ISO-NE Pre-Winter 2015/16 Outlook

Electric/Gas Operations Committee

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PRINCIPAL ENGINEER – SYSTEM PLANNING

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Executive Summary

- ISO-NE expects to be able to meet the winter 2015/16 peak demand and operating reserve requirements, however, an extreme weather event or major contingency on the regional natural gas or electric grid could quickly diminish projected reserve margins
  - The ISO-NE Winter 2015/16 Reliability Program (OIL, LNG, DR) will again supplement the loss of fuel-constrained, gas-only, operable capacity

Forecast Winter 2015/16 Peak Demands

- 50/50 Reference Case Winter Peak Demand Forecast at 7 ^{o}F is 21,077 MW (net peak demand)
  - Prior winter's 50/50 forecast was 22,575
  - This is almost a 1,500 MW reduction in the 50/50 forecast demand
  - Winter 2014/15 peak demand was 20,583 MW on January 8, 2015 for HE 18:00
- 90/10 Extreme Case Winter Peak Demand Forecast at 2 ^{o}F is 21,737 MW (net peak demand)
  - Prior winter's 90/10 forecast was 23,325
  - This is almost a 1,600 MW reduction in the 90/10 forecast demand

- Both forecasts take into account approximately 1,650 MW in energy savings from energy–efficiency measure procured through the region's Forward Capacity Market (FCM)

Resource Capacity

- Resources with an Forward Capacity Market - Capacity Supply Obligation (CSO) are 31,058 MW, which includes:
  - 29,932 MW of generation
  - 587 MW of demand response resources
  - 1,226 MW of import capacity
  - Minus 687 MW of capacity unavailable due to maintenance and/or other reasons

Winter 2015/16 Reliability Program

Oil Program

- Initially, 81 units submitted intent to provide 4.464 million barrels
- Based upon assets participating in final program, total eligible oil is anticipated to be 2.965 million barrels
- Total oil program cost exposure is anticipated to be $38.25 M (@$12.90/Bbls)

LNG Program

- 8 units submitted intent to provide at least 1.42 million MMBTU
- Based upon assets participating in the final program, total LNG is 1.278 million MMBTU
- Total LNG program cost exposure is anticipated to be $2.75 M (@$2.15/MMBTU)

Demand Response (DR) Program

- 6 assets submitted intent to provide at least 26.5 MW of interruption capability
- Total DR program cost exposure is anticipated to be $132,000

Winter 2015/16 Reliability Program – cont'd

Dual Fuel Commissioning (DFC) Program

Participation:

- 6 units submitted intent to commission dual fuel capability
  - 4 units for 2014/15 (1,039 MW)
  - 2 units for 2015/16 (735 MW)
- Total winter seasonal claimed capability added will be 1,774 MW

DFC Activity and Related Costs:

- Units commissioned (as of Oct 31): 3 successful, 1 outstanding
- Total Commissioning Cap of $5.7 M
  - 2014/15: $3.56 M
  - 2015/16: $2.19 M

Operating Procedures

- ISO-NE has Operating Procedures ready to provide the necessary load & capacity relief, if required:
  - Master/Local Control Center Procedure No. 2 – *Abnormal Conditions Alert,* **(M/LCC2)** is designed to alert power system operations, maintenance, construction and test personnel, as well as Market Participants, when abnormal conditions affecting the reliability of the power system are anticipated or exist
  - ISO-NE Operating Procedure No. 4 – *Actions During a Capacity Deficiency* **(OP4),** is designed to provide the necessary load and capacity relief to mitigate reliability impacts when available capacity is unable to meet anticipated demand plus operating reserves

Operating Procedures - cont'd

- ISO-NE has Operating Procedures ready to provide the necessary load & capacity relief, if required: - cont'd
  - ISO-NE Operating Procedure No. 21 – *Energy Inventory Accounting and Actions During an Energy Emergency* **(OP21),** is designed to mitigate the loss of operable capacity due to prolonged national or regional fuel supply deficiencies, which could occur anytime during the year
    - Includes the fuel supply chains delivering coal, natural gas, LNG, and heavy and light fuel oil

FORECAST OPERABLE CAPACITY ANALYSIS

Winter 2015/16

Fall 2015 and Winter 2015/16 Forecast Operable Capacity Margins

- The lowest (50/50 & 90/10) Fall 2015 Operable Capacity Margin was projected for week beginning November 21, 2015.
- The lowest (50/50 & 90/10) Winter 2015/16 Operable Capacity Margin is projected for week beginning January 9, 2016.

Winter 2015/16 Operable Capacity Analysis – Reference

50/50 Load Forecast (Reference)	January - 2016[2] CSO	January –2016[2] SCC
Generator Operable Capacity MW [1]	29,897	32,837
OP CAP From OP-4 RTDR (+)	413	413
OP CAP From OP-4 RTEG (+)	174	174
Operable Capacity Generator with OP-4 DR and RTEG	30,484	33,424
External Node Available Net Capacity, CSO imports minus firm capacity exports (+)	1,226	1,226
Non Commercial Capacity (+)	35	35
Non Gas-fired Planned Outage MW (-)	687	729
Gas Generator Outages MW (-)	0	34
Allowance for Unplanned Outages (-) [5]	2,800	2,800
Generation at Risk Due to Gas Supply (-) [4]	3,828	4,220
Net Capacity (NET OPCAP SUPPLY MW) [3]	24,430	26,902
Peak Load Forecast MW(adjusted for Other Demand Resources) [2]	21,077	21,077
Operating Reserve Requirement MW	2,375	2,375
Operable Capacity Required (NET LOAD OBLIGATION MW)	23,452	23,452
Operable Capacity Margin [3]	978	3,450

[1] Generator Operable Capacity is based on data as of **October 19, 2015** and does not include Capacity associated with Settlement Only Generators, Passive and Active Demand Response, and external capacity. SCC value is based on data as of **October 19, 2015**

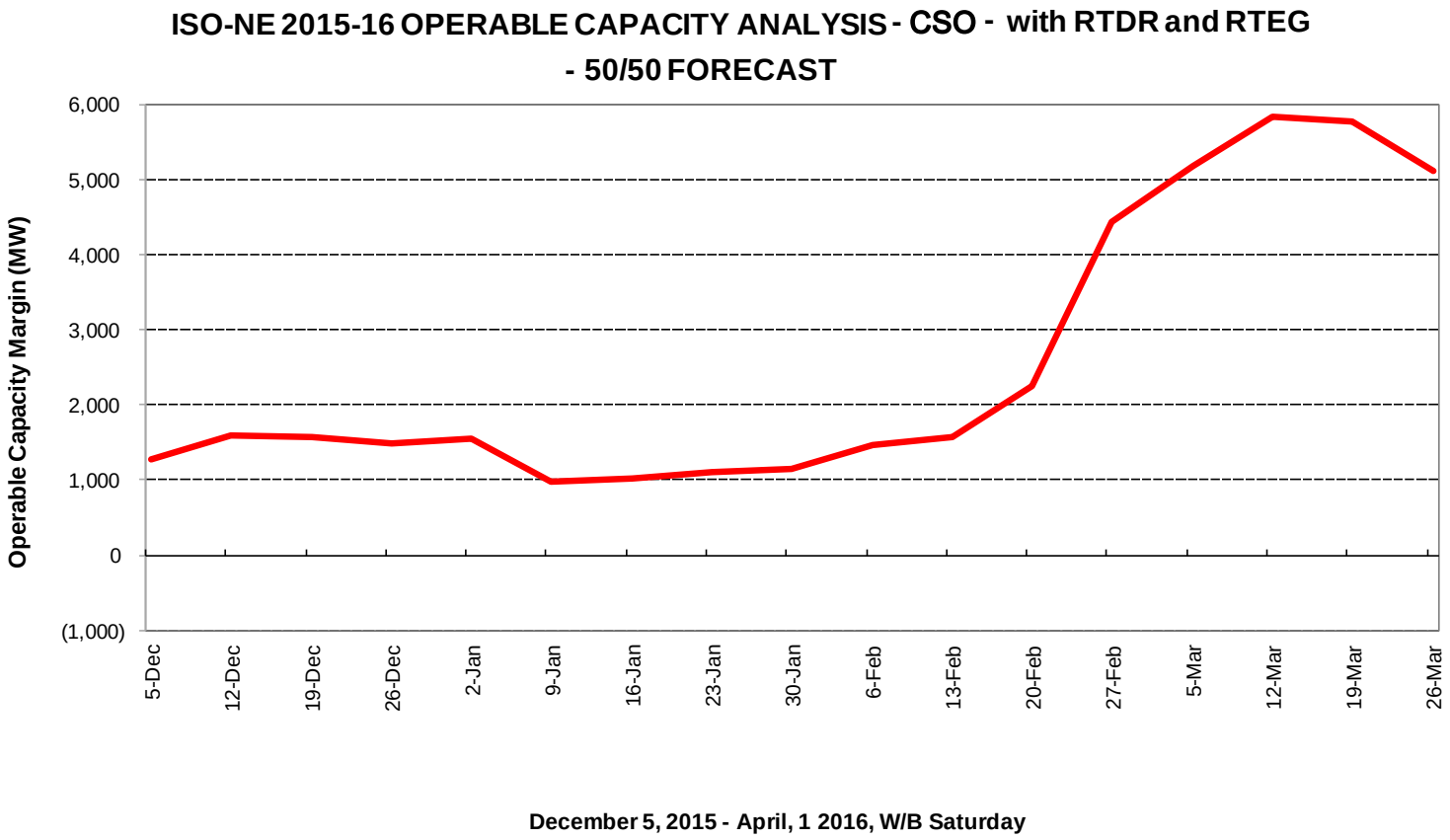
[2] Load based on 2015 CELT report and week with lowest Operable Capacity Margin, week beginning **January 9, 2016**.

[3] Includes OP4 actions associated with RTEG and RTDR

[4] Total of (Gas at Risk MW) – (Gas Gen Outages MW)

[5] Allowance For Unplanned Outage MW is based on the month corresponding to the day with the lowest Operable Capacity Margin for the week.

Winter 2015/16 Operable Capacity Analysis(MW) 50/50 Forecast (Reference)



Winter 2015/16 Operable Capacity Analysis(MW)
50/50 Forecast (Reference)

ISO-NE 2015-16 OPERABLE CAPACITY ANALYSIS

November 6, 2015 - 50/50 FORECAST using CSO values with RTDR and RTEG

This analysis is a tabulation of weekly assessments shown in one single table. The information shows the operable capacity situation under assumed conditions for each week. It is not expected that the system peak will occur every week during June, July, and August and Mid September.

STUDY WEEK (Week Beginning, Saturday)	AVAILABLE OPCAP MW	EXTERNAL NODE AVAIL CAPACITY MW	NON COMMERCIAL CAPACITY MW	NON-GAS PLANNED OUTAGES CSO MW	GAS GENERATOR OUTAGES CSO MW	ALLOWANCE FOR UNPLANNED OUTAGES MW	GAS AT RISK MW	NET OPCAP SUPPLY MW	PEAK LOAD FORECAST MW	OPER RESERVE REQUIREMENT MW	NET LOAD OBLIGATION MW	OPCAP MARGIN MW	OPCAP FROM OP4 ACTIVE REAL-TIME DR MW	OPCAP MARGIN w/ OP4 actions through OP4 Step 2 MW	OPCAP FROM OP4 REAL-TIME EMER. GEN MW	OPCAP MARGIN w/ OP4 actions through OP4 Step 6 MW
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]
12/5/2015	30,004	1,156	30	1,504	1,209	3,200	2,229	23,048	19,951	2,375	22,326	722	378	1,100	174	1,274
12/12/2015	30,004	1,156	30	851	900	3,200	2,581	23,658	20,247	2,375	22,622	1,036	378	1,414	174	1,588
12/19/2015	30,004	1,156	30	814	654	3,200	2,870	23,652	20,258	2,375	22,633	1,019	378	1,397	174	1,571
12/26/2015	30,004	1,156	35	714	161	3,200	3,494	23,626	20,322	2,375	22,697	929	378	1,307	174	1,481
1/2/2016	29,897	1,226	35	685	0	2,800	3,741	23,932	20,602	2,375	22,977	955	413	1,368	174	1,542
1/9/2016	29,897	1,226	35	687	0	2,800	3,828	23,843	21,077	2,375	23,452	391	413	804	174	978
1/16/2016	29,897	1,226	35	644	0	2,800	3,828	23,886	21,077	2,375	23,452	434	413	847	174	1,021
1/23/2016	29,897	1,226	35	610	0	2,800	3,785	23,963	21,077	2,375	23,452	511	413	924	174	1,098
1/30/2016	29,897	1,226	35	611	0	3,100	3,655	23,792	20,850	2,375	23,225	567	413	980	174	1,154
2/6/2016	29,897	1,226	35	655	0	3,100	3,568	23,835	20,577	2,375	22,952	883	413	1,296	174	1,470
2/13/2016	29,897	1,226	35	670	0	3,100	3,481	23,907	20,547	2,375	22,922	985	413	1,398	174	1,572
2/20/2016	29,897	1,226	35	351	0	3,100	3,394	24,313	20,279	2,375	22,654	1,659	413	2,072	174	2,246
2/27/2016	29,897	1,226	37	763	0	2,200	2,715	25,482	19,269	2,375	21,644	3,838	413	4,251	174	4,425
3/5/2016	29,897	1,226	37	820	1,156	2,200	1,106	25,878	18,912	2,375	21,287	4,591	413	5,004	174	5,178
3/12/2016	29,897	1,226	37	819	916	2,200	894	26,331	18,712	2,375	21,087	5,244	413	5,657	174	5,831
3/19/2016	29,897	1,226	37	2,166	501	2,200	404	25,889	18,339	2,375	20,714	5,175	413	5,588	174	5,762
3/26/2016	29,897	1,226	37	2,977	822	2,700	0	24,661	17,762	2,375	20,137	4,524	413	4,937	174	5,111

1. Available OPCAP MW based on resource Capacity Supply Obligations, CSO. Does not include Settlement Only Generators.
2. External Node Available Capacity MW based on the sum of external Capacity Supply Obligations (CSO) imports and exports.
3. New resources and generator improvements that have acquired a CSO but have not become commercial.
4. Non-Gas Planned Outages is the total of Non Gas-fired Generator/DARD Outages for the period. This value would also include any known long-term Non Gas-fired Forced Outages.
5. All Planned Gas-fired generation outage for the period. This value would also include any known long-term Gas-fired Forced Outages.
6. Allowance for Unplanned Outages includes forced outages and maintenance outages scheduled less than 14 days in advance per ISO New England Operating Procedure No. 5 Appendix A.
7. Generation at Risk due to Gas Supply pertains to gas fired capacity expected to be at risk during cold weather conditions or gas pipeline maintenance outages.
8. Net OpCap Supply MW Available (1 + 2 + 3 - 4 - 5 - 6 - 7 = 8)
9. Peak Load Forecast as provided in the 2015 CELT Report and adjusted for Passive Demand Resources. http://www.iso-ne.com/system planning/system plans-studies/celt
10. Operating Reserve Requirement based on 125% of first largest contingency plus 50% of the second largest contingency.
11. Total Net Load Obligation per the formula(9 + 10 = 11)
12. Net OPCAP Margin MW = Net Op Cap Supply MW minus Net Load Obligation (8 - 11 = 12)
13. OP 4 Action 2 Real-time Demand Response based on OP4 Appendix A. Reserve Margins and Distribution Loss Factor Gross Ups are Included.
14. OPCAP Margin taking into account Real Time Demand Response through OP4 Step 2 (12 + 13 = 14)
15. OP 4 Action 6 Emergency Generation Response without the Voltage Reduction requiring > 10 Minutes based on OP4 Appendix A. Real Time Emergency Generation is capped at 600MW. Reserve Margins and Distribution Loss Factor Gross Ups are Included.
16. OPCAP Margin taking into account Real Time Demand Response and Real Time Emergency Generation through OP4 Step 6 (14 + 15 = 16) This does not include Emergency Energy Transactions (EETs).

Winter 2015/16 Operable Capacity Analysis - Extreme

90/10 Load Forecast (Extreme)	January- 2016[2] CSO	January - 2016[2] SCC
Generator Operable Capacity MW [1]	29,897	32,837
OP CAP From OP-4 RTDR (+)	413	413
OP CAP From OP-4 RTEG (+)	174	174
Operable Capacity Generator with OP-4 DR and RTEG	30,484	33,424
External Node Available Net Capacity, CSO imports minus firm capacity exports (+)	1,226	1,226
Non Commercial Capacity (+)	35	35
Non Gas-fired Planned Outage MW (-)	687	729
Gas Generator Outages MW (-)	0	34
Allowance for Unplanned Outages (-) [5]	2,800	2,800
Generation at Risk Due to Gas Supply (-) [4]	4,534	5,004
Net Capacity (NET OPCAP SUPPLY MW) [3]	23,724	26,118
Peak Load Forecast MW(adjusted for Other Demand Resources) [2]	21,737	21,737
Operating Reserve Requirement MW	2,375	2,375
Operable Capacity Required (NET LOAD OBLIGATION MW)	24,112	24,112
Operable Capacity Margin [3]	(388)	2,006

[1] Generator Operable Capacity is based on data as of **October 19, 2015** and does not include Capacity associated with Settlement Only Generators, Passive and Active Demand Response, and external capacity. SCC value is based on data as of **October 19, 2015**

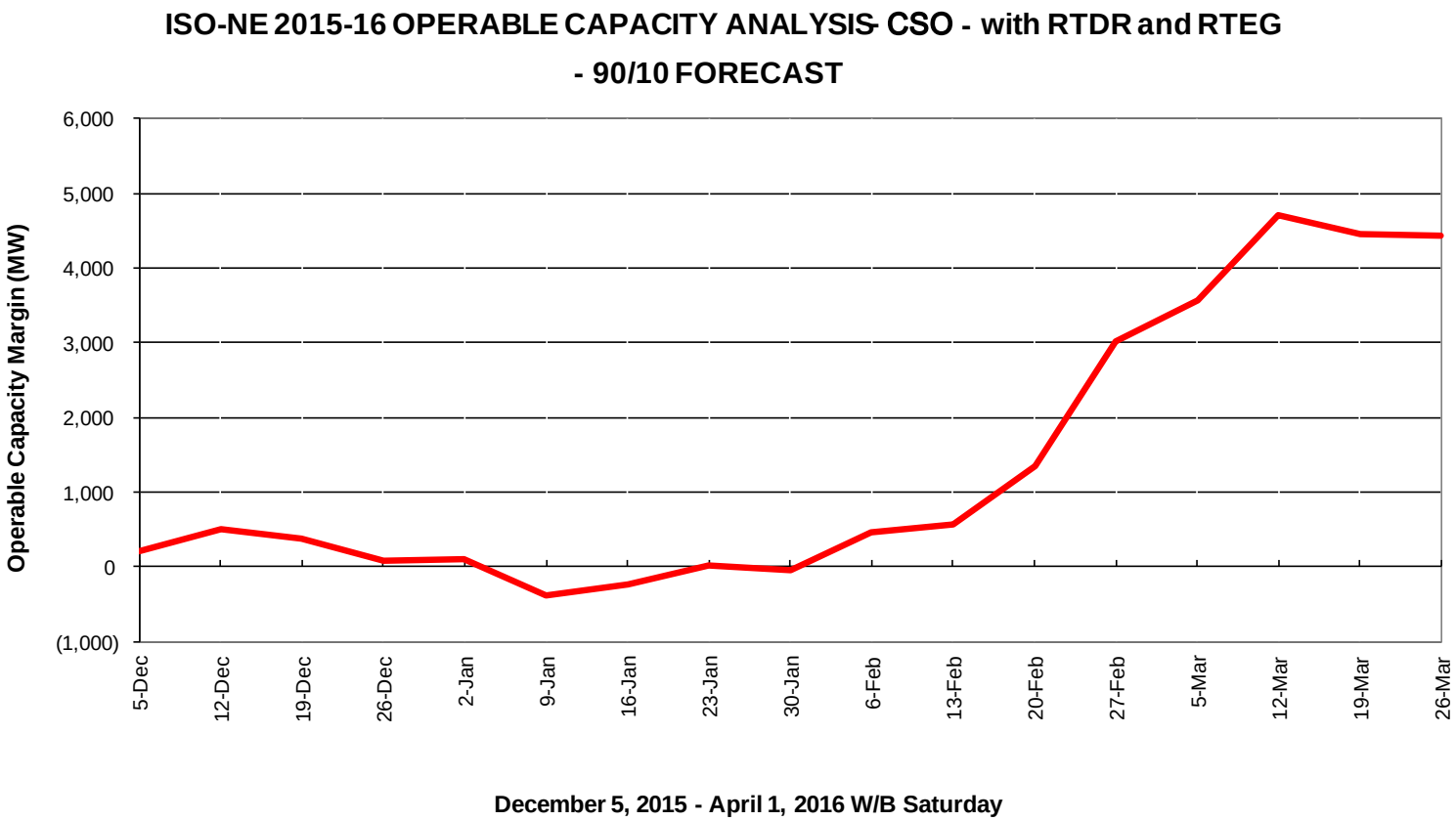
[2] Load based on 2015 CELT report and week with lowest Operable Capacity Margin, week beginning **January 9, 2016**.

[3] Includes OP4 actions associated with RTEG and RTDR

[4] Total of (Gas at Risk MW) – (Gas Gen Outages MW)

[5] Allowance For Unplanned Outage MW is based on the month corresponding to the day with the lowest Operable Capacity Margin for the week.

Winter 2015/16 Operable Capacity Analysis(MW)
90/10 Forecast (Extreme)



Winter 2015/16 Operable Capacity Analysis(MW)
90/10 Forecast (Extreme)

ISO-NE 2015-16 OPERABLE CAPACITY ANALYSIS

November 6, 2015 - 90/10 FORECAST using CSO values with RTDR and RTEG

This analysis is a tabulation of weekly assessments shown in one single table. The information shows the operable capacity situation under assumed conditions for each week. It is not expected that the system peak will occur every week during June, July, and August and Mid September.

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12/5/2015	30,004	1,156	30	1,504	1,209	3,200	2,668	22,609	20,579	2,375	22,954	(345)	378	33	174	207
12/12/2015	30,004	1,156	30	851	900	3,200	3,022	23,217	20,883	2,375	23,258	(41)	378	337	174	511
12/19/2015	30,004	1,156	30	814	654	3,200	3,427	23,095	20,895	2,375	23,270	(175)	378	203	174	377
12/26/2015	30,004	1,156	35	714	161	3,200	4,260	22,860	20,960	2,375	23,335	(475)	378	(97)	174	77
1/2/2016	29,897	1,226	35	685	0	2,800	4,534	23,139	21,248	2,375	23,623	(484)	413	(71)	174	103
1/9/2016	29,897	1,226	35	687	0	2,800	4,534	23,137	21,737	2,375	24,112	(975)	413	(562)	174	(388)
1/16/2016	29,897	1,226	35	644	0	2,800	4,421	23,293	21,737	2,375	24,112	(819)	413	(406)	174	(232)
1/23/2016	29,897	1,226	35	610	0	2,800	4,194	23,554	21,737	2,375	24,112	(558)	413	(145)	174	29
1/30/2016	29,897	1,226	35	611	0	3,100	4,194	23,253	21,503	2,375	23,878	(625)	413	(212)	174	(38)
2/6/2016	29,897	1,226	35	655	0	3,100	3,922	23,481	21,222	2,375	23,597	(116)	413	297	174	471
2/13/2016	29,897	1,226	35	670	0	3,100	3,832	23,556	21,192	2,375	23,567	(11)	413	402	174	576
2/20/2016	29,897	1,226	35	351	0	3,100	3,652	24,055	20,916	2,375	23,291	764	413	1,177	174	1,351
2/27/2016	29,897	1,226	37	763	0	2,200	3,517	24,680	19,877	2,375	22,252	2,428	413	2,841	174	3,015
3/5/2016	29,897	1,226	37	820	1,156	2,200	2,126	24,858	19,509	2,375	21,884	2,974	413	3,387	174	3,561
3/12/2016	29,897	1,226	37	819	916	2,200	1,429	25,796	19,303	2,375	21,678	4,118	413	4,531	174	4,705
3/19/2016	29,897	1,226	37	2,166	501	2,200	1,141	25,152	18,920	2,375	21,295	3,857	413	4,270	174	4,444
3/26/2016	29,897	1,226	37	2,977	822	2,700	116	24,545	18,325	2,375	20,700	3,845	413	4,258	174	4,432

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Possible Load & Capacity Relief from OP4 - Appendix A

OP 4 Action Number	Page 1 of 2 Action Description	Amount Assumed Obtainable Under OP 4 (MW)
1	Implement Power Caution and advise Resources with a CSO to prepare to provide capacity and notify "Settlement Only" generators with a CSO to monitor reserve pricing to meet those obligations. Begin to allow depletion of 30-minute reserve.	0 [1] 600
2	Dispatch real time Demand Resources.	**November 308[3]** **December 378[3]** **January - March 413[3]**
3	Voluntary Load Curtailment of Market Participants' facilities.	40 [2]
4	Implement Power Watch	0
5	Schedule Emergency Energy Transactions and arrange to purchase Control Area-to-Control Area Emergency	1,000
6	Voltage Reduction requiring > 10 minutes Dispatch real time Emergency Generation	135 [4] **November 157 [3]** **December 174[3]** **January - March 174 [3]**

NOTES:

1. Based on Summer Ratings. Assumes 25% of total MW Settlement Only units <5 MW will be available and respond.
2. The actual load relief obtained is highly dependent on circumstances surrounding the appeals, including timing and the amount of advanced notice that can be given.
3. The RTDR and RTEG MW values are based on FCM results as of October 19, 2015.
4. The MW values are based on a 26,930 MW system load and the most recent voltage reduction test % achieved.

Possible Load & Capacity Relief from OP4 - Appendix A

OP 4 Action Number	Page 2 of 2 Action Description	Amount Assumed Obtainable Under OP 4 (MW)
7	Request generating resources not subject to a Capacity Supply Obligation to voluntary provide energy for reliability purposes	0
8	Voltage Reduction requiring 10 minutes or less	269 [4]
9	Transmission Customer Generation Not Contractually Available to Market Participants during a Capacity Deficiency. Voluntary Load Curtailment by Large Industrial and Commercial Customers.	5 200 [2]
10	Radio and TV Appeals for Voluntary Load Curtailment Implement Power Warning	200 [2]
11	Request State Governors to Reinforce Power Warning Appeals.	100 [2]
Total		**November 3,014 MW** **December 3,101 MW** **January - March 3,136 MW**

NOTES:

1. Based on Summer Ratings. Assumes 25% of total MW Settlement Only units <5 MW will be available and respond.
2. The actual load relief obtained is highly dependent on circumstances surrounding the appeals, including timing and the amount of advanced notice that can be given.
3. The RTDR and RTEG MW values are based on FCM results as of October 19, 2015.
4. The MW values are based on a 26,930 MW system load and the most recent voltage reduction test % achieved.

Questions