



NEW YORK STATE ELECTIC AND GAS

SENECA COMPRESSED AIR ENERGY STORAGE PROJECT

TRANSMISSION IMPACT STUDY

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**NYSEG COMPRESSED AIR ENERGY STORAGE PROJECT
TRANSMISSION IMPACT STUDY**

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1.0 EXECUTIVE SUMMARY

A Compressed Air Energy Storage (CAES) generation facility is proposed for construction in the New York State Electric Gas (NYSEG) service area near the city of Watkins Glen close to the west shore of Seneca Lake. This facility is to be connected to the nearby 115kV transmission system. During power system off peak times the plant would take energy from the transmission system and compress air into a below ground cavern. During system peak loading periods the compressed air would be used to generate electricity.

This study was performed to provide a preliminary assessment of the impacts of the proposed plant on the power system facilities in the area. From the impact assessment, generation and compression load levels were chosen to maximize generation output while minimizing negative impacts and their resultant mitigation costs. The study results indicate that a generation level of 210_MW and a compression load of 170_MW are appropriate for the CAES plant.

The study results indicate that the operation of the CAES plant in either the 210 MW generating or 170 MW compressing mode is acceptable. This analysis was conducted assuming no contingencies. With contingencies the expectation is the CAES plant would be limited to certain input and output power levels that would be controlled administratively.

2.0 DESCRIPTION

The purpose of this preliminary interconnection analysis is to investigate the impacts of the proposed Compressed Air Energy Storage (CAES) plant on the transmission system in western New York in the Finger Lake region. The plant would be physically located north northwest of the city of Watkins Glen. The area is supplied with an 115kV transmission system with two transmission lines running north to south just west of the site location. These two transmission lines connect to the Greenidge station to the north and tie to the Texas Eastern and Montour Falls stations to the south. The point of interconnection (POI) would be approximately 9 miles to the north of Montour Falls and would be the termination point of two transmission lines to Greenidge, one to Texas Eastern, and another to Montour Falls. The POI is physically located near the transmission line corridor. A short transmission line would tie the CAES plant switch yard to the POI. Two transformers would be located at the CAES plant; one would be a generator step up and the other would supply the station's compressor motor facility. The generator is to have a capacity of 210 MW. The compressor motor would have a capacity of 170 MW and be started on a variable frequency drive with a load of 40 MW. The generator would operate during normal transmission system loading and the compressor would operate during light load system loading. Other generation in the area consists of fossil, small hydro and wind farms.



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For this study the Eastern Interconnect was modeled and the western portion of the New York power grid was monitored to determine the impacts of the CAES facility on the nearby transmission system. The analysis considered changes in the power flow on the grid for both the generating and compression modes of operation, fault level changes, system stability issues, and the changes in the voltage profile for the area. A summary of the results of the analyses is:

- The power flow analysis revealed minor thermal and voltage changes for the service area near the plant. The inclusion of the CAES plant into the system did not significantly impact the area for the proposed generation and compressor load levels. Therefore, no costly mitigation measures would be required.
- While short circuit currents increased on nearby buses, they did not impact breaker capabilities. No existing circuit breakers would have to be replaced.
- The results of the transient stability analysis showed lightly damped oscillations at the 210 MW level and damped oscillations at the 135 MW output level during generation. The oscillations can be addressed with a power system stabilizer which is included as part of the exciter for the generator.
- The compression mode analysis assumed the CAES compressor motor was started with a variable frequency drive (vfd) loaded to forty megawatts and then switched across the line. The study results indicate that starting the compressor motor in this manner is satisfactory. It was assumed that a VFD would be included with the machine package.
- The import capability of the transmission system was impacted slightly when the plant was in compression mode. There was no negative impact when the plant was generating.

3.0 STUDY METHODOLOGY

Siemens-PTI's PSS/E Version 32 was used as the study tool for loadflow, short circuit, and transient stability analyses. MUST Version 10 was used for power deliverability and transfer analysis. Base case models of the power system were obtained from New York Independent System Operator (NYISO) and were used for all analyses. These models were included in the latest NYISO FERC 715 filing.

4.0 LOAD FLOW ANALYSIS

The power system base cases used for this analysis were the Federal Energy Regulatory Commission (FERC) 715 cases provided by New York Independent System Operator (NYISO). The summer 2016 normal and light load cases were used for the study. The normal load case

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was used to analyze the CAES generation's impact on the system. This case simulates a mid to late afternoon on a normal summer day with hydro and fossil generation supplemented with wind farm generation dispatched to supply the load. The light load case represents a late night system loading and was used to analyze CAES compression motor impact on the system. The light load case had fossil and hydro dispatched at lower power levels and wind farm dispatched similarly to the normal case.

A thermal violation was assumed to be any loading that exceeded the "Rate A" thermal values of any transmission line, transformers, or switches. The voltage criteria was set at 90% for low voltage and for 105% on the high voltage of nominal values. The system areas monitored were the West, Genesee, and Central of New York state.

4.1 Baseline Cases – Pre CAES – FERC 715 Cases (Based on Cases from NYISO)

A baseline analysis was performed on the light load and normal load cases to determine what thermal and voltage violations may have existed prior to the inclusion of the CAES plant in the models. The detailed results of the baseline analysis are provided in Attachments 1 and 2.

In the light load base case the following thermal problems were identified as shown in the following Table 1.

Area	Fm Bus (34.5kV)	To Bus (34.5kV)	Load (MVA)	Rating (MVA)	Percent
Genesee	S29 34Y	S 1 34.5	60.2	43.6	138.0
Genesee	S 1 34.5	S42 34-3	65.8	50.7	129.7
Genesee	S 49 729	S42 34-4	33.0	31.3	105.5

Table 1: Light Load – Pre CAES - Thermal Violations

In the light load base case there were 80 instances of voltages exceeding the 105% criteria. There no instances of voltages below the 90% level. (See Attachment 1 for listing of voltage violations.)

In the normal loading case the following thermal problems were identified as shown in the following Table 2.

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Area	Fm Bus (34.5kV)	To Bus (34.5kV)	Load (MVA)	Rating (MVA)	Percent
Genesee	S48 34	Jamestown	35.7	34.2	104.3
Genesee	S42 34-1	S43-778	36.6	32.4	113.0
Genesee	Jamestown	Jasco TL	34.9	34.2	101.0

Table 2: Normal Load – Pre CAES – Thermal Violations

In the normal load base case there were 19 instances of voltages exceeding the 105% criteria. There no instances of voltages below the 90% level. (See Attachment 2 for listing of voltage violations.)

4.2 FERC 715 Dispatched Wind Generation (Based on Cases from NYISO)

Attachment 3 provides the results of the light load case with the CAES plant compressing at 170 MW with 5 additional MW for auxiliary plant load. The summary of the results for this scenario are provided in Table 3 as follows:

Area	Fm Bus (34.5kV)	To Bus (34.5kV)	Load (MVA)	Rating (MVA)	Percent
Genesee	S29 34Y	S 1 34.5	59.7	43.6	136.8
Genesee	S 1 34.5	S42 34-3	65.3	50.7	128.7
Genesee	S 49 729	S42 34-4	32.9	31.3	105.0

Table 3: Light Load – CAES Compressing 175MW – Thermal Violations

In this case there were 68 instances of voltages exceeding the 105% criteria. There no instances of voltages below the 90% level. (See Attachment 3 for listing of voltage violations.)

Attachment 4 reveals the results of the scenario with CAES plant generating at 210 MW. The summary of the results of thermal violations are as follows:

Area	Fm Bus (34.5kV)	To Bus (34.5kV)	Load (MVA)	Rating (MVA)	Percent
Genesee	S48 34	Jamestown	35.6	34.2	104.1
Genesee	S42 34-1	S43-778	36.6	32.4	112.8
Genesee	Jamestown	Jasco TL	34.8	34.2	101.9

Table 4: CAES Generating 210 MW – Thermal Violations

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In this case there were 23 instances of voltages exceeding the 105% criteria. There no instances of voltages below the 90% level. (See Attachment 4 for listing of voltage violations.)

4.3 Additional Local Wind Farm Generation

The following wind farm generation was added to the light load and normal load power system models to determine the impact of the CAES plant and the surrounding buses

Wind Farm	MW of Generation	Location
Canisteo Hills Wind Farm	148.5	Bennett-Bath 115kV TL
Western Door Wind Farm	100	Greenidge-Haley Rd 115kV TL
Watkins Glen Wind Farm	300.8	Hillside-Meyer 230kV TL

Table 5: Added Local Wind Farm Generation – Somerset Fossil Plant Compensated

Attachment 5 provides the results of the light load case with the CAES plant compressing at 170 MW with 5 additional MW for auxiliary plant load. Local additional wind power is dispatched in accordance with Table 5 above. The summary of the results for this case are provided in Table 6 as follows:

Area	Fm Bus (34.5kV)	To Bus (34.5kV)	Load (MVA)	Rating (MVA)	Percent
Genesee	S29 34Y	S 1 34.5	60.5	43.6	138.7
Genesee	S 1 34.5	S42 34-3	66.1	50.7	130.4
Genesee	S 49 729	S42 34-4	33.1	31.3	105.8

Table 6: CAES Compressing 170 MW – Light Load – Thermal Violations

In this case there were 82 instances of voltages exceeding the 105% criteria. There no instances of voltages below the 90% level. (See Attachment 5 for listing of voltage violations.)

Attachment 6 shows the results of the case with CAES plant generating at 210 MW. Local additional wind power is dispatched in accordance with Table 4 above. The summary of the thermal violations are shown in Table 7:

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Area	Fm Bus (34.5kV)	To Bus (34.5kV)	Load (MVA)	Rating (MVA)	Percent
Genesee	S48 34	Jamestown	35.5	34.2	103.9
Genesee	S42 34-1	S43-778	36.5	32.4	112.7
Genesee	Jamestown	Jasco TL	34.8	34.2	101.7

Table 7: CAES Generating 210 MW – Normal Load – Thermal Violations

In this case there were 27 instances of voltages exceeding the 105% criteria. There were no instances of voltages below the 90% level. (See Attachment 6 for listing of voltage violations.)

4.4 Heavy Wind Penetration in Western New York

Additional wind farm generation was dispatched in the western New York area for the light load case. The following Table 8 lists the amount of dispatch in the original case and the new dispatch that increases the wind farm dispatch.

Name of Farm	Original Dispatch (MW)	New Dispatch (MW)
Ball Hill Wind Farm	0	90
Bliss Wind Farm	17.98	100.0
Prattsburg Wind Farm	0	78.2
Howard Wind Farm	0	57.4
Alabama Ledge Wind Farm	0	79.8
Arkwright Summit Wind Farm	0	79.8
Steel Winds II	0	15
Allegany Wind Farm	0	72.5
Ripley Westfield Wind Farm	0	124.2
Stony Creek Wind Farm	0	88.5
High Sheldon Wind Farm	12	113
West Hill Wind Farm	12	31.5

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Name of Farm	Original Dispatch (MW)	New Dispatch (MW)
Wethersfield Wind Farm	13.5	126
Canisteo Hills Wind Farm	0	148.5
Total	55.48	1204.45

Table 8: Light Load – Heavy Wind Dispatch

Fossil Generation at Cayuga, Somerset, and Dunkirk G3 and G4 turned off to balance the system.

Attachment 7 shows the results of the light load case without the CAES compression load but with heavy wind dispatch. The wind farm dispatch is shown in Table 8 above. The thermal violations are shown in Table 9 below.

Area	Fm Bus	To Bus	Load (MVA)	Rating (MVA)	Percent
West	Falconer	Warren	128.3	98.0	130.9
West	Q254RIPW_1C	Q254RIP_1G	20.7	5.2	398.7
West	Q198_AWRIT	Q198_34	100.9	84.0	120.1
West	BLISS_C	BLISS2_GE3G	14.3	96.0	102.9
West	BLISS_34	BLISS115	98.8	96.0	102.9
Genesee	S29 34Y	S 1 34.5	59.5	43.6	136.4
Genesee	S 1 34.5	S42 34-3	65.1	50.7	128.3
Genesee	S 49 729	S42 34-4	32.8	31.3	104.8
Central	SHLDN_1C	SHLDN_GE_G1	28.7	14	205.2
Central	WTHRS_C	WTHRS_GE_G1	32	15.8	203.4

Table 9: Light Load Case – No CAES Compression – Heavy Wind Dispatch

In this case there were 85 instances of voltages exceeding the 105% criteria. There were 9 instances of voltages below the 90% level. (See Attachment 7 for listing of voltage violations.)

Attachment 8 shows the results of the light load case with CAES compression load and with heavy wind dispatch. The wind farm dispatch is shown in Table 8 above. The thermal violations are shown in Table 10 below.

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Area	Fm Bus	To Bus	Load (MVA)	Rating (MVA)	Percent
West	Falconer	Warren	125.5	98.0	128.1
West	Q254RIPW_1C	Q254RIP_1G	20.7	5.2	398.7
West	Q198_AWRIT	Q198_34	100.9	84.0	120.1
West	BLISS_C	BLISS2_GE3G	14.3	96.0	102.9
West	BLISS_34	BLISS115	98.8	96.0	102.9
Genesee	S29 34Y	S 1 34.5	59.2	43.6	135.8
Genesee	S 1 34.5	S42 34-3	64.8	50.7	127.8
Genesee	S 49 729	S42 34-4	32.7	31.3	104.5
Central	SHLDN_1C	SHLDN_GE_G1	28.7	14	205.2
Central	WTHRS_C	WTHRS_GE_G1	32	15.8	203.4
Central	CANDG_C93_G10	CANAD G1	7.9	7.8	101.1

Table 10: Light Load Case – CAES Compression – Heavy Wind Dispatch
4.5 Transient Stability Analysis

The transient stability analysis of the CAES generator by using single machine infinite bus methodology with detail of the local transmission system addressed. This method allows for the demonstration of how the machine will perform without the influence of other generators. A basic IEEE static exciter was used for the excitation of the 233 MVA machine at a power factor of 90% (210MW). A basic governor was used for control of the mechanical power to the machine. The following graphics demonstrate the response of the CAES generator to various nearby faults.



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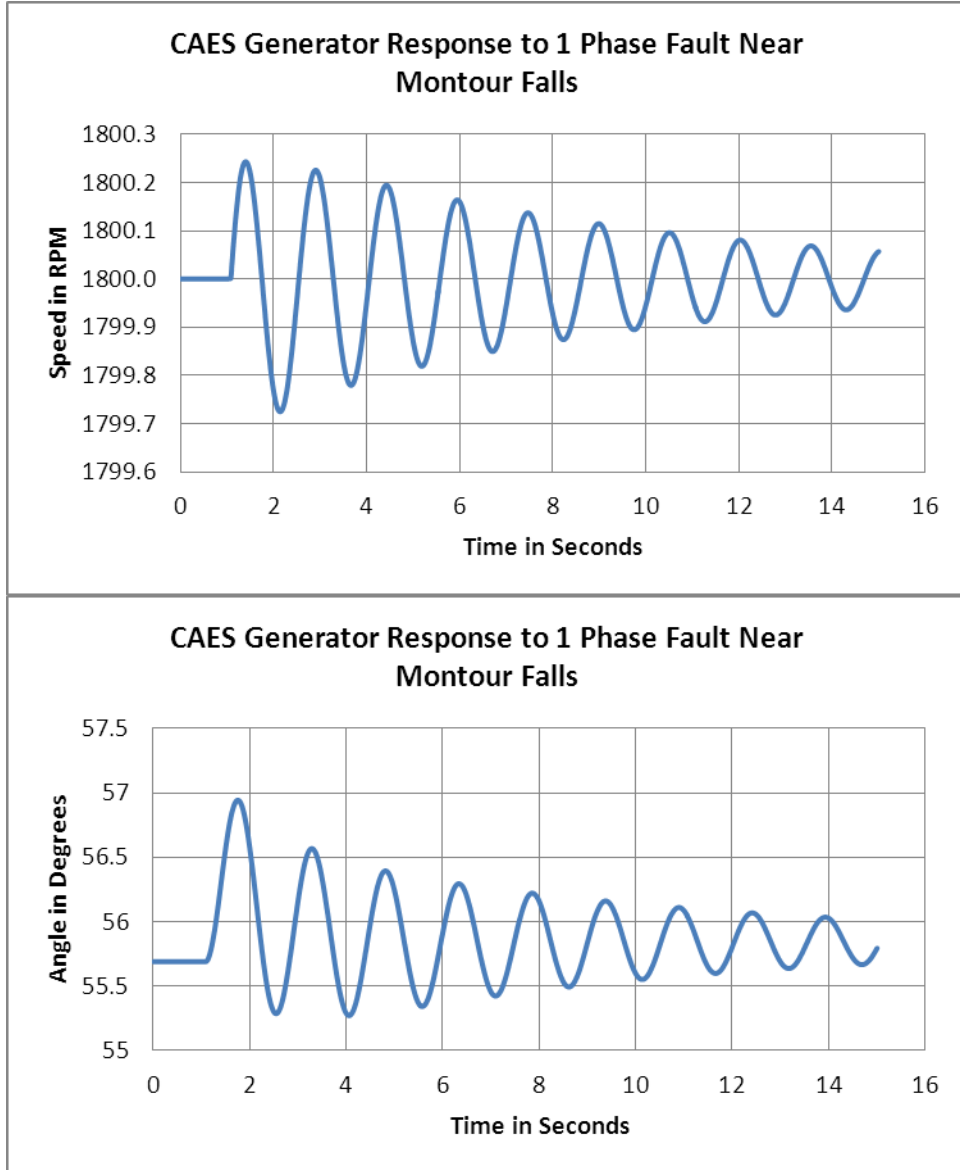


Figure 1: Response of CAES Generation to Single Phase Faults near Montour Falls



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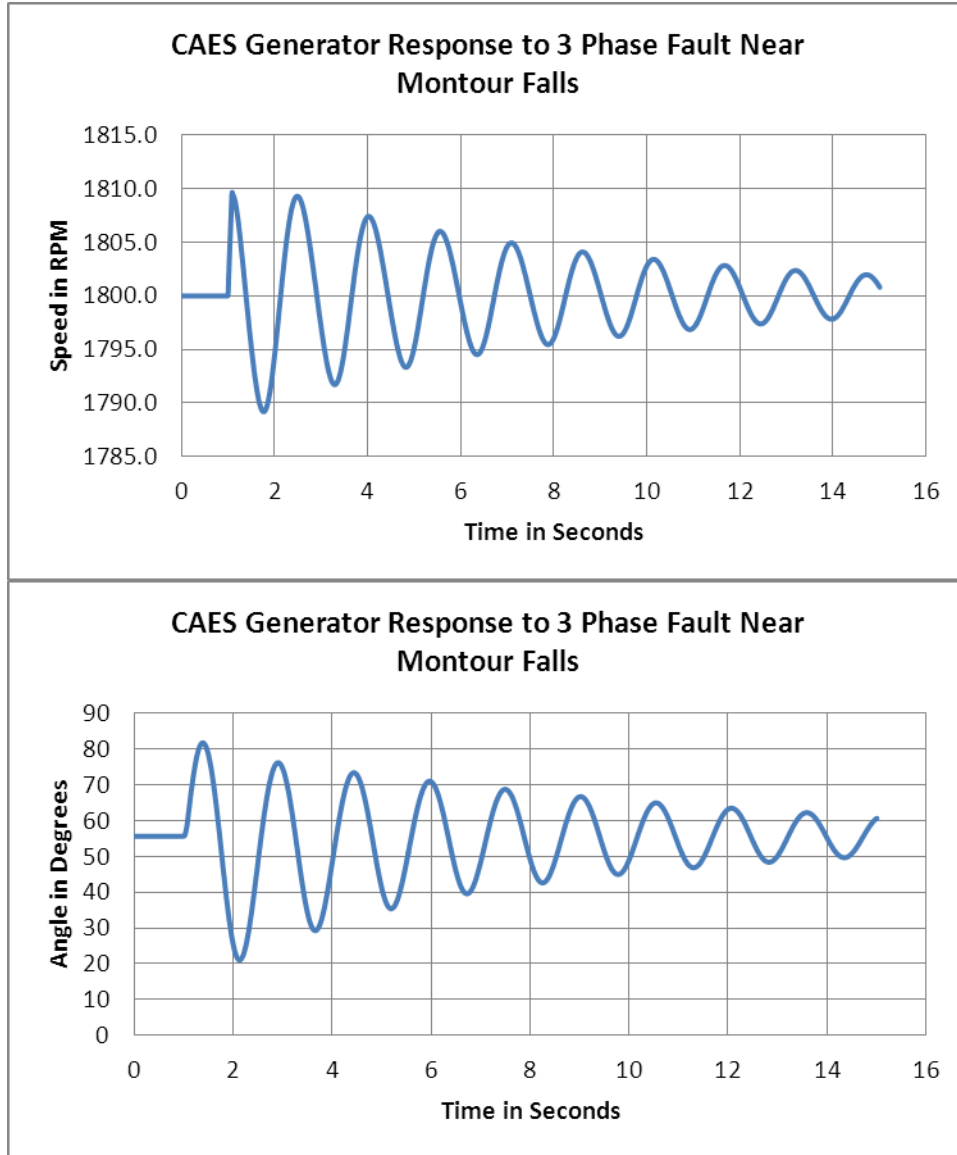


Figure 2: Response of CAES Generation a Three Phase Fault near Montour Falls

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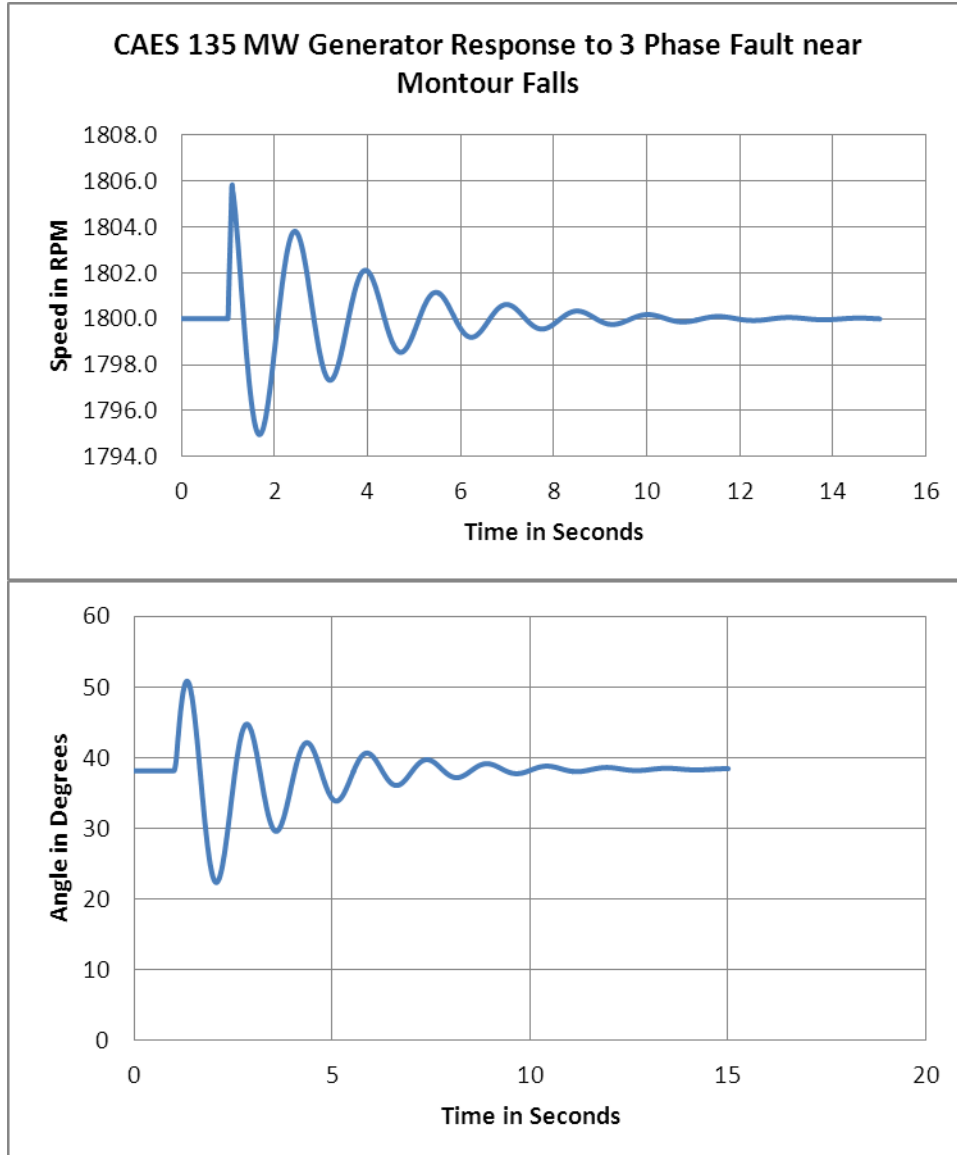


Figure 3: Response of CAES Generator Operating at 135 MW.



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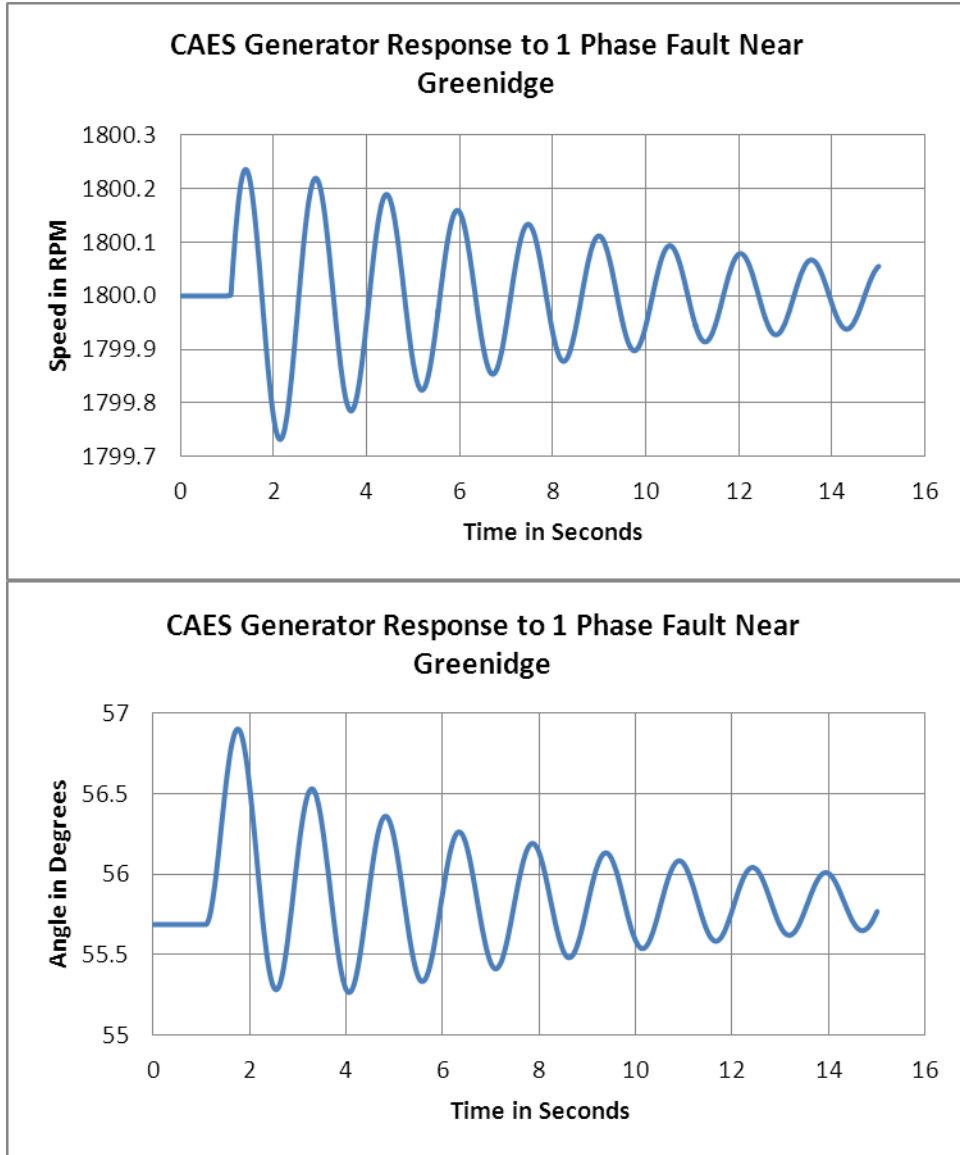


Figure 4: Response of CAES Generation to Single Phase Faults near Greenidge

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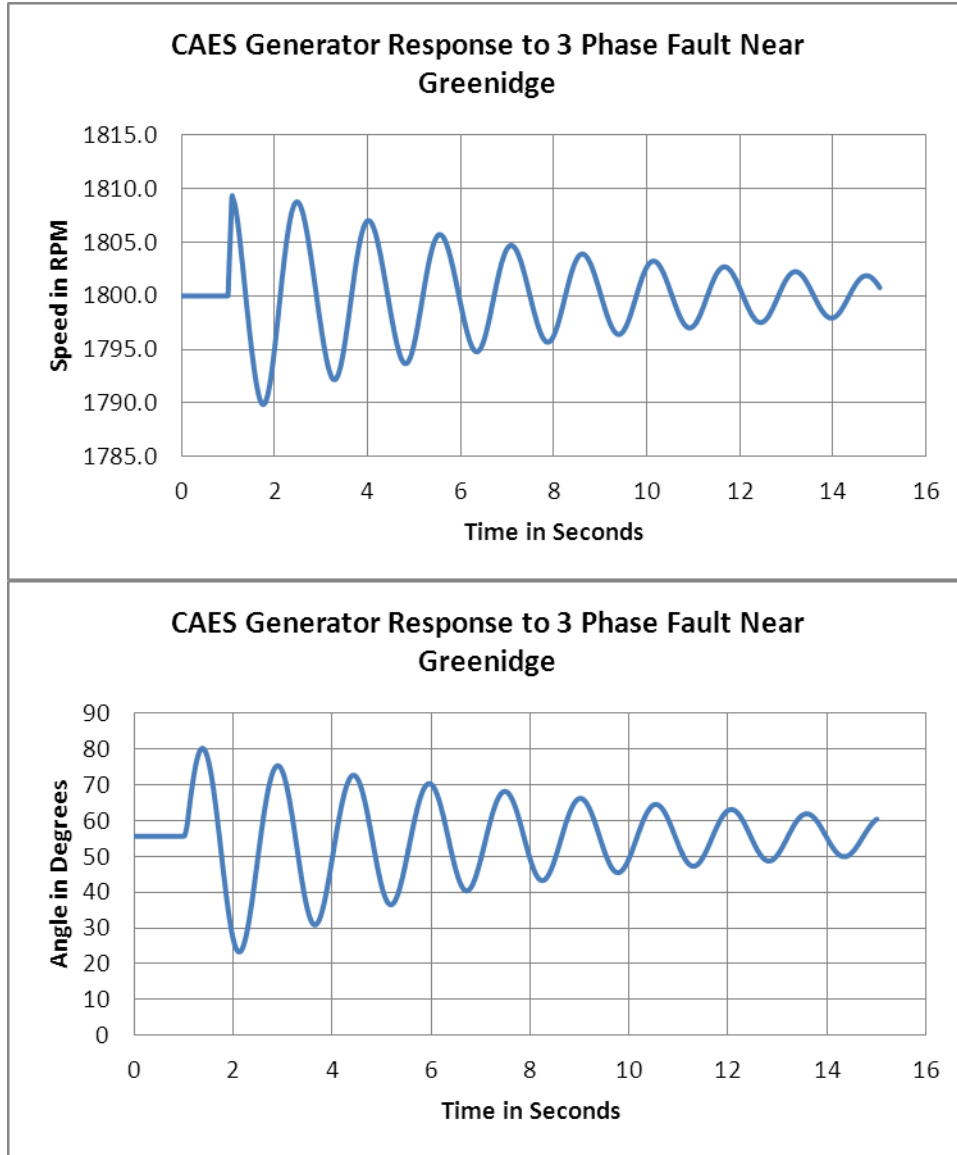


Figure 5: Response of CAES Generation a Three Phase Fault near Greenidge.

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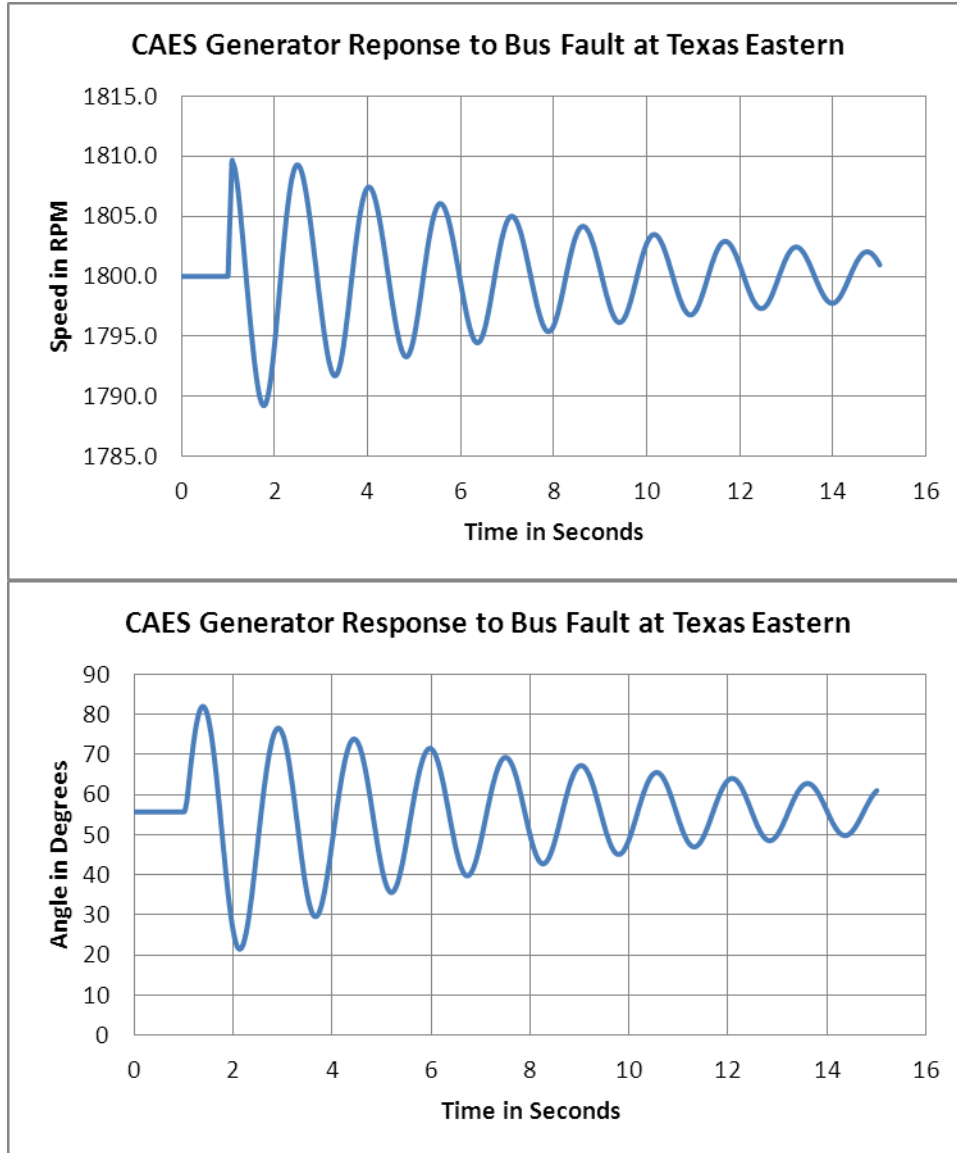


Figure 6: Bus Fault on the Texas Eastern Station.

A measure of generator stability is the angular displacement of the rotor from its initial operating point as a result of a disturbance. In a transmission system, when a fault occurs, the electrical power (MW) output of the machine suddenly decreases and because the mechanical power into the machine does not change the rotor accelerates increasing the rotor's angular displacement. When the circuit breaker opens the fault clears causing the electrical power to increase slowing the generator rotor. If the accelerated rotor has moved too far and the

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electrical power cannot slow the machine damage will occur unless automatic protection equipment removes the generator from service.

The generator response to nearby bolted three phase 5 cycle faults is practically identical. There is considerable angular oscillation which does not dampen out rapidly. The damping of the machine and the inertia of the rotational elements combined with the response of the governor controls influence these results. The bolted three phase fault is a rare event (Once in 50 years.) and is considered the worst case fault. By comparison when the CAES generator is operated at 135 MW output the response to a nearby 3 phase 5 cycle fault is less oscillatory.

A more likely fault (Once in 20 years.) is the single line to ground condition. The generator responses to nearby 5 cycle single line to ground faults show little angular displacement and a small speed change. Again the governor will influence the actual response.

4.6 Short Circuit Fault Levels

The area buses were investigated for fault current levels. The analysis was done prior to the installation of the CAES plant and then again after the addition of the new generator. The short circuit consisted of a bolted three phase fault at each of the nearby buses electrically close to the CAES plant. For the case prior to the installation of the CAES plant each of the nearby buses had fault currents less than 12kA as shown in the following table:

Station	3 Phase Fault Level
115 kV Greenidge Station	7886.7 Amperes
115 kV Texas Eastern Tap Point	7336.3 Amperes
115 kV Montour Falls	11403.9 Amperes

Table 11

With the 210 MW CAES synchronous generator in service and supplying power through a 250 MVA transformer with 8% impedance the nearby buses had fault currents levels of less than 13.5kA as shown in the following table:

Station	3 Phase Fault Level
115 kV Greenidge Station	8628.6 Amperes
115 kV Texas Eastern	10442.9 Amperes
115 kV Montour Falls	13479.5 Amperes
115 kV CAES Point of Interconnection	11874.7 Amperes

Table 12

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4.7 Compressor Starting Analysis:

An analysis was performed starting the compressor motor loaded to 40 MW on a variable frequency drive. The system maintained adequate voltage for this scenario. When the motor was at rated speed it was switch directly across the line at 13.8kV with a load of 175 MW (5 MW was for the auxiliary load to support the operation of the motor.) Since the compressor motor is a synchronous machine it was operated at a leading power factor of 96% to maintain adequate voltage at the terminal of the machine.

4.8 Off Peak High Voltage Problems in Elmira – Binghamton Area:

The investigation into the off peak high voltage problem in the Elmira – Binghamton area indicates that the problem has been mitigated by the way the double bank at Watercure Substation was setup. This substation is in the Elmira area and has two parallel 345 to 230kV transformers. In the light load case these transformers have tap settings that differ from each other significantly such that there is a large circulating MVAR flow in the two bank combination. The circulating MVAR flow is ~450MVAR compared to the transformer's A Rating of 494 MVA. It controls the 230kV bus voltage to less than 1.02 pu volts. Balancing the banks such that there is no circulating MVAR flow the 230kV bus voltage goes to approximately 1.07 pu volts. This is the high voltage problem. In the normal load case the two transformer tap settings are set identical and the transformers loads are also balanced with little or no circulating current. The voltages are within proper limits.

The following Table 13 presents the voltage data for the Elmira – Binghamton area. The wind farm generation dispatch has not been changed from that provided in the Summer 2016 FERC 715 submittals. The two Watercure transformer bank taps have not been changed.

Before CAES Plant	Voltage Bus 1 Per Unit	Voltage Bus 2 Per Unit	After CAES Compression Plant	Voltage Bus 1 Per Unit	Voltage Bus 2 Per Unit
Oakdale 345kV Bus	1.012		Oakdale 345kV Bus	1.012	
Oakdale 115kV Bus	0.99	1.004	Oakdale 115kV Bus	0.99	1.004
Watercure 345kV Bus	1.00625		Watercure 345kV Bus	1.0056	
Watercure 230kV Bus	1.02		Watercure 230kV Bus	1.0198	

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Before CAES Plant	Voltage Bus 1 Per Unit	Voltage Bus 2 Per Unit	After CAES Compression Plant	Voltage Bus 1 Per Unit	Voltage Bus 2 Per Unit
Hillsdale 230kV Bus	1.02		Hillsdale 230kV Bus	1.02	
Hillsdale 34.5kV Bus	0.99	1.09	Hillsdale 34.5kV Bus	0.99	1.09

Table 13
4.9 Market Transfer Analysis – Transmission Line Overloads:

Consideration was given to the transmission line overload problems that may occur as a result of a transfer of 210 MW or more of electric power from the Pennsylvania New Jersey Maryland Independent Service Operator (PJM) to the New York Independent Service Operator (NYISO).

Based on the FERC 715 power system modeling cases provided by NYISO the transfer of 210 MW from PJM to the Central region of New York when the CAES plant is generating only one contingency limitation was identified. That limiting 345kV transmission line is located in New York City and is the E13St to Farragut East 345kV line when the E13St to Farragut West 345kV line is out of service. The transfer is then limited to 115.9 MWs. When the CAES plant is not in service the same line is limited to 112.1 MWs for the same contingency.

Western New York was re-dispatched with a large amount of wind power and a corresponding reduction of fossil generation. Given this dispatch another analysis was performed with a transfer of power into the Genesee region from PJM. The first scenario was with the CAES plant off line. It was not compressing or generating. The limiting condition was the outage of the Ginna to Pannelli 115kV circuit 1 and would be impacted by the capability of the Station 23 to PS_S23 115kV circuit 1 and hold the power transfer to 844 MW. With the CAES plant compressing the limits of the Station 23 to PS_S23 115kV line would hold the power transfer to 823 MW a reduction of 23 MW.

With the CAES plant generating at 210 MW there were no limitations of a transfer of power from PJM to the Genesee area.

5.0 CONCLUSION

The operation of the CAES plant in either the 210 MW generating or 170 MW compressing mode is acceptable. A generation level of 210 MW and a compression level of 170 MW are near optimum values when their impacts on the power system are considered. At these levels, the addition of the CAES plant to the system did not present significant negative impacts to the area. These studies were conducted without considering transmission system contingencies.



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With contingencies, the expectation is the CAES plant would be limited to certain input and output power levels and these limitations would be controlled administratively.

- Thermal and voltage issues that were identified were minor changes to pre-existing conditions.
- The transient stability analysis showed lightly damped oscillations at the 210 MW level and damped oscillations at the 135 MW output level. The oscillations will be addressed with a power system stabilizer which is included as part of the exciter and will have no cost impacts.
- Short circuit current levels increased on nearby buses but did not significantly impact fault duties on existing power circuit breakers.
- The analysis assumed the CAES compressor motor was started with a variable frequency drive loaded to forty megawatts and then switched to across the line. Starting the compressor motor in this manner was satisfactory.
- The impact of the CAES plant on the import and import capability of the transmission system was impacted slightly when the plant was in compression mode. There was no impact when the plant was generating.

Attachment 1

Pre CAES Case 3 Light Load Summer of 2016 Overloads and Voltage Violations

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 13:40
CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 1 [WEST]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
* NONE *

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 13:40
CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 2 [GENESEE]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
149082 S29 34Y 34.500 2 149092 S 1 34.5 34.500* 2 1 60.2 43.6 138.0
149092 S 1 34.5 34.500 2 149107 S42 34-3 34.500* 2 1 65.8 50.7 129.7
149102 S 49 729 34.500 2 149109 S42 34-4 34.500* 2 1 33.0 31.3 105.5

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 13:40
CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 3 [CENTRAL]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
* NONE *

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 13:42
CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
W/ ERAG/MMWG DS SERIES

BUSES WITH VOLTAGE GREATER THAN 1.0500:

BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)	BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)
130868		CANDG_C93_G10		0.6900	3	1.0500	0.724	130928		CNDGII_C93_10		0.6900	3	1.0500	0.724
130929		CNDGII_C93		20.6900	3	1.0500	0.724	131230		HILSD M4		34.500	3	1.0896	37.592
131350		HOWD_C93_G1		0.6900	3	1.0500	0.724	131477		BENNGTON		34.500	1	1.0547	36.388
131479		BLOSOM R		34.500	1	1.0535	36.347	131483		BUFF FOR		34.500	1	1.0538	36.356
131488		EBENZ T2		34.500	1	1.0505	36.243	131492		COWLESVL		34.500	1	1.0546	36.384
131494		DEPEW 34		34.500	1	1.0549	36.393	131497		EBENEZER		34.500	1	1.0526	36.315
131498		EBENZ T1		34.500	1	1.0526	36.316	131499		ELLICOT		34.500	1	1.0537	36.353
131504		GIBRALTR		34.500	1	1.0536	36.349	131508		IND CHUR		34.500	1	1.0525	36.312
131509		JAVA TP		34.500	1	1.0564	36.447	131510		JAVA 34		34.500	1	1.0574	36.480
131520		N.GARD34		34.500	1	1.0527	36.319	131523		OLD GARD		34.500	1	1.0526	36.316
131529		3 ROD RD		34.500	1	1.0546	36.385	131533		SLOAN 34		34.500	1	1.0542	36.368
131537		W.VARSBR		34.500	1	1.0538	36.358	131538		WALES CE		34.500	1	1.0523	36.304
131539		WALES TP		34.500	1	1.0514	36.273	131543		W.SENECA		34.500	1	1.0527	36.318
131653		HOWD_C93_G2		0.6900	3	1.0500	0.724	131654		HOWD_C93_G3		0.6900	3	1.0500	0.724
135573		DUNLOPLV		4.1600	1	1.0539	4.384	135575		AMBR LV		13.800	1	1.0668	14.721
135576		BUFSEWL		13.800	1	1.0734	14.813	135807		FORD		13.200	1	1.0641	14.046
135878		SWEDEN		34.500	2	1.0534	36.343	135879		VREG-LOW		34.500	2	1.0535	36.345
135890		AKZOSALT		63.000	2	1.0669	67.215	135891		GOLAH63K		63.000	2	1.0660	67.156
135892		MORT63KV		63.000	2	1.0641	67.039	135893		S PERRY		63.000	2	1.0672	67.236
135894		YORKCNTR		63.000	2	1.0657	67.142	135922		SWEDENTP		34.500	2	1.0538	36.358
136366		CORT REG		34.500	3	1.0722	36.989	136478		LHH		34.500	3	1.0524	36.307
136479		LHH TAP1		34.500	3	1.0524	36.307	136480		LHH TAP2		34.500	3	1.0523	36.305
146745		STL1_G1		0.6900	1	1.0500	0.724	149037		C704T26E		34.500	2	1.0512	36.265
149052		C736T782		34.500	2	1.0539	36.360	149074		STA127		34.500	2	1.0506	36.247
149075		FARMNGTN		34.500	2	1.0612	36.612	149105		C7367840		34.500	2	1.0538	36.358
149131		C736T786		34.500	2	1.0548	36.389	149132		C736T31		34.500	2	1.0539	36.360
149135		C736T5W		34.500	2	1.0548	36.389	149136		C736T737		34.500	2	1.0548	36.389

Attachment 1

149137	S155C704	34.500	2	1.0518	36.286	149138	S121	34.500	2	1.0548	36.392
149141	FRMNGT2	34.500	2	1.0612	36.612	149149	S156	34.500	2	1.0596	36.556
149160	S142	34.500	2	1.0511	36.263	149193	C736T10	34.500	2	1.0541	36.365
149208	HBKS35	34.500	2	1.0547	36.388	149209	S8377	34.500	2	1.0547	36.387
149210	C591TP	34.500	2	1.0518	36.288	149306	S216 34	34.500	2	1.0624	36.652
149307	S208C796	34.500	2	1.0585	36.518	149308	S214C796	34.500	2	1.0567	36.457
149309	P28C796	34.500	2	1.0566	36.454	149310	S207C796	34.500	2	1.0566	36.451
149311	PT788	34.500	2	1.0566	36.451	149312	OPPT193	34.500	2	1.0566	36.451
149313	P59_154	34.500	2	1.0597	36.559	149314	P59_117	34.500	2	1.0579	36.496
149315	S202C797	34.500	2	1.0579	36.496	149316	S210C794	34.500	2	1.0616	36.624
149317	P387C794	34.500	2	1.0590	36.535	149321	S209C794	34.500	2	1.0573	36.477
149322	S210C795	34.500	2	1.0605	36.588	149323	S212C795	34.500	2	1.0593	36.545
149324	S195C795	34.500	2	1.0560	36.433	149325	S799C795	34.500	2	1.0531	36.331

BUSES WITH VOLTAGE LESS THAN 0.9000:

BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)	BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)
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* NONE *

Attachment 2

Pre CAES Case 4 Load 50 50 Summer 2016 Overloads and Voltage Violations

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 12:43
CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
W/ 2010 ERAG/MMWG DS SERIES

OUTPUT FOR AREA 1 [WEST]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
* NONE *

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 12:43
CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
W/ 2010 ERAG/MMWG DS SERIES

OUTPUT FOR AREA 2 [GENESEE]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
149085 S48 34 34.500* 2 149570 JAMESTWN 34.500 2 1 35.7 34.2 104.3
149106 S42 34-1 34.500 2 149546 S43-778 34.500* 2 1 36.6 32.4 113.0
149570 JAMESTWN 34.500 2 149571 JASCO TL 34.500* 2 1 34.9 34.2 102.0

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 12:43
CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
W/ 2010 ERAG/MMWG DS SERIES

OUTPUT FOR AREA 3 [CENTRAL]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
* NONE *

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 12:48
CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
W/ 2010 ERAG/MMWG DS SERIES

BUSES WITH VOLTAGE GREATER THAN 1.0500:

BUS#	X-- NAME	--X BASKV	AREA	V(PU)	V(KV)	BUS#	X-- NAME	--X BASKV	AREA	V(PU)	V(KV)
131230	HILSD M4	34.500	3	1.0634	36.686	135891	GOLAH63K	63.000	2	1.0573	66.610
135892	MORT63KV	63.000	2	1.0622	66.920	135893	S PERRY	63.000	2	1.0501	66.153
135951	BRCKPT34	34.500	2	1.0500	36.227	136366	CORT REG	34.500	3	1.0657	36.768
136706	HMGENBUS	13.800	3	1.0687	14.749	136728	ESYR GT1	13.200	3	1.0551	13.927
146744	STL1 G2	0.6900	1	1.0500	0.724	146745	STL1 G1	0.6900	1	1.0500	0.724
149075	FARMNGTN	34.500	2	1.0616	36.627	149138	S121	34.500	2	1.0547	36.386
149141	FRMNGT2	34.500	2	1.0616	36.627	149149	S156	34.500	2	1.0535	36.345
149306	S216 34	34.500	2	1.0577	36.490	149313	P59_154	34.500	2	1.0513	36.271
149316	S210C794	34.500	2	1.0557	36.423	149322	S210C795	34.500	2	1.0532	36.334
149323	S212C795	34.500	2	1.0502	36.230						

BUSES WITH VOLTAGE LESS THAN 0.9000:

BUS#	X-- NAME	--X BASKV	AREA	V(PU)	V(KV)	BUS#	X-- NAME	--X BASKV	AREA	V(PU)	V(KV)
* NONE *											

Attachment 3

CAES 175 MW Comp Light Load Summer 2016 Overloads and Voltage Violations

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 13:28
CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 1 [WEST]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
* NONE *

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 13:28
CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 2 [GENESEE]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
149082 S29 34Y 34.500 2 149092 S 1 34.5 34.500* 2 1 59.7 43.6 136.8
149092 S 1 34.5 34.500 2 149107 S42 34-3 34.500* 2 1 65.3 50.7 128.7
149102 S 49 729 34.500 2 149109 S42 34-4 34.500* 2 1 32.9 31.3 105.0

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 13:28
CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 3 [CENTRAL]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
* NONE *

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 13:30
CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
W/ ERAG/MMWG DS SERIES

BUSES WITH VOLTAGE GREATER THAN 1.0500:

BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)	BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)
130878		CANDG_C93_G20		6.900	3	1.0500	0.724	130928		CNDGII_C93_10		6.900	3	1.0500	0.724
130929		CNDGII_C93_20		6.900	3	1.0500	0.724	131230		HILSD M4		34.500	3	1.0866	37.489
131350		HOWD_C93_G1		0.6900	3	1.0500	0.724	131477		BENNGTON		34.500	1	1.0539	36.358
131479		BLOSOM R		34.500	1	1.0528	36.321	131483		BUFF FOR		34.500	1	1.0530	36.327
131492		COWLESVL		34.500	1	1.0537	36.354	131494		DEPEW 34		34.500	1	1.0541	36.365
131497		EBENEZER		34.500	1	1.0519	36.290	131498		EBENZ T1		34.500	1	1.0519	36.291
131499		ELLICOT		34.500	1	1.0529	36.325	131504		GIBRALTR		34.500	1	1.0528	36.321
131508		IND CHUR		34.500	1	1.0518	36.286	131509		JAVA TP		34.500	1	1.0556	36.418
131510		JAVA 34		34.500	1	1.0565	36.450	131520		N.GARD34		34.500	1	1.0520	36.294
131523		OLD GARD		34.500	1	1.0519	36.291	131529		3 ROD RD		34.500	1	1.0538	36.355
131533		SLOAN 34		34.500	1	1.0533	36.340	131537		W.VARSBR		34.500	1	1.0530	36.328
131538		WALES CE		34.500	1	1.0514	36.275	131539		WALES TP		34.500	1	1.0505	36.244
131543		W.SENECA		34.500	1	1.0520	36.293	135573		DUNLOPLV		4.1600	1	1.0538	4.384
135575		AMBR LV		13.800	1	1.0667	14.720	135576		BUFSEWLV		13.800	1	1.0733	14.812
135807		FORD		13.200	1	1.0633	14.035	135878		SWEDEN		34.500	2	1.0517	36.283
135879		VREG-LOW		34.500	2	1.0517	36.283	135890		AKZOSALT		63.000	2	1.0650	67.093
135891		GOLAH63K		63.000	2	1.0641	67.036	135892		MORT63KV		63.000	2	1.0620	66.907
135893		S PERRY		63.000	2	1.0653	67.114	135894		YORKCNTR		63.000	2	1.0638	67.020
135922		SWEDENTP		34.500	2	1.0521	36.296	136366		CORT REG		34.500	3	1.0715	36.968
136478		LHH		34.500	3	1.0524	36.307	136479		LHH TAP1		34.500	3	1.0524	36.307
136480		LHH TAP2		34.500	3	1.0523	36.305	146745		STL1 G1		0.6900	1	1.0500	0.724
149075		FARMNGTN		34.500	2	1.0566	36.453	149131		C736T786		34.500	2	1.0500	36.226
149135		C736TSW		34.500	2	1.0500	36.226	149136		C736T737		34.500	2	1.0500	36.226
149138		S121		34.500	2	1.0528	36.321	149141		FRMNGT2		34.500	2	1.0566	36.453
149149		S156		34.500	2	1.0550	36.396	149208		HBKS35		34.500	2	1.0527	36.318
149209		S8377		34.500	2	1.0527	36.317	149306		S216 34		34.500	2	1.0621	36.643
149307		S208C796		34.500	2	1.0583	36.510	149308		S214C796		34.500	2	1.0565	36.449

Attachment 3

149309	P28C796	34.500	2	1.0564	36.445	149310	S207C796	34.500	2	1.0563	36.442
149311	PT788	34.500	2	1.0563	36.442	149312	OPPT193	34.500	2	1.0563	36.442
149313	P59_154	34.500	2	1.0594	36.550	149314	P59_117	34.500	2	1.0576	36.487
149315	S202C797	34.500	2	1.0576	36.487	149316	S210C794	34.500	2	1.0613	36.615
149317	P387C794	34.500	2	1.0587	36.526	149321	S209C794	34.500	2	1.0571	36.469
149322	S210C795	34.500	2	1.0603	36.579	149323	S212C795	34.500	2	1.0590	36.536
149324	S195C795	34.500	2	1.0558	36.424	149325	S799C795	34.500	2	1.0528	36.322

BUSES WITH VOLTAGE LESS THAN 0.9000:

BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)	BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)
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* NONE *

Attachment 4

CAES 175 MW Compression Local Wind Light Load Sum of 2016 Overloads and Voltage Violations

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 15:12
CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 1 [WEST]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
* NONE *

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 15:12
CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 2 [GENESEE]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
149082 S29 34Y 34.500 2 149092 S 1 34.5 34.500* 2 1 60.5 43.6 138.7
149092 S 1 34.5 34.500 2 149107 S42 34-3 34.500* 2 1 66.1 50.7 130.4
149102 S 49 729 34.500 2 149109 S42 34-4 34.500* 2 1 33.1 31.3 105.8

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 15:12
CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 3 [CENTRAL]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
* NONE *

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 15:15
CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
W/ ERAG/MMWG DS SERIES

BUSES WITH VOLTAGE GREATER THAN 1.0500:

BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)	BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)
130878		CANDG_C93		34.500	3	1.0500	0.724	130879		CNDGUA_C		34.500	3	1.0549	36.393
130911		CNDGUA34		34.500	3	1.0548	36.389	131230		HILSD M4		34.500	3	1.0836	37.383
131261		BORDER34		34.500	3	1.0508	36.253	131267		HALLST34		34.500	3	1.0500	36.226
131477		BENNGTON		34.500	1	1.0563	36.442	131479		BLOSOM R		34.500	1	1.0550	36.397
131483		BUFF FOR		34.500	1	1.0554	36.410	131488		EBENZ T2		34.500	1	1.0520	36.293
131492		COWLESVL		34.500	1	1.0562	36.438	131494		DEPEW 34		34.500	1	1.0564	36.447
131497		EBENEZER		34.500	1	1.0541	36.365	131498		EBENZ T1		34.500	1	1.0541	36.366
131499		ELLCOT		34.500	1	1.0553	36.407	131504		GIBRALTR		34.500	1	1.0552	36.403
131508		IND CHUR		34.500	1	1.0539	36.361	131509		JAVA TP		34.500	1	1.0580	36.501
131510		JAVA 34		34.500	1	1.0590	36.534	131520		N.GARD34		34.500	1	1.0541	36.368
131523		OLD GARD		34.500	1	1.0541	36.366	131529		3 ROD RD		34.500	1	1.0562	36.439
131533		SLOAN 34		34.500	1	1.0557	36.423	131535		STOLLE34		34.500	1	1.0512	36.265
131537		W.VARSBR		34.500	1	1.0554	36.412	131538		WALES CE		34.500	1	1.0538	36.358
131539		WALES TP		34.500	1	1.0529	36.326	131543		W.SENECA		34.500	1	1.0541	36.368
135573		DUNLOPLV		4.1600	1	1.0540	4.385	135575		AMBR LV		13.800	1	1.0669	14.723
135576		BUFSEWLV		13.800	1	1.0735	14.814	135807		FORD		13.200	1	1.0656	14.066
135878		SWEDEN		34.500	2	1.0542	36.369	135879		VREG-LOW		34.500	2	1.0542	36.371
135890		AKZOSALT		63.000	2	1.0677	67.265	135891		GOLAH63K		63.000	2	1.0668	67.206
135892		MORT63KV		63.000	2	1.0650	67.096	135893		S PERRY		63.000	2	1.0680	67.287
135894		YORKCNTR		63.000	2	1.0665	67.192	135922		SWEDENTP		34.500	2	1.0546	36.384
136366		CORT REG		34.500	3	1.0728	37.012	136478		LHH		34.500	3	1.0524	36.307
136479		LHH TAP1		34.500	3	1.0524	36.307	136480		LHH TAP2		34.500	3	1.0523	36.305

Attachment 4

146744	STL1_G2	0.6900	1	1.0500	0.724	147800	BLISS1_GE_1G0.5750	1	1.0500	0.604	
149024	GINNA115	115.00	2	1.0500	120.75	149037	C704T26E	34.500	2	1.0540	36.364
149041	S8132VR	34.500	2	1.0505	36.241	149052	C736T782	34.500	2	1.0566	36.451
149074	STA127	34.500	2	1.0526	36.314	149075	FARMNGTN	34.500	2	1.0639	36.705
149105	C736T7840	34.500	2	1.0565	36.448	149131	C736T786	34.500	2	1.0574	36.480
149132	C736T31	34.500	2	1.0566	36.451	149135	C736T31	34.500	2	1.0574	36.480
149136	C736T737	34.500	2	1.0574	36.480	149137	S155C704	34.500	2	1.0546	36.385
149141	FRMNGT2	34.500	2	1.0639	36.705	149149	S156	34.500	2	1.0623	36.650
149160	S142	34.500	2	1.0539	36.361	149193	C736T10	34.500	2	1.0567	36.456
149208	HBKS35	34.500	2	1.0538	36.358	149209	S8377	34.500	2	1.0538	36.357
149210	C591TP	34.500	2	1.0509	36.257	149306	S216_34	34.500	2	1.0626	36.658
149307	S208C796	34.500	2	1.0587	36.524	149308	S214C796	34.500	2	1.0569	36.464
149309	P28C796	34.500	2	1.0568	36.460	149310	S207C796	34.500	2	1.0567	36.457
149311	PT788	34.500	2	1.0567	36.457	149312	OPPT193	34.500	2	1.0567	36.457
149313	P59_154	34.500	2	1.0599	36.565	149314	P59_117	34.500	2	1.0580	36.502
149315	S202C797	34.500	2	1.0580	36.502	149316	S210C794	34.500	2	1.0617	36.630
149317	P387C794	34.500	2	1.0592	36.541	149321	S209C794	34.500	2	1.0575	36.484
149322	S210C795	34.500	2	1.0607	36.594	149323	S212C795	34.500	2	1.0594	36.551
149324	S195C795	34.500	2	1.0562	36.439	149325	S799C795	34.500	2	1.0533	36.337

BUSES WITH VOLTAGE LESS THAN 0.9000:

BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)	BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)
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* NONE *

Attachment 4

CAES 175 MW Compression Local Wind Light Load Sum of 2016 Overloads and Voltage Violations

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 15:12
CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 1 [WEST]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT

* NONE *

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 15:12
CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 2 [GENESEEE]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
149082 S29 34Y 34.500 2 149092 S 1 34.5 34.500* 2 1 60.5 43.6 138.7
149092 S 1 34.5 34.500 2 149107 S42 34-3 34.500* 2 1 66.1 50.7 130.4
149102 S 49 729 34.500 2 149109 S42 34-4 34.500* 2 1 33.1 31.3 105.8

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 15:12
CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 3 [CENTRAL]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT

* NONE *

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 15:15
CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
W/ ERAG/MMWG DS SERIES

BUSES WITH VOLTAGE GREATER THAN 1.0500:

BUS#	X-- NAME	--X BASKV	AREA	V(PU)	V(KV)	BUS#	X-- NAME	--X BASKV	AREA	V(PU)	V(KV)
130878	CANDG_C93	20.6900	3	1.0500	0.724	130879	CNDGUA_C	34.500	3	1.0549	36.393
130911	CNDGUA34	34.500	3	1.0548	36.389	131230	HILSD M4	34.500	3	1.0836	37.383
131261	BORDER34	34.500	3	1.0508	36.253	131267	HALLST34	34.500	3	1.0500	36.226
131477	BENNGTON	34.500	1	1.0563	36.442	131479	BLOSOM R	34.500	1	1.0550	36.397
131483	BUFF FOR	34.500	1	1.0554	36.410	131488	EBENZ T2	34.500	1	1.0520	36.293
131492	COWLESVL	34.500	1	1.0562	36.438	131494	DEPEW 34	34.500	1	1.0564	36.447
131497	EBENEZER	34.500	1	1.0541	36.365	131498	EBENZ T1	34.500	1	1.0541	36.366
131499	ELLICOT	34.500	1	1.0553	36.407	131504	GIBRALTR	34.500	1	1.0552	36.403
131508	IND CHUR	34.500	1	1.0539	36.361	131509	JAVA TP	34.500	1	1.0580	36.501
131510	JAVA 34	34.500	1	1.0590	36.534	131520	N.GARD34	34.500	1	1.0541	36.368
131523	OLD GARD	34.500	1	1.0541	36.366	131529	3 ROD RD	34.500	1	1.0562	36.439
131533	SLOAN 34	34.500	1	1.0557	36.423	131535	STOLLE34	34.500	1	1.0512	36.265
131537	W.VARSBR	34.500	1	1.0554	36.412	131538	WALES CE	34.500	1	1.0538	36.358
131539	WALES TP	34.500	1	1.0529	36.326	131543	W.SENECA	34.500	1	1.0541	36.368
135573	DUNLOPLV	4.1600	1	1.0540	4.385	135575	AMBR LV	13.800	1	1.0669	14.723
135576	BUFSEWLV	13.800	1	1.0735	14.814	135807	FORD	13.200	1	1.0656	14.066
135878	SWEDEN	34.500	2	1.0542	36.369	135879	VREG-LOW	34.500	2	1.0542	36.371
135890	AKZOSALT	63.000	2	1.0677	67.265	135891	GOLAH63K	63.000	2	1.0668	67.206
135892	MORT63KV	63.000	2	1.0650	67.096	135893	S PERRY	63.000	2	1.0680	67.287
135894	YORKCNTR	63.000	2	1.0665	67.192	135922	SWEDENTP	34.500	2	1.0546	36.384
136366	CORT REG	34.500	3	1.0728	37.012	136478	LHH	34.500	3	1.0524	36.307
136479	LHH TAP1	34.500	3	1.0524	36.307	136480	LHH TAP2	34.500	3	1.0523	36.305

146744	STL1_G2	0.6900	1	1.0500	0.724	147800	BLISS1_GE_1G0.5750	1	1.0500	0.604	
149024	GINNA115	115.00	2	1.0500	120.75	149037	C704T26E	34.500	2	1.0540	36.364
149041	S8132VR	34.500	2	1.0505	36.241	149052	C736T782	34.500	2	1.0566	36.451
149074	STA127	34.500	2	1.0526	36.314	149075	FARMNGTN	34.500	2	1.0639	36.705
149105	C7367840	34.500	2	1.0565	36.448	149131	C736T786	34.500	2	1.0574	36.480
149132	C736T31	34.500	2	1.0566	36.451	149135	C736TSW	34.500	2	1.0574	36.480
149136	C736T737	34.500	2	1.0574	36.480	149137	S155C704	34.500	2	1.0546	36.385
149141	FRMNGT2	34.500	2	1.0639	36.705	149149	S156	34.500	2	1.0623	36.650
149160	S142	34.500	2	1.0539	36.361	149193	C736T10	34.500	2	1.0567	36.456
149208	HBKS35	34.500	2	1.0538	36.358	149209	S8377	34.500	2	1.0538	36.357
149210	C591TP	34.500	2	1.0509	36.257	149306	S216 34	34.500	2	1.0626	36.658
149307	S208C796	34.500	2	1.0587	36.524	149308	S214C796	34.500	2	1.0569	36.464
149309	P28C796	34.500	2	1.0568	36.460	149310	S207C796	34.500	2	1.0567	36.457
149311	PT788	34.500	2	1.0567	36.457	149312	OPPT193	34.500	2	1.0567	36.457
149313	P59_154	34.500	2	1.0599	36.565	149314	P59_117	34.500	2	1.0580	36.502
149315	S202C797	34.500	2	1.0580	36.502	149316	S210C794	34.500	2	1.0617	36.630
149317	P387C794	34.500	2	1.0592	36.541	149321	S209C794	34.500	2	1.0575	36.484
149322	S210C795	34.500	2	1.0607	36.594	149323	S212C795	34.500	2	1.0594	36.551
149324	S195C795	34.500	2	1.0562	36.439	149325	S799C795	34.500	2	1.0533	36.337

BUSES WITH VOLTAGE LESS THAN 0.9000:

BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)	BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)
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* NONE *

Attachment 5

CAES Generating 210 MW Summer 2016 Overloads and Voltage Violations

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 12:57
CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
W/ 2010 ERAG/MMWG DS SERIES

OUTPUT FOR AREA 1 [WEST]

SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
* NONE *

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 12:57
CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
W/ 2010 ERAG/MMWG DS SERIES

OUTPUT FOR AREA 2 [GENESEE]

SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
149085 S48 34 34.500 2 149570 JAMESTWN 34.500* 2 1 35.6 34.2 104.1
149106 S42 34-1 34.500* 2 149546 S43-778 34.500 2 1 36.6 32.4 112.8
149570 JAMESTWN 34.500 2 149571 JASCO TL 34.500* 2 1 34.8 34.2 101.9

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 12:57
CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
W/ 2010 ERAG/MMWG DS SERIES

OUTPUT FOR AREA 3 [CENTRAL]

SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
* NONE *

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 13:02
CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
W/ 2010 ERAG/MMWG DS SERIES

BUSES WITH VOLTAGE GREATER THAN 1.0500:

BUS#	X-- NAME	--X BASKV	AREA	V(PU)	V(KV)	BUS#	X-- NAME	--X BASKV	AREA	V(PU)	V(KV)
130928	CNDGII_C93	10.6900	3	1.0500	0.724	131230	HILSD M4	34.500	3	1.0624	36.653
131350	HOWD_C93_G1	0.6900	3	1.0500	0.724	135890	AKZOSALT	63.000	2	1.0510	66.215
135891	GOLAH63K	63.000	2	1.0586	66.692	135892	MORT63KV	63.000	2	1.0636	67.007
135893	S PERRY	63.000	2	1.0514	66.237	136366	CORT REG	34.500	3	1.0672	36.819
136706	HMGENBUS	13.800	3	1.0688	14.750	136728	ESYR GT1	13.200	3	1.0561	13.940
146744	STL1_G2	0.6900	1	1.0500	0.724	146745	STL1_G1	0.6900	1	1.0500	0.724
149075	FARMNGTN	34.500	2	1.0596	36.558	149138	S121	34.500	2	1.0510	36.259
149141	FRMNGT2	34.500	2	1.0596	36.558	149149	S156	34.500	2	1.0515	36.276
149306	S216 34	34.500	2	1.0593	36.545	149307	S208C796	34.500	2	1.0501	36.229
149313	P59_154	34.500	2	1.0529	36.326	149316	S210C794	34.500	2	1.0573	36.477
149317	P387C794	34.500	2	1.0511	36.262	149322	S210C795	34.500	2	1.0548	36.389
149323	S212C795	34.500	2	1.0517	36.285						

BUSES WITH VOLTAGE LESS THAN 0.9000:

BUS# X-- NAME --X BASKV AREA V(PU) V(KV) BUS# X-- NAME --X BASKV AREA V(PU) V(KV)
* NONE *

Attachment 6

CAES Generating 210 MW Local Wind Summer 2016 Overloads and Voltage Violations

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 13:11
CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
W/ 2010 ERAG/MMWG DS SERIES

OUTPUT FOR AREA 1 [WEST]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
* NONE *

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 13:11
CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
W/ 2010 ERAG/MMWG DS SERIES

OUTPUT FOR AREA 2 [GENESEE]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
149085 S48 34 34.500 2 149570 JAMESTWN 34.500* 2 1 35.5 34.2 103.9
149106 S42 34-1 34.500 2 149546 S43-778 34.500* 2 1 36.5 32.4 112.7
149570 JAMESTWN 34.500* 2 149571 JASCO TL 34.500 2 1 34.8 34.2 101.7

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 13:11
CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
W/ 2010 ERAG/MMWG DS SERIES

OUTPUT FOR AREA 3 [CENTRAL]
SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X X----- TO BUS -----X
BUS# X-- NAME --X BASKV AREA BUS# X-- NAME --X BASKV AREA CKT LOADING RATING PERCENT
* NONE *

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E MON, NOV 14 2011 13:15
CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
W/ 2010 ERAG/MMWG DS SERIES

BUSES WITH VOLTAGE GREATER THAN 1.0500:

BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)	BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)
130878		CANDG_C93_G20		0.6900	3	1.0500	0.724	130929		CNDGII_C93_20		0.6900	3	1.0500	0.724
131230		HILSD_M4		34.500	3	1.0586	36.520	131653		HOWD_C93_G2		0.6900	3	1.0500	0.724
131654		HOWD_C93_G3		0.6900	3	1.0500	0.724	135890		AKZOSALT		63.000	2	1.0525	66.309
135891		GOLAH63K		63.000	2	1.0601	66.783	135892		MORT63KV		63.000	2	1.0652	67.108
135893		S_PERRY		63.000	2	1.0529	66.330	135894		YORKCNTR		63.000	2	1.0514	66.236
136366		CORT_REG		34.500	3	1.0676	36.833	136706		HMGENBUS		13.800	3	1.0689	14.751
136728		ESYR_GT1		13.200	3	1.0568	13.950	146745		STL1_G1		0.6900	1	1.0500	0.724
149075		FARMNGTN		34.500	2	1.0641	36.711	149138		S121		34.500	2	1.0539	36.361
149141		FRMNGT2		34.500	2	1.0641	36.711	149149		S156		34.500	2	1.0560	36.432
149306		S216_34		34.500	2	1.0608	36.598	149307		S208C796		34.500	2	1.0517	36.283
149313		P59_154		34.500	2	1.0545	36.379	149314		P59_117		34.500	2	1.0502	36.231
149315		S202C797		34.500	2	1.0502	36.231	149316		S210C794		34.500	2	1.0589	36.531
149317		P387C794		34.500	2	1.0527	36.317	149322		S210C795		34.500	2	1.0563	36.443
149323		S212C795		34.500	2	1.0533	36.339								

BUSES WITH VOLTAGE LESS THAN 0.9000:

BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)	BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)
* NONE *															

Attachment 7

CAES Generation Off - High Penetration of Wind Generation (1500 MW in Zones A B C)

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E TUE, NOV 15 2011 9:59
 CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
 W/ 2010 ERAG/MMWG DS SERIES

OUTPUT FOR AREA 1 [WEST]
 SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
 LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X				X----- TO BUS -----X				CKT	LOADING	RATING	PERCENT
BUS#	X-- NAME	--X BASKV	AREA	BUS#	X-- NAME	--X BASKV	AREA				
146152	Q254RIPW_1C	34.500	1	146157	Q254RIPW_1G	0.6900*	1	1	20.7	5.2	398.7
146710	Q198_ARKWRIT115.00*		1	146720	Q198_34	34.500	1	1	100.5	84.0	119.6
147787	BLISS2_GE_1G0.5750*		1	147801	BLISS_C	34.500	1	1	14.3	3.5	408.6
147801	BLISS_C	34.500	1	148030	BLISS2_GE_3G0.5750*		1	1	14.4	12.2	117.4
147802	BLISS_34	34.500*	1	147803	BLISS115	115.00	1	1	99.3	96.0	103.4

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E TUE, NOV 15 2011 9:59
 CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
 W/ 2010 ERAG/MMWG DS SERIES

OUTPUT FOR AREA 2 [GENESEE]
 SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
 LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X				X----- TO BUS -----X				CKT	LOADING	RATING	PERCENT
BUS#	X-- NAME	--X BASKV	AREA	BUS#	X-- NAME	--X BASKV	AREA				
149085	S48_34	34.500	2	149570	JAMESTWN	34.500*	2	1	35.6	34.2	104.2
149106	S42_34-1	34.500*	2	149546	S43-778	34.500	2	1	36.6	32.4	112.9
149570	JAMESTWN	34.500*	2	149571	JASCO_TL	34.500	2	1	34.9	34.2	102.0

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E TUE, NOV 15 2011 9:59
 CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
 W/ 2010 ERAG/MMWG DS SERIES

OUTPUT FOR AREA 3 [CENTRAL]
 SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
 LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X				X----- TO BUS -----X				CKT	LOADING	RATING	PERCENT
BUS#	X-- NAME	--X BASKV	AREA	BUS#	X-- NAME	--X BASKV	AREA				
2000	CANHILWF	115.00	3	130774	BATH_115	115.00*	3	1	162.9	124.0	131.4
130837	SHLDN_1C	34.500	3	130841	SHLDN_GE_G1	0.5750*	3	1	28.5	14.0	203.7
131125	WTHRS_C	34.500	3	131126	WTHRS_GE_G1	0.5750*	3	1	31.6	15.8	200.5
131243	SLEIG115	115.00*	3	131298	SLEIG134	34.500	3	1	35.9	35.0	102.7
135202	Q263STONY_C	34.500*	3	135203	Q263STONYCRK230.00		3	1	90.8	90.0	100.9

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E TUE, NOV 15 2011 10:03
 CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
 W/ 2010 ERAG/MMWG DS SERIES

BUSES WITH VOLTAGE GREATER THAN 1.0500:

BUS#	X-- NAME	--X BASKV	AREA	V(PU)	V(KV)	BUS#	X-- NAME	--X BASKV	AREA	V(PU)	V(KV)
130868	CANDG_C93_G10.6900		3	1.0500	0.724	130878	CANDG_C93_G20.6900		3	1.0500	0.724
131126	WTHRS_GE_G1	0.5750	3	1.0500	0.604	131230	HILSD_M4	34.500	3	1.0611	36.606
131614	WTHRS_GE_G2	0.5750	3	1.0500	0.604	131615	WTHRS_GE_G3	0.5750	3	1.0500	0.604
131616	WTHRS_GE_G4	0.5750	3	1.0500	0.604	135192	Q263STONY_4G0.6900		3	1.0500	0.724
135193	Q263STONY_3G0.6900		3	1.0500	0.724	135194	Q263STONY_2G0.6900		3	1.0500	0.724
135195	Q263STONY_1G0.6900		3	1.0500	0.724	135392	DUNK115G	13.800	1	1.0854	14.979
135891	GOLAH63K	63.000	2	1.0571	66.597	135892	MORT63KV	63.000	2	1.0614	66.865
136366	CORT_REG	34.500	3	1.0649	36.741	136706	HMGENBUS	13.800	3	1.0683	14.743
136728	ESYR_GT1	13.200	3	1.0571	13.954	146065	Q237ALGANY1G0.6600		1	1.0500	0.693
146066	Q237ALGANY2G0.6600		1	1.0500	0.693	146166	Q254RIPW_6G	0.6900	1	1.0500	0.724
146744	STL1_G2	0.6900	1	1.0500	0.724	146745	STL1_G1	0.6900	1	1.0500	0.724
147800	BLISS1_GE_1G0.5750		1	1.0500	0.604	148026	BLISS1_GE_2G0.5750		1	1.0500	0.604
148027	BLISS1_GE_3G0.5750		1	1.0500	0.604	148029	BLISS2_GE_2G0.5750		1	1.0500	0.604
148030	BLISS2_GE_3G0.5750		1	1.0500	0.604	149075	FARMNGTN	34.500	2	1.0577	36.491
149138	S121	34.500	2	1.0519	36.290	149141	FRMNGT2	34.500	2	1.0577	36.491
149306	S216_34	34.500	2	1.0602	36.576	149307	S208C796	34.500	2	1.0510	36.261
149313	P59_154	34.500	2	1.0538	36.357	149316	S210C794	34.500	2	1.0582	36.509
149317	P387C794	34.500	2	1.0520	36.294	149322	S210C795	34.500	2	1.0557	36.421
149323	S212C795	34.500	2	1.0527	36.317						

Attachment 8

CAES Generation at 210 MW - High Penetration of Wind Farm Generation (1500 MW in Zones A B C)

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E TUE, NOV 15 2011 9:46
 CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
 W/ 2010 ERAG/MMWG DS SERIES

OUTPUT FOR AREA 1 [WEST]
 SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
 LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X				X----- TO BUS -----X				CKT	LOADING	RATING	PERCENT
BUS#	X-- NAME	--X BASKV	AREA	BUS#	X-- NAME	--X BASKV	AREA				
146152	Q254RIPW_1C	34.500	1	146157	Q254RIPW_1G	0.6900*	1	1	20.7	5.2	398.7
146710	Q198 ARKWRIT115.00*		1	146720	Q198 34	34.500	1	1	100.5	84.0	119.7
147787	BLISS2_GE_1G0.5750*		1	147801	BLISS_C	34.500	1	1	14.3	3.5	408.6
147801	BLISS_C	34.500	1	148030	BLISS2_GE_3G0.5750*		1	1	14.4	12.2	117.4
147802	BLISS_34	34.500*	1	147803	BLISS115	115.00	1	1	99.3	96.0	103.4

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E TUE, NOV 15 2011 9:46
 CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
 W/ 2010 ERAG/MMWG DS SERIES

OUTPUT FOR AREA 2 [GENESEE]
 SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
 LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X				X----- TO BUS -----X				CKT	LOADING	RATING	PERCENT
BUS#	X-- NAME	--X BASKV	AREA	BUS#	X-- NAME	--X BASKV	AREA				
149085	S48 34	34.500	2	149570	JAMESTWN	34.500*	2	1	35.6	34.2	104.1
149106	S42 34-1	34.500	2	149546	S43-778	34.500*	2	1	36.6	32.4	112.8
149570	JAMESTWN	34.500	2	149571	JASCO TL	34.500*	2	1	34.8	34.2	101.9

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E TUE, NOV 15 2011 9:46
 CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
 W/ 2010 ERAG/MMWG DS SERIES

OUTPUT FOR AREA 3 [CENTRAL]
 SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
 LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X				X----- TO BUS -----X				CKT	LOADING	RATING	PERCENT
BUS#	X-- NAME	--X BASKV	AREA	BUS#	X-- NAME	--X BASKV	AREA				
2000	CANHILWF	115.00	3	130774	BATH 115	115.00*	3	1	149.5	124.0	120.5
130787	CODNT115	115.00	3	130830	MONTR115	115.00*	3	1	120.1	108.0	111.2
130837	SHLDN_1C	34.500	3	130841	SHLDN_GE_G1	0.5750*	3	1	28.5	14.0	203.7
131125	WTHRS_C	34.500	3	131126	WTHRS_GE_G1	0.5750*	3	1	31.6	15.8	200.5
131243	SLEIG115	115.00*	3	131298	SLEIG134	34.500	3	1	35.6	35.0	101.7
135202	Q263STONY_C	34.500*	3	135203	Q263STONYCRK230.00		3	1	90.6	90.0	100.7

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E TUE, NOV 15 2011 9:56
 CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 50-50
 W/ 2010 ERAG/MMWG DS SERIES

BUSES WITH VOLTAGE GREATER THAN 1.0500:

BUS#	X-- NAME	--X BASKV	AREA	V(PU)	V(KV)	BUS#	X-- NAME	--X BASKV	AREA	V(PU)	V(KV)
130868	CANDG_C93_G10.6900		3	1.0500	0.724	130878	CANDG_C93_G20.6900		3	1.0500	0.724
131230	HILSD M4	34.500	3	1.0537	36.354	131614	WTHRS_GE_G2	0.5750	3	1.0500	0.604
131615	WTHRS_GE_G3	0.5750	3	1.0500	0.604	131616	WTHRS_GE_G4	0.5750	3	1.0500	0.604
131653	HOWD_C93_G2	0.6900	3	1.0500	0.724	131654	HOWD_C93_G3	0.6900	3	1.0500	0.724
135195	Q263STONY_1G0.6900		3	1.0500	0.724	135392	DUNK115G	13.800	1	1.0851	14.975
135890	AKZOSALT	63.000	2	1.0503	66.169	135891	GOLAH63K	63.000	2	1.0579	66.646
135892	MORT63KV	63.000	2	1.0621	66.915	135893	S PERRY	63.000	2	1.0506	66.190
136366	CORT REG	34.500	3	1.0632	36.682	136706	HMGENBUS	13.800	3	1.0683	14.742
136728	ESYR GT1	13.200	3	1.0570	13.952	146066	Q237ALGANY2G0.6600		1	1.0500	0.693
146067	Q237ALGANY3G0.6600		1	1.0500	0.693	146744	STL1 G2	0.6900	1	1.0500	0.724
146745	STL1 G1	0.6900	1	1.0500	0.724	147787	BLISS2_GE_1G0.5750		1	1.0500	0.604
148026	BLISS1_GE_2G0.5750		1	1.0500	0.604	148027	BLISS1_GE_3G0.5750		1	1.0500	0.604
148030	BLISS2_GE_3G0.5750		1	1.0500	0.604	149075	FARMNGTN	34.500	2	1.0591	36.540
149138	S121	34.500	2	1.0527	36.320	149141	FRMNGT2	34.500	2	1.0591	36.540
149149	S156	34.500	2	1.0510	36.258	149306	S216 34	34.500	2	1.0606	36.592

Attachment 9

No CAES Compression - Light Load - Heavy Wind Farm Penetration (1200 MW)

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E TUE, NOV 15 2011 13:15
 CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
 W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 1 [WEST]
 SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
 LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X				X----- TO BUS -----X									
BUS#	X--	NAME	--X BASKV	AREA	BUS#	X--	NAME	--X BASKV	AREA	CKT	LOADING	RATING	PERCENT
135277		FALCONER	115.00*	1	200579		WARREN	115.00	226	1	128.3	98.0	130.9
146152		Q254RIPW_1C	34.500	1	146157		Q254RIPW_1G	0.6900*	1	1	20.7	5.2	398.7
146710		Q198 ARKWRIT115.00*		1	146720		Q198_34	34.500	1	1	100.9	84.0	120.1
147801		BLISS_C	34.500	1	148030		BLISS2_GE_3G0.5750*		1	1	14.3	12.2	116.7
147802		BLISS_34	34.500	1	147803		BLISS115	115.00*	1	1	98.8	96.0	102.9

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E TUE, NOV 15 2011 13:15
 CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
 W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 2 [GENESEE]
 SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
 LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X				X----- TO BUS -----X									
BUS#	X--	NAME	--X BASKV	AREA	BUS#	X--	NAME	--X BASKV	AREA	CKT	LOADING	RATING	PERCENT
149082		S29 34Y	34.500	2	149092		S 1 34.5	34.500*	2	1	59.5	43.6	136.4
149092		S 1 34.5	34.500	2	149107		S42 34-3	34.500*	2	1	65.1	50.7	128.3
149102		S 49 729	34.500	2	149109		S42 34-4	34.500*	2	1	32.8	31.3	104.8

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E TUE, NOV 15 2011 13:15
 CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
 W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 3 [CENTRAL]
 SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
 LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X				X----- TO BUS -----X									
BUS#	X--	NAME	--X BASKV	AREA	BUS#	X--	NAME	--X BASKV	AREA	CKT	LOADING	RATING	PERCENT
130837		SHLDN_1C	34.500*	3	130841		SHLDN_GE_G1	0.5750	3	1	28.7	14.0	205.2
131125		WTHRS_C	34.500*	3	131126		WTHRS_GE_G1	0.5750	3	1	32.0	15.8	203.4

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E TUE, NOV 15 2011 13:18
 CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
 W/ ERAG/MMWG DS SERIES

BUSES WITH VOLTAGE GREATER THAN 1.0500:

BUS#	X--	NAME	--X BASKV	AREA	V(PU)	V(KV)	BUS#	X--	NAME	--X BASKV	AREA	V(PU)	V(KV)
130929		CNDGII_C93_20.6900		3	1.0500	0.724	131230		HILSD M4	34.500	3	1.0787	37.214
131248		BELONA T	34.500	3	1.0516	36.279	131249		BELONA34	34.500	3	1.0515	36.276
131258		FLAT ST1	34.500	3	1.0511	36.263	131259		FLAT ST2	34.500	3	1.0518	36.286
131289		FLAT TAP	34.500	3	1.0518	36.287	131300		TOWNSEND	34.500	3	1.0511	36.263
131350		HOWD_C93_G1	0.6900	3	1.0500	0.724	131477		BENNGTON	34.500	1	1.0521	36.296
131479		BLOSOM R	34.500	1	1.0508	36.251	131483		BUFF FOR	34.500	1	1.0515	36.277
131492		COWLESVL	34.500	1	1.0519	36.291	131494		DEPEW 34	34.500	1	1.0526	36.316
131499		ELLICOT	34.500	1	1.0515	36.275	131504		GIBRALTR	34.500	1	1.0513	36.271
131509		JAVA TP	34.500	1	1.0538	36.356	131510		JAVA 34	34.500	1	1.0547	36.388
131520		N.GARD34	34.500	1	1.0500	36.225	131529		3 ROD RD	34.500	1	1.0520	36.292
131533		SLOAN 34	34.500	1	1.0519	36.290	131537		W.VARSBR	34.500	1	1.0512	36.266
131547		SHLDN_GE_G4	0.5750	3	1.0500	0.604	131614		WTHRS_GE_G2	0.5750	3	1.0500	0.604
131615		WTHRS_GE_G3	0.5750	3	1.0500	0.604	131616		WTHRS_GE_G4	0.5750	3	1.0500	0.604
135195		Q263STONY_1G0.6900		3	1.0500	0.724	135573		DUNLOPLV	4.1600	1	1.0538	4.384
135575		AMBR LV	13.800	1	1.0667	14.721	135576		BUFSEWL	13.800	1	1.0733	14.812
135807		FORD	13.200	1	1.0613	14.009	135890		AKZOSALT	63.000	2	1.0646	67.072
135891		GOLAH63K	63.000	2	1.0637	67.015	135892		MORT63KV	63.000	2	1.0612	66.855
135893		S PERRY	63.000	2	1.0650	67.093	135894		YORKCNTR	63.000	2	1.0635	66.999
136012		OAKFIELD	34.500	2	1.0506	36.244	136034		USGYPS	34.500	2	1.0506	36.244

Attachment 10

CAES Compression 175MW - Light Load Case - Heavy Wind Penetration (1200 MW)

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E TUE, NOV 15 2011 13:09
 CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
 W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 1 [WEST]
 SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
 LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X				X----- TO BUS -----X				CKT	LOADING	RATING	PERCENT
BUS#	X-- NAME	--X BASKV	AREA	BUS#	X-- NAME	--X BASKV	AREA				
135277	FALCONER	115.00*	1	200579	WARREN	115.00	226	1	125.5	98.0	128.1
146152	Q254RIPW_1C	34.500	1	146157	Q254RIPW_1G	0.6900*	1	1	20.7	5.2	398.7
146710	Q198_ARKWRIT115.00*		1	146720	Q198_34	34.500	1	1	100.9	84.0	120.1
147801	BLISS_C	34.500	1	148030	BLISS2_GE_3G0.5750*		1	1	14.3	12.2	116.7
147802	BLISS_34	34.500	1	147803	BLISS115	115.00*	1	1	98.8	96.0	102.9

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E TUE, NOV 15 2011 13:09
 CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
 W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 2 [GENESEE]
 SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
 LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X				X----- TO BUS -----X				CKT	LOADING	RATING	PERCENT
BUS#	X-- NAME	--X BASKV	AREA	BUS#	X-- NAME	--X BASKV	AREA				
149082	S29_34Y	34.500	2	149092	S_1_34.5	34.500*	2	1	59.2	43.6	135.8
149092	S_1_34.5	34.500	2	149107	S42_34-3	34.500*	2	1	64.8	50.7	127.8
149102	S_49_729	34.500	2	149109	S42_34-4	34.500*	2	1	32.7	31.3	104.5

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E TUE, NOV 15 2011 13:09
 CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
 W/ ERAG/MMWG DS SERIES

OUTPUT FOR AREA 3 [CENTRAL]
 SUBSYSTEM LOADING CHECK (INCLUDED: LINES; BREAKERS AND SWITCHES; TRANSFORMERS) (EXCLUDED: NONE)
 LOADINGS ABOVE 100.0 % OF RATING SET A (MVA FOR TRANSFORMERS, CURRENT FOR NON-TRANSFORMER BRANCHES):

X----- FROM BUS -----X				X----- TO BUS -----X				CKT	LOADING	RATING	PERCENT
BUS#	X-- NAME	--X BASKV	AREA	BUS#	X-- NAME	--X BASKV	AREA				
130837	SHLDN_1C	34.500*	3	130841	SHLDN_GE_G1	0.5750	3	1	28.7	14.0	205.2
130868	CANDG_C93_G10.6900*		3	130869	CANAD_G1	34.500	3	1	7.9	7.8	101.1
131125	WTHRS_C	34.500*	3	131126	WTHRS_GE_G1	0.5750	3	1	32.0	15.8	203.4

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS®E TUE, NOV 15 2011 13:13
 CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
 W/ ERAG/MMWG DS SERIES

BUSES WITH VOLTAGE GREATER THAN 1.0500:

BUS#	X-- NAME	--X BASKV	AREA	V(PU)	V(KV)	BUS#	X-- NAME	--X BASKV	AREA	V(PU)	V(KV)
131230	HILSD_M4	34.500	3	1.0763	37.133	131477	BENNGTON	34.500	1	1.0521	36.296
131479	BLOSOM_R	34.500	1	1.0505	36.243	131483	BUFF_FOR	34.500	1	1.0514	36.273
131492	COWLESVL	34.500	1	1.0519	36.292	131494	DEPEW_34	34.500	1	1.0525	36.312
131499	ELLICOT	34.500	1	1.0513	36.271	131504	GIBRALTR	34.500	1	1.0512	36.267
131509	JAVA_TP	34.500	1	1.0538	36.356	131510	JAVA_34	34.500	1	1.0547	36.388
131529	3_ROD_RD	34.500	1	1.0520	36.293	131533	SLOAN_34	34.500	1	1.0518	36.286
131537	W_VARSBR	34.500	1	1.0512	36.266	131545	SHLDN_GE_G2	0.5750	3	1.0500	0.604
131546	SHLDN_GE_G3	0.5750	3	1.0500	0.604	131547	SHLDN_GE_G4	0.5750	3	1.0500	0.604
131653	HOWD_C93_G2	0.6900	3	1.0500	0.724	131654	HOWD_C93_G3	0.6900	3	1.0500	0.724
135192	Q263STONY_4G0.6900		3	1.0500	0.724	135193	Q263STONY_3G0.6900		3	1.0500	0.724
135194	Q263STONY_2G0.6900		3	1.0500	0.724	135195	Q263STONY_1G0.6900		3	1.0500	0.724
135573	DUNLOPLV	4.1600	1	1.0538	4.384	135575	AMBR_LV	13.800	1	1.0667	14.720
135576	BUFSEWL	13.800	1	1.0733	14.812	135807	FORD	13.200	1	1.0610	14.006
135890	AKZOSALT	63.000	2	1.0636	67.007	135891	GOLAH63K	63.000	2	1.0627	66.951
135892	MORT63KV	63.000	2	1.0602	66.790	135893	S_PERRY	63.000	2	1.0639	67.029
135894	YORKCNTR	63.000	2	1.0624	66.934	136366	CORT_REG	34.500	3	1.0707	36.939
136478	LHH	34.500	3	1.0524	36.307	136479	LHH_TAP1	34.500	3	1.0524	36.307
136480	LHH_TAP2	34.500	3	1.0523	36.305	146019	BALLHL3G	0.6900	1	1.0500	0.724
146744	STL1_G2	0.6900	1	1.0500	0.724	147787	BLISS2_GE_1G0.5750		1	1.0500	0.604
147800	BLISS1_GE_1G0.5750		1	1.0500	0.604	148026	BLISS1_GE_2G0.5750		1	1.0500	0.604

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148027	BLISS1_GE_3G0.5750	1	1.0500	0.604	148028	BLISS1_GE_4G0.5750	1	1.0500	0.604
148029	BLISS2_GE_2G0.5750	1	1.0500	0.604	148030	BLISS2_GE_3G0.5750	1	1.0500	0.604
149075	FARMNGTN_34.500	2	1.0569	36.461	149131	C736T786_34.500	2	1.0503	36.234
149135	C736TSW_34.500	2	1.0503	36.234	149136	C736T737_34.500	2	1.0503	36.234
149138	S121_34.500	2	1.0531	36.332	149141	FRMNGT2_34.500	2	1.0569	36.461
149149	S156_34.500	2	1.0552	36.404	149208	HBKS35_34.500	2	1.0502	36.232
149209	S8377_34.500	2	1.0502	36.231	149306	S216_34_34.500	2	1.0622	36.645
149307	S208C796_34.500	2	1.0583	36.511	149308	S214C796_34.500	2	1.0565	36.450
149309	P28C796_34.500	2	1.0564	36.447	149310	S207C796_34.500	2	1.0563	36.444
149311	PT788_34.500	2	1.0563	36.444	149312	OPPT193_34.500	2	1.0563	36.444
149313	P59_154_34.500	2	1.0595	36.552	149314	P59_117_34.500	2	1.0576	36.489
149315	S202C797_34.500	2	1.0576	36.489	149316	S210C794_34.500	2	1.0614	36.617
149317	P387C794_34.500	2	1.0588	36.528	149321	S209C794_34.500	2	1.0571	36.470
149322	S210C795_34.500	2	1.0603	36.580	149323	S212C795_34.500	2	1.0591	36.537
149324	S195C795_34.500	2	1.0558	36.426	149325	S799C795_34.500	2	1.0529	36.324

BUSES WITH VOLTAGE LESS THAN 0.9000:

BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)	BUS#	X--	NAME	--X	BASKV	AREA	V(PU)	V(KV)
146711	Q198_S88_1G	0.6000	1	0.8643	0.519	146712	Q198_S88_2G	0.6000	1	0.8640	0.518				
146713	Q198_S88_3G	0.6000	1	0.8641	0.518	146714	Q198_S88_4G	0.6000	1	0.8628	0.518				
146715	Q198_S88_1C	34.500	1	0.8888	30.665	146716	Q198_S88_2C	34.500	1	0.8886	30.656				
146717	Q198_S88_3C	34.500	1	0.8886	30.656	146718	Q198_S88_4C	34.500	1	0.8874	30.615				
146719	Q198_COLL	34.500	1	0.8889	30.668										

Attachment 11

Prior to CAES in service:

CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 90-10
W/ 2010 ERAG/MMWG PF SERIES

OPTIONS USED:

- DC LINES AND FACTS DEVICES BLOCKED

```

                                     <-SCMVA-> <-Sym I''k rms-->
                                     /I/      AN(I)
X----- BUS -----X              MVA      AMP      DEG
131163 [TEXAS115   115.00] 3PH      1570.92  7886.7  -135.49
THEVENIN IMPEDANCE, X/R (OHM)      Z+:/8.205/70.986, 2.90191
-----

```

```

                                     <-SCMVA-> <-Sym I''k rms-->
                                     /I/      AN(I)
X----- BUS -----X              MVA      AMP      DEG
131241 [GRNDG115   115.00] 3PH      1540.96  7736.3  -136.50
THEVENIN IMPEDANCE, X/R (OHM)      Z+:/8.287/72.909, 3.25235
-----

```

```

                                     <-SCMVA-> <-Sym I''k rms-->
                                     /I/      AN(I)
X----- BUS -----X              MVA      AMP      DEG
130830 [MONTR115   115.00] 3PH      2271.49  11403.9 -136.01
THEVENIN IMPEDANCE, X/R (OHM)      Z+:/5.685/71.343, 2.96164
-----

```


Attachment 12

With CAES Compressor in sevice - modeled as a lumped load and not a machine.
CEII - DO NOT RELEASE - 2011 FERC715 LIGHT LOAD 2016
W/ ERAG/MMWG DS SERIES

OPTIONS USED:
- DC LINES AND FACTS DEVICES BLOCKED

```

                                <-SCMVA-> <-Sym I''k rms-->
                                /I/      AN(I)
X----- BUS -----X          MVA      AMP      DEG
131163 [TEXAS115   115.00] 3PH   1848.74  9281.5  -100.76
THEVENIN IMPEDANCE, X/R (OHM)  Z+:2.403+j6.817, 2.83680
-----
                                <-SCMVA-> <-Sym I''k rms-->
                                /I/      AN(I)
X----- BUS -----X          MVA      AMP      DEG
131241 [GRNDG115   115.00] 3PH   1699.92  8534.3  -100.89
THEVENIN IMPEDANCE, X/R (OHM)  Z+:2.181+j7.650, 3.50759
-----
                                <-SCMVA-> <-Sym I''k rms-->
                                /I/      AN(I)
X----- BUS -----X          MVA      AMP      DEG
130830 [MONTR115   115.00] 3PH   2475.99  12430.5 -101.75
THEVENIN IMPEDANCE, X/R (OHM)  Z+:1.665+j5.136, 3.08568
-----
                                <-SCMVA-> <-Sym I''k rms-->
                                /I/      AN(I)
X----- BUS -----X          MVA      AMP      DEG
   600 [CAESPOI    115.00] 3PH   1925.31  9665.9  -100.81
THEVENIN IMPEDANCE, X/R (OHM)  Z+:2.351+j6.528, 2.77736
-----
                                <-SCMVA-> <-Sym I''k rms-->
                                /I/      AN(I)
X----- BUS -----X          MVA      AMP      DEG
   700 [CAESXFMR   115.00] 3PH   1815.53  9114.7  -101.12
THEVENIN IMPEDANCE, X/R (OHM)  Z+:2.496+j6.921, 2.77277
-----
                                <-SCMVA-> <-Sym I''k rms-->
                                /I/      AN(I)
X----- BUS -----X          MVA      AMP      DEG
   800 [CAES       13.800] 3PH    755.48  31607.0 -112.78
THEVENIN IMPEDANCE, X/R (OHM)  Z+:0.036+j0.252, 6.96731
-----

```

Attachment 13

With CAES in service:

CEII - DO NOT RELEASE - 2011 FERC715 SUMMER 2016 LOAD 90-10
W/ 2010 ERAG/MMWG PF SERIES

OPTIONS USED:

- DC LINES AND FACTS DEVICES BLOCKED

```

                                     <-SCMVA-> <-Sym I''k rms-->
                                     /I/      AN(I)
X----- BUS -----X              MVA      AMP      DEG
131163 [TEXAS115   115.00] 3PH      2080.08  10442.9  -132.60
THEVENIN IMPEDANCE, X/R (OHM)      Z+:/6.236/74.135, 3.51874
-----
```

```

                                     <-SCMVA-> <-Sym I''k rms-->
                                     /I/      AN(I)
X----- BUS -----X              MVA      AMP      DEG
131241 [GRNDG115   115.00] 3PH      1718.69   8628.6  -133.46
THEVENIN IMPEDANCE, X/R (OHM)      Z+:/7.484/74.694, 3.65387
-----
```

```

                                     <-SCMVA-> <-Sym I''k rms-->
                                     /I/      AN(I)
X----- BUS -----X              MVA      AMP      DEG
130830 [MONTR115   115.00] 3PH      2684.94  13479.5  -133.76
THEVENIN IMPEDANCE, X/R (OHM)      Z+:/4.836/74.008, 3.48932
-----
```

```

                                     <-SCMVA-> <-Sym I''k rms-->
                                     /I/      AN(I)
X----- BUS -----X              MVA      AMP      DEG
   600 [CAESPOI    115.00] 3PH      2365.28  11874.7  -134.05
THEVENIN IMPEDANCE, X/R (OHM)      Z+:/5.481/76.809, 4.26663
-----
```

```

                                     <-SCMVA-> <-Sym I''k rms-->
                                     /I/      AN(I)
X----- BUS -----X              MVA      AMP      DEG
   700 [CAESXFMR   115.00] 3PH      2279.84  11445.8  -134.27
THEVENIN IMPEDANCE, X/R (OHM)      Z+:/5.685/77.447, 4.49106
-----
```

```

                                     <-SCMVA-> <-Sym I''k rms-->
                                     /I/      AN(I)
X----- BUS -----X              MVA      AMP      DEG
   800 [CAES       13.800] 3PH      1925.64  80562.9  -133.09
THEVENIN IMPEDANCE, X/R (OHM)      Z+:/0.095/86.720, 17.44673
-----
```

Attachment 14

High Voltage in the Elmira and Binghamton Area

The investigation into the off peak high voltage problem in the Elmira – Binghamton area indicates that the problem has been mitigated by the setup of the double bank at Watercure Substation. This substation is in the Elmira area and has two parallel 345 to 230kV transformers. In the light load case these transformers have tap settings that differ from each other significantly such that there is a large circulating MVAR flow in the two bank combination. The circulating MVAR flow is ~450MVAR compared to the transformer's A Rating of 494 MVA. It controls the 230kV bus voltage to less than 1.02 pu volts. Balancing the banks such that there is no circulating MVAR flow the 230kV bus voltage goes to approximately 1.07 pu volts. This is the high voltage problem. In the normal load case the two transformer tap settings are set identical and the transformers loads are also balance with little or no circulating current. The voltages are within proper limits.

The following table presents the voltage data for the Elmira – Binghamton area. The wind farm generation dispatch has not been changed from that provided in the Summer 2016 FERC 715 submittals.

Before CAES Plant	Voltage Bus 1 Per Unit	Voltage Bus 2 Per Unit	After CAES Compression Plant	Voltage Bus 1 Per Unit	Voltage Bus 2 Per Unit
Oakdale 345kV Bus	1.012		Oakdale 345kV Bus	1.012	
Oakdale 115kV Bus	0.99	1.004	Oakdale 115kV Bus	0.99	1.004
Watercure 345kV Bus	1.00625		Watercure 345kV Bus	1.0056	
Watercure 230kV Bus	1.02		Watercure 230kV Bus	1.0198	
Hillsdale 230kV Bus	1.02		Hillsdale 230kV Bus	1.02	
Hillsdale 34.5kV Bus	0.99	1.09	Hillsdale 34.5kV Bus	0.99	1.09