15]

This assessment uses all capacity available within the ISO balancing authority regardless of contractual arrangements to evaluate resource adequacy in order to 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 considered available to the ISO.

The NQC values for wind and solar are determined and annually adjusted based on actual output during peak hours 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.

Generation Unavailability

The ongoing situation at the San Onofre Nuclear Generating Station (SONGS) will impact system generator capacity by a minimum of 1,124 MW with unit 3 out of service and not scheduled to return before next fall. SCE has proposed returning unit 2 to service in June 2013, restricted to a 70% maximum output level, but the Nuclear Regulatory Commission is still reviewing the license amendment request. This report assumes all 2,246 MW will not be available during 2013 summer.

In addition, the Huntington Beach units 3 and 4 air permits were transferred to other generation on October 21, 2012 and their ISO capacity procurement mechanism contract ended. This will result in a loss of 450 MW of generation capacity for 2013 summer peak. These units are currently in the process of being converted into synchronous condensers by the summer 2013 to provide voltage support in anticipation of the continued unavailability of SONGS. As a result, the existing generation net qualifying capacity did not include 450 MW from Huntington Beach units 3 & 4.

The estimated 1-in-2 generation outages during 2013 summer peak demand for the ISO, SP26 and NP26 are 5,067 MW, 1,866 MW and 2,994 MW, respectively. The outage calculation excluded SONGS units 2 and 3 because the existing generation did not include them. The estimated 1-in-10 generation outages for the ISO, SP26 and NP26 are 6,704 MW, 3,500 MW and 4,132 MW, respectively (*Table 8)*. 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.

[14] *Net Qualifying Capacity (NQC).* Retrieved from website: http://www.caiso.com/planning/Pages/ReliabilityRequirements/Default.aspx

[15] *Master Control Area Generating Capability List* website : http://www.caiso.com/participate/Pages/Generation/Default.aspx

Table 8

Generation Outages for Summer 2013 (MW)			
	ISO	SP26	NP26
1-in-2	5,067	1,866	2,994
1-in-10	6,704	3,500	4,132

Hydrologic conditions

Hydrologic conditions for 2013 are well below average. The snowpack water content is similar to that in 2007. *Figure 5* shows the California snow water content as of May 2, 2013 and indicates that statewide snowpack was 17% of normal, 16% for the northern area, 23% for central area and 9% for southern area. The northern Sierra precipitation was 95% of the average for April 4, and southern San Joaquin was 72% of the average of April 3.

Snowpack is the best indicator of conditions for the majority of hydro generation within the ISO balancing authority area. Additional charts are provided in *Appendix F: 2013 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 2013 will depend on weather conditions between May 2, 2013 and the summer. Unusually warm conditions could accelerate snowpack melting that decreases runoff available during summer peak demand. Key reservoir levels could be of concern as some below normal reservoir levels are likely to impact pumped storage capabilities as water deliveries continue to draw down reservoir levels. It is important to note that hydro capability does not contribute to the Southern California local capacity needs and therefore the hydro derates will not directly impact the reliability concerns related to the SONGS outages.

***Figure* 5**

California Snow Water Content, May 2 2013, Percent of April 1 Average

California Snow Water Equivalents

In inches - as of May 2, 2013

Section		5/2/13
Summary By Section		
NORTH	Number of Stations Reporting	30
	Average snow water equivalent	3"
	Percent of April 1 Average	11%
	Percent of normal for this date	16%
CENTRAL	Number of Stations Reporting	40
	Average snow water equivalent	6"
	Percent of April 1 Average	18%
	Percent of normal for this date	23%
SOUTH	Number of Stations Reporting	30
	Average snow water equivalent	2"
	Percent of April 1 Average	7%
	Percent of normal for this date	9%
Statewide Summary		
	Statewide Average SWEQ	4"
	Statewide Percent of April 1	13%
	Statewide Percent of Normal	17%

Provided by the California Cooperative Snow Surveys
Report generated: 05/02/2013 06:44

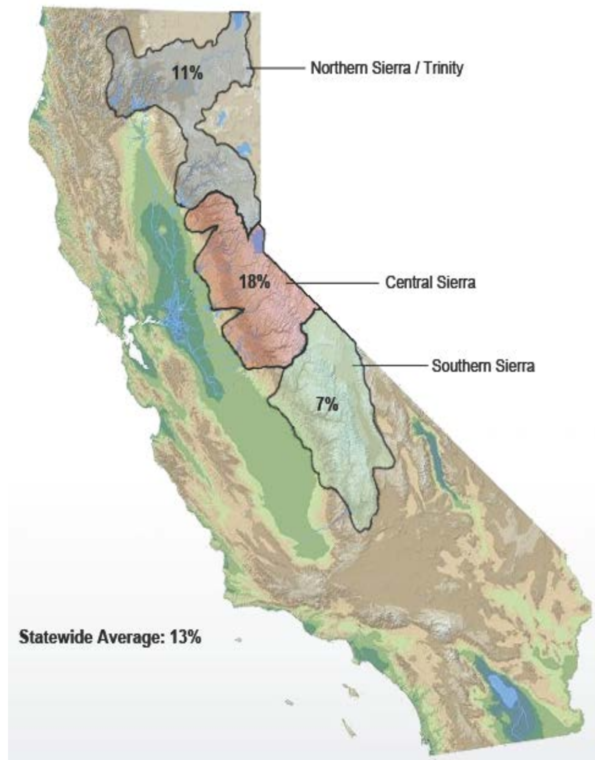


Figure 5 shows that the current snow water content is well below average in all areas.

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, accuracy of day-ahead forecasts, generation availability, transmission congestion and hydro conditions. On any given day the degree to which any one of these interrelated factors influence import levels can vary greatly.

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 a 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 9 shows the amounts of imports used for the high, moderate and low import scenarios for the 2013 assessment. Graphs of actual imports during summer 2010 to 2012 peak operating hours for the ISO system and the SP26 and NP26 zones are included in *Appendix E: 2010 – 2012 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 9

2013 Summer Outlook - Import Scenarios (MW)			
	ISO	**SP26**	**NP26**
High Net Interchange	11,400	11,300	3,000
Moderate Net Interchange	9,800	9,800	2,100
Low Net Interchange	8,600	9,200	1,300

Demand response and interruptible load programs

Table 10 shows demand response and interruptible load programs for summer 2013 based on resource adequacy criteria on summer amounts in August. Demand response and interruptible load programs reduce end-user loads in response to a high price, a financial incentive, an environmental condition or a reliability issue. They play an important role to offset the need for more generation and provide system operators with additional flexibility in operating the system during periods of limited supply.

Demand response programs include critical peak pricing, demand bidding, capacity biding, demand response contract, and peak day pricing programs whereas interruptible load programs include interruptible rates and direct control programs. Other customer voluntary curtail amounts or non-dispatchable demand response is embedded in the load forecast as natural load reductions.

The Flex Alert program is an energy conservation program funded by the investor-owned utilities and authorized by the California Public Utilities Commission. The alerts advise consumers about how and when to conserve energy. In 2012, the ISO utilized the Flex Alerts program to help reduce loads during a number of high peak demand periods to reduce the risk of potential load shedding due to issues such as local capacity limitations with SONGS out of service. The Flex Alert program continues to be a vital tool for the ISO during periods of high peak demand to maintain system reliability, using Flex Alerts as a signal that demand side resources are needed.

Table 10

Demand Response and Interruptible Load for Summer 2013 (based on summer amounts in August)			
	Demand Response	Interruptible Load	Total Program Amounts
ISO	810	1,512	2,322
SP26	536	1,245	1,781
NP26	274	267	541

Demand

The 47,413 MW 1-in-2 peak demand forecast for 2013 is 2.3% above the 2012 1-in-2 forecast and 1.6% above the actual 2012 summer peak demand. The increase represents a modest economic recovery over 2012 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 peak load forecasts. The inputs to the models are historical peak loads, calendar information, economic and demographic data, and weather data. The weather data came from 24 weather stations located throughout the large population centers within the ISO balancing authority. Weather data used in the model includes maximum, minimum and average temperatures, cooling degree days, heat index, relative humidity, solar radiation indexes, as well as a 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, 2012.

Peak load data is based on 60-minute average peak demands. Water delivery 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 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 2012 historical weather was used, which produces 126 weather scenarios. The scenarios are used to 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.

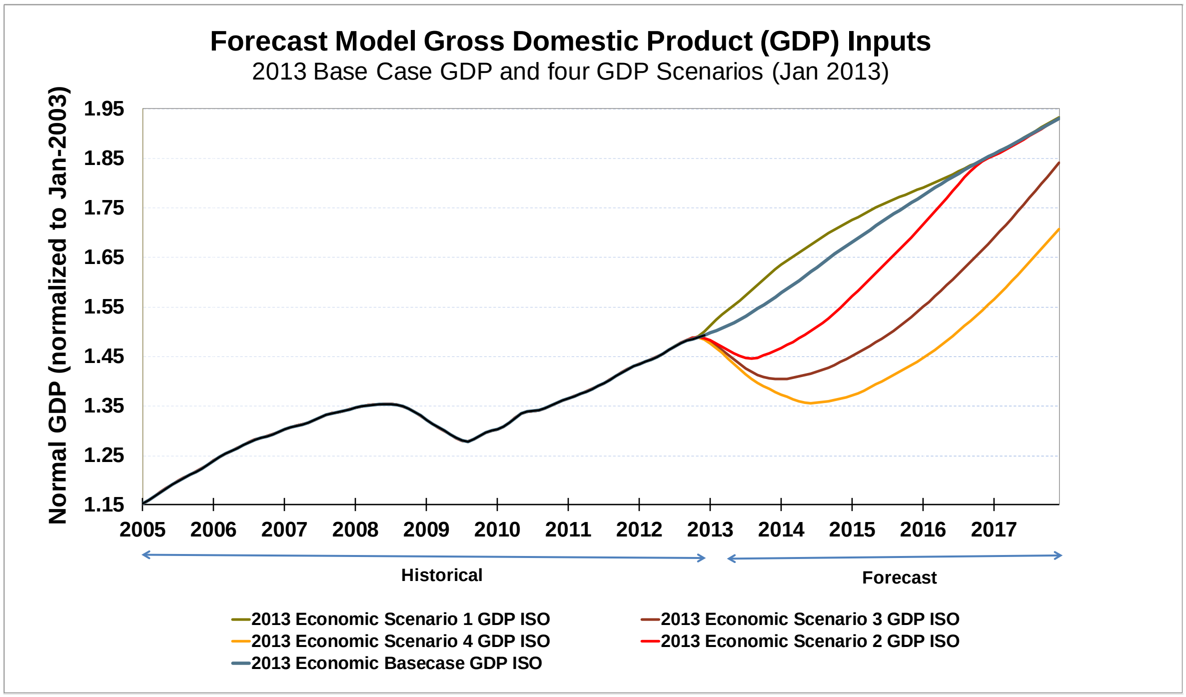
A base case forecast model is developed using baseline economic forecast data. The models are then trained with these new data. Five load forecast scenarios were developed using five economic scenario forecasts representing different outlooks of how the economy will perform based on different assumptions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

- <u>Scenario 1</u> is a stronger recovery in the 2013 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.
- <u>Scenario 2</u> 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.
- <u>Scenario 3</u> 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.
- <u>Scenario 4</u> 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 – Jan 2013

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

In *Figure 6, s*cenario 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 Dec 31, 2012.

It is important to note that these forecasts are based on the Moody's gross domestic product forecasts released in December 2012. 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 2011 (January 2012 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 2012 GDP forecast to their 2013 GDP forecast. Moody's 2013 forecast is a more conservative economic recovery forecast as compared to their 2012 economic base case forecast where the forecast for August 2013 GDP decreased 2% from 2012 to 2013.

Figure 8 shows ISO 1-in-2 peak demand forecasts based on the five economic scenarios from Moody's. The 2013 base case peak demand forecast and the scenario 1 forecasts by area are provided in *Table 11* and *Table 12,* respectively. The forecasted 1.6% increase in ISO demand represents a moderate level of economic recovery over 2012. 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* 7**

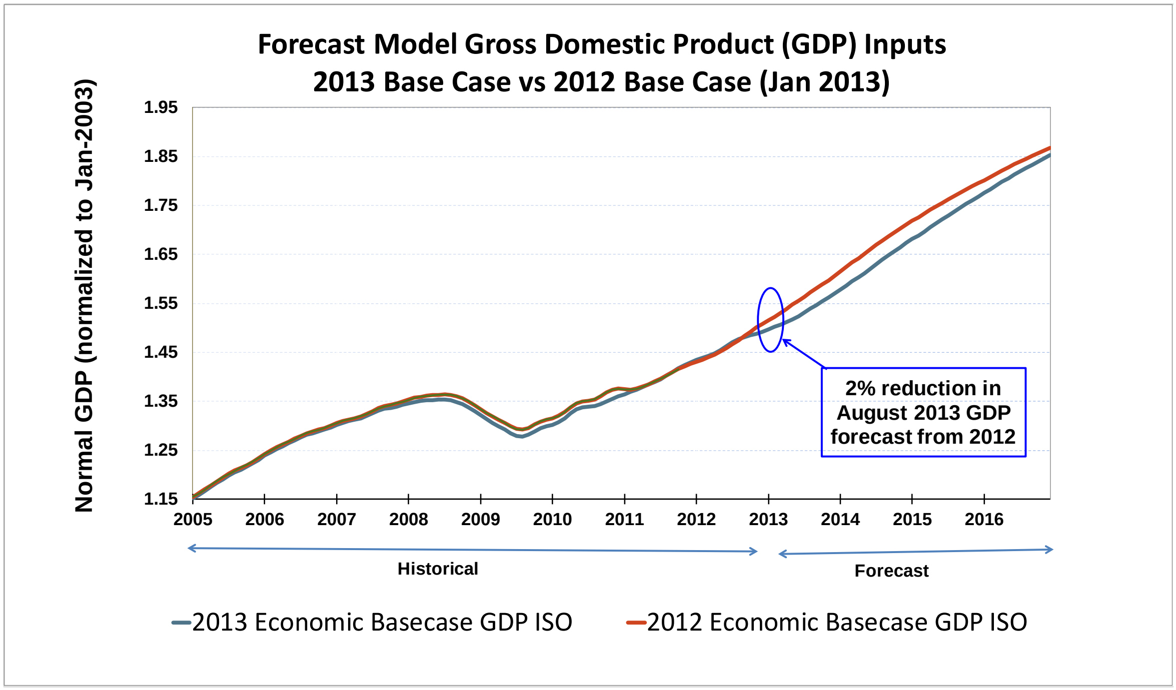


Figure 7 shows the difference between 2012 Economic base case GDP ISO and 2013 Economic base case GDP ISO.

***Figure* 8**

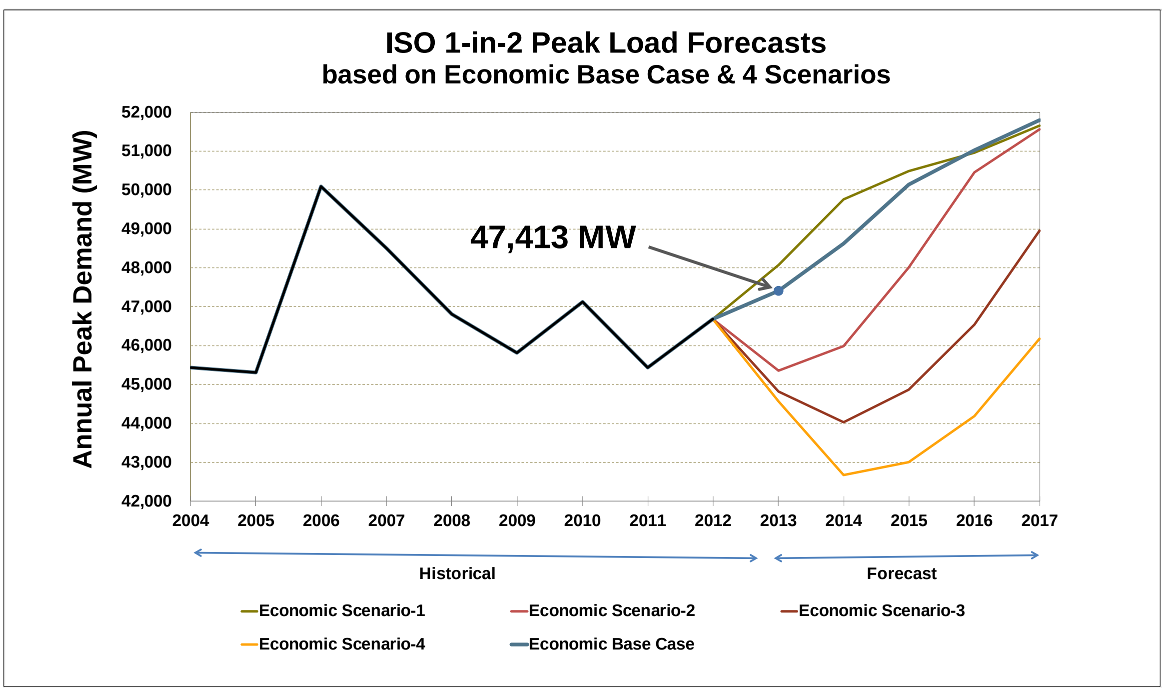


Figure 8 shows that as the economy improves in 2013 (see *Figure 6*) the ISO annual peak demand will increase in close parallel with base case.

Table 11

2013 Peak Demand Forecast vs. 2012 Actual Peak Demand 2013 Peak Demand Forecast based on 2013 economic base case					
	Probability	Percentile	2013 Forecast	2012 Actual	% Change
ISO	1-in-2	50^{th}	47,413	46,675	1.6%
SP26	1-in-2	50^{th}	27,253	26,712	2.0%
NP26	1-in-2	50^{th}	21,328	20,136	5.9%

Table 12 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 12

2013 Peak Demand Forecast vs. 2012 Actual Peak Demand 2013 Peak Demand Forecast based on 2013 economic scenario-1					
	Probability	Percentile	2013 Forecast	2012 Actual	% Change
ISO	1-in-2	50^{th}	48,145	46,675	3.2%
SP26	1-in-2	50^{th}	27,591	26,712	3.3%
NP26	1-in-2	50^{th}	21,484	20,136	6.7%

Table 13 and *Table 14* provided a comparison of 1-in-2, 1-in-10 and 1-in-20 probability peak demand forecasts based on the 2013 economic base case and the 2013 economic scenario 1, using the 2012 peak demand forecasts from the 2012 economic base case as a point of reference.

Table 13

2013 Peak Demand Forecast vs. 2012 Peak Demand Forecast 2013 Peak Demand Forecast based on 2013 economic base case 2012 Peak Demand Forecast based on 2012 economic base case					
	Probability	Percentile	2013 Forecast	2012 Forecast	% Change
ISO	1-in-2	50th	47,413	46,352	2.3%
	1-in-10	90th	49,168	48,744	0.9%
	1-in-20	95th	50,475	50,719	-0.5%
SP26	1-in-2	50th	27,253	27,399	-0.5%
	1-in-10	90th	29,519	29,414	0.4%
	1-in-20	95th	30,067	29,766	1.0%
NP26	1-in-2	50th	21,328	20,702	3.0%
	1-in-10	90th	22,290	21,977	1.4%
	1-in-20	95th	23,231	22,641	2.6%

Table 14

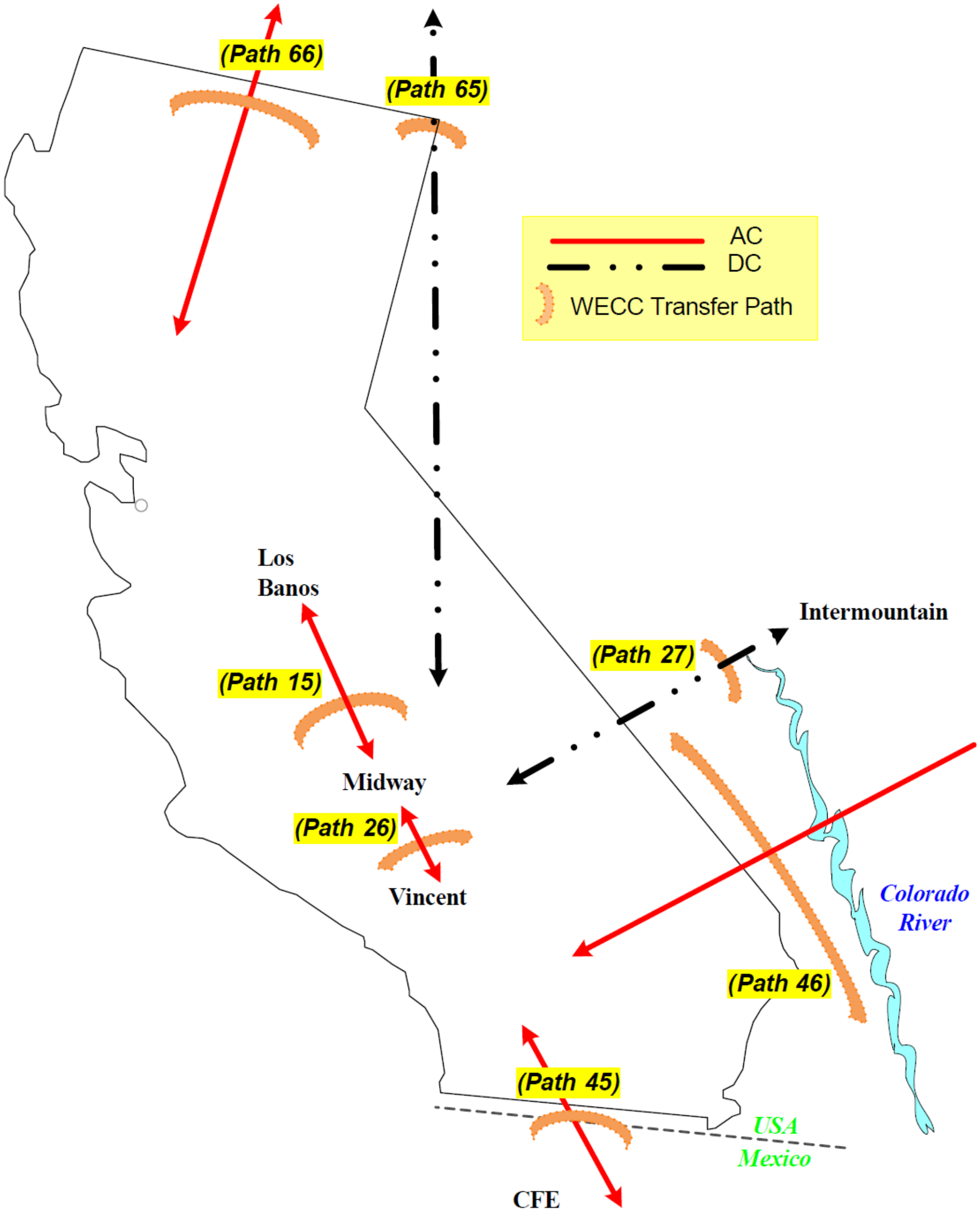
2013 Peak Demand Forecast vs. 2012 Peak Demand Forecast 2013 Forecast based on 2013 economic scenario-1 2012 Forecast based on 2012 economic scenario-1					
	Probability	Percentile	2013 Forecast	2012 Forecast	% Change
ISO	1-in-2	50th	48,145	46,639	3.2%
	1-in-10	90th	50,033	49,085	1.9%
	1-in-20	95th	51,250	51,384	-0.3%
SP26	1-in-2	50th	27,591	27,610	-0.1%
	1-in-10	90th	29,896	29,680	0.7%
	1-in-20	95th	30,493	30,010	1.6%
NP26	1-in-2	50th	21,484	20,806	3.3%
	1-in-10	90th	22,497	22,075	1.9%
	1-in-20	95th	23,406	22,771	2.8%

Transmission

The WECC sets the operating transfer capability limits on transmission paths on a seasonal basis. *Figure* 9 shows the main transmission paths for California ISO. The critical transmission paths 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 ISO performed a seasonal transmission operations assessment using a variety of system operation scenarios. The scenarios included supply shortages of nuclear units, gas units, and variable resources. The COI was studied with different Northern California Hydro output levels. The Fresno area was studied with drought conditions and high area imports. The Bay Area was studied with high load and potential long term transmission and generation outages. The study indicated that the transmission paths limits will not be exceeded during 2013 summer normal operation scenario and no lines or equipment will operate above their normal thermal ratings.

Figure **9**


(Path 66)
(Path 65)
AC
DC
WECC Transfer Path
Los Banos
(Path 15)
Midway
(Path 26)
Vincent
Intermountain
(Path 27)
Colorado River
(Path 46)
(Path 45)
USA
Mexico
CFE

System and zonal supply and demand deterministic analysis

Table 15 is the supply and demand outlook for the 2013 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 system and zonal planning reserve margins are robust because of generation additions and 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 2013 summer. The import amounts are based on the high, moderate and low import levels from *Table 9*.

Table 15

Planning Reserve Margins

Summer 2013 Supply & Demand Outlook

(Planning Reserve Margins)

Resource Adequacy Planning Conventions	ISO	SP26	NP26
Existing Generation	50,177	23,380	26,797
Retirement	0	0	0
High Probability Addition	891	735	156
Net Interchange (Moderate)	9,800	9,800	2,100
Total Net Supply (MW)	60,868	33,915	29,053
DR & Interruptible Programs	2,322	1,781	541
Demand (1-in-2 Summer Temperature)	47,413	27,253	21,328
Planning Reserve Margin	**33.3%**	**31.0%**	**38.8%**

Operating reserve margins transition from the planning perspective (*Table 15)* to a real-time perspective (*Table 16)* by adding in generation outages. The amount of imports into the ISO system and the SP26 and NP26 zones are based on the three import scenarios shown in *Table 9*. The total ISO system, and particularly SP26, is highly dependent on imports to meet peak demand, especially during the summer high load periods.

Table 16 shows how the import assumption impacts system and zonal operating reserve margins using 1-in-2 level generation 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 generation outage added. *Table 17* calculates system and zonal operating reserve margins under weather conditions that produce 1-in-10 peak demands coincident with 1-in-10 level generation outage and curtailment. The scenarios portrayed in *Table 17* rarely happen.

Table 16

Summer 2013 Loads and Resources Outlook
1-in-2 Demand, 1-in-2 Generation Outage

Summer 2013 Outlook - High Imports

Resource Adequacy Conventions	ISO	SP26	NP26
Existing Generation	50,177	23,380	26,797
Retirement	0	0	0
High Probability Additions	891	735	156
Hydro Derate	(1,022)	(239)	(782)
Outages (1-in-2 Generation)	(5,067)	(1,866)	(2,994)
Net Interchange (High)	11,400	11,300	3,000
Total Net Supply (MW)	56,379	33,309	26,177
DR & Interruptible Programs	2,322	1,781	541
Demand (1-in-2 Summer Temperature)	47,413	27,253	21,328
Operating Reserve Margin	**23.8%**	**28.8%**	**25.3%**

Summer 2013 Outlook - Moderate Imports

Resource Adequacy Conventions	ISO	SP26	NP26
Existing Generation	50,177	23,380	26,797
Retirement	0	0	0
High Probability Additions	891	735	156
Hydro Derate	(1,022)	(239)	(782)
Outages (1-in-2 Generation)	(5,067)	(1,866)	(2,994)
Net Interchange (Moderate)	9,800	9,800	2,100
Total Net Supply (MW)	54,779	31,809	25,277
DR & Interruptible Programs	2,322	1,781	541
Demand (1-in-2 Summer Temperature)	47,413	27,253	21,328
Operating Reserve Margin	**20.4%**	**23.3%**	**21.1%**

Summer 2013 Outlook - Low Imports

Resource Adequacy Conventions	ISO	SP26	NP26
Existing Generation	50,177	23,380	26,797
Retirement	0	0	0
High Probability Additions	891	735	156
Hydro Derate	(1,022)	(239)	(782)
Outages (1-in-2 Generation)	(5,067)	(1,866)	(2,994)
Net Interchange (Low)	8,600	9,200	1,300
Total Net Supply (MW)	53,579	31,209	24,477
DR & Interruptible Programs	2,322	1,781	541
Demand (1-in-2 Summer Temperature)	47,413	27,253	21,328
Operating Reserve Margin	**17.9%**	**21.1%**	**17.3%**

Table 17

Summer 2013 Loads and Resources Outlook

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

Summer 2013 Outlook - High Imports

Resource Adequacy Conventions	ISO	SP26	NP26
Existing Generation	50,177	23,380	26,797
Retirement	0	0	0
High Probability Additions	891	735	156
Hydro Derate	(1,022)	(239)	(782)
High Outages (1-in-10 Generation)	(6,704)	(3,500)	(4,132)
Net Interchange (High)	11,400	11,300	3,000
Total Net Supply (MW)	54,742	31,676	25,039
DR & Interruptible Programs	2,322	1,781	541
High Demand (1-in-10 Summer Temperature)	49,168	29,519	22,290
Operating Reserve Margin	**16.1%**	**13.3%**	**14.8%**

Summer 2013 Outlook - Moderate Imports

Resource Adequacy Conventions	ISO	SP26	NP26
Existing Generation	50,177	23,380	26,797
Retirement	0	0	0
High Probability Additions	891	735	156
Hydro Derate	(1,022)	(239)	(782)
High Outages (1-in-10 Generation)	(6,704)	(3,500)	(4,132)
Net Interchange (Moderate)	9,800	9,800	2,100
Total Net Supply (MW)	53,142	30,176	24,139
DR & Interruptible Programs	2,322	1,781	541
High Demand (1-in-10 Summer Temperature)	49,168	29,519	22,290
Operating Reserve Margin	**12.8%**	**8.3%**	**10.7%**

Summer 2013 Outlook - Low Imports

Resource Adequacy Conventions	ISO	SP26	NP26
Existing Generation	50,177	23,380	26,797
Retirement	0	0	0
High Probability Additions	891	735	156
Hydro Derate	(1,022)	(239)	(782)
High Outages (1-in-10 Generation)	(6,704)	(3,500)	(4,132)
Net Interchange (Low)	8,600	9,200	1,300
Total Net Supply (MW)	51,942	29,576	23,339
DR & Interruptible Programs	2,322	1,781	541
High Demand (1-in-10 Summer Temperature)	49,168	29,519	22,290
Operating Reserve Margin	**10.4%**	**6.2%**	**7.1%**

Figures 10 and *11* provide graphical representations in percentage and MW, respectively, of the deterministic analysis results based on the inputs from *Tables 16* and *17*. They show system and zonal 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* represent analyses of conditions for the ISO system as a whole, and for the SP26 and NP26 zones analyzed on a stand-alone, non-coincident basis. Furthermore, these results do not account for transmission constraints within the ISO system or within each zone. Based on this study methodology no firm load shedding would be needed except under more extreme scenarios, or scenarios that include significant transmission outages. *Figure 10* shows that the operating reserve margins for ISO, SP26 and NP26 were above 3% of the firm load shedding threshold in the extreme scenario analyzed.

Figure 11 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* 10**

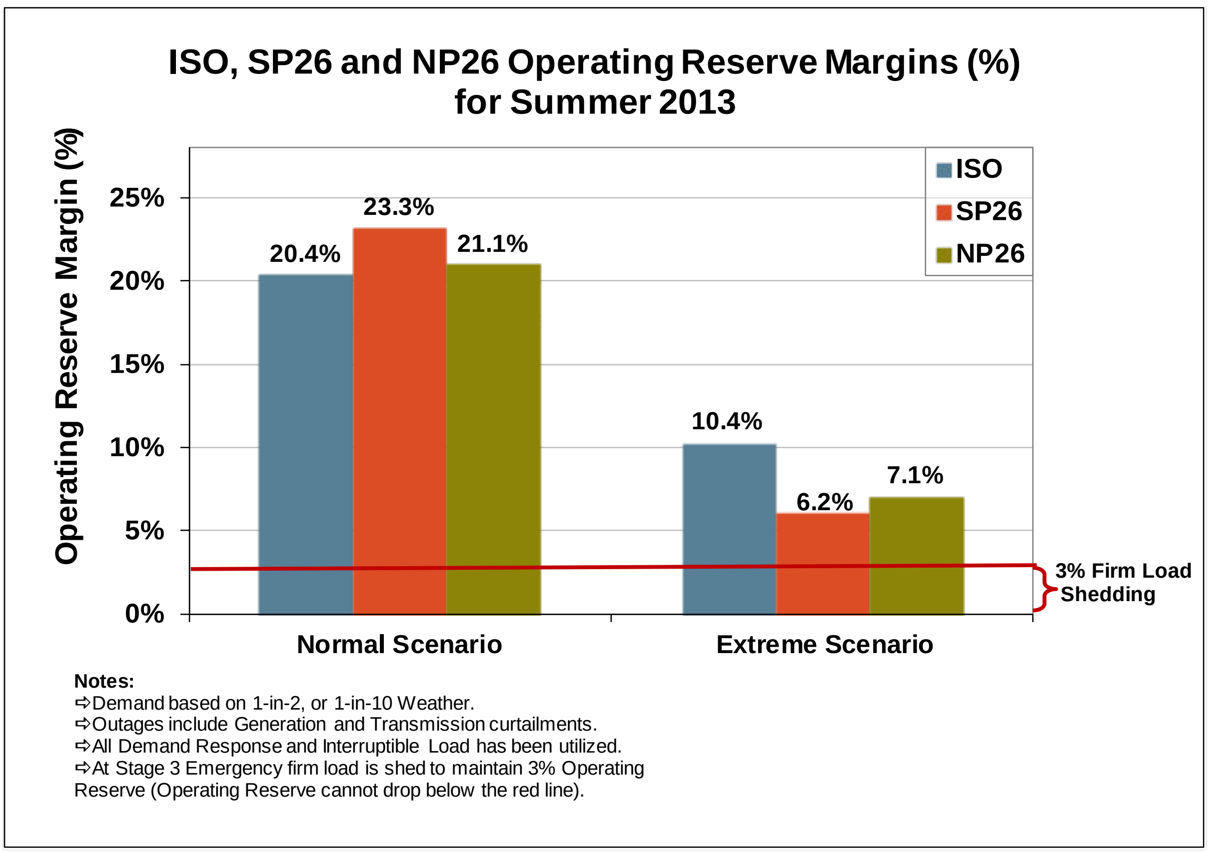


Figure 10 shows adequate operating reserve forecast margins under the normal and extreme scenario. The operating reserve margins for ISO, SP26 and NP26 were above 3% of the firm load shedding threshold in the extreme scenario.

***Figure* 11**

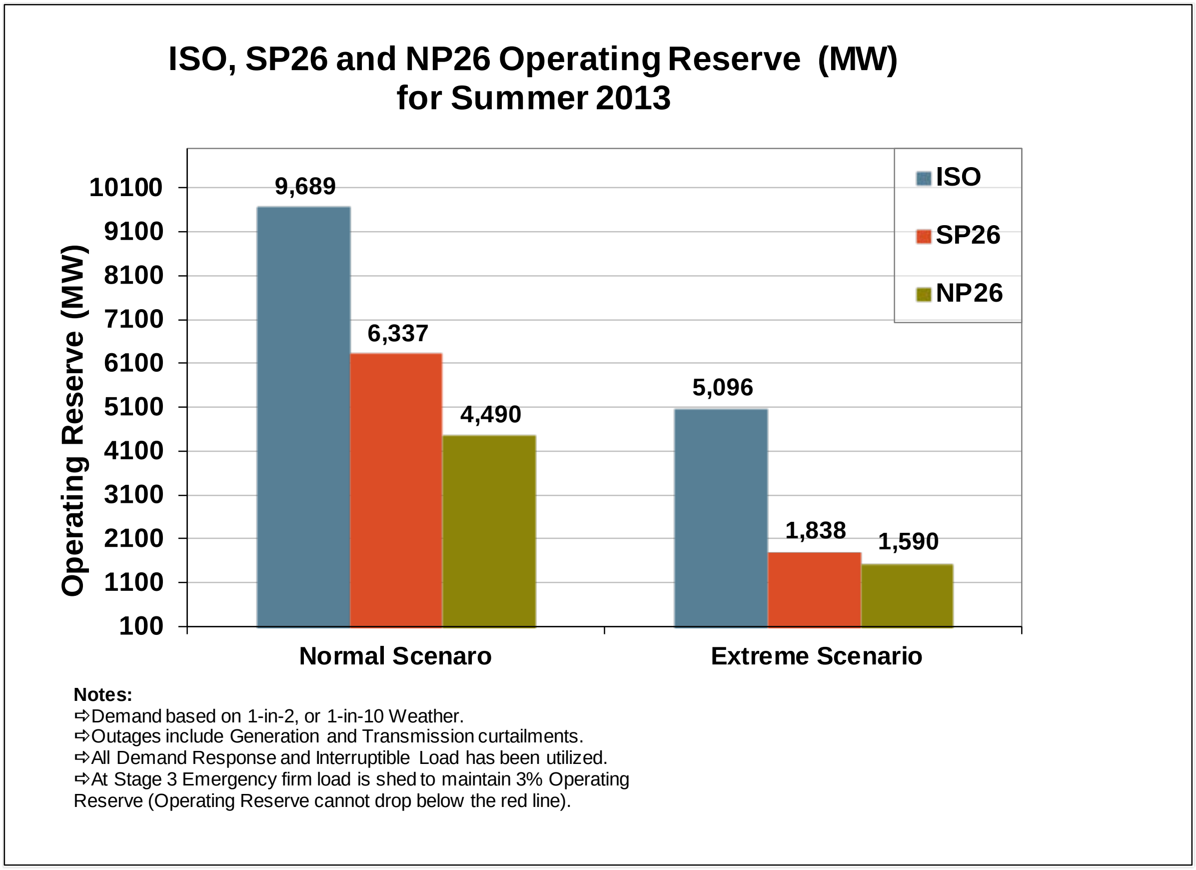


Figure 11 complements *Figure 8* and reflects operating reserve margins in megawatts.

System and zonal supply and demand 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 17*.

The randomly generated forced and planned generation outages and curtailments are based on actual occurrences as shown in graphs in *Appendix C: 2010 – 2012 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.

The expected probability of experiencing involuntary load curtailments at 3% or less operating reserve margins in summer 2013 is extremely low, approximately 1% for the ISO system, SP26 and NP26, assuming moderate imports. It is worth mentioning that these system and zonal results do not capture the local issues such as overlapping transmission outages together with both SONGS units out of service during summer peak conditions because supply and demand issues within a particular zone with local transmission outages are beyond the scope of this assessment. Although this report projects extremely low probability of load shedding at ISO system wide and zonal level for summer 2013, overlapping transmission and generation outages in SP26 could result in shedding firm load in the south Orange County and San Diego area.

Status of Generation Subject to Once Through Cooling Regulations

Table 18 shows the power plants that are subject to the Statewide Water Quality Control Policy on the Use of Coastal and Estuarine Waters for power Plant Cooling. Of the total 17,792 MW affected by the regulations 2,022 MW will have completed their plan to comply, while 10,832 MW of natural gas fired generation have yet to complete their compliance plan. The remaining 10,832 MW of generation will be required to repower or retire in by the end of 2020, many by the end of 2017. Compliance for San Onofre and Diablo Canyon is subject to a pending study by a Water Board Review Committee for Nuclear Fueled Power Plants.

Table 18

Generating Units Compliance with California Statewide Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling				
Plant (Unit)	**Owner**	**Final Compliance Date**	**Capacity (MW)**	**PTO Area**
Compliance Plan Yet to be Implemented (Natural Gas Fired)				
El Segundo Units 4	NRG	12/31/2015	335	SCE
Morro Bay Units 3 and 4	Dynegy	12/31/2015	650	PG&E
Encina Power Station Units 1-5	NRG	12/31/2017	946	SDG&E
Pittsburg Units 5 and 6	NRG	12/31/2017	629	PG&E
Moss Landing Units 1 and 2	Dynegy	12/31/2017	1,020	PG&E
Moss Landing Units 6 and 7	Dynegy	12/31/2017	1,500	PG&E
Huntington Beach Units 1-2	AES	12/31/2020	452	SCE
Redondo Beach Units 5-8	AES	12/31/2020	1,343	SCE
Alamitos Units 1-6	AES	12/31/2020	2,011	SCE
Mandalay Units 1 and 2	NRG	12/31/2020	430	SCE
Ormond Beach Units 1 and 2	NRG	12/31/2020	1,516	SCE
		Total MW	**10,832**	
In Compliance				
Humboldt	PG&E	Sept. 2010	105	PG&E
Potrero Unit 3	GenOn	2/28/2011	206	PG&E
South Bay	Dynegy	1/1/2011	702	SDG&E
Huntington Beach Units 3-4[1]	AES	12/7/2012	452	SCE
		Total MW	1,465	
Expected to be in Compliance by end of 2013				
El Segundo Units 3	NRG	12/31/2015	335	SCE
Contra Costa Units 6 and 7	NRG	12/31/2017	674	PG&E
		Total MW	1,009	
Compliance pending study by Water Board Review Committee for Nuclear Plants				
San Onofre	SCE	12/31/2022	2,246	SCE
Diablo Canyon	PG&E	12/31/2024	2,240	PG&E
		Total MW	4,486	
		Total of all OTC Units	**17,792**	

[1] Huntington Beach generating units 3-4 are retired and are being converted to synchronous condensers. A portion (i.e., about 25%) of the plant cooling system is required only when synchronous condensers are operating. When synchronous condensers are not operating, no ocean water cooling is required.

Conclusion

The slowly improving economy, which resulted in moderate peak demand growth, matched with the availability of 3,393 MW of new power generation since June 2012 show an overall positive summer outlook for 2013 to meet a broad range of supply and demand conditions. However, there is a risk of localized customer outages under extreme conditions in the southern Orange County and San Diego as a result of the voltage deficiency caused by the shutdown of SONGS.

To address these concerns, a mitigation plan is being implemented to convert the retired Huntington Beach units 3 & 4 into synchronous condensers, install 80 MVAR capacitors at Santiago and Johanna, and a 160 MVAR capacitor at Viejo, split the Barre - Ellis 220 kV lines from the existing two circuits to four circuits, closely monitor the construction of new generation resources in Los Angeles, and dispatch demand side resources during peak days. Even with these measures in place the southern area is still susceptible to reliability concerns and will require close attention over summer operations – particularly during critical peak days and in the event of wildfire conditions that could potentially force transmission out of service.

The ISO continually trains its grid operators to be prepared for system events, and understanding operating procedures and utility best 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 2013, it will be critical for new generation additions to keep pace with anticipated load growth and generation retirements. Significant amounts of new renewable generation has reached commercial operation and this trend is expected to continue as new renewable generation comes online to meet the state's 33% renewable portfolio standard. Dispatchable resources will need to be maintained on the system to be able to successfully integrate the increasing levels of renewables. This will be particularly challenging in light of the remaining 10,832 MW of natural gas fired generation capacity that is subject to once-through-cooling regulations, which requires this capacity to be retired, retrofitted with new cooling systems, or repowered by the end of 2020, some by the end of 2017. 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. 2012 Summer Peak Load Summary Graphs

B. 2013 ISO NDC and RPS by Fuel Type

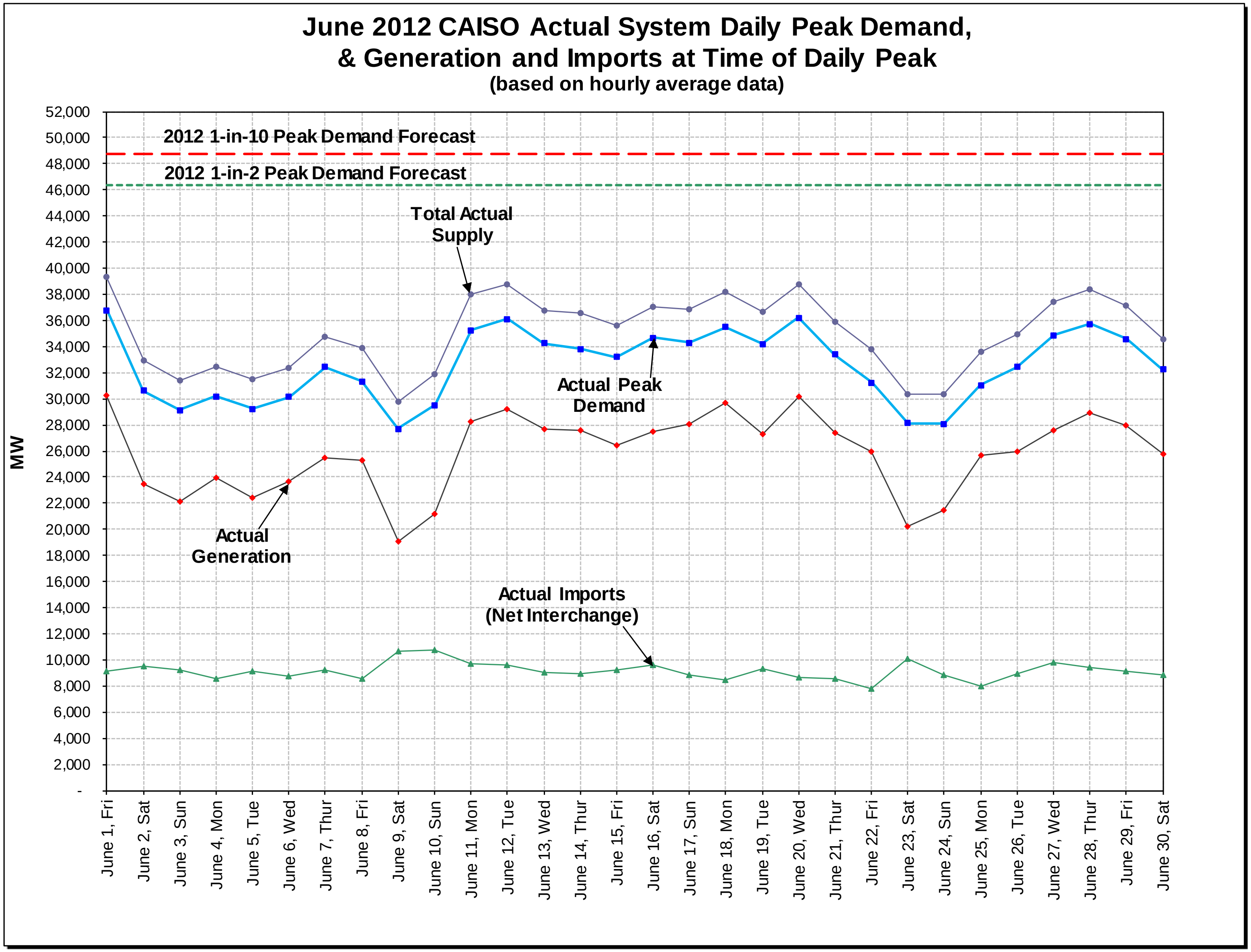
C. 2010 – 2012 Summer Generation Outage Graphs

D. 2010 – 2012 Summer Imports Summary Graphs

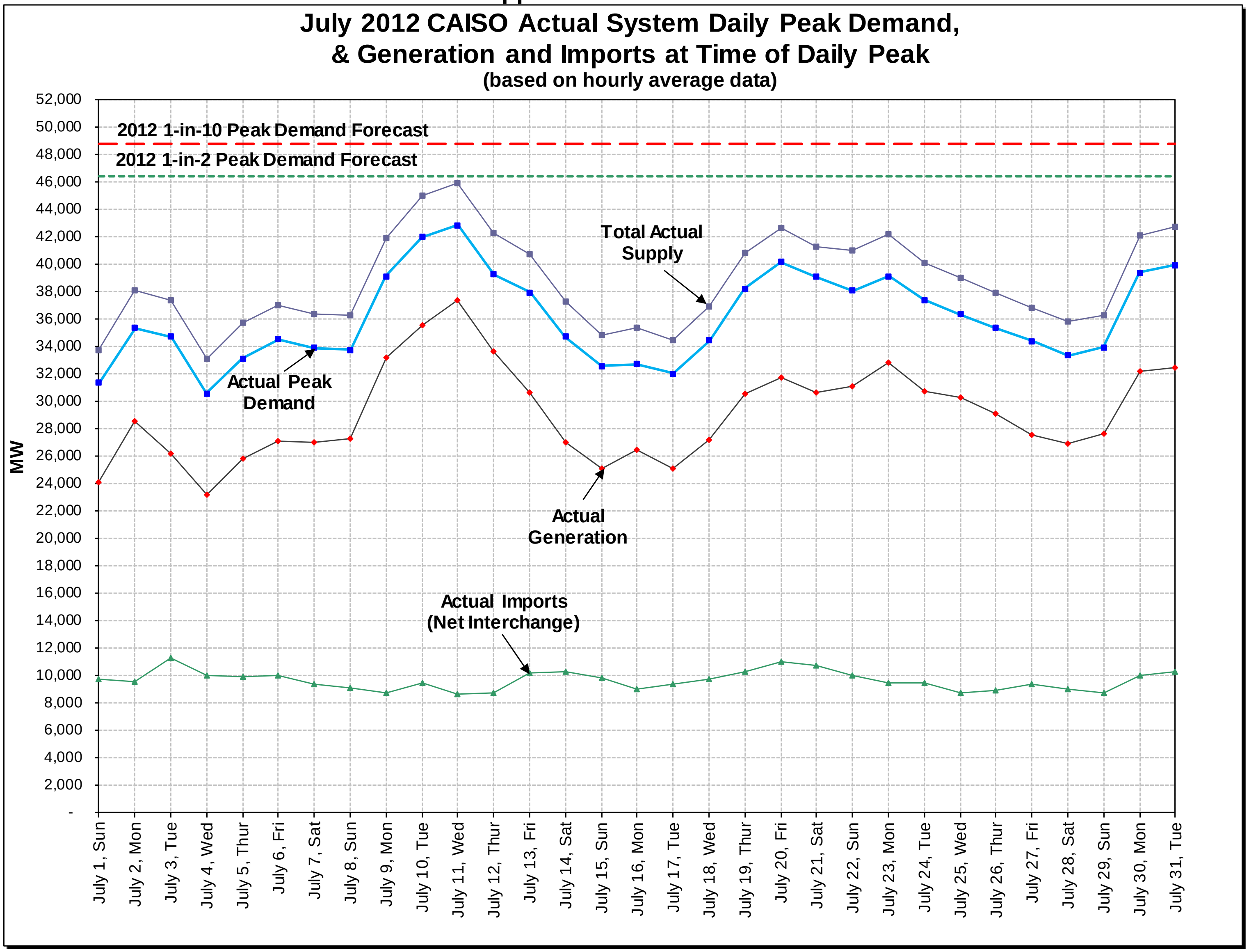
E. 2013 ISO Summer On-Peak NQC Fuel Type

F. 2013 California Hydrologic Conditions

Appendix A: 2012 Summer Peak Load Summary Graphs



Appendix A – Continued



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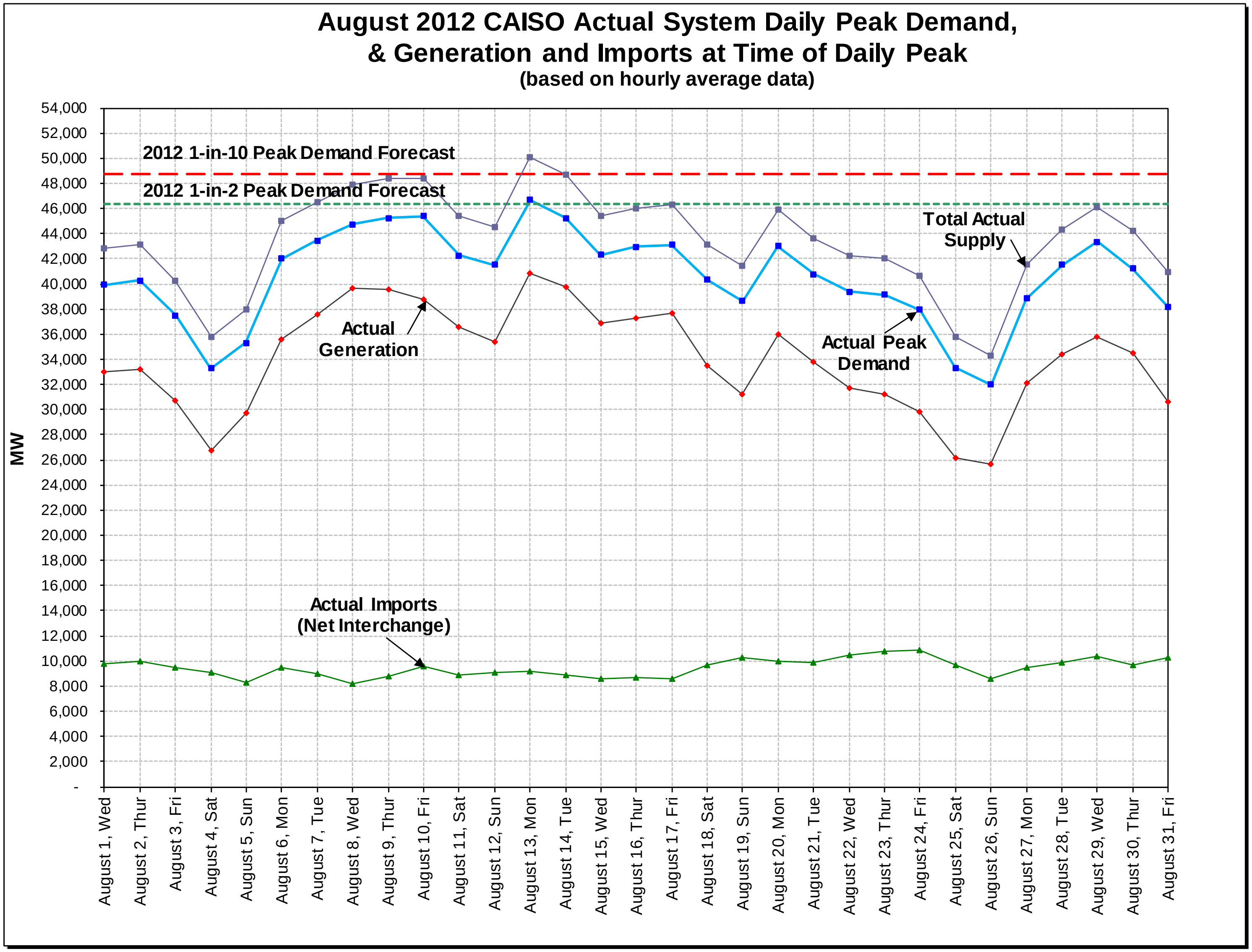

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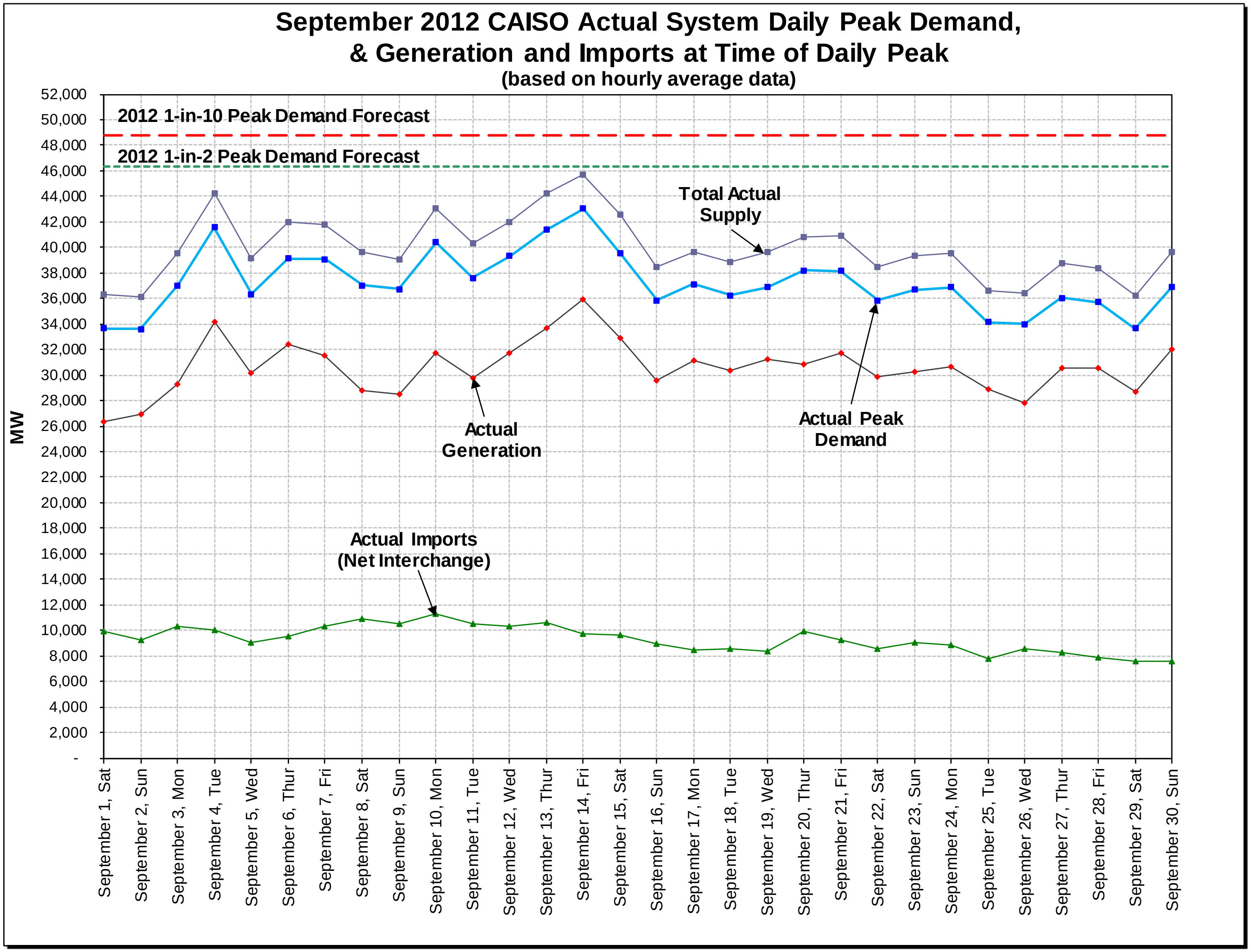

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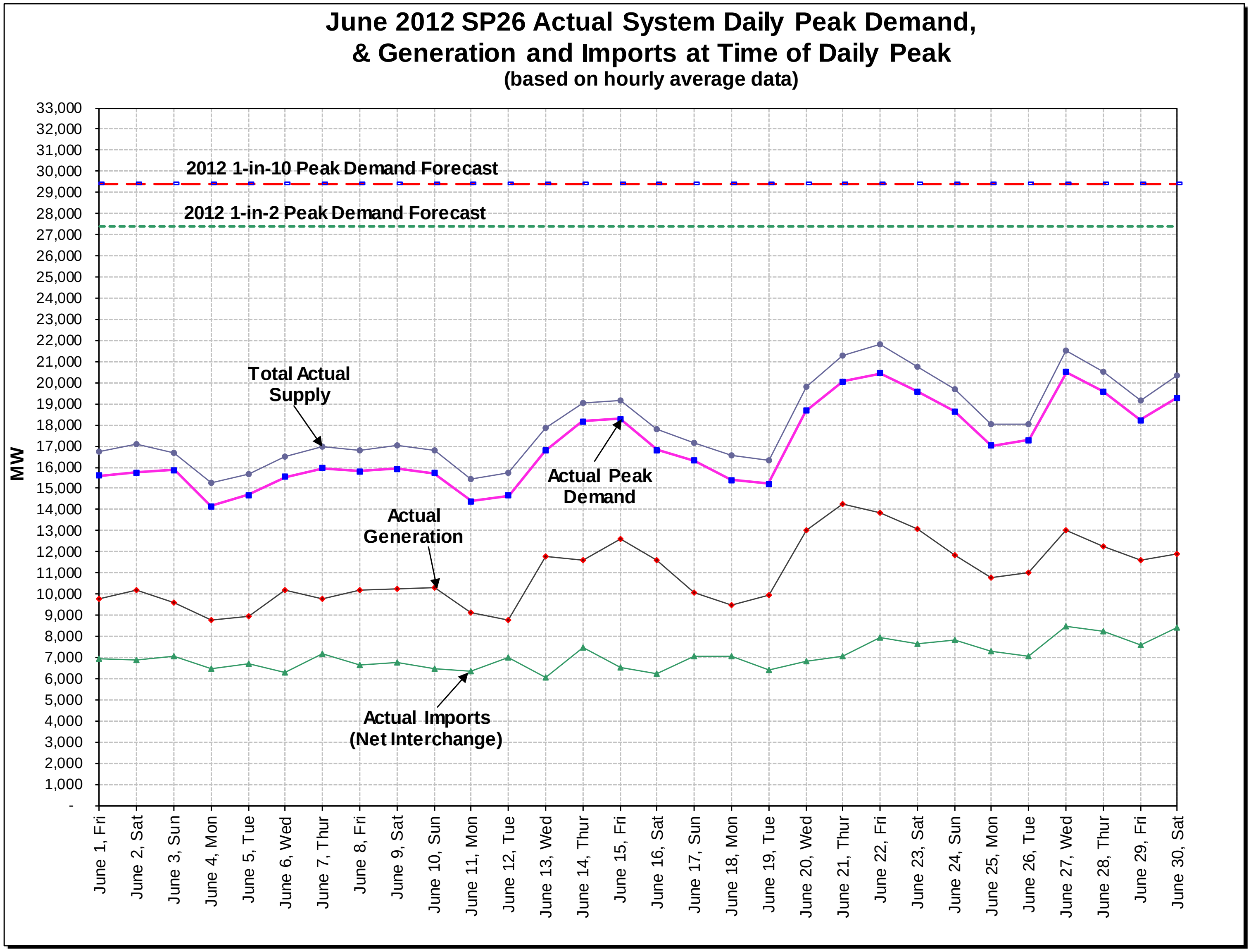

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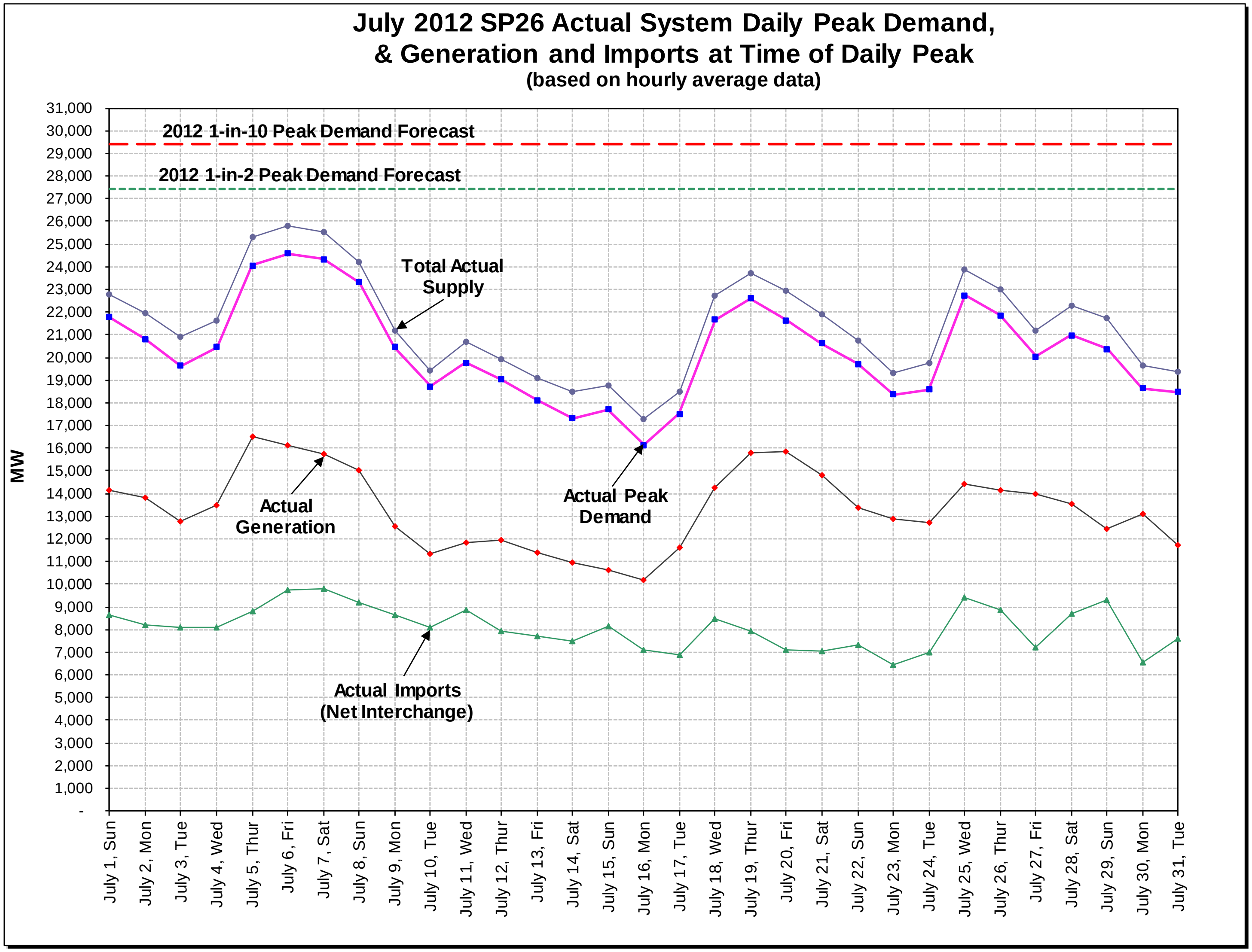

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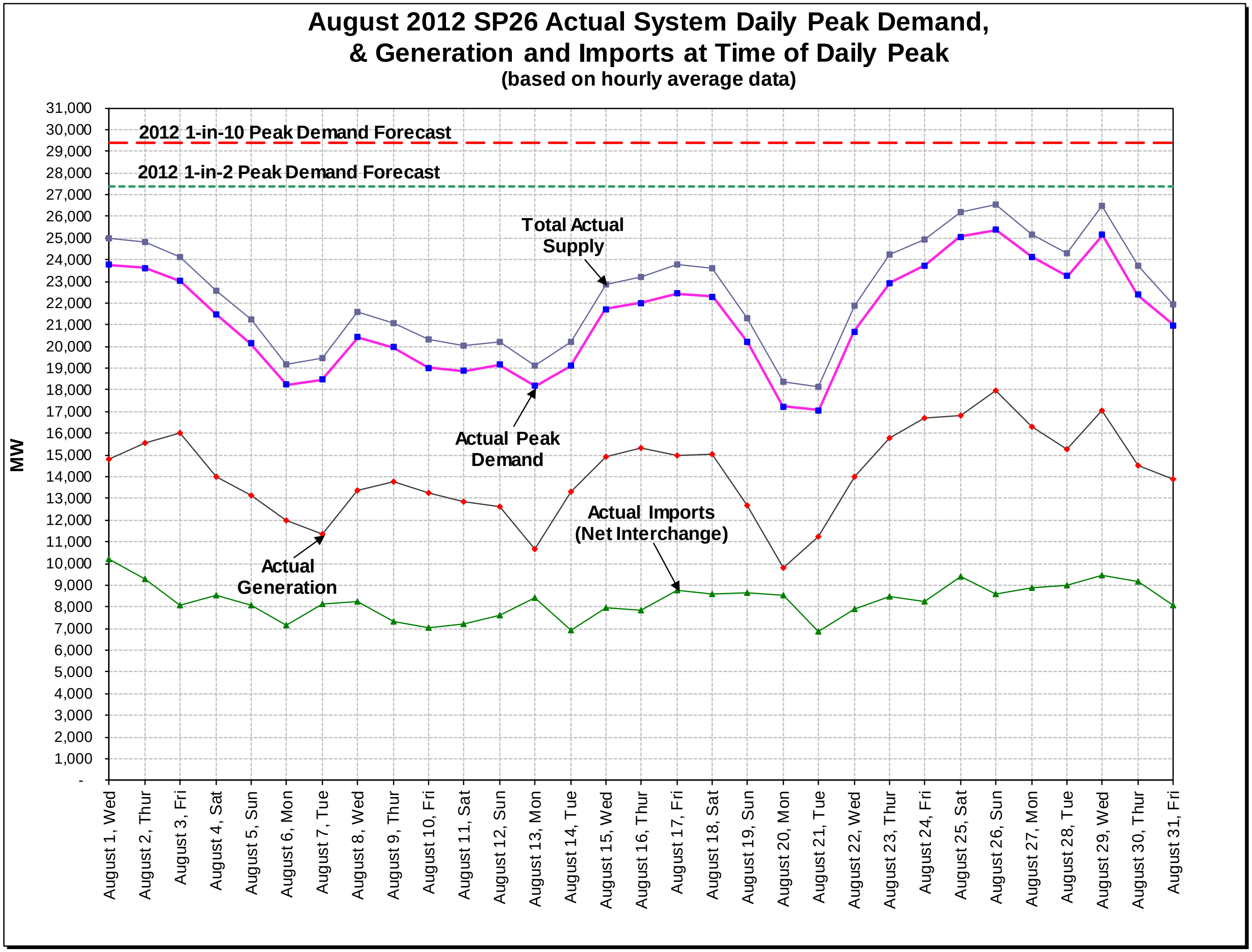

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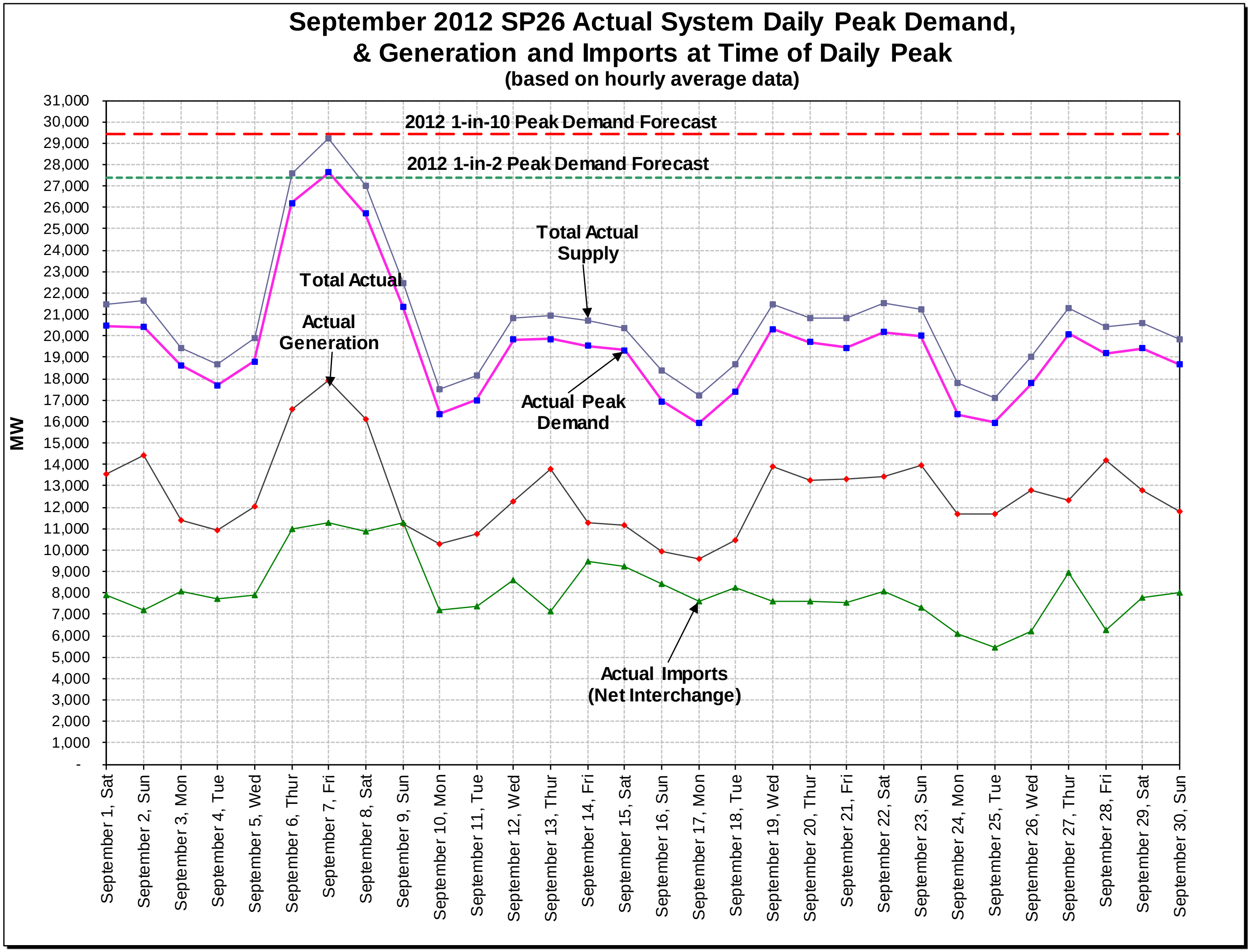

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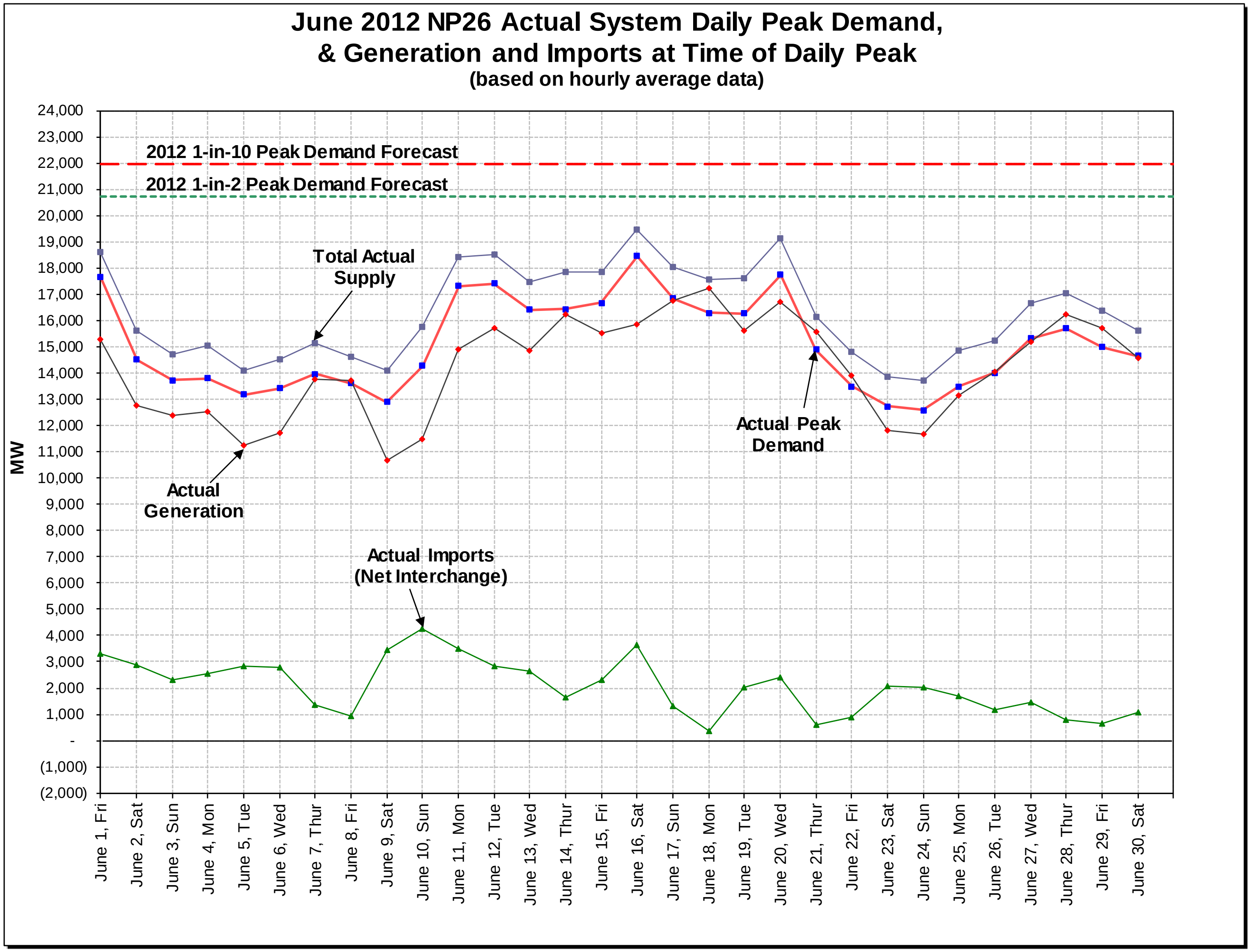

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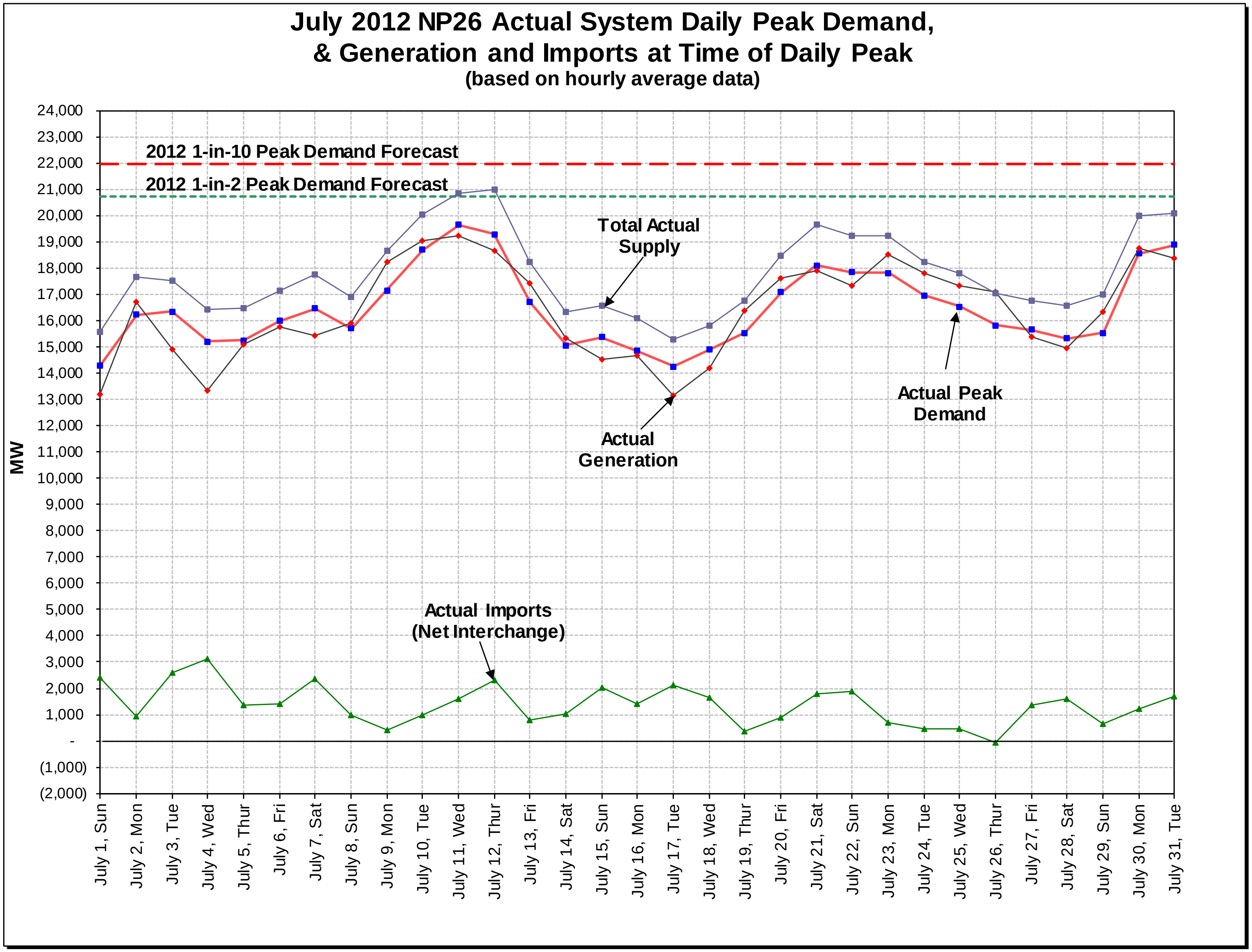

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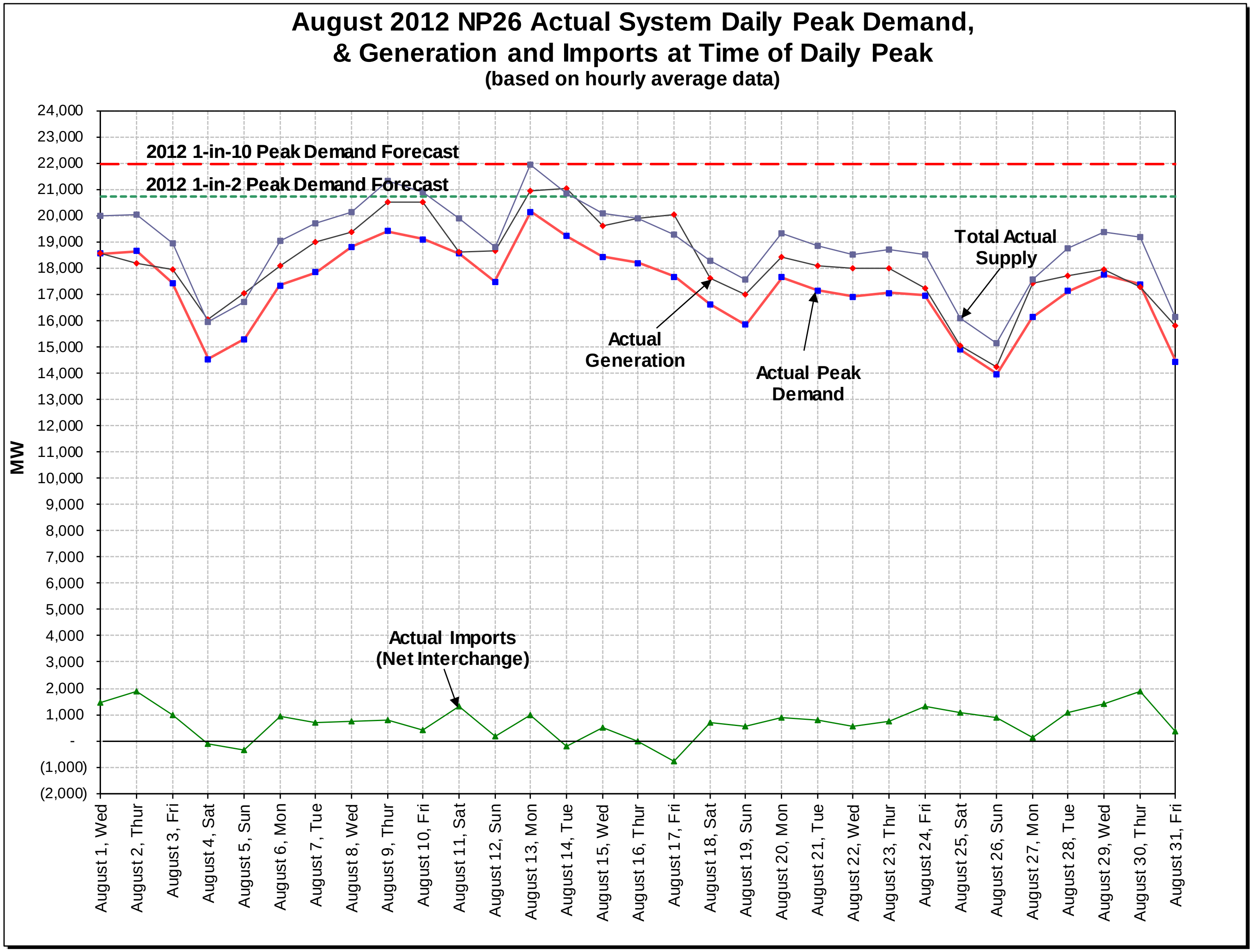

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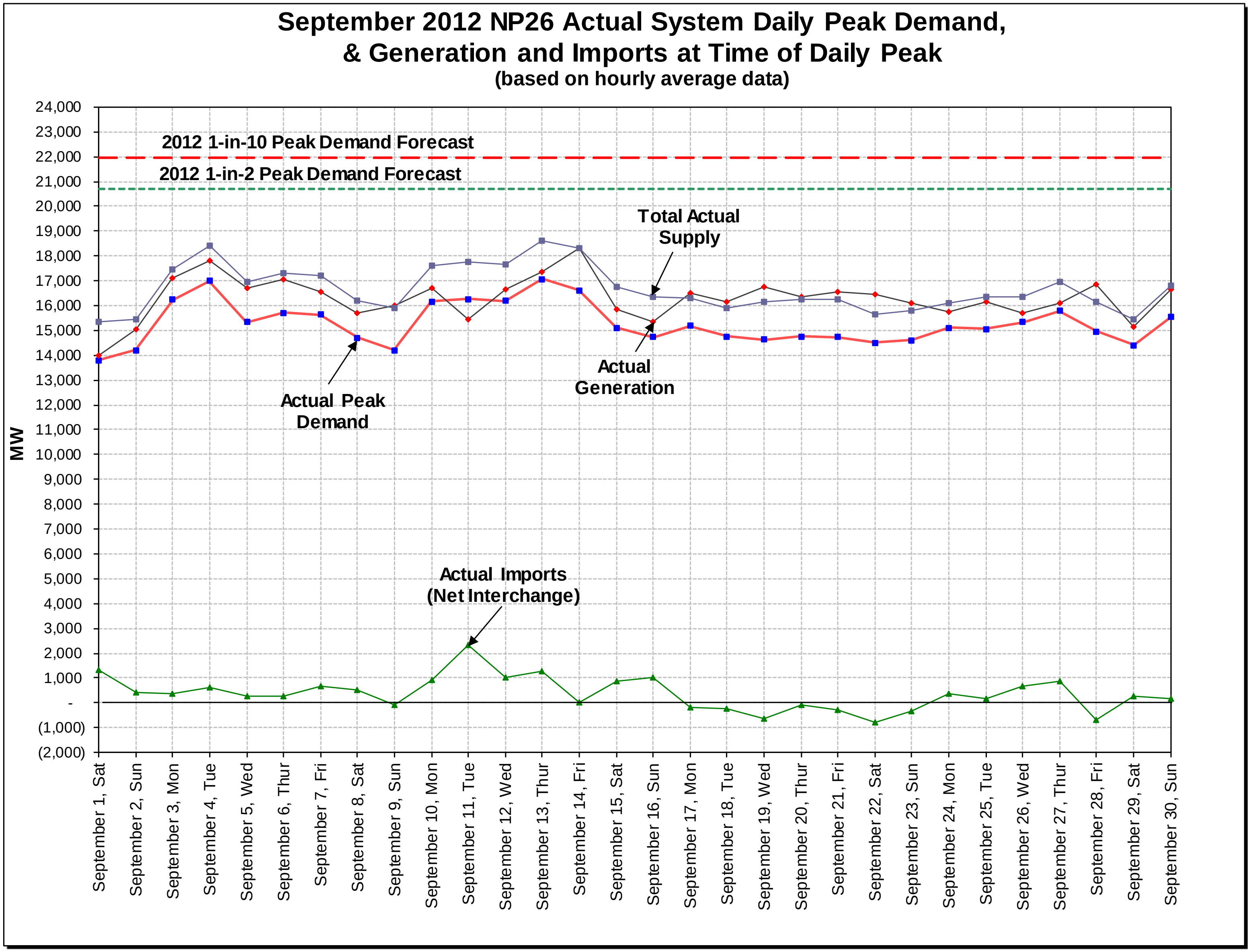
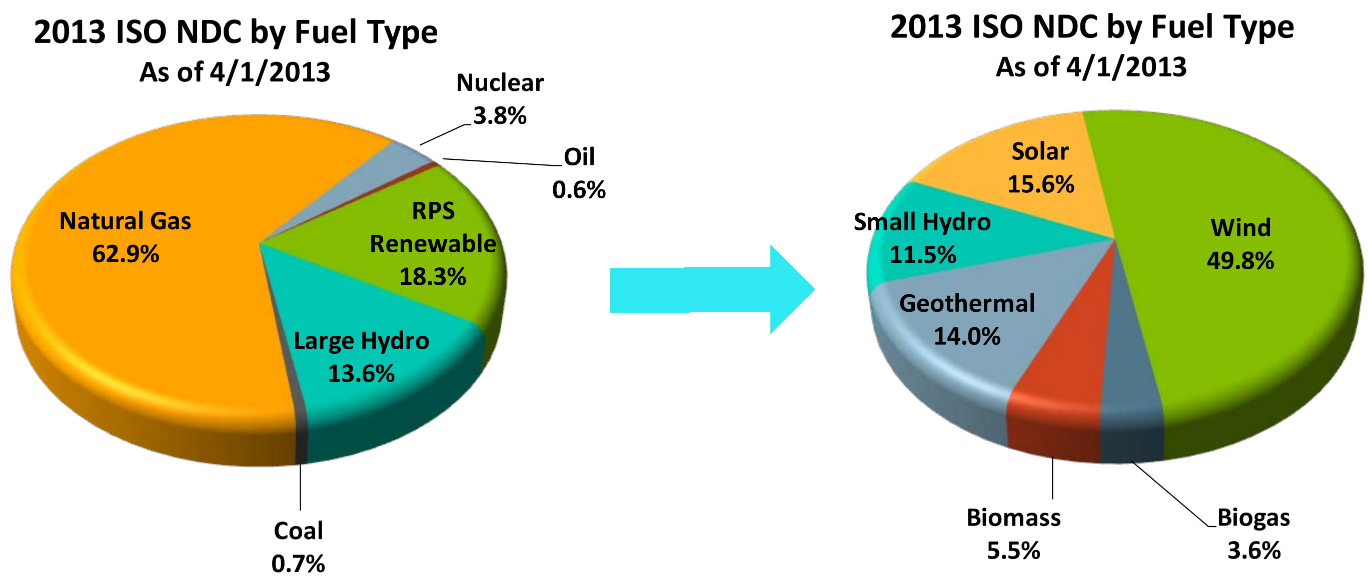
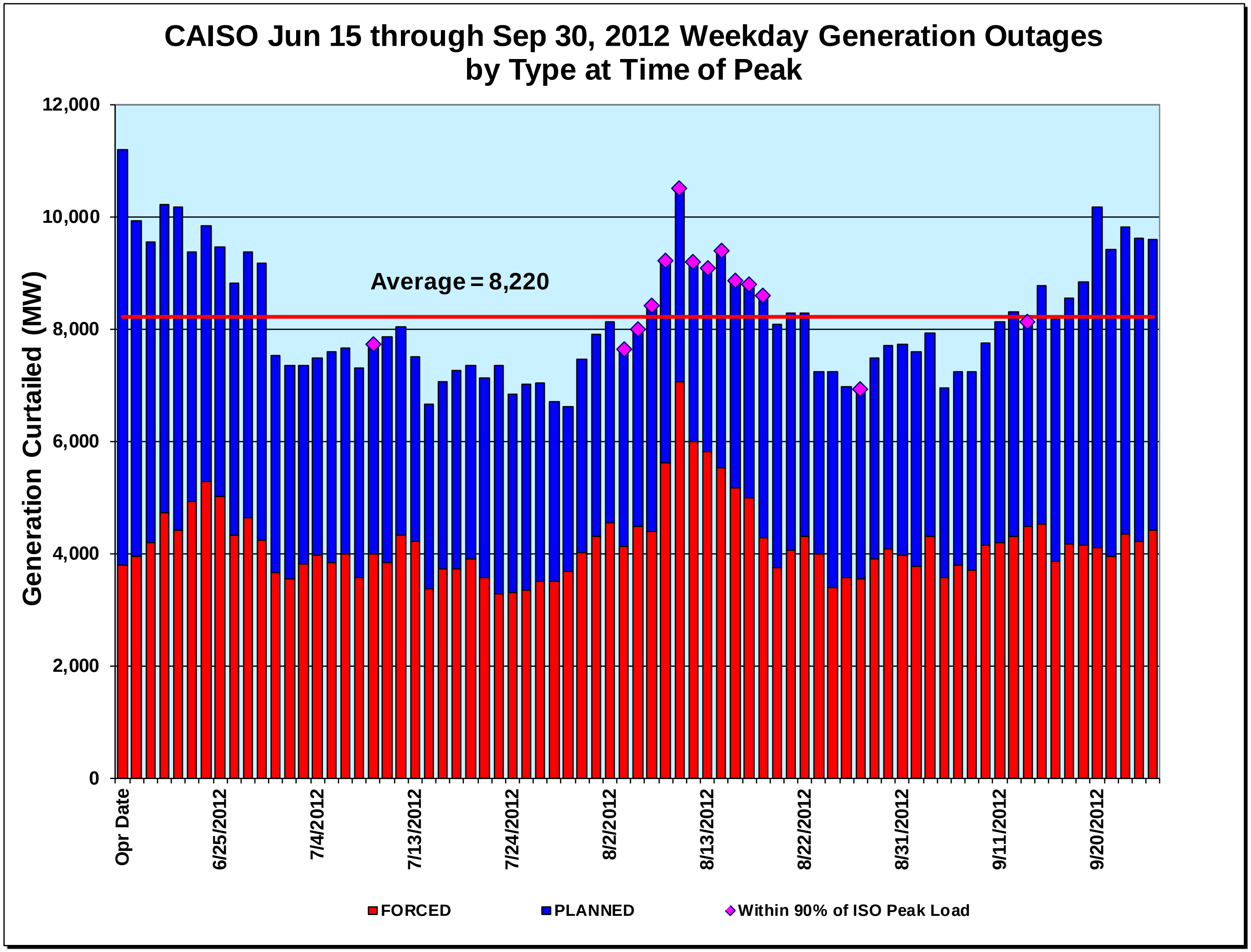


Appendix B: 2013 ISO NDC and RPS by Fuel Type



Appendix C: 2010 – 2012 Summer Generation Outage Graphs



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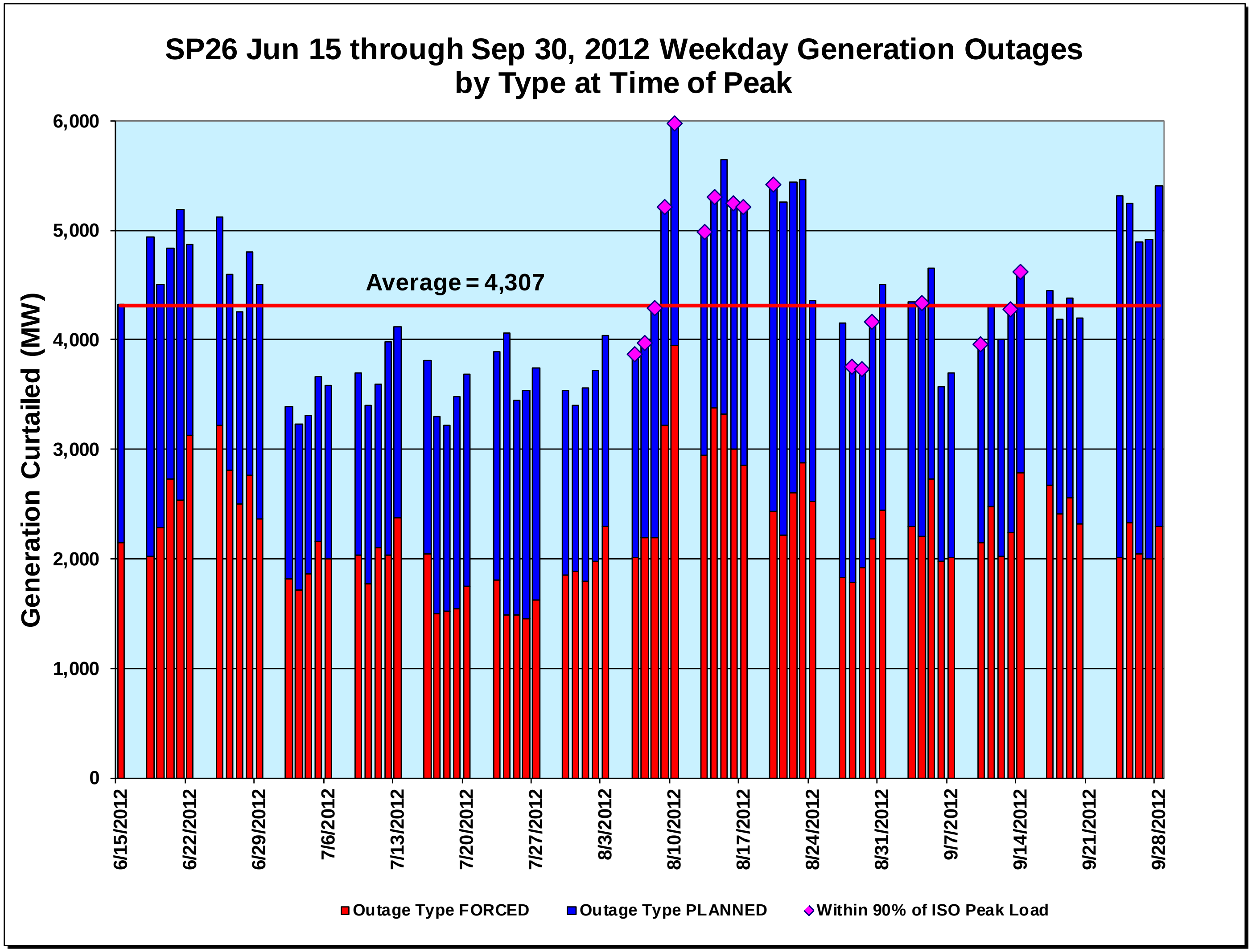

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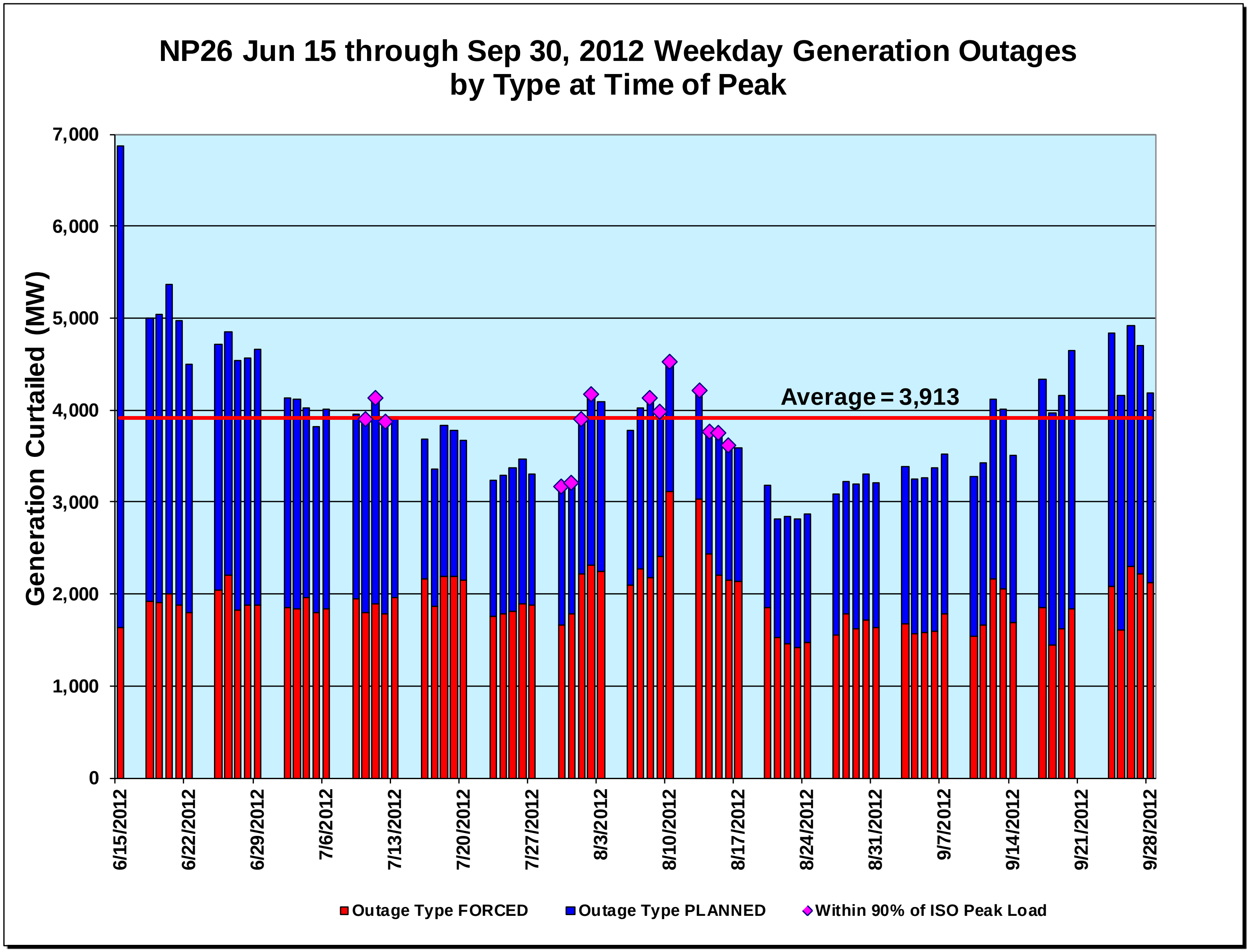

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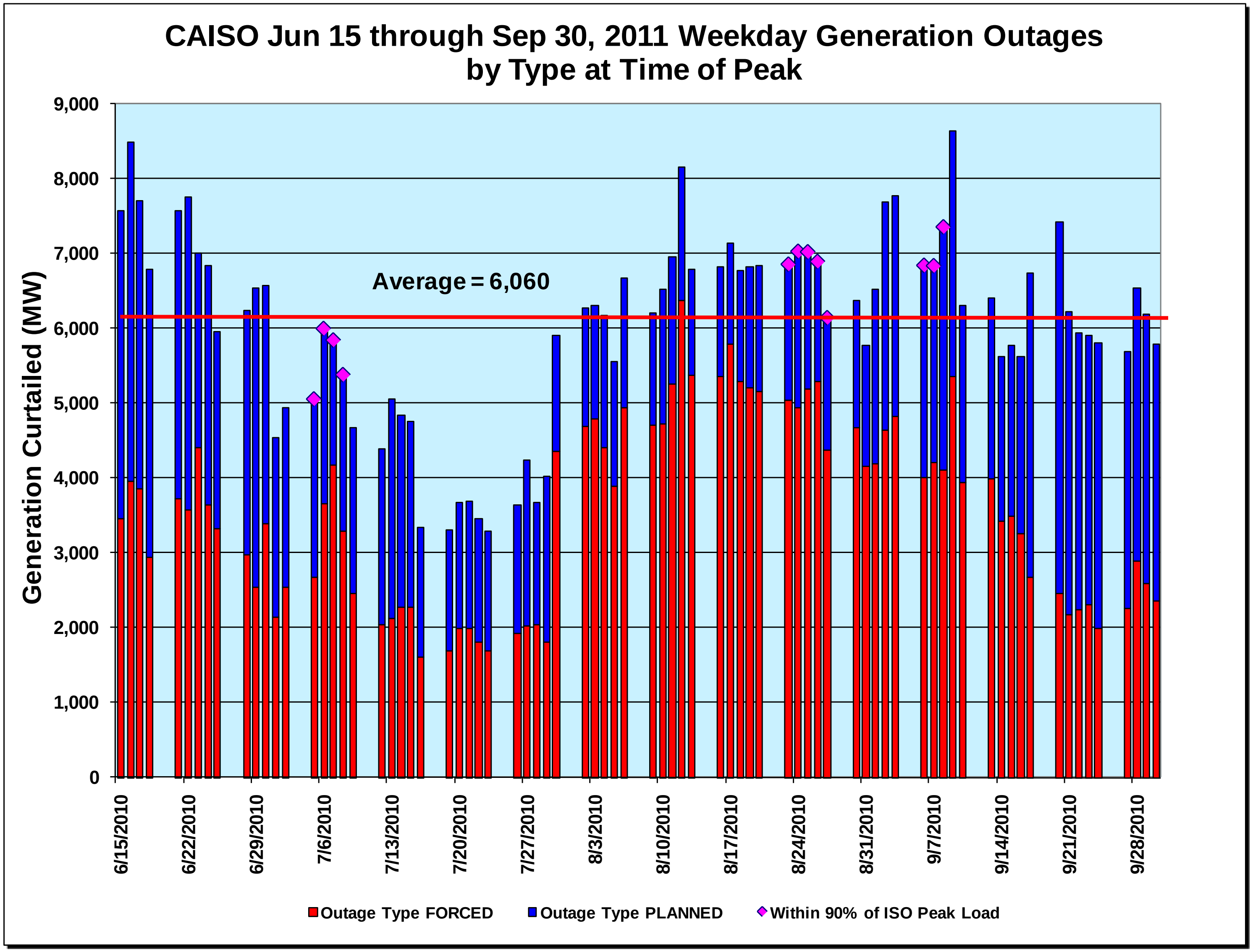

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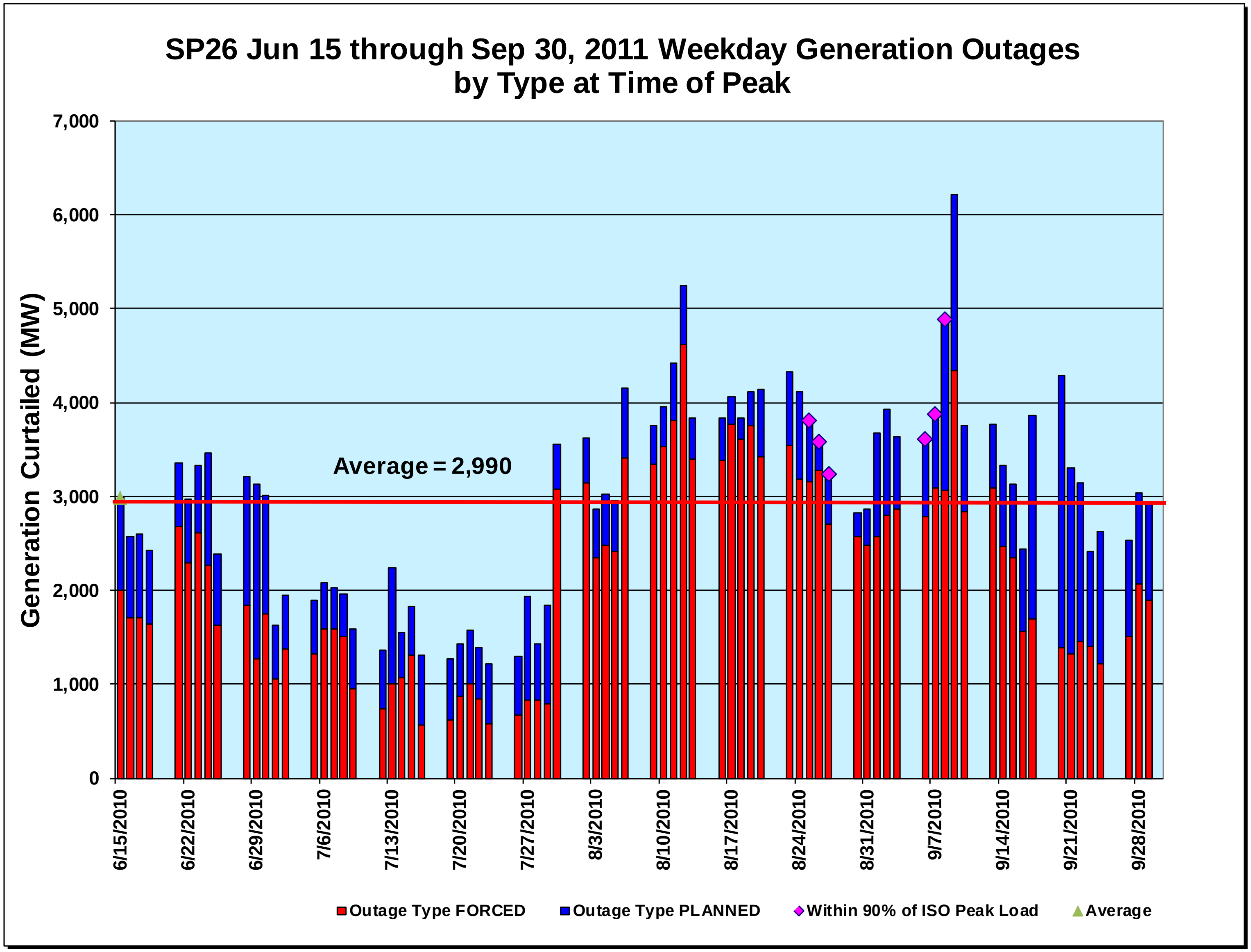

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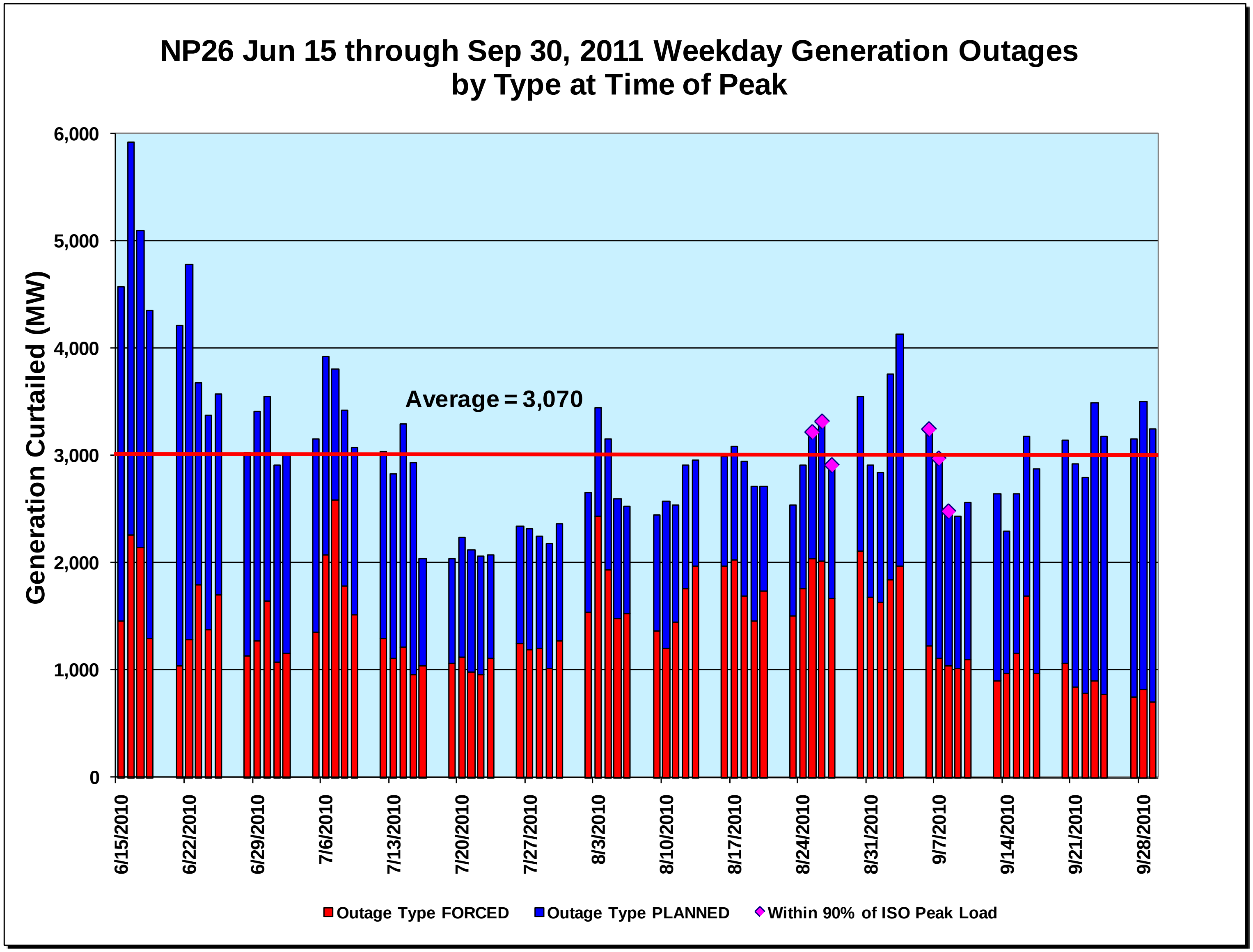

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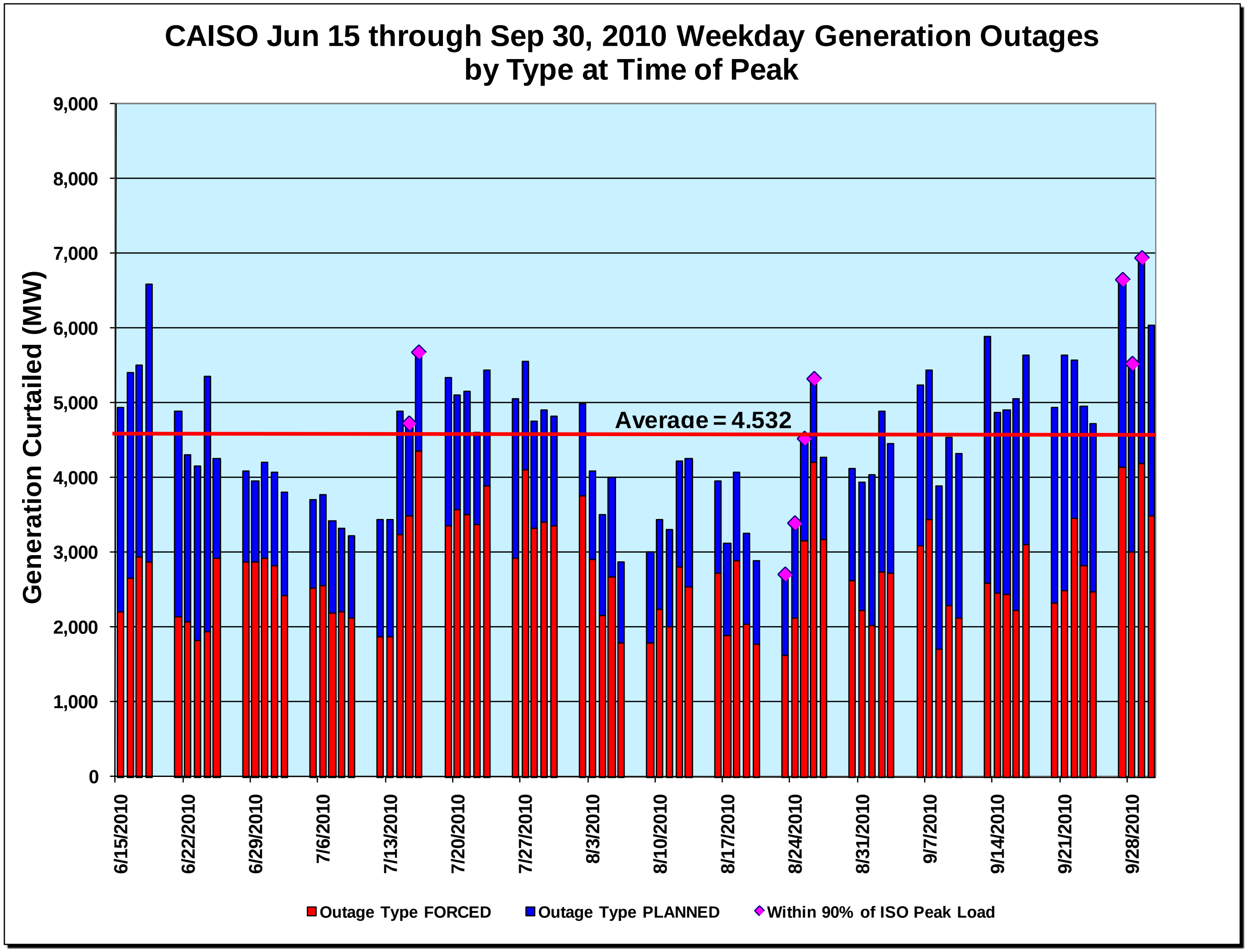

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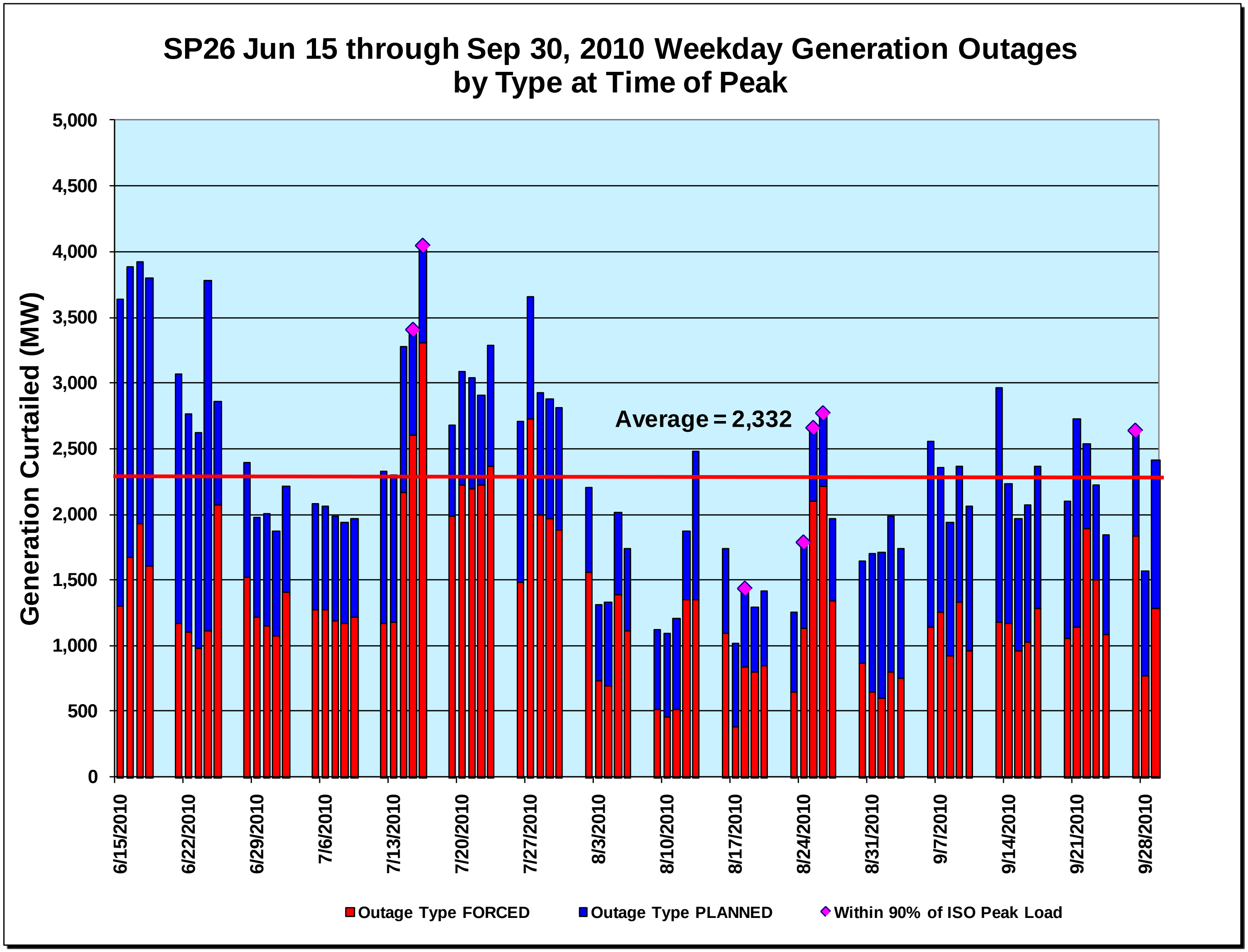

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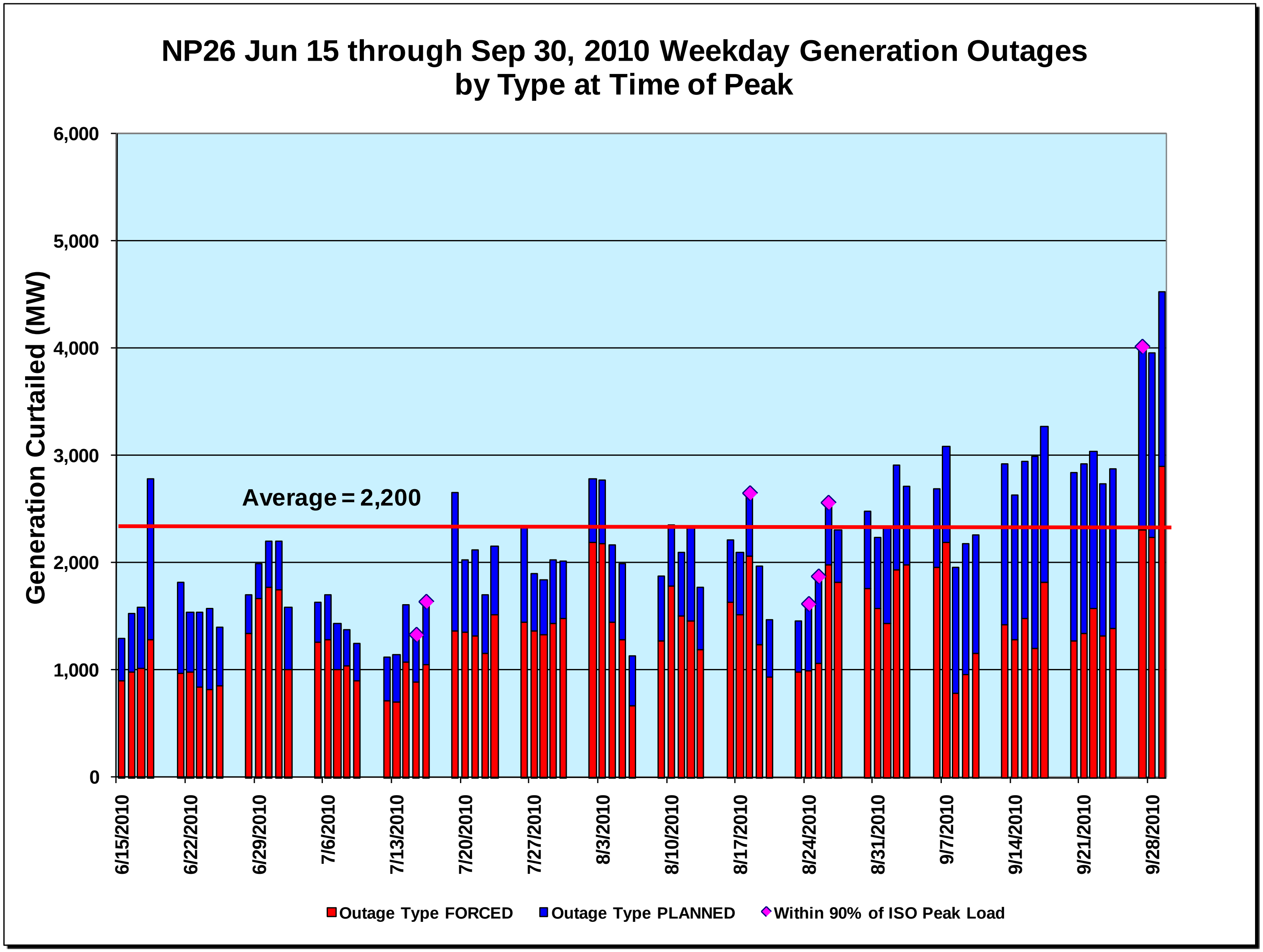
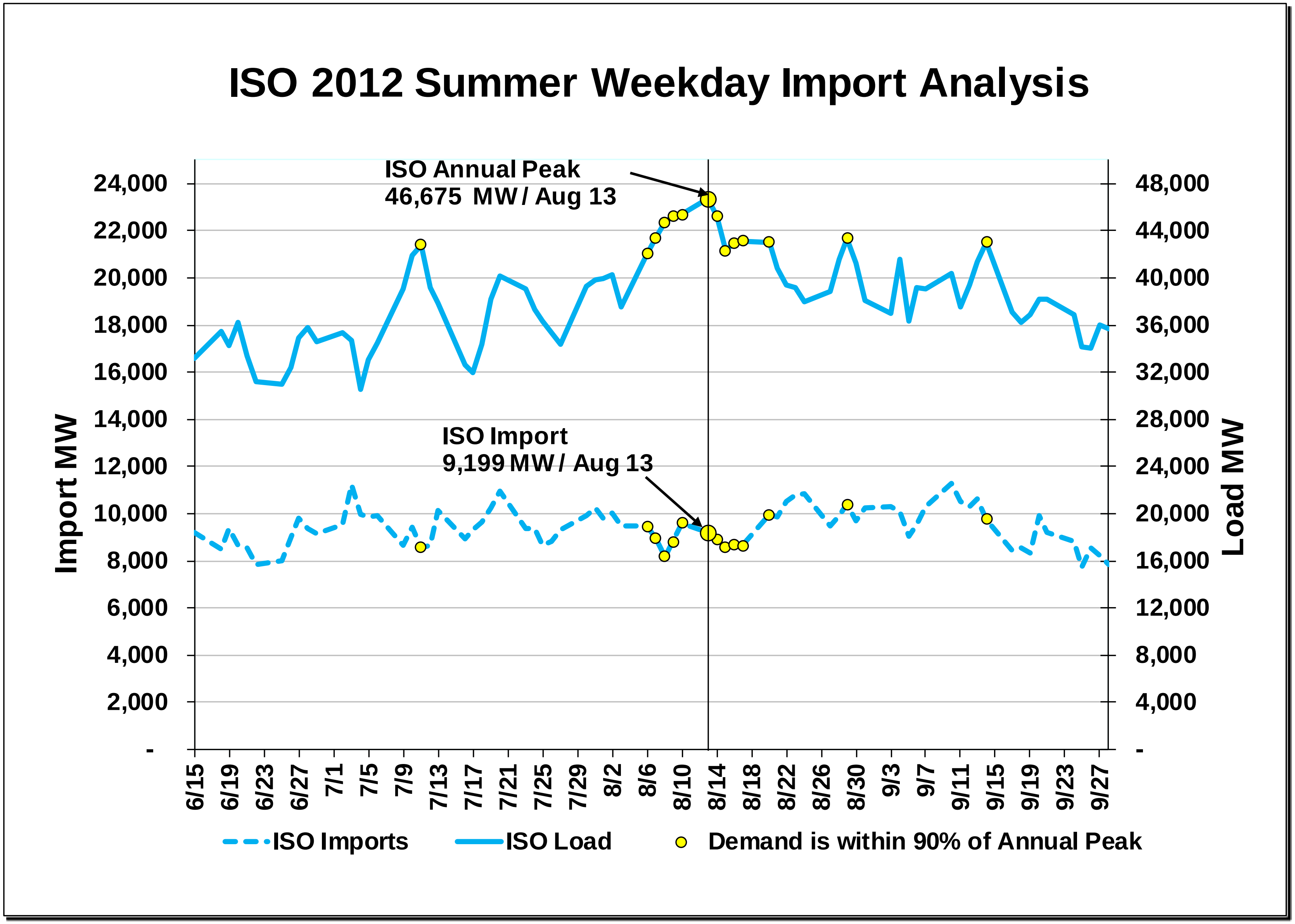


Appendix D: 2010 – 2012 Summer Imports Summary Graphs



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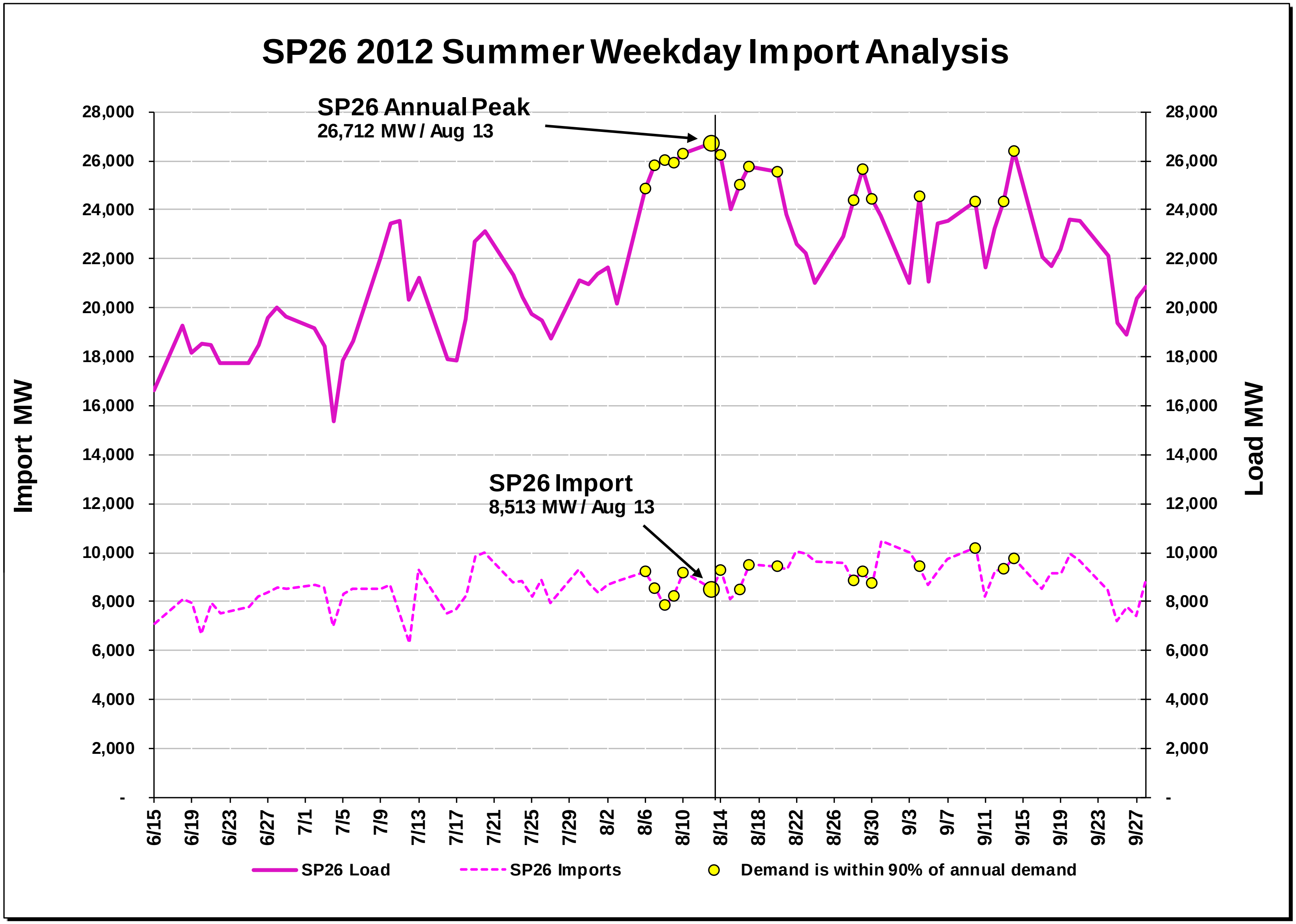

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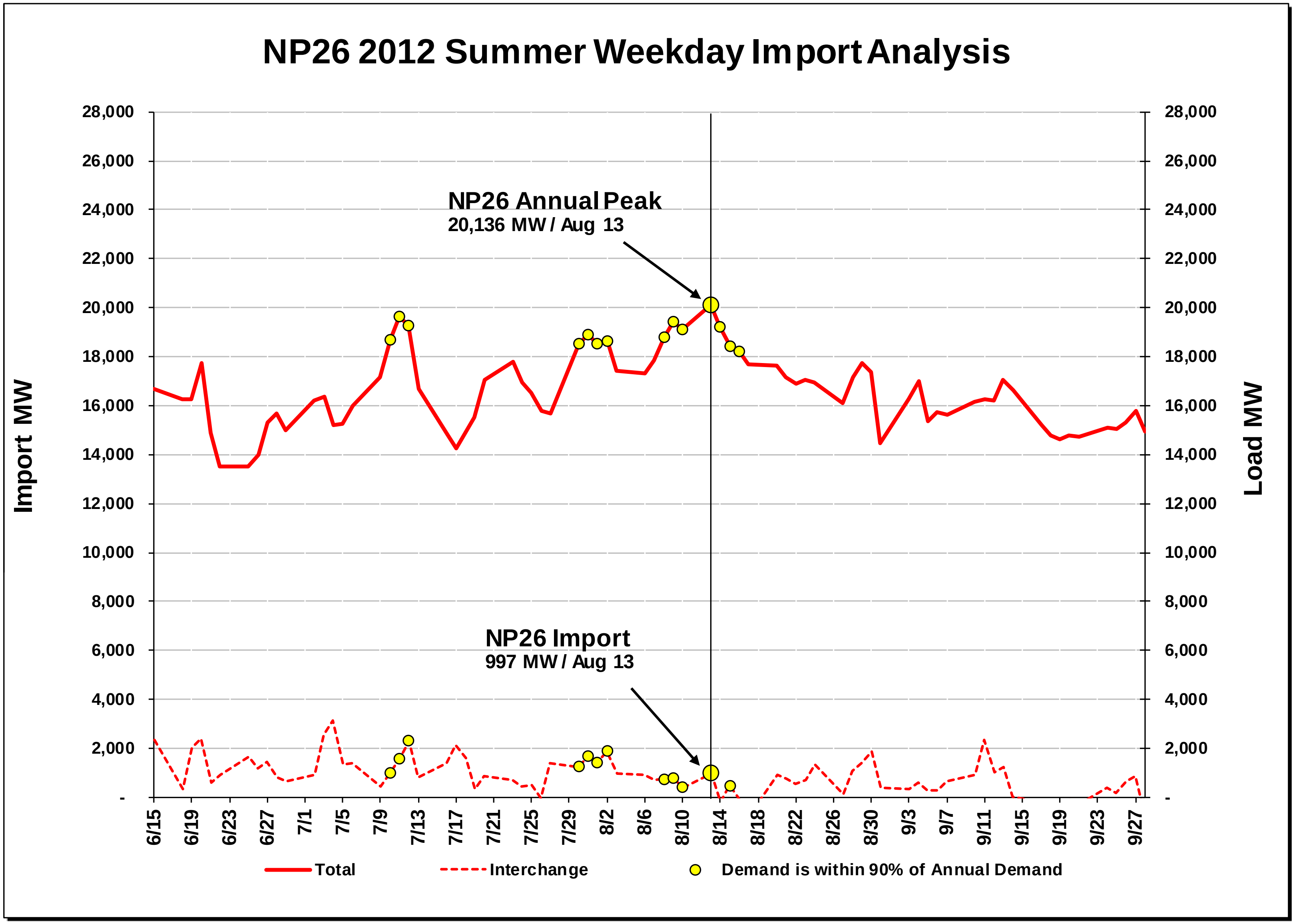

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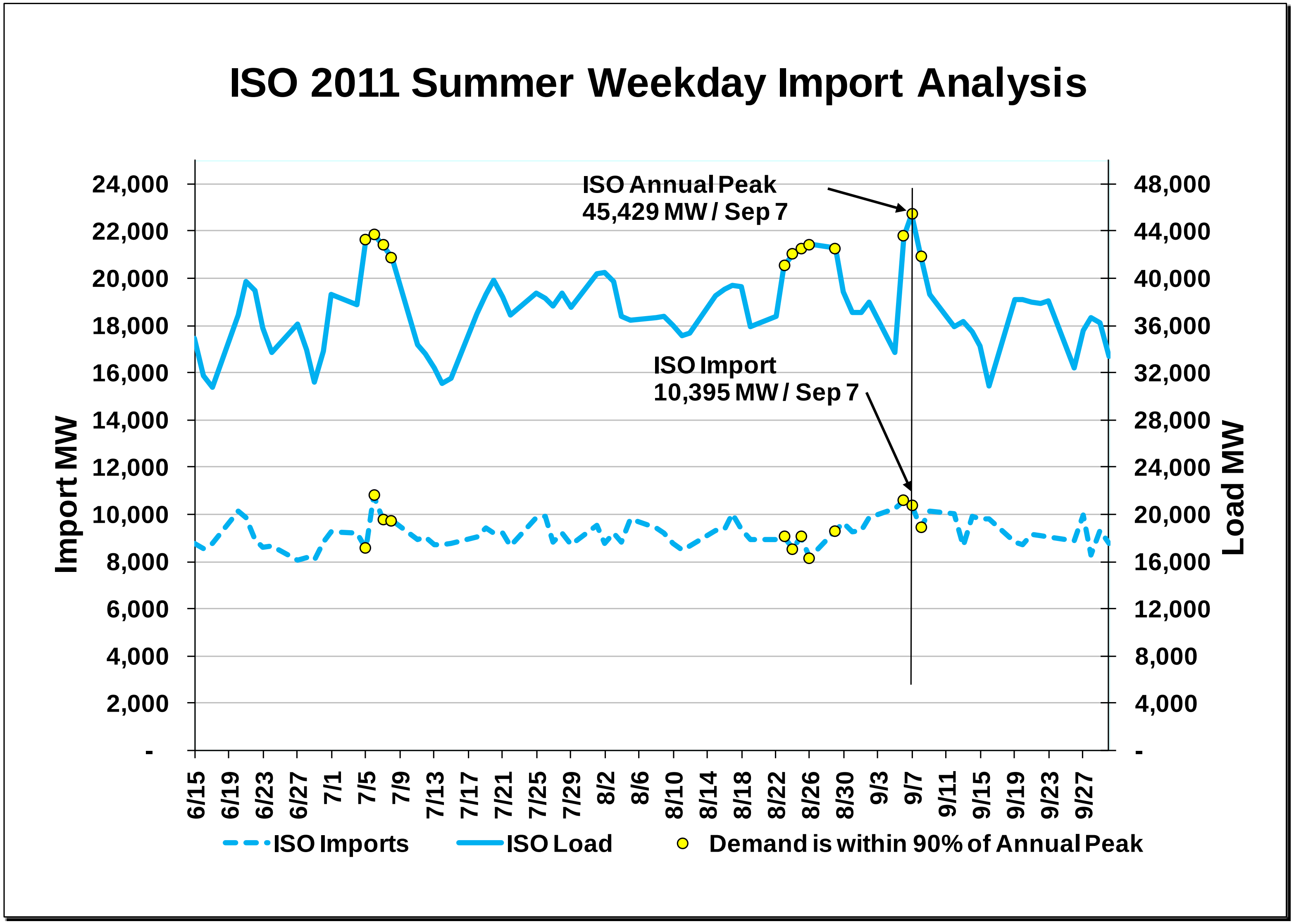

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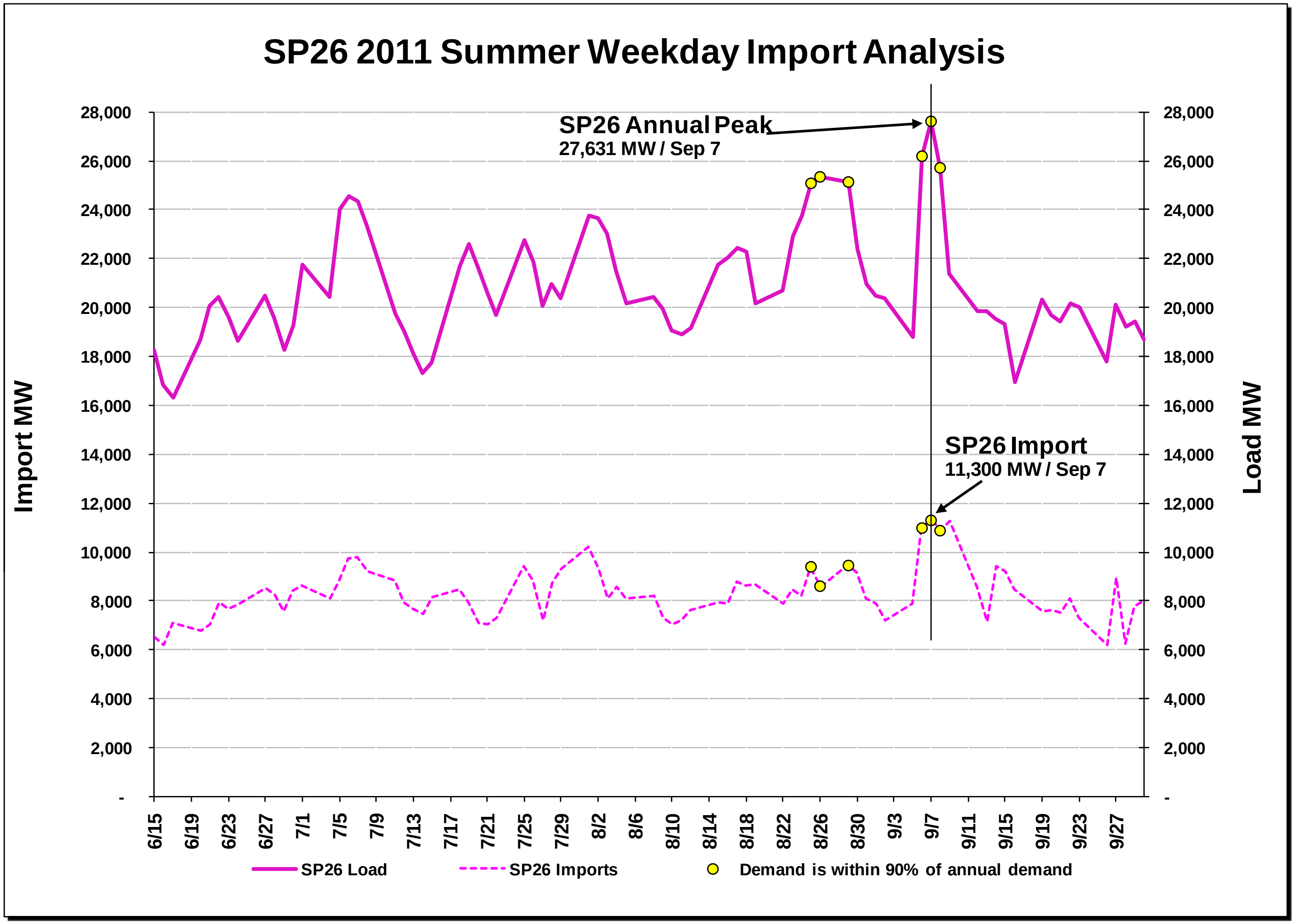

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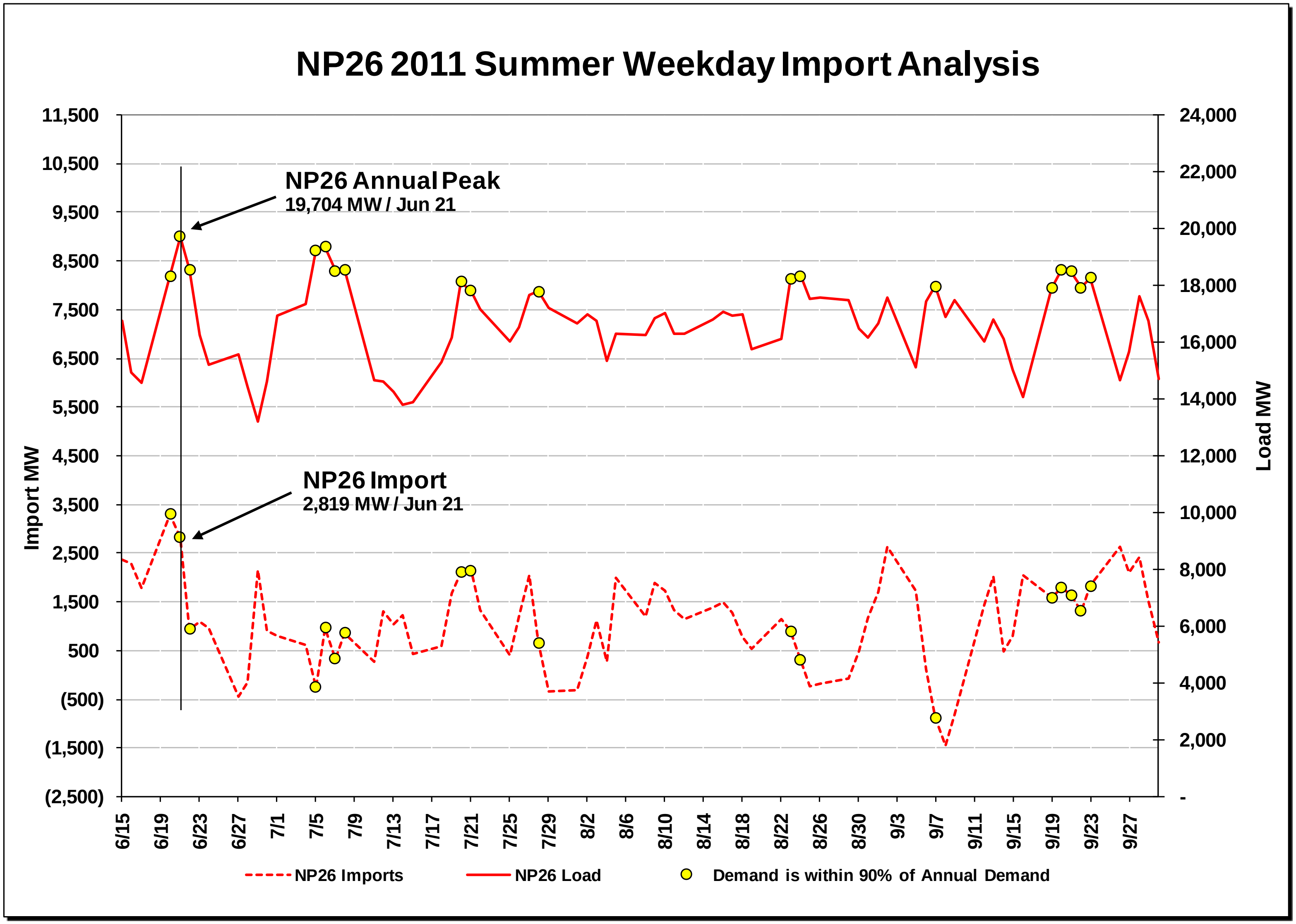

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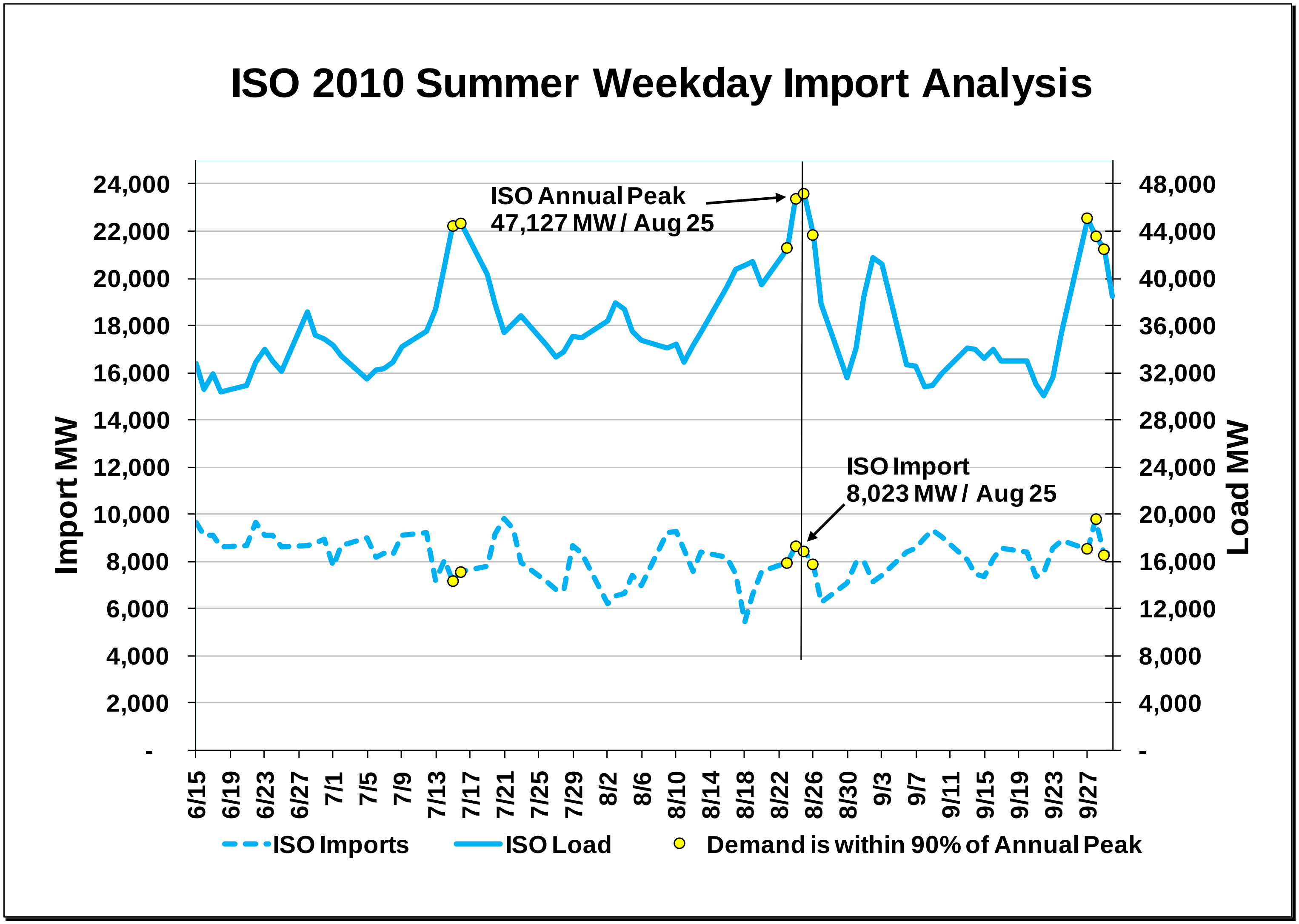

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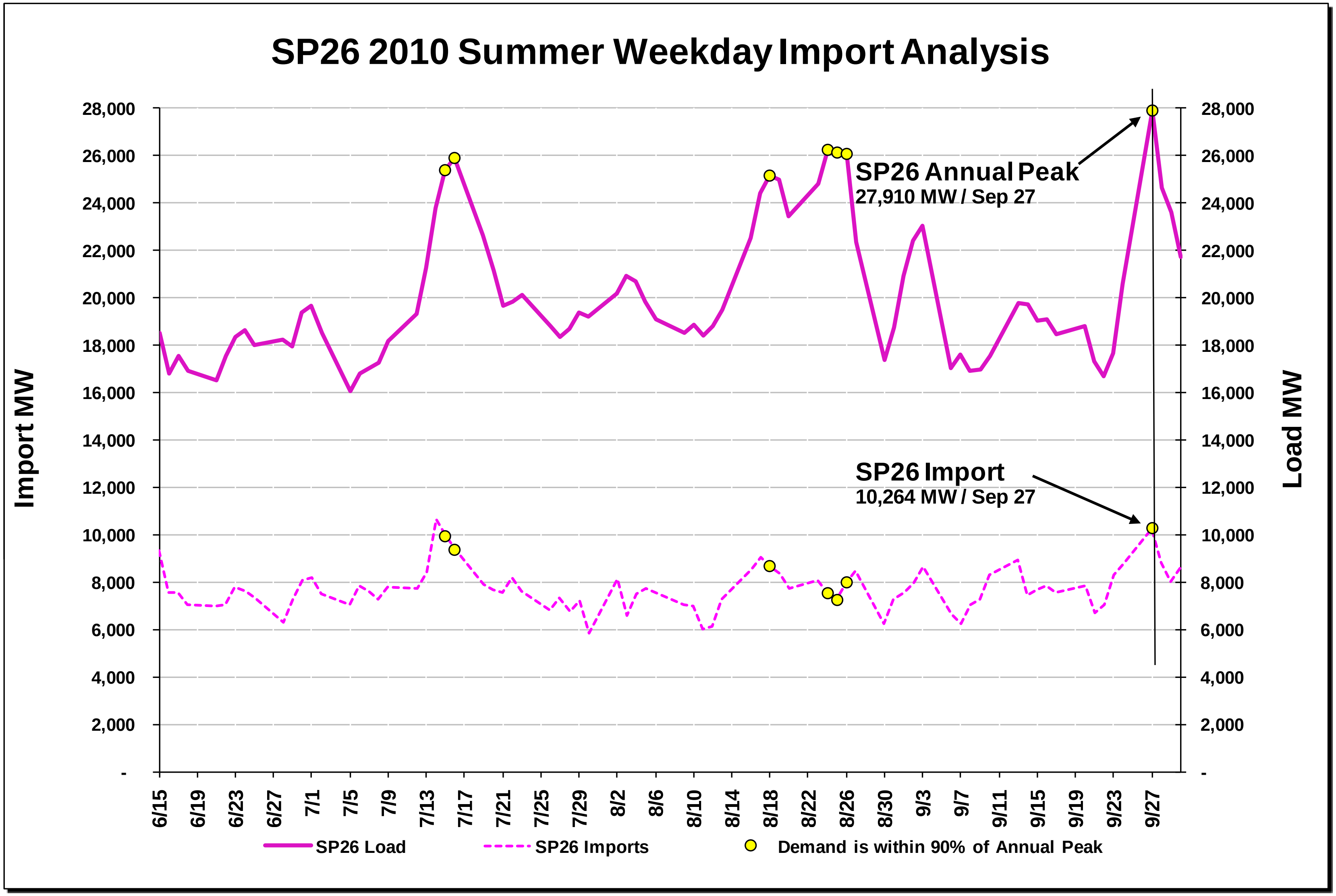

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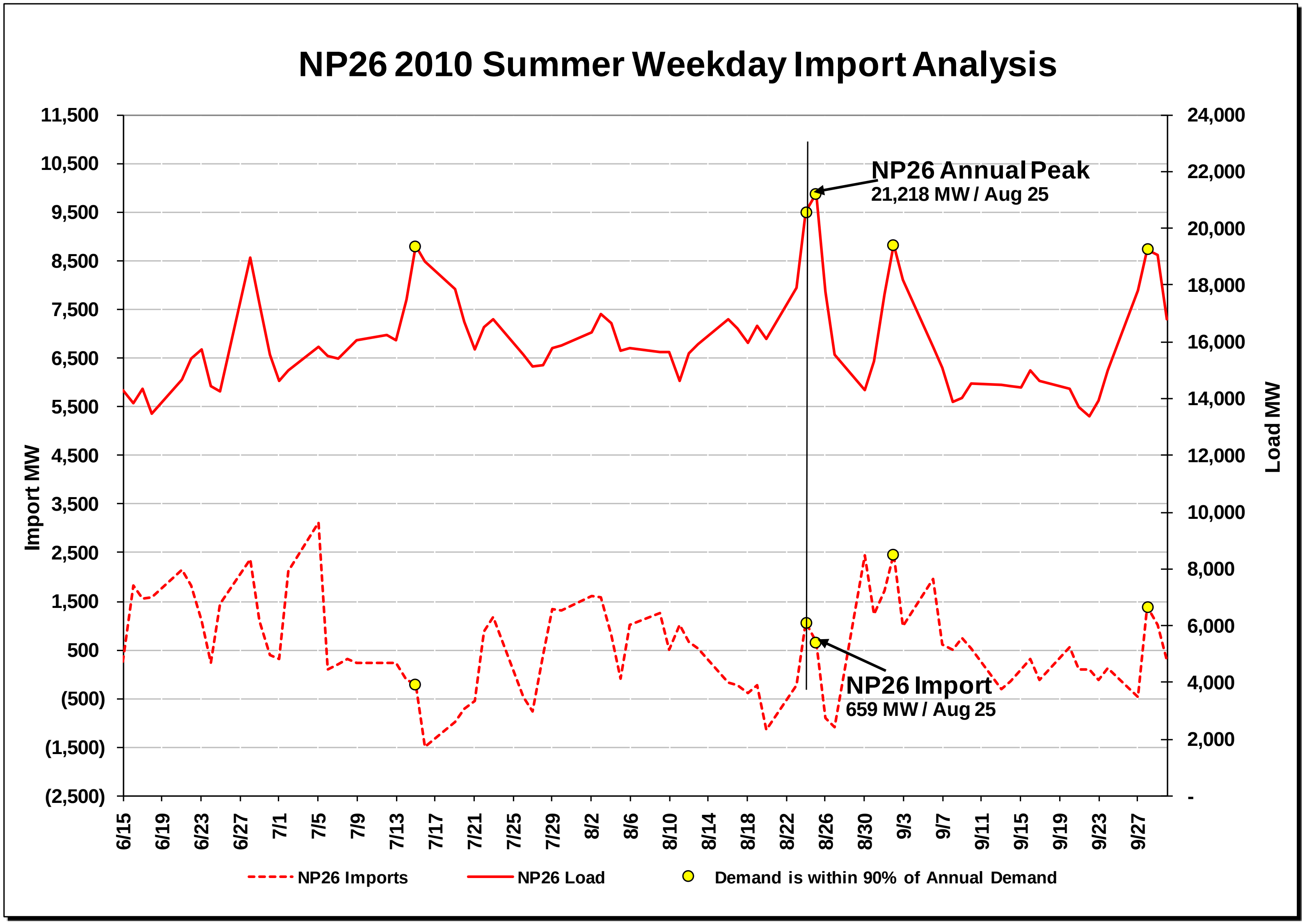
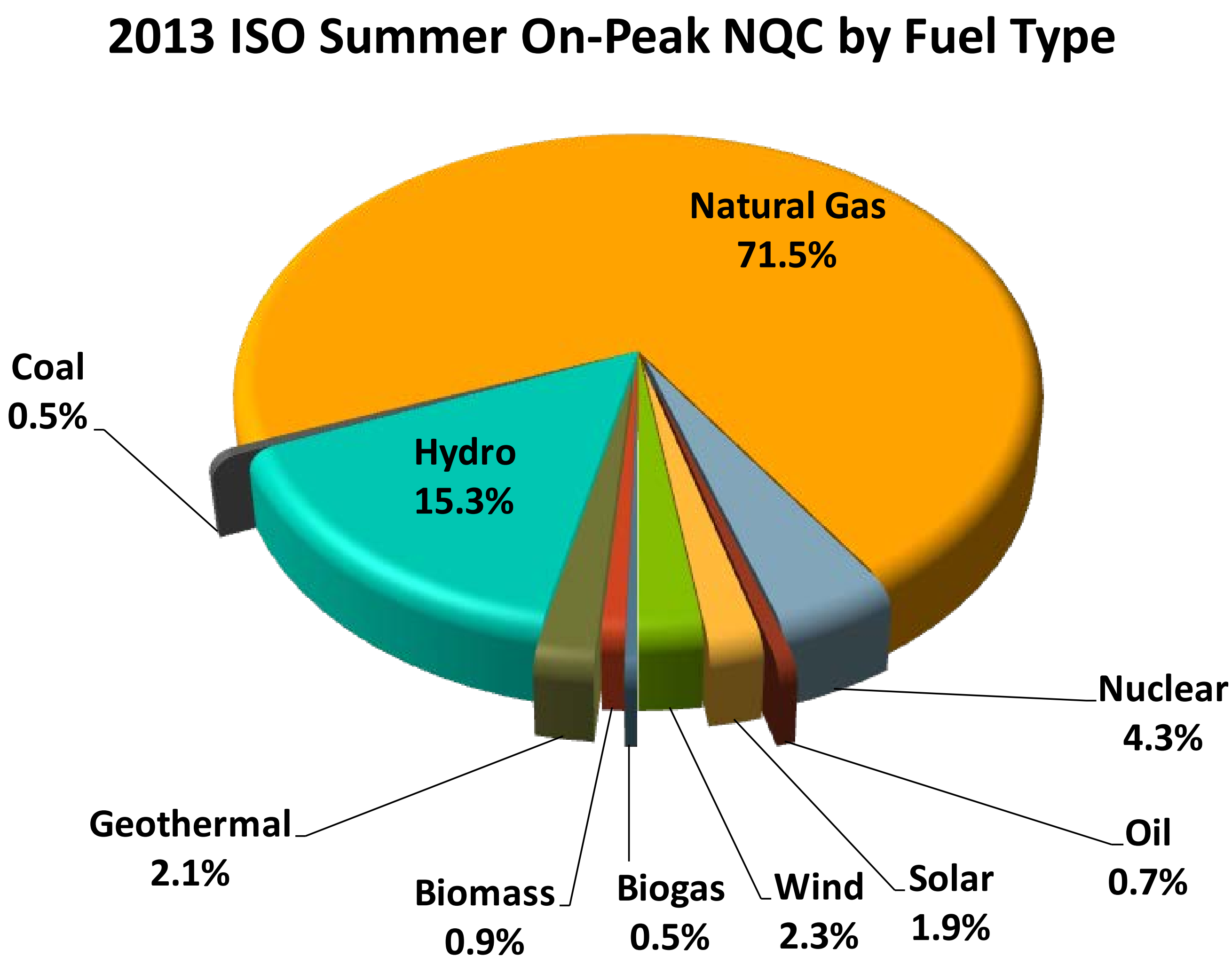
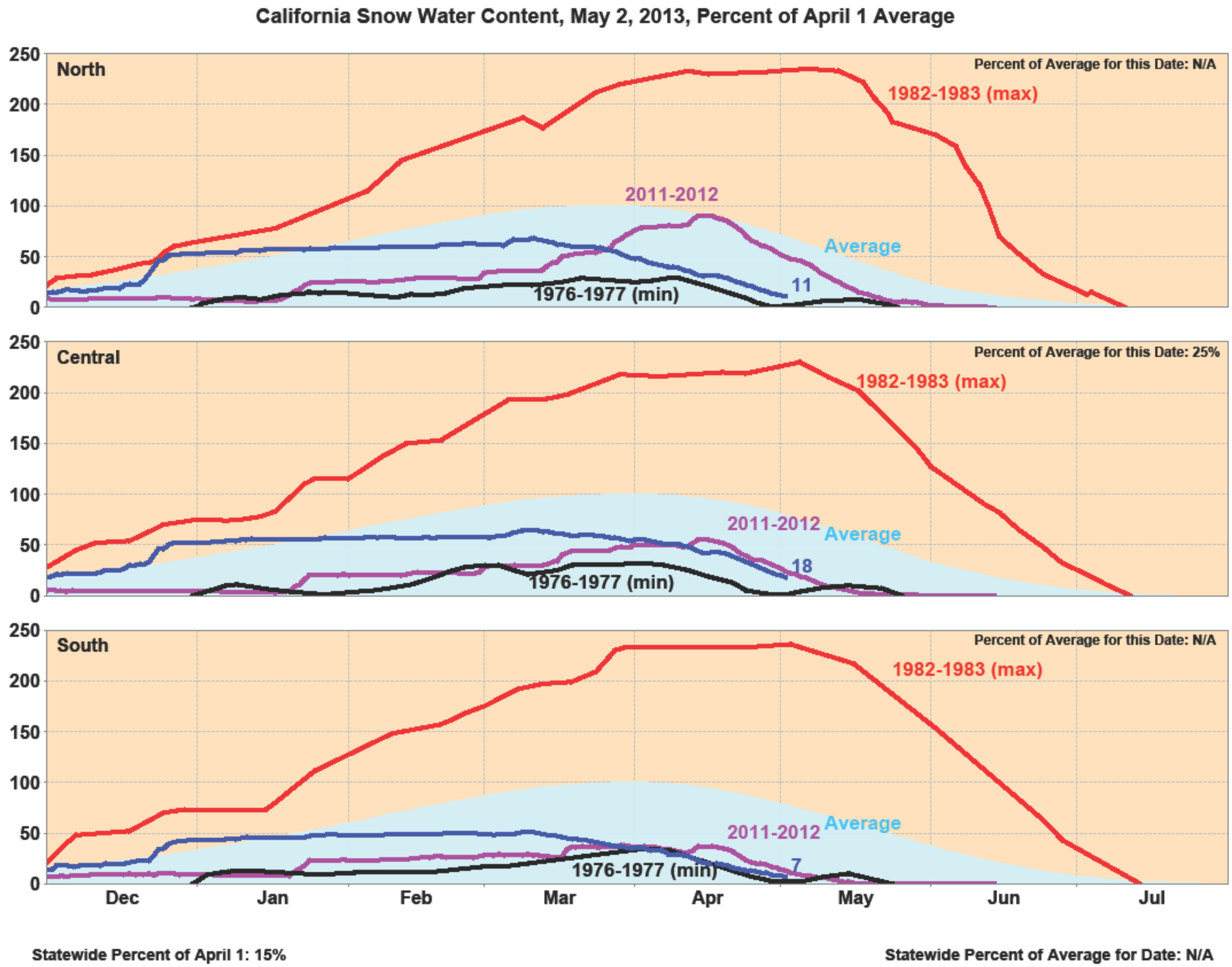


Appendix E: 2013 ISO Summer On-Peak NQC Fuel Type

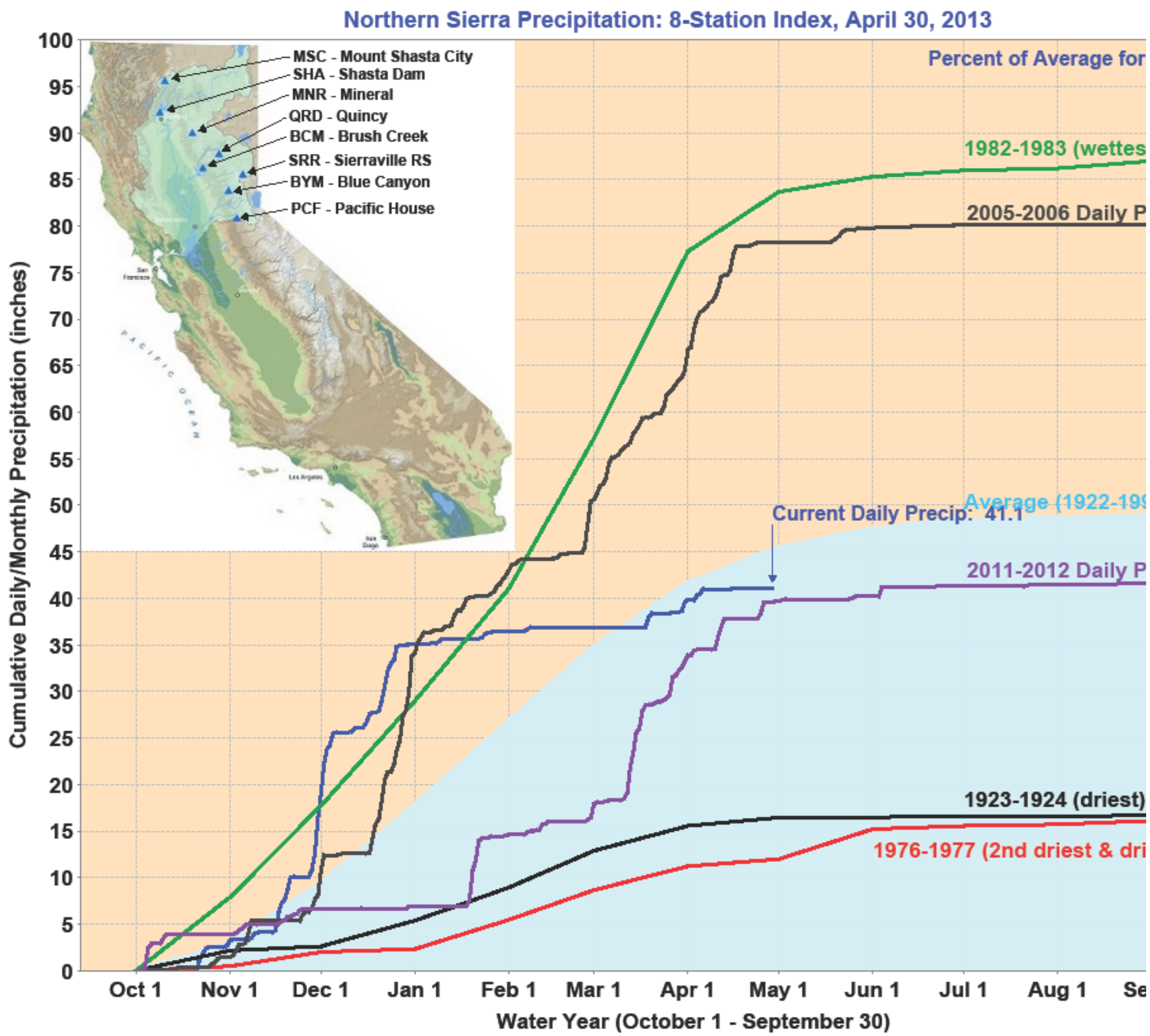


Appendix F: 2013 California Hydrologic Conditions



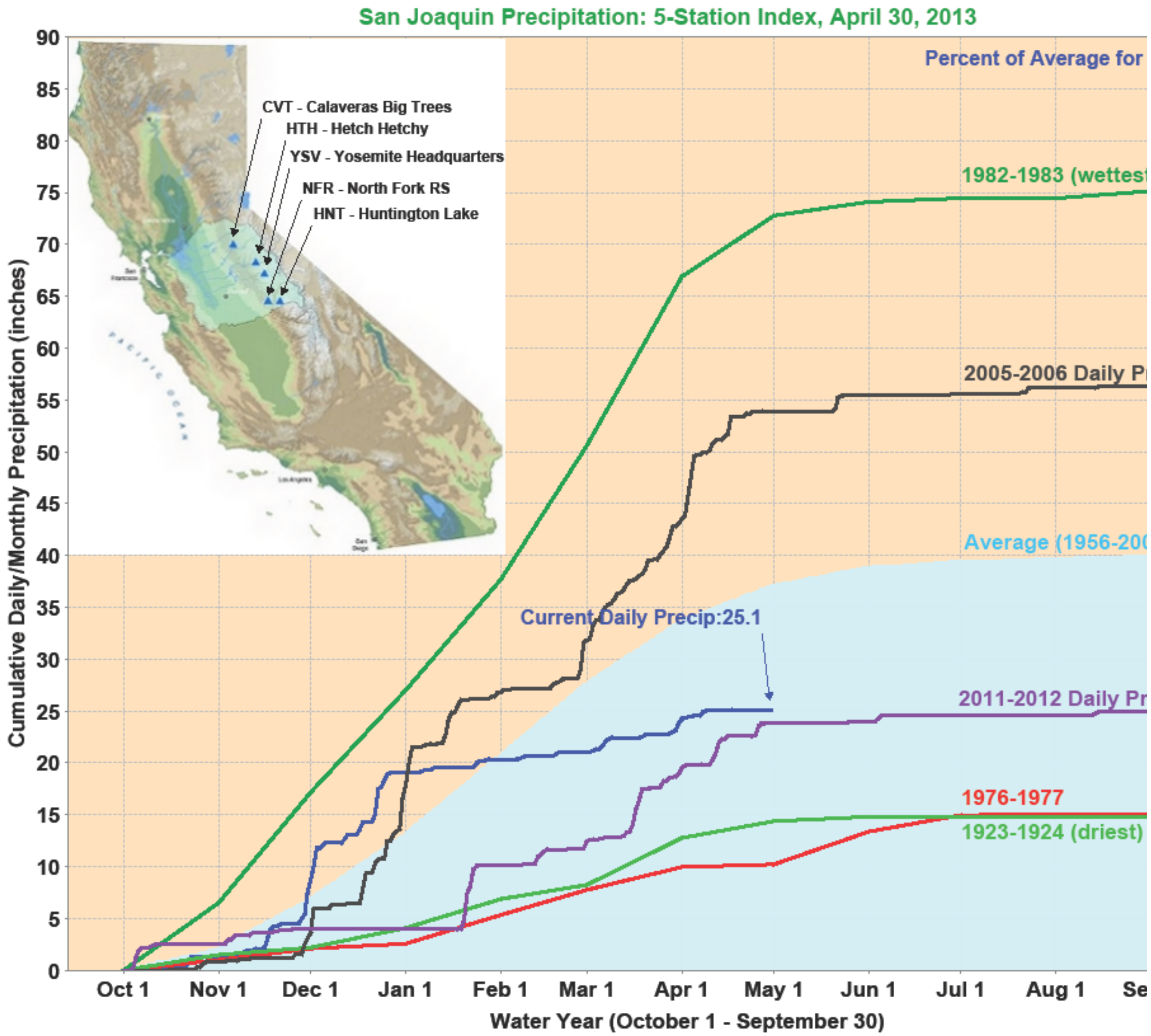
Source: California Department of Water Resources

Appendix F – Continued



Source: California Department of Water Resources

Appendix F – Continued



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