



**Generation Interconnection
Feasibility Study Report
for
Queue Project AE2-139
SOUTH TROY-EAST TOWANDA 115 KV
60.3 MW Capacity / 100.5 MW Energy**

July, 2019

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1 Preface

The intent of the feasibility study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. Cost allocation rules for network upgrades can be found in PJM Manual 14A, Attachment B. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

The Interconnection Customer seeking to interconnect a wind or solar generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

An Interconnection Customer with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

PJM utilizes manufacturer models to ensure the performance of turbines is properly captured during the simulations performed for stability verification and, where applicable, for compliance with low voltage ride through requirements. Turbine manufacturers provide such models to their customers. The list of manufacturer models PJM has already validated is contained in Attachment B of Manual 14G. Manufacturer models may be updated from time to time, for various reasons such as to reflect changes to the control systems or to more accurately represent the capabilities turbines and controls which are currently available in the field. Additionally, as new turbine models are developed, turbine manufacturers provide such new models which must be used in the conduct of these studies. PJM needs adequate time to evaluate the new models in order to reduce delays to the System Impact Study process timeline for the Interconnection Customer as well as other Interconnection Customers in the study group. Therefore, PJM will require that any Interconnection Customer with a new manufacturer model must supply that model to PJM, along with a \$10,000 fully refundable deposit, no later than three (3) months prior to the starting date of the System Impact Study (See Section 4.3 for starting dates) for the Interconnection Request which shall specify the use of the new model. The Interconnection Customer will be required to submit a completed dynamic model study request form (Attachment B-1 of Manual 14G) in order to document the request for the study.

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

2 General

The Interconnection Customer (IC) has proposed a Solar generating facility located in McKean County, Pennsylvania. The installed facilities will have a total capability of 100.5 MW with 60.3 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is May 31, 2022. This study does not imply a Transmission Owner (TO) commitment to this in-service date.

Queue Number	AE2-139
Project Name	SOUTH TROY-EAST TOWANDA 115 KV
Interconnection Customer	
State	Pennsylvania
County	McKean
Transmission Owner	PENELEC
MFO	100.5
MWE	100.5
MWC	60.3
Fuel	Solar
Basecase Study Year	2022

3 Point of Interconnection

3.1 Primary POI

The interconnection of the project at the Primary POI will be accomplished by constructing a new 115 kV three (3) breaker ring bus substation and looping the East Towanda – Everts Drive 115 kV line into the new station. The new substation will be located approximately 6.1 miles from East Towanda substation. The IC will be responsible for acquiring all easements, properties, and permits that may be required to construct both the new interconnection switching station and the associated facilities. The IC will also be responsible for the rough grade of the property and an access road to the proposed three breaker ring bus site. The project will also require non-direct connection upgrades at East Towanda substation.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AE2-139 generation project to connect to the FirstEnergy (“FE”) transmission system. Attachment 2 provides the proposed location for the point of interconnection. IC will be responsible for constructing all of the facilities on its side of the POI, including the attachment facilities which connect the generator to the FE transmission system’s direct connection facilities.

3.2 Secondary POI

The interconnection of the project at a Secondary POI can be accomplished by constructing a new 230 kV three (3) breaker ring bus substation and looping the East Towanda - Marshall 230 kV line into the new station. The new substation would be located approximately 6.2 miles from East Towanda substation. A full scope of work or estimated cost is not provided for the proposed Secondary POI. Only network impacts are presented for the Secondary POI under “Network Impacts- Secondary Point of Interconnection”.

4 Cost Summary

The AE2-139 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	\$1,233,475
Direct Connection Network Upgrade	\$5,290,925
Non Direct Connection Network Upgrades	\$230,400
Total Costs	\$6,754,80

In addition, the AE2-139 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	\$ 55,480,000

Cost allocations for these upgrades will be provided in the System Impact Study Report.

The costs provided above exclude the Contribution in Aid of Construction (“CIAC”) Federal Income Tax Gross Up charge. If, at a future date, it is determined that the CIAC Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

The required Attachment Facilities and Direct and Non-Direct Connection work for the interconnection of the AE2-139 generation project to the FE Transmission System is detailed in the following sections. The associated one-line with the generation project Attachment Facilities and the Primary Direct and Non-Direct Connection facilities are shown in Attachment 1.

5 Transmission Owner Scope of Work

The interconnection of the project at the Primary POI will be accomplished by constructing a new 115 kV three (3) breaker ring bus substation and looping the East Towanda – Everts Drive 115 kV line into the new station. The new substation will be located approximately 6.1 miles from East Towanda substation. The IC will be responsible for acquiring all easements, properties, and permits that may be required to construct both the new interconnection switching station and the associated facilities. The IC will also be responsible for the rough grade of the property and an access road to the proposed three breaker ring bus site. The project will also require non-direct connection upgrades at East Towanda substation.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AE2-139 generation project to connect to the FirstEnergy (“FE”) transmission system. Attachment 2 provides the proposed location for the point of interconnection. IC will be responsible for constructing all of the facilities on its side of the POI, including the attachment facilities which connect the generator to the FE transmission system’s direct connection facilities.

6 Attachment Facilities

The total preliminary cost estimate for the Attachment work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Install line exit take-off structure, foundations, disconnect switch and associated equipment at new ring bus substation.	\$1,233,475
Total Attachment Facility Costs	\$1,233,475

7 Direct Connection Cost Estimate

The total preliminary cost estimate for the Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Construct new interconnection substation with 3-115 kV breakers in a ring bus arrangement and associated facilities.	\$3,700,425
Loop the East Towanda-Everts Drive 115 kV into the new ring bus substation.	\$1,590,500
Total Direct Connection Facility Costs	\$5,290,925

8 Non-Direct Connection Cost Estimate

The total preliminary cost estimate for the Non-Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Install anti-islanding equipment at East Towanda substation.	\$230,400
Total Non-Direct Connection Facility Costs	\$230,400

9 System Reinforcements Cost Estimate

Facility	Upgrade Description	Cost
26E.TWANDA 230.0 kV - HILSD230 230.0 kV Ckt 1	PN-0001 (291) : Reconductor line with 1033 ACSS high temperature conductor (21.52 miles). At East Towanda, replace the wave trap and bus conductor. Project Type : FAC Cost : \$50,700,000 Time Estimate : 36.0 Months	\$50,700,000
26TOWANDA 115.0 kV - 26NO MESHO 115.0 kV Ckt 1	PN-0009a (299) : At East Towanda, replace the breaker disconnect, line trap and relaying. At North Meshoppen, replace the relaying and bus conductor. Project Type : FAC Cost : \$650,000 Time Estimate : 12.0 Months	\$650,000
LACK 230.0 kV - LACKAW 500.0 kV Ckt 3	R-PL-0001 (329) : Re-Terminate LACK T4 500/230kV transformer Project Type : CON Cost : \$4,000,000 Time Estimate : 24.0 Months	\$4,000,000
26CHAPMAN+ 230.0 kV - 01MOSHAN 230.0 kV Ckt 1	WP-0012 (61) : Replace 1033 Substation Conductor on Chapman Terminal Project Type : FAC Cost : \$130,000 Time Estimate : 9.0 Months	\$130,000
TOTAL COST		\$55,480,000

10 Schedule

Based on the scope of work for the Attachment Facilities and the Direct and Non-Direct Connection facilities, it is expected to take a minimum of 24 months after the signing of an Interconnection Construction Service Agreement to complete the installation. This includes the requirement for the IC to make a preliminary payment that compensates FE for the first three months of the engineering design work that is related to the construction of the interconnection substation. This assumes that there will be no environmental issues with any of the new properties associated with this project, that there will be no delays in acquiring the necessary permits for implementing the defined direct connection and network upgrades, and that all transmission system outages will be allowed when requested.

The schedule for the required Network Impact Reinforcements will be more clearly identified in future study phases. The estimate elapsed time to complete each of the required reinforcements is identified in the “System Reinforcements” section of the report.

11 Transmission Owner Analysis

11.1 Power Flow Analysis

FE performed an analysis of its underlying transmission <100 kV system. The AE2-139 project did not contribute to any overloads on the FE transmission <100 kV system.

12 Interconnection Customer Requirements

12.1 System Protection

The IC must design its Customer Facilities in accordance with all applicable standards, including the standards in FE's "Requirements for Transmission Connected Facilities" document located at: <http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx>. Preliminary Protection requirements will be provided as part of the Facilities Study. Detailed Protection Requirements will be provided once the project enters the construction phase.

The IC has requested a non-standard GSU transformer winding configuration. This transformer is in violation of section 14.2.6 of FE's "Requirements for Transmission Connected Facilities" document and will not be accepted. The GSU transformer must have a grounded wye connection on the high (utility) side and a delta connection on the low (generator) side.

12.2 Compliance Issues and Interconnection Customer Requirements

The proposed Customer Facilities must be designed in accordance with FE's "Requirements for Transmission Connected Facilities" document located at: <http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx>. In particular, the IC is responsible for the following:

1. The purchase and installation of a fully rated 115 kV circuit breaker to protect the AE2-139 generator lead line. A single circuit breaker must be used to protect this line; if the project has several GSU transformers, the individual GSU transformer breakers cannot be used to protect this line.
2. The purchase and installation of the minimum required FE generation interconnection relaying and control facilities. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.
3. The purchase and installation of supervisory control and data acquisition ("SCADA") equipment to provide information in a compatible format to the FE Transmission System Control Center.
4. Compliance with the FE and PJM generator power factor and voltage control requirements.
5. The execution of a back-up service agreement to serve the customer load supplied from the AE2-139 generation project metering point when the units are out-of-service. This assumes the intent of the IC is to net the generation with the load.

The IC will also be required to meet all PJM, ReliabilityFirst, and NERC reliability criteria and operating procedures for standards compliance. For example, the IC will need to properly locate and report the over and under voltage and over and under frequency system protection elements for its units as well as the submission of the generator model and protection data required to satisfy the PJM and ReliabilityFirst audits.

Failure to comply with these requirements may result in a disconnection of service if the violation is found to compromise the reliability of the FE system.

12.3 Power Factor Requirements

The IC shall design its non-synchronous Customer Facility with the ability to maintain a power factor of at least 0.95 leading (absorbing VARs) to 0.95 lagging (supplying VARs) measured at the high-side of the facility substation transformer(s) connected to the FE transmission system.

13 Revenue Metering and SCADA Requirements

13.1 PJM Requirements

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Section 8 of Attachment O.

13.2 FE Requirements

The IC will be required to comply with all FE revenue metering requirements for generation interconnection customers which can be found in FE's "Requirements for Transmission Connected Facilities" document located at: <http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx>.

14 Network Impacts- Primary Point of Interconnection

The Queue Project AE2-139 was evaluated as a 100.5 MW (Capacity 60.3 MW) injection tapping the East Towanda to Tennessee Gas 115kV line in the PENELEC area. Project AE2-139 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-139 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

14.1 Generation Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1515064	200908	26CHAPMAN+	PENELEC	235220	01MOSHAN	AP	1	Base Case	single	520.0	98.87	100.36	DC	8.55

14.2 Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7046496	135251	S RIPLEY	NYISO	200654	26ERIE E	PENELEC	1	PN-P2-3-PN-345-3A	breaker	607.0	98.83	100.72	DC	11.43
7046497	135251	S RIPLEY	NYISO	200654	26ERIE E	PENELEC	1	PN-P2-3-PN-345-002A	breaker	607.0	98.83	100.72	DC	11.43
7046373	200654	26ERIE E	PENELEC	903645	W3-099 TAP	PENELEC	1	PN-P2-3-PN-345-003A	breaker	592.0	98.07	99.98	DC	11.46
7046374	200654	26ERIE E	PENELEC	903645	W3-099 TAP	PENELEC	1	PN-P2-3-PN-345-3A	breaker	592.0	96.83	98.74	DC	11.43
7046375	200654	26ERIE E	PENELEC	903645	W3-099 TAP	PENELEC	1	PN-P2-3-PN-345-002A	breaker	592.0	96.83	98.74	DC	11.43
1514337	200674	26TOWANDA	PENELEC	200677	26NO MESHO	PENELEC	1	PN-P2-3-PN-230-3C	breaker	172.0	99.98	113.38	DC	22.93
1514496	200928	26FOURMILE	PENELEC	200819	26ERIE SE	PENELEC	1	PN-P2-3-PN-345-003A	breaker	666.0	83.92	85.45	DC	10.23
1514522	208009	LACK	PPL	200074	LACKAW	PJM	3	PL:02:P42:001057	breaker	1165.0	98.7	99.55	DC	21.58

14.3 Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7046495	135251	S RIPLEY	NYISO	200654	26ERIE E	PENELEC	1	PN-P2-3-PN-345-003A	breaker	607.0	100.05	101.94	DC	11.46
7046957	200674	26TOWANDA	PENELEC	200676	26E.SAYRE	PENELEC	1	PN-P1-2-PN-230-101T	single	246.0	135.11	138.08	DC	7.3
1514378	200675	26E.TWANDA	PENELEC	130763	HILSD230	NYISO	1	PN-P2-3-PN-115-19H	breaker	531.0	139.99	142.51	DC	15.02
1515463	200675	26E.TWANDA	PENELEC	130763	HILSD230	NYISO	1	PL:03:P71:001017	tower	531.0	143.72	144.51	DC	11.25
7046966	200675	26E.TWANDA	PENELEC	130763	HILSD230	NYISO	1	PN-P1-2-PN-115-038	single	531.0	134.13	135.83	DC	9.01
7046967	200675	26E.TWANDA	PENELEC	130763	HILSD230	NYISO	1	PN-P1-2-PN-345-104T	single	531.0	132.33	133.44	DC	5.89
7046973	200675	26E.TWANDA	PENELEC	130763	HILSD230	NYISO	1	Base Case	single	483.0	124.07	125.35	DC	6.2
1515034	200676	26E.SAYRE	PENELEC	130836	N.WAV115	NYISO	1	Base Case	single	108.0	128.2	133.59	DC	5.82
7046732	200676	26E.SAYRE	PENELEC	130836	N.WAV115	NYISO	1	PN-P1-2-PN-230-101T	single	128.0	234.74	240.44	DC	7.29
7046733	200676	26E.SAYRE	PENELEC	130836	N.WAV115	NYISO	1	PN-P1-2-PN-115-039	single	128.0	144.99	149.56	DC	5.85
1514362	200677	26NO MESHO	PENELEC	200706	26N.MESHP	PENELEC	4	PN-P2-3-PN-230-17B19	breaker	189.0	101.68	106.25	DC	19.8

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1513952	200927	26FOURMILE	PENELE C	200820	26ERIE SE	PENELE C	1	PN-P2-3-PN-230-6G	breaker	245.0	125.29	126.51	DC	6.59
7046229	903645	W3-099 TAP	PENELE C	200928	26FOURMILE	PENELE C	1	PN-P2-3-PN-345-003A	breaker	592.0	108.22	110.01	DC	11.46
7046230	903645	W3-099 TAP	PENELE C	200928	26FOURMILE	PENELE C	1	PN-P2-3-PN-345-3A	breaker	592.0	107.02	108.81	DC	11.43
7046231	903645	W3-099 TAP	PENELE C	200928	26FOURMILE	PENELE C	1	PN-P2-3-PN-345-002A	breaker	592.0	107.02	108.81	DC	11.43

14.4 Potential Congestion due to Local Energy Deliverability

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7047421	135251	S RIPLEY	NYISO	200654	26ERIE E	PENELEC	1	PN-P1-2-PN-345-003	operation	607.0	98.76	100.65	DC	11.43
1514963	200599	26ERIE W	PENELEC	238547	02AT	ATSI	1	Base Case	operation	1560.0	115.36	115.83	DC	16.4
7047260	200654	26ERIE E	PENELEC	903645	W3-099 TAP	PENELEC	1	PN-P1-2-PN-345-003	operation	592.0	96.74	98.65	DC	11.43
7046956	200674	26TOWANDA	PENELEC	200676	26E.SAYRE	PENELEC	1	PN-P1-2-PN-230-101T	operation	246.0	140.97	145.92	DC	12.17
7047342	200674	26TOWANDA	PENELEC	200677	26NO MESHO	PENELEC	1	PN-P1-2-PN-230-013	operation	172.0	96.87	109.71	DC	21.98
1515172	200675	26E.TWANDA	PENELEC	130763	HILSD230	NYISO	1	Base Case	operation	483.0	130.09	130.89	DC	10.33
7046962	200675	26E.TWANDA	PENELEC	130763	HILSD230	NYISO	1	PN-P1-2-PN-115-038	operation	531.0	139.95	142.47	DC	15.01
1515030	200676	26E.SAYRE	PENELEC	130836	N.WAV115	NYISO	1	Base Case	operation	108.0	124.41	128.46	DC	9.7
7046731	200676	26E.SAYRE	PENELEC	130836	N.WAV115	NYISO	1	PN-P1-2-PN-230-101T	operation	128.0	246.0	255.5	DC	12.16
7047403	200767	26HOMER CT	PENELEC	200795	26SHELOCTA	PENELEC	1	AP-P1-2-WP-345-311T	operation	917.0	101.58	102.3	DC	14.35

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1515062	200908	26CHAPMAN+	PENELEC	235220	01MOSHAN	AP	1	Base Case	operation	520.0	107.71	110.46	DC	14.24
7047394	200908	26CHAPMAN+	PENELEC	235220	01MOSHAN	AP	1	PN-P1-2-PN-230-101T	operation	621.0	104.28	106.85	DC	15.94
7047526	200927	26FOURMILE	PENELEC	200820	26ERIE SE	PENELEC	1	PN-P1-2-PN-230-027	operation	245.0	74.89	75.99	DC	5.94
1514876	903645	W3-099 TAP	PENELEC	200928	26FOURMILE	PENELEC	1	Base Case	operation	488.0	83.24	85.51	DC	11.2
7047133	903645	W3-099 TAP	PENELEC	200928	26FOURMILE	PENELEC	1	PN-P1-2-PN-345-003	operation	592.0	106.94	108.72	DC	11.43
1515159	919490	AA2-000 TAP	PENELEC	200908	26CHAPMAN+	PENELEC	1	Base Case	operation	546.0	102.66	105.27	DC	14.24

14.5 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
7046732,7046733,1515034	9	26E.SAYRE 115.0 kV - N.WAV115 115.0 kV Ckt 1	<u>PENELEC</u> No Reinforcement Needed. Not a valid violation¹ <u>NYISO</u> NonPJM Area : The external (i.e. Non-PJM) Transmission Owner, NYISO, will not evaluate this violation until the impact study phase. Project Type : FAC Cost : \$0 Time Estimate : N/A Months	\$0
1513952	11	26FOURMILE 115.0 kV - 26ERIE SE 115.0 kV Ckt 1	n5174 (312) : New 230kV series reactor and required associated substation equipment at Erie East substation, ISD 4/08/2019² Project Type : CON Cost : \$0 Time Estimate : 0.0 Months	\$0
7046229,7046231,7046230	12	W3-099 TAP 230.0 kV - 26FOURMILE 230.0 kV Ckt 1	n5174 (312) : New 230kV series reactor and required associated substation equipment at Erie East substation, ISD 4/08/2019² Project Type : CON Cost : \$0 Time Estimate : 0.0 Months	\$0

¹ If “No Reinforcement Needed. Not a valid violation” was provided as the Upgrade Description for a facility in the System Reinforcements table then that facility met one of the following conditions:

- The loading on the facility at your queue position was less than 100%; therefore, the facility is not yet overloaded, but may be overloaded by end of the AE2 queue.
- The TO reviewed their ratings on the facility and determined that the current rating was greater than the rating in PJM’s model. This new rating was greater than the loading at your queue position making the violation invalid.
- The TO reviewed the contingency and determined that contingency was not valid; therefore the violation is invalid. Any contingency corrections will be assessed and corrected in the AE2 impact study phase.

² Network Upgrade n5174 is already in-service. This system reinforcement may resolve the overload violation but will not be tested until the System Impact Phase.

ID	Index	Facility	Upgrade Description	Cost
7046495,7046497,7046496	2	S RIPLEY 230.0 kV - 26ERIE E 230.0 kV Ckt 1	<u>PENELEC</u> n5174 (312) : New 230kV series reactor and required associated substation equipment at Erie East substation, ISD 4/08/2019² Project Type : CON Cost : \$0 Time Estimate : 0.0 Months <u>NYISO</u> NonPJM Area : The external (i.e. Non-PJM) Transmission Owner, NYISO, will not evaluate this violation until the impact study phase. Project Type : FAC Cost : \$0 Time Estimate : N/A Months	\$0
7046967,7046973,1515463,1514378,7046966	8	26E.TWANDA 230.0 kV - HILSD230 230.0 kV Ckt 1	PN-0001 (291) : Reconductor line with 1033 ACSS high temperature conductor (21.52 miles). At East Towanda, replace the wave trap and bus conductor. Project Type : FAC Cost : \$50,700,000 Time Estimate : 36.0 Months	\$50,700,000
1514337	4	26TOWANDA 115.0 kV - 26NO MESHO 115.0 kV Ckt 1	PN-0009a (299) : At East Towanda, replace the breaker disconnect, line trap and relaying. At North Meshoppen, replace the relaying and bus conductor. Project Type : FAC Cost : \$650,000 Time Estimate : 12.0 Months	\$650,000
7046957	7	26TOWANDA 115.0 kV - 26E.SAYRE 115.0 kV Ckt 1	No Reinforcement Needed. Not a valid violation ¹	\$0
7046373,7046374,7046375	3	26ERIE E 230.0 kV - W3- 099 TAP 230.0 kV Ckt 1	n5174 (312) : New 230kV series reactor and required associated substation equipment at Erie East substation, ISD 4/08/2019² Project Type : CON Cost : \$0 Time Estimate : 0.0 Months	\$0
1514522	6	LACK 230.0 kV - LACKAW 500.0 kV Ckt 3	R-PL-0001 (329) : Re-Terminate LACK T4 500/230kV transformer Project Type : CON Cost : \$4,000,000 Time Estimate : 24.0 Months	\$4,000,000
1514496	5	26FOURMILE 230.0 kV - 26ERIE SE 230.0 kV Ckt 1	n5174 (312) : New 230kV series reactor and required associated substation equipment at Erie East substation, ISD 4/08/2019² Project Type : CON Cost : \$0 Time Estimate : 0.0 Months	\$0
1514362	10	26NO MESHO 115.0 kV - 26N.MESHPN 230.0 kV Ckt 4	No Reinforcement Needed. Not a valid violation ¹	\$0

ID	Index	Facility	Upgrade Description	Cost
1515064	1	26CHAPMAN+ 230.0 kV - 01MOSHAN 230.0 kV Ckt 1	WP-0012 (61) : Replace 1033 Substation Conductor on Chapman Terminal Project Type : FAC Cost : \$130,000 Time Estimate : 9.0 Months	\$130,000
			TOTAL COST	\$55,480,000

14.6 Flow Gate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact. It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

14.7 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1515064	200908	26CHAPMAN+	PENELEC	235220	01MOSHAN	AP	1	Base Case	single	520.0	98.87	100.36	DC	8.55

Bus #	Bus	MW Impact
200823	26MHP_X3-003	7.03
200851	26MEHOOP3	0.85
200887	26ARMNA MT	0.27
200917	26MTNTP_P28	0.43
200949	26X1-109	16.05
203261	26BLOSSBCT	0.36
203283	26MANOR_T86	0.02
913191	Y1-047 OP1	0.29
914041	Y2-042	0.21
916351	Z1-091	2.15
916361	Z1-092	0.29
916541	Z1-110	0.63
917072	Z2-011	0.63
917631	Z2-104	0.02
919201	AA1-144 O1	30.67
919491	AA2-000	298.39
920341	AA2-132	2.03
920351	AA2-133	0.33
930511	AB1-092	10.96
934801	AD1-108	0.05
934811	AD1-109	0.03
934821	AD1-110	0.02
935061	AD1-142	0.02
936421	AD2-055	22.56
940801	AE2-067 C	2.36
941421	AE2-139 C O1	8.55
BLUEG	BLUEG	2.21
CALDERWOOD	CALDERWOOD	0.22
CANNELTON	CANNELTON	0.13
CATAWBA	CATAWBA	0.13
CBM-N	CBM-N	2.5
CHEOAH	CHEOAH	0.2
CHILHOWEE	CHILHOWEE	0.07
COFFEEN	COFFEEN	0.23
COTTONWOOD	COTTONWOOD	0.88
DUCKCREEK	DUCKCREEK	0.51
EDWARDS	EDWARDS	0.23
ELMERSMITH	ELMERSMITH	0.23
FARMERCITY	FARMERCITY	0.15
G-007A	G-007A	2.25
GIBSON	GIBSON	0.09
HAMLET	HAMLET	0.21

Bus #	Bus	MW Impact
NEWTON	NEWTON	0.61
NYISO	NYISO	10.64
PRAIRIE	PRAIRIE	1.12
SANTEETLA	SANTEETLA	0.06
SMITHLAND	SMITHLAND	0.09
TATANKA	TATANKA	0.28
TILTON	TILTON	0.28
TRIMBLE	TRIMBLE	0.25
TVA	TVA	0.72
UNIONPOWER	UNIONPOWER	0.32
VFT	VFT	6.55

14.8 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7046495	135251	S RIPLEY	NYISO	200654	26ERIE E	PENELEC	1	PN-P2-3-PN-345-003A	breaker	607.0	100.05	101.94	DC	11.46

Bus #	Bus	MW Impact
200823	26MHP_X3-003	5.52
200887	26ARMNA MT	0.29
200894	26K02	4.53
200949	26X1-109	10.07
203261	26BLOSSBCT	0.25
203283	26MANOR_T86	0.02
203999	P-047 E	9.48
294573	P-028 E	11.17
915952	Y3-092 FTWR	58.38
915953	Y3-092 NFTWR	58.38
916201	Z1-069 C	0.17
916202	Z1-069 E	5.91
916351	Z1-091	2.55
916361	Z1-092	0.36
918682	AA1-082 E	6.21
919201	AA1-144 O1	17.3
919491	AA2-000	24.05
920341	AA2-132	2.92
923821	AB2-019	3.27
930411	AB1-082	1.81
930511	AB1-092	0.88
931091	AB1-160 C	0.05
931092	AB1-160 E	1.69
932571	AC2-077	2.1
935061	AD1-142	0.02
936421	AD2-055	1.82
940801	AE2-067 C	1.83
940802	AE2-067 E	0.01
940861	AE2-074 C O1	1.37
940862	AE2-074 E O1	1.81
941191	AE2-113 C O1	3.72
941192	AE2-113 E O1	4.0
941421	AE2-139 C O1	6.88
941422	AE2-139 E O1	4.58
941491	AE2-146 C	7.51
941492	AE2-146 E	10.59
942813	AE2-299 BAT	44.43
AA3-300	AA3-300	18.41
AA3-700	AA3-700	14.21
BLUEG	BLUEG	6.3

Bus #	Bus	MW Impact
CALDERWOOD	CALDERWOOD	0.55
CANNELTON	CANNELTON	0.38
CATAWBA	CATAWBA	0.29
CBM-N	CBM-N	6.12
CHEOAH	CHEOAH	0.5
CHILHOWEE	CHILHOWEE	0.18
COFFEEN	COFFEEN	0.67
COTTONWOOD	COTTONWOOD	2.34
DUCKCREEK	DUCKCREEK	1.51
EDWARDS	EDWARDS	0.69
ELMERSMITH	ELMERSMITH	0.65
FARMERCITY	FARMERCITY	0.44
G-007A	G-007A	3.95
GIBSON	GIBSON	0.26
HAMLET	HAMLET	0.43
NEWTON	NEWTON	1.75
NYISO	NYISO	27.06
PRAIRIE	PRAIRIE	3.18
SANTEETLA	SANTEETLA	0.15
SMITHLAND	SMITHLAND	0.24
TATANKA	TATANKA	0.81
TILTON	TILTON	0.82
TRIMBLE	TRIMBLE	0.7
TVA	TVA	1.9
UNIONPOWER	UNIONPOWER	0.83
VFT	VFT	10.99

14.9 Index 3

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7046373	200654	26ERIE E	PENELEC	903645	W3-099 TAP	PENELEC	1	PN-P2-3-PN-345-003A	breaker	592.0	98.07	99.98	DC	11.46

Bus #	Bus	MW Impact
200823	26MHP_X3-003	5.52
200887	26ARMNA MT	0.29
200894	26K02	4.53
200949	26X1-109	10.07
203261	26BLOSSBCT	0.25
203283	26MANOR_T86	0.02
203999	P-047 E	9.48
294573	P-028 E	11.17
915952	Y3-092 FTWR	58.38
915953	Y3-092 NFTWR	58.38
916202	Z1-069 E	5.91
916351	Z1-091	2.55
916361	Z1-092	0.36
918682	AA1-082 E	6.21
919201	AA1-144 O1	17.3
919491	AA2-000	24.05
920341	AA2-132	2.92
923821	AB2-019	3.27
930411	AB1-082	1.81
930511	AB1-092	0.88
931092	AB1-160 E	1.69
932571	AC2-077	2.1
935061	AD1-142	0.02
936421	AD2-055	1.82
940801	AE2-067 C	1.83
940802	AE2-067 E	0.01
940861	AE2-074 C O1	1.37
940862	AE2-074 E O1	1.81
941191	AE2-113 C O1	3.72
941192	AE2-113 E O1	4.0
941421	AE2-139 C O1	6.88
941422	AE2-139 E O1	4.58
941491	AE2-146 C	7.51
941492	AE2-146 E	10.59
942811	AE2-299 C	23.11
942812	AE2-299 E	92.53
AA3-300	AA3-300	18.41
AA3-700	AA3-700	14.21
BLUEG	BLUEG	6.3
CALDERWOOD	CALDERWOOD	0.55

Bus #	Bus	MW Impact
CANNELTON	CANNELTON	0.38
CATAWBA	CATAWBA	0.29
CBM-N	CBM-N	6.12
CHEOAH	CHEOAH	0.5
CHILHOWEE	CHILHOWEE	0.18
COFFEEN	COFFEEN	0.67
COTTONWOOD	COTTONWOOD	2.34
DUCKCREEK	DUCKCREEK	1.51
EDWARDS	EDWARDS	0.69
ELMERSMITH	ELMERSMITH	0.65
FARMERCITY	FARMERCITY	0.44
G-007A	G-007A	3.95
GIBSON	GIBSON	0.26
HAMLET	HAMLET	0.43
NEWTON	NEWTON	1.75
NYISO	NYISO	27.06
PRAIRIE	PRAIRIE	3.18
SANTEETLA	SANTEETLA	0.15
SMITHLAND	SMITHLAND	0.24
TATANKA	TATANKA	0.81
TILTON	TILTON	0.82
TRIMBLE	TRIMBLE	0.7
TVA	TVA	1.9
UNIONPOWER	UNIONPOWER	0.83
VFT	VFT	10.99

14.10 Index 4

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1514337	200674	26TOWANDA	PENELEC	200677	26NO MESHO	PENELEC	1	PN-P2-3-PN-230-3C	breaker	172.0	99.98	113.38	DC	22.93

Bus #	Bus	MW Impact
200887	26ARMNA MT	0.41
200894	26K02	8.27
200949	26X1-109	18.42
203261	26BLOSSBCT	0.34
203283	26MANOR_T86	0.04
203999	P-047 E	13.55
916201	Z1-069 C	0.17
916202	Z1-069 E	6.01
916361	Z1-092	0.42
916541	Z1-110	0.4
917072	Z2-011	0.4
918682	AA1-082 E	11.36
919201	AA1-144 O1	31.63
919491	AA2-000	44.62
930411	AB1-082	1.58
930511	AB1-092	1.64
931091	AB1-160 C	0.05
931092	AB1-160 E	1.72
932571	AC2-077	2.15
934801	AD1-108	0.03
934811	AD1-109	0.02
935061	AD1-142	0.02
936421	AD2-055	3.37
940861	AE2-074 C O1	1.2
940862	AE2-074 E O1	1.58
941191	AE2-113 C O1	3.45
941192	AE2-113 E O1	3.72
941421	AE2-139 C O1	13.76
941422	AE2-139 E O1	9.17
941491	AE2-146 C	7.25
941492	AE2-146 E	10.22
942491	AE2-262 C	2.54
942492	AE2-262 E	1.71
942501	AE2-263 C	2.39
942502	AE2-263 E	1.59
CBM-N	CBM-N	1.27
CBM-S1	CBM-S1	1.96
CBM-S2	CBM-S2	0.76
CBM-W1	CBM-W1	4.16
CBM-W2	CBM-W2	14.95
CIN	CIN	1.66

Bus #	Bus	MW Impact
CPLE	CPLE	0.27
G-007	G-007	1.95
IPL	IPL	1.07
LGEE	LGEE	0.47
MEC	MEC	3.09
MECS	MECS	2.8
NYISO	NYISO	5.43
O-066	O-066	13.54
WEC	WEC	0.46

14.11 Index 5

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1514496	200928	26FOURMILE	PENELEC	200819	26ERIE SE	PENELEC	1	PN-P2-3-PN-345-003A	breaker	666.0	83.92	85.45	DC	10.23

Bus #	Bus	MW Impact
200823	26MHP_X3-003	4.93
200887	26ARMNA MT	0.26
200894	26K02	4.19
203999	P-047 E	8.49
294573	P-028 E	9.97
903643	W3-099 C OP1	8.25
903644	W3-099 E OP1	55.19
915952	Y3-092 FTWR	58.69
915953	Y3-092 NFTWR	58.69
916202	Z1-069 E	5.44
916351	Z1-091	2.25
916361	Z1-092	0.32
918682	AA1-082 E	5.55
919201	AA1-144 O1	15.49
919491	AA2-000	23.91
920341	AA2-132	2.57
923821	AB2-019	3.29
930411	AB1-082	1.71
930511	AB1-092	0.88
931092	AB1-160 E	1.55
932571	AC2-077	1.93
935061	AD1-142	0.02
936421	AD2-055	1.81
940801	AE2-067 C	1.63
940802	AE2-067 E	0.01
940861	AE2-074 C O1	1.3
940862	AE2-074 E O1	1.71
941191	AE2-113 C O1	3.81
941192	AE2-113 E O1	4.1
941421	AE2-139 C O1	6.14
941422	AE2-139 E O1	4.09
941491	AE2-146 C	6.99
941492	AE2-146 E	9.85
942811	AE2-299 C	19.72
942812	AE2-299 E	78.96
AA3-300	AA3-300	15.61
AA3-700	AA3-700	12.14
BLUEG	BLUEG	6.12
CALDERWOOD	CALDERWOOD	0.54
CANNELTON	CANNELTON	0.37

Bus #	Bus	MW Impact
CATAWBA	CATAWBA	0.28
CBM-N	CBM-N	5.41
CHEOAH	CHEOAH	0.49
CHILHOWEE	CHILHOWEE	0.18
COFFEEN	COFFEEN	0.65
COTTONWOOD	COTTONWOOD	2.27
DUCKCREEK	DUCKCREEK	1.47
EDWARDS	EDWARDS	0.68
ELMERSMITH	ELMERSMITH	0.63
FARMERCITY	FARMERCITY	0.43
G-007A	G-007A	3.72
GIBSON	GIBSON	0.26
HAMLET	HAMLET	0.41
NEWTON	NEWTON	1.7
NYISO	NYISO	23.9
PRAIRIE	PRAIRIE	3.09
SANTEETLA	SANTEETLA	0.14
SMITHLAND	SMITHLAND	0.24
TATANKA	TATANKA	0.79
TILTON	TILTON	0.8
TRIMBLE	TRIMBLE	0.68
TVA	TVA	1.84
UNIONPOWER	UNIONPOWER	0.81
VFT	VFT	10.34

14.12 Index 6

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1514522	208009	LACK	PPL	200074	LACKAW	PJM	3	PL:02:P42:001057	breaker	1165.0	98.7	99.55	DC	21.58

Bus #	Bus	MW Impact
200823	26MHP_X3-003	17.38
200894	26K02	9.79
203999	P-047 E	14.14
208055	LAEN	75.67
209009	PEIP 2	2.41
210706	HOLD	9.02
294573	P-028 E	35.17
916202	Z1-069 E	6.92
916351	Z1-091	4.83
917661	WAYM E	25.2
918601	AA1-077 C	1.88
918602	AA1-077 E	35.81
918682	AA1-082 E	13.51
919201	AA1-144 O1	37.59
919491	AA2-000	52.68
920341	AA2-132	4.29
930511	AB1-092	1.93
931092	AB1-160 E	1.98
931942	AB1-182 E	4.7
932571	AC2-077	2.48
936421	AD2-055	3.98
938331	AE1-051	2.4
938401	AE1-059 C O1	86.88
938402	AE1-059 E O1	86.88
940801	AE2-067 C	5.86
940802	AE2-067 E	0.03
941421	AE2-139 C O1	12.95
941422	AE2-139 E O1	8.63
941491	AE2-146 C	8.44
941492	AE2-146 E	11.89
942301	AE2-243 C	1.04
942302	AE2-243 E	6.44
942311	AE2-244 C	1.04
942312	AE2-244 E	6.44
CBM-N	CBM-N	0.34
CBM-S1	CBM-S1	0.78
CBM-S2	CBM-S2	0.04
CBM-W1	CBM-W1	2.33
CBM-W2	CBM-W2	6.56
CIN	CIN	0.85
G-007	G-007	4.66
HAMLET	HAMLET	0.01
IPL	IPL	0.55

Bus #	Bus	MW Impact
LGEE	LGEE	0.23
MEC	MEC	1.52
MECS	MECS	1.83
NYISO	NYISO	1.23
O-066	O-066	32.38
WEC	WEC	0.24

14.13 Index 7

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7046957	200674	26TOWANDA	PENELEC	200676	26E.SAYRE	PENELEC	1	PN-P1-2-PN-230-101T	single	246.0	135.11	138.08	DC	7.3

Bus #	Bus	MW Impact
200823	26MHP_X3-003	4.36
200851	26MEHOOP3	0.53
200917	26MTNTP_P28	0.27
200949	26X1-109	10.23
203283	26MANOR_T86	0.02
913191	Y1-047 OP1	0.18
914041	Y2-042	0.14
916541	Z1-110	0.16
917072	Z2-011	0.16
917631	Z2-104	0.01
919201	AA1-144 O1	17.45
920351	AA2-133	0.29
934801	AD1-108	0.01
934811	AD1-109	0.01
934821	AD1-110	0.01
940801	AE2-067 C	1.65
941421	AE2-139 C O1	7.3
AA3-200	AA3-200	35.16
AA3-700	AA3-700	7.07
BLUEG	BLUEG	2.45
CALDERWOOD	CALDERWOOD	0.23
CANNELTON	CANNELTON	0.15
CARR	CARR	1.23
CATAWBA	CATAWBA	0.13
CHEOAH	CHEOAH	0.21
CHILHOWEE	CHILHOWEE	0.08
COFFEEN	COFFEEN	0.26
COTTONWOOD	COTTONWOOD	0.94
DUCKCREEK	DUCKCREEK	0.57
EDWARDS	EDWARDS	0.26
ELMERSMITH	ELMERSMITH	0.25
FARMERCITY	FARMERCITY	0.17
G-007A	G-007A	2.19
GIBSON	GIBSON	0.1
HAMLET	HAMLET	0.2
NEWTON	NEWTON	0.68
PRAIRIE	PRAIRIE	1.24
RENSSELAER	RENSSELAER	0.99
SANTEETLA	SANTEETLA	0.06
SMITHLAND	SMITHLAND	0.1

Bus #	Bus	MW Impact
TATANKA	TATANKA	0.31
TILTON	TILTON	0.31
TRIMBLE	TRIMBLE	0.27
TVA	TVA	0.77
UNIONPOWER	UNIONPOWER	0.34
VFT	VFT	6.2

14.14 Index 8

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1515463	200675	26E.TWANDA	PENELEC	130763	HILSD230	NYISO	1	PL:03:P71:001017	tower	531.0	143.72	144.51	DC	11.25

Bus #	Bus	MW Impact
200823	26MHP_X3-003	7.64
200851	26MEHOOP3	0.93
200894	26K02	9.25
200917	26MTNTP_P28	0.47
200949	26X1-109	23.15
203283	26MANOR_T86	0.03
210706	HOLD	1.27
294573	P-028 E	15.46
916541	Z1-110	0.32
917072	Z2-011	0.32
917661	WAYM E	3.56
918602	AA1-077 E	5.05
918682	AA1-082 E	14.28
919201	AA1-144 O1	39.47
919491	AA2-000	40.05
920351	AA2-133	0.35
925951	AC1-071 C	0.55
925952	AC1-071 E	3.71
930511	AB1-092	1.47
934801	AD1-108	0.02
934811	AD1-109	0.02
936421	AD2-055	3.03
938331	AE1-051	0.34
938401	AE1-059 C O1	14.19
938402	AE1-059 E O1	14.19
940801	AE2-067 C	2.62
940802	AE2-067 E	0.01
941421	AE2-139 C O1	6.75
941422	AE2-139 E O1	4.5
942301	AE2-243 C	0.15
942302	AE2-243 E	0.91
942311	AE2-244 C	0.15
942312	AE2-244 E	0.91
942813	AE2-299 BAT	5.83
AA3-200	AA3-200	47.57
AA3-300	AA3-300	7.92
AA3-700	AA3-700	11.33
BLUEG	BLUEG	4.41
CALDERWOOD	CALDERWOOD	0.42
CANNELTON	CANNELTON	0.26
CARR	CARR	2.27
CATAWBA	CATAWBA	0.24
CHEOAH	CHEOAH	0.38

Bus #	Bus	MW Impact
CHILHOWEE	CHILHOWEE	0.14
COFFEEN	COFFEEN	0.47
COTTONWOOD	COTTONWOOD	1.69
DUCKCREEK	DUCKCREEK	1.03
EDWARDS	EDWARDS	0.47
ELMERSMITH	ELMERSMITH	0.45
FARMERCITY	FARMERCITY	0.3
G-007A	G-007A	2.41
GIBSON	GIBSON	0.18
HAMLET	HAMLET	0.36
NEWTON	NEWTON	1.22
PRAIRIE	PRAIRIE	2.23
RENSSELAER	RENSSELAER	1.83
SANTEETLA	SANTEETLA	0.11
SMITHLAND	SMITHLAND	0.17
TATANKA	TATANKA	0.56
TILTON	TILTON	0.56
TRIMBLE	TRIMBLE	0.49
TVA	TVA	1.39
UNIONPOWER	UNIONPOWER	0.61
VFT	VFT	6.39

14.15 Index 9

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7046732	200676	26E.SAYRE	PENELEC	130836	N.WAV115	NYISO	1	PN-P1-2-PN-230-101T	single	128.0	234.74	240.44	DC	7.29

Bus #	Bus	MW Impact
200823	26MHP_X3-003	4.35
200851	26MEHOOP3	0.53
200917	26MTNTP_P28	0.27
200949	26X1-109	10.22
203283	26MANOR_T86	0.02
913191	Y1-047 OP1	0.18
914041	Y2-042	0.14
916361	Z1-092	1.38
916541	Z1-110	0.16
917072	Z2-011	0.16
917631	Z2-104	0.01
919201	AA1-144 O1	17.43
920351	AA2-133	0.29
934801	AD1-108	0.01
934811	AD1-109	0.01
934821	AD1-110	0.01
935061	AD1-142	0.08
940801	AE2-067 C	1.65
941421	AE2-139 C O1	7.29
AA3-200	AA3-200	35.16
AA3-700	AA3-700	7.07
BLUEG	BLUEG	2.52
CALDERWOOD	CALDERWOOD	0.24
CANNELTON	CANNELTON	0.15
CARR	CARR	1.23
CATAWBA	CATAWBA	0.13
CHEOAH	CHEOAH	0.22
CHILHOWEE	CHILHOWEE	0.08
COFFEEN	COFFEEN	0.27
COTTONWOOD	COTTONWOOD	0.96
DUCKCREEK	DUCKCREEK	0.59
EDWARDS	EDWARDS	0.27
ELMERSMITH	ELMERSMITH	0.26
FARMERCITY	FARMERCITY	0.17
G-007A	G-007A	2.16
GIBSON	GIBSON	0.1
HAMLET	HAMLET	0.2
NEWTON	NEWTON	0.69
PRAIRIE	PRAIRIE	1.27
RENSSELAER	RENSSELAER	0.99

Bus #	Bus	MW Impact
SANTEETLA	SANTEETLA	0.06
SMITHLAND	SMITHLAND	0.1
TATANKA	TATANKA	0.32
TILTON	TILTON	0.32
TRIMBLE	TRIMBLE	0.28
TVA	TVA	0.79
UNIONPOWER	UNIONPOWER	0.35
VFT	VFT	6.12

14.16 Index 10

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1514362	200677	26NO MESHO	PENELEC	200706	26N.MESHPN	PENELEC	4	PN-P2-3-PN-230-17B19	breaker	189.0	101.68	106.25	DC	19.8

Bus #	Bus	MW Impact
200823	26MHP_X3-003	29.39
200851	26MEHOOP3	3.56
200894	26K02	7.48
200917	26MTNTP_P28	1.81
203999	P-047 E	12.87
294573	P-028 E	59.48
913191	Y1-047 OP1	1.2
916202	Z1-069 E	6.31
916351	Z1-091	7.25
918682	AA1-082 E	10.12
919201	AA1-144 O1	28.2
919491	AA2-000	41.45
920341	AA2-132	5.85
920351	AA2-133	0.72
930411	AB1-082	1.72
930511	AB1-092	1.52
931092	AB1-160 E	1.8
932571	AC2-077	2.26
934821	AD1-110	0.09
936421	AD2-055	3.13
940801	AE2-067 C	7.39
940802	AE2-067 E	0.04
940861	AE2-074 C O1	1.3
940862	AE2-074 E O1	1.72
941421	AE2-139 C O1	11.88
941422	AE2-139 E O1	7.92
941491	AE2-146 C	7.7
941492	AE2-146 E	10.85
CBM-N	CBM-N	2.19
CBM-S1	CBM-S1	2.2
CBM-S2	CBM-S2	0.84
CBM-W1	CBM-W1	4.71
CBM-W2	CBM-W2	16.81
CIN	CIN	1.88
CPL	CPL	0.3
G-007	G-007	2.28
IPL	IPL	1.21
LGEE	LGEE	0.53
MEC	MEC	3.48
MECS	MECS	3.19

Bus #	Bus	MW Impact
NYISO	NYISO	9.25
O-066	O-066	15.8
WEC	WEC	0.52

14.17 Index 11

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1513952	200927	26FOURMILE	PENELEC	200820	26ERIE SE	PENELEC	1	PN-P2-3-PN-230-6G	breaker	245.0	125.29	126.51	DC	6.59

Bus #	Bus	MW Impact
200642	26SENECA#1	3.09
200643	26SENECA#2	3.29
200644	26SENECA#3	0.25
200823	26MHP_X3-003	3.14
200894	26K02	3.21
201201	26WRREN CT	1.05
203999	P-047 E	5.52
294573	P-028 E	6.36
903643	W3-099 C OP1	4.3
903644	W3-099 E OP1	28.79
914101	Y2-055	4.38
916202	Z1-069 E	4.37
916351	Z1-091	1.39
918682	AA1-082 E	3.6
919201	AA1-144 O1	10.15
919491	AA2-000	23.96
920341	AA2-132	1.57
930411	AB1-082	1.65
930511	AB1-092	0.88
931092	AB1-160 E	1.25
932571	AC2-077	1.54
936421	AD2-055	1.81
940801	AE2-067 C	1.04
940802	AE2-067 E	0.01
940861	AE2-074 C O1	1.25
940862	AE2-074 E O1	1.65
941191	AE2-113 C O1	4.94
941192	AE2-113 E O1	5.32
941321	AE2-126 C	0.64
941322	AE2-126 E	0.43
941421	AE2-139 C O1	3.96
941422	AE2-139 E O1	2.64
941491	AE2-146 C	6.04
941492	AE2-146 E	8.51
942811	AE2-299 C	10.31
942812	AE2-299 E	41.29
AA3-300	AA3-300	8.07
AA3-700	AA3-700	6.92
BLUEG	BLUEG	4.04
CALDERWOOD	CALDERWOOD	0.36
CANNELTON	CANNELTON	0.24

Bus #	Bus	MW Impact
CATAWBA	CATAWBA	0.19
CBM-N	CBM-N	3.25
CHEOAH	CHEOAH	0.33
CHILHOWEE	CHILHOWEE	0.12
COFFEEN	COFFEEN	0.43
COTTONWOOD	COTTONWOOD	1.51
DUCKCREEK	DUCKCREEK	0.96
EDWARDS	EDWARDS	0.44
ELMERSMITH	ELMERSMITH	0.41
FARMERCITY	FARMERCITY	0.28
G-007A	G-007A	2.38
GIBSON	GIBSON	0.17
HAMLET	HAMLET	0.29
NEWTON	NEWTON	1.12
NYISO	NYISO	14.36
PRAIRIE	PRAIRIE	2.04
SANTEETLA	SANTEETLA	0.1
SMITHLAND	SMITHLAND	0.16
TATANKA	TATANKA	0.52
TILTON	TILTON	0.53
TRIMBLE	TRIMBLE	0.45
TVA	TVA	1.23
UNIONPOWER	UNIONPOWER	0.54
VFT	VFT	6.62

14.18 Index 12

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7046229	903645	W3-099 TAP	PENELEC	200928	26FOURMILE	PENELEC	1	PN-P2-3-PN-345-003A	breaker	592.0	108.22	110.01	DC	11.46

Bus #	Bus	MW Impact
200823	26MHP_X3-003	5.52
200887	26ARMNA MT	0.29
200894	26K02	4.53
200949	26X1-109	10.07
203261	26BLOSSBCT	0.25
203283	26MANOR_T86	0.02
203999	P-047 E	9.48
294573	P-028 E	11.17
903643	W3-099 C OP1	9.67
903644	W3-099 E OP1	64.7
915952	Y3-092 FTWR	58.38
915953	Y3-092 NFTWR	58.38
916202	Z1-069 E	5.91
916351	Z1-091	2.55
916361	Z1-092	0.36
918682	AA1-082 E	6.21
919201	AA1-144 O1	17.3
920341	AA2-132	2.92
923821	AB2-019	3.27
930411	AB1-082	1.81
931092	AB1-160 E	1.69
932571	AC2-077	2.1
935061	AD1-142	0.02
940801	AE2-067 C	1.83
940802	AE2-067 E	0.01
940861	AE2-074 C O1	1.37
940862	AE2-074 E O1	1.81
941191	AE2-113 C O1	3.72
941192	AE2-113 E O1	4.0
941421	AE2-139 C O1	6.88
941422	AE2-139 E O1	4.58
941491	AE2-146 C	7.51
941492	AE2-146 E	10.59
942811	AE2-299 C	23.11
942812	AE2-299 E	92.53
AA3-300	AA3-300	18.41
AA3-700	AA3-700	14.21
BLUEG	BLUEG	6.3
CALDERWOOD	CALDERWOOD	0.55
CANNELTON	CANNELTON	0.38

Bus #	Bus	MW Impact
CATAWBA	CATAWBA	0.29
CBM-N	CBM-N	6.12
CHEOAH	CHEOAH	0.5
CHILHOWEE	CHILHOWEE	0.18
COFFEEN	COFFEEN	0.67
COTTONWOOD	COTTONWOOD	2.34
DUCKCREEK	DUCKCREEK	1.51
EDWARDS	EDWARDS	0.69
ELMERSMITH	ELMERSMITH	0.65
FARMERCITY	FARMERCITY	0.44
G-007A	G-007A	3.95
GIBSON	GIBSON	0.26
HAMLET	HAMLET	0.43
NEWTON	NEWTON	1.75
NYISO	NYISO	27.06
PRAIRIE	PRAIRIE	3.18
SANTEETLA	SANTEETLA	0.15
SMITHLAND	SMITHLAND	0.24
TATANKA	TATANKA	0.81
TILTON	TILTON	0.82
TRIMBLE	TRIMBLE	0.7
TVA	TVA	1.9
UNIONPOWER	UNIONPOWER	0.83
VFT	VFT	10.99

Affected Systems

14.19 Affected Systems

14.19.1 LG&E

LG&E Impacts to be determined during later study phases (as applicable).

14.19.2 MISO

MISO Impacts to be determined during later study phases (as applicable).

14.19.3 TVA

TVA Impacts to be determined during later study phases (as applicable).

14.19.4 Duke Energy Progress

Duke Energy Progress Impacts to be determined during later study phases (as applicable).

14.19.5 NYISO

NYISO Impacts to be determined during later study phases (as applicable).

14.20 Contingency Descriptions

Contingency Name	Contingency Definition
PN-P2-3-PN-345-003A	CONTINGENCY 'PN-P2-3-PN-345-003A' /* WAYNE 345KV STUCK BREAKER DISCONNECT BUS 200595 /* 26WAYNE 345 END
PN-P2-3-PN-345-002A	CONTINGENCY 'PN-P2-3-PN-345-002A' /* HANDSOME LAKE 345KV STUCK BREAKER DISCONNECT BUS 200826 /* 26HANDSMLK 345 DISCONNECT BUS 200830 /* 26HNSMLK 3 14 DISCONNECT BUS 200828 /* 26HNSMLK 1 14 DISCONNECT BUS 200829 /* 26HNSMLK 2 14 DISCONNECT BUS 200831 /* 26HNSMLK 4 14 DISCONNECT BUS 200832 /* 26HNSMLK 5 14 END
PN-P1-2-PN-115-039	CONTINGENCY 'PN-P1-2-PN-115-039' /* LENOX - NORTH MESHOPPEN 115KV DISCONNECT BRANCH FROM BUS 200677 TO BUS 200678 CKT 1 /* 26NO MESHO 115 26LENOX 115 END
PN-P1-2-PN-345-003	CONTINGENCY 'PN-P1-2-PN-345-003' /* HANDSOME LAKE - WAYNE 345KV DISCONNECT BRANCH FROM BUS 200826 TO BUS 200595 CKT 1 /* 26HANDSMLK 345 26WAYNE 345 END
PL:03:P71:001017	CONTINGENCY 'PL:03:P71:001017' /* LACK-HOPA 500KV & PAUP-BLGR 230KV DISCONNECT BRANCH FROM BUS 200074 TO BUS 200098 CKT 1 /* LACKAW-LACHOP_T 500 DISCONNECT BRANCH FROM BUS 200091 TO BUS 200098 CKT 1 /* HOPAKONG-LACHOP_T 500 DISCONNECT BRANCH FROM BUS 208049 TO BUS 207919 CKT 1 /* PAUP-BLGR TR2 230 DISCONNECT BRANCH FROM BUS 207919 TO BUS 211394 CKT 2 /* BLGR-BLGR 230/69KV T2 END
AP-P1-2-WP-345-311T	CONTINGENCY 'AP-P1-2-WP-345-311T' /* ARMSTRONG -HOMERCITY 345KV DISCONNECT BRANCH FROM BUS 235129 TO BUS 200769 CKT 1 /* 01ARMSTRONG 345 26HOMER CY 345 END
PN-P2-3-PN-115-19H	CONTINGENCY 'PN-P2-3-PN-115-19H' /* EAST TOWANDA STUCK 115KV BKR (BUS 2/EAST SAYRE) OPEN BRANCH FROM BUS 200674 TO BUS 200676 CKT 1 /* EAST TOWANDA - EAST SAYRE 115KV LINE OPEN BRANCH FROM BUS 200674 TO BUS 200689 CKT 5 /* EAST TOWANDA #5 115/34.5KV XFMR REDUCE BUS 200674 SHUNT BY 100 PERCENT /* EAST TOWANDA 115KV CAP END
PN-P2-3-PN-230-17B19	CONTINGENCY 'PN-P2-3-PN-230-17B19' /* NORTH MESHOPPEN 230KV SB 19 DISCONNECT BRANCH FROM BUS 200677 TO BUS 200706 CKT 3 /* 26NO MESHO 115 26N.MESHPN 230 DISCONNECT BRANCH FROM BUS 200706 TO BUS 200924 CKT 1 /* 26N.MESHPN 230 26CANYON 230 DISCONNECT BRANCH FROM BUS 200675 TO BUS 200924 CKT 1 /* 26E.TWANDA 230 26CANYON 230 END

Contingency Name	Contingency Definition
PN-P1-2-PN-345-104T	CONTINGENCY 'PN-P1-2-PN-345-104T' /* MAINESBURG - WATERCURE ROAD (NYSEG) 345KV LINE DISCONNECT BRANCH FROM BUS 200930 TO BUS 130757 CKT 1 /* 26MAINESBURG345 WATRC345 345 END
PN-P1-2-PN-115-038	CONTINGENCY 'PN-P1-2-PN-115-038' /* EAST TOWANDA - EAST SAYRE 115KV DISCONNECT BRANCH FROM BUS 200674 TO BUS 200676 CKT 1 /* 26TOWANDA 115 26E.SAYRE 115 END
PN-P2-3-PN-345-3A	CONTINGENCY 'PN-P2-3-PN-345-3A' /* 724 DISCONNECT BRANCH FROM BUS 200826 TO BUS 200828 TO BUS 200829 CKT 1/* 26HANDSMLK 345 26HNSMLK 1 14 26HNSMLK 2 13.80 DISCONNECT BRANCH FROM BUS 200826 TO BUS 200830 CKT 1 /* 26HANDSMLK 345 26HNSMLK 3 14 DISCONNECT BRANCH FROM BUS 200826 TO BUS 200831 TO BUS 200832 CKT 1/* 26HANDSMLK 345 26HNSMLK 4 14 26HNSMLK 5 13.80 DISCONNECT BRANCH FROM BUS 200595 TO BUS 200826 CKT 1 /* 26WAYNE 345 26HANDSMLK 345 REMOVE MACHINE 1 FROM BUS 200828 /* 26HNSMLK 1 14 REMOVE MACHINE 2 FROM BUS 200829 /* 26HNSMLK 2 14 REMOVE MACHINE 3 FROM BUS 200830 /* 26HNSMLK 3 14 REMOVE MACHINE 4 FROM BUS 200831 /* 26HNSMLK 4 14 REMOVE MACHINE 5 FROM BUS 200832 /* 26HNSMLK 5 14 END
PN-P1-2-PN-230-027	CONTINGENCY 'PN-P1-2-PN-230-027' /* ERIE SOUTH - FOUR MILE JCT. 230KV LINE DISCONNECT BRANCH FROM BUS 200928 TO BUS 200819 CKT 1 /* 26FOURMILE 230 26ERIE SE 230 END
PL:02:P42:001057	CONTINGENCY 'PL:02:P42:001057' /* LACK-PAUP 230KV; PAUP_E CB @ LACK DISCONNECT BRANCH FROM BUS 208009 TO BUS 925950 CKT 1 /* LACK-AC1-071 TAP 230 /* CONTINGENCY LINE ADDED FOR AE1 BUILD DISCONNECT BRANCH FROM BUS 208009 TO BUS 211681 CKT 2 /* LACK-LACK 230/69KV T2 DISCONNECT BRANCH FROM BUS 208009 TO BUS 200074 CKT 4 /* LACK-LACKAW 500/230KV T4 END
Base Case	
PN-P1-2-PN-230-013	CONTINGENCY 'PN-P1-2-PN-230-013' /* EAST TOWANDA - NORTH MESHOPPEN 230KV DISCONNECT BRANCH FROM BUS 200675 TO BUS 200924 CKT 1 /* 26E.TWANDA 230 26CANYON 230 DISCONNECT BRANCH FROM BUS 200924 TO BUS 200706 CKT 1 /* 26CANYON 230 26N.MESHPN 230 DISCONNECT BRANCH FROM BUS 200706 TO BUS 200677 CKT 4 /* 26N.MESHPN 230 26NO MESHO 115 END
PN-P1-2-PN-230-101T	CONTINGENCY 'PN-P1-2-PN-230-101T' /* EAST TOWANDA - HILLSIDE 230KV DISCONNECT BRANCH FROM BUS 200675 TO BUS 130763 CKT 1 /* 26E.TWANDA 230 HILSD230 230 END

Contingency Name	Contingency Definition
PN-P2-3-PN-230-3C	CONTINGENCY 'PN-P2-3-PN-230-3C' /* EAST TOWANDA 230KV SB62 OR SB44 (SAME AS LINE) DISCONNECT BRANCH FROM BUS 200675 TO BUS 200924 CKT 1 /* 26E.TWANDA 230 26CANYON 230 DISCONNECT BRANCH FROM BUS 200706 TO BUS 200924 CKT 1 /* 26N.MESHPN 230 26CANYON 230 END
PN-P2-3-PN-230-6G	CONTINGENCY 'PN-P2-3-PN-230-6G' /* ERIE SOUTH 230KV SB 35 OPEN BUS 200819 /*ERIE SOUTH 1 230KV BUS OPEN BUS 200918 /*ERIE SOUTH 230 KV BUS TIE END

Short Circuit

14.21 Short Circuit

The following Breakers are overduty:

None

15 Network Impacts-Secondary Point of Interconnection

The Queue Project AE2-139 was evaluated as a 100.5 MW (Capacity 60.3 MW) injection tapping the Grover to Scotch Hollow 230kV line in the PENELEC area. Project AE2-139 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-139 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

15.1 Generation Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1515064	200908	26CHAPMAN+	PENELEC	235220	01MOSHAN	AP	1	Base Case	single	520.0	98.88	101.65	DC	15.28
11948616	919490	AA2-000 TAP	PENELEC	200908	26CHAPMAN+	PENELEC	1	PN-P1-2-PN-230-012B_FSA	single	666.0	97.88	105.9	DC	53.45

15.2 Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7046495	135251	S RIPLEY	NYISO	200654	26ERIE E	PENELEC	1	PN-P2-3-PN-345-003A	breaker	607.0	99.48	100.21	DC	9.89
7046496	135251	S RIPLEY	NYISO	200654	26ERIE E	PENELEC	1	PN-P2-3-PN-345-3A	breaker	607.0	98.26	98.99	DC	9.86
7046497	135251	S RIPLEY	NYISO	200654	26ERIE E	PENELEC	1	PN-P2-3-PN-345-002A	breaker	607.0	98.26	98.99	DC	9.86
7046373	200654	26ERIE E	PENELEC	903645	W3-099 TAP	PENELEC	1	PN-P2-3-PN-345-003A	breaker	592.0	97.48	98.23	DC	9.89
7046374	200654	26ERIE E	PENELEC	903645	W3-099 TAP	PENELEC	1	PN-P2-3-PN-345-3A	breaker	592.0	96.25	96.99	DC	9.86
7046375	200654	26ERIE E	PENELEC	903645	W3-099 TAP	PENELEC	1	PN-P2-3-PN-345-002A	breaker	592.0	96.25	96.99	DC	9.86
1514337	200674	26TOWANDA	PENELEC	200677	26NO MESHO	PENELEC	1	PN-P2-3-PN-230-3C	breaker	172.0	99.89	110.45	DC	18.05
1514522	208009	LACK	PPL	200074	LACKAW	PJM	3	PL:02:P42:001057	breaker	1165.0	98.7	99.55	DC	21.42
7045832	235248	01SHINGL	AP	200513	26LEWISTW N	PENELEC	1	AP-P2-3-WP-230-001T	bus	554.0	86.17	87.41	DC	15.2
7046604	235248	01SHINGL	AP	200513	26LEWISTW N	PENELEC	1	AP-P2-3-WP-230-446T	breaker	554.0	86.35	87.59	DC	15.2
7046605	235248	01SHINGL	AP	200513	26LEWISTW N	PENELEC	1	AP-P2-3-WP-230-443T *	breaker	554.0	86.19	87.42	DC	15.2
7046606	235248	01SHINGL	AP	200513	26LEWISTW N	PENELEC	1	AP-P2-2-WP-230-001T	breaker	554.0	86.17	87.41	DC	15.2

15.3 Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7046957	200674	26TOWANDA	PENELEC	200676	26E.SAYRE	PENELEC	1	PN-P1-2-PN-230-101T	single	246.0	135.11	137.47	DC	5.79
1514378	200675	26E.TWANDA	PENELEC	130763	HILSD230	NYISO	1	PN-P2-3-PN-115-19H	breaker	531.0	140.0	144.0	DC	23.16
1515463	200675	26E.TWANDA	PENELEC	130763	HILSD230	NYISO	1	PL:03:P71:001017	tower	531.0	143.77	147.53	DC	21.82
7046966	200675	26E.TWANDA	PENELEC	130763	HILSD230	NYISO	1	PN-P1-2-PN-115-038	single	531.0	134.15	136.77	DC	13.9
7046967	200675	26E.TWANDA	PENELEC	130763	HILSD230	NYISO	1	PN-P1-2-PN-345-104T	single	531.0	132.33	134.35	DC	10.75
7046973	200675	26E.TWANDA	PENELEC	130763	HILSD230	NYISO	1	Base Case	single	483.0	124.07	126.67	DC	12.54

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC/D C	MW IMPACT
11779027	200675	26E.TWANDA	PENELE C	200674	26TOWANDA	PENELE C	4	PN-P2-3-PN-115-19E	breaker	226.0	104.84	106.69	DC	9.19
11948657	200675	26E.TWANDA	PENELE C	200674	26TOWANDA	PENELE C	3	PN-P1-2-PN-230-101T	single	296.0	108.35	111.37	DC	8.94
7046732	200676	26E.SAYRE	PENELE C	130836	N.WAV115	NYISO	1	PN-P1-2-PN-230-101T	single	128.0	234.74	239.26	DC	5.79
1514362	200677	26NO MESHO	PENELE C	200706	26N.MESHPN	PENELE C	4	PN-P2-3-PN-230-17B19	breaker	189.0	101.67	105.39	DC	16.16
11948486	200908	26CHAPMAN+	PENELE C	235220	01MOSHAN	AP	1	PN-P1-2-PN-230-012B_FSA	single	621.0	104.91	113.51	DC	53.45
1513952	200927	26FOURMILE	PENELE C	200820	26ERIE SE	PENELE C	1	PN-P2-3-PN-230-6G	breaker	245.0	125.12	126.24	DC	6.11
11948326	200940	26SCOTCHHLL W	PENELE C	200675	26E.TWANDA	PENELE C	1	AP-P1-2-WP-230-324T-A	single	570.0	114.15	124.42	DC	58.54
7046229	903645	W3-099 TAP	PENELE C	200928	26FOURMILE	PENELE C	1	PN-P2-3-PN-345-003A	breaker	592.0	107.67	108.36	DC	9.89
7046230	903645	W3-099 TAP	PENELE C	200928	26FOURMILE	PENELE C	1	PN-P2-3-PN-345-3A	breaker	592.0	106.48	107.17	DC	9.86
7046231	903645	W3-099 TAP	PENELE C	200928	26FOURMILE	PENELE C	1	PN-P2-3-PN-345-002A	breaker	592.0	106.48	107.17	DC	9.86
11948444	919200	AA1-144 TAP	PENELE C	200940	26SCOTCHHLL W	PENELE C	1	AP-P1-2-WP-230-324T-A	single	621.0	106.21	115.63	DC	58.54

15.4 Potential Congestion due to Local Energy Deliverability

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC/D C	MW IMPACT
7047421	135251	S RIPLEY	NYISO	200654	26ERIE E	PENELE C	1	PN-P1-2-PN-345-003	operation	607.0	98.19	98.93	DC	9.86
1514963	200599	26ERIE W	PENELE C	238547	02AT	ATSI	1	Base Case	operation	1560.0	115.33	115.78	DC	15.77
7047260	200654	26ERIE E	PENELE C	903645	W3-099 TAP	PENELE C	1	PN-P1-2-PN-345-003	operation	592.0	96.17	96.91	DC	9.86
7046956	200674	26TOWANDA	PENELE C	200676	26E.SAYRE	PENELE C	1	PN-P1-2-PN-230-101T	operation	246.0	140.97	142.75	DC	9.66
7047342	200674	26TOWANDA	PENELE C	200677	26NO MESHO	PENELE C	1	PN-P1-2-PN-230-013	operation	172.0	95.09	105.17	DC	17.28
1515172	200675	26E.TWANDA	PENELE C	130763	HILSD230	NYISO	1	Base Case	operation	483.0	130.14	134.12	DC	20.9
7046962	200675	26E.TWANDA	PENELE C	130763	HILSD230	NYISO	1	PN-P1-2-PN-115-038	operation	531.0	139.98	143.99	DC	23.16

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPAC T
7047555	200675	26E.TWANDA	PENELE C	200924	26CANYON	PENELE C	1	AP-P1-2-WP-230-324T-A	operatio n	615.0	89.55	97.01	DC	45.66
11948656	200675	26E.TWANDA	PENELE C	200674	26TOWANDA	PENELE C	3	PN-P1-2-PN-230-101T	operatio n	296.0	112.32	117.35	DC	14.9
7046731	200676	26E.SAYRE	PENELE C	130836	N.WAV115	NYISO	1	PN-P1-2-PN-230-101T	operatio n	128.0	246.0	249.41	DC	9.65
7047403	200767	26HOMER CT	PENELE C	200795	26SHELOCTA	PENELE C	1	AP-P1-2-WP-345-311T	operatio n	917.0	101.44	102.06	DC	12.36
1515062	200908	26CHAPMAN+	PENELE C	235220	01MOSHAN	AP	1	Base Case	operatio n	520.0	107.71	112.61	DC	25.46
11948485	200908	26CHAPMAN+	PENELE C	235220	01MOSHAN	AP	1	PN-P1-2-PN-230-012B_FS A	operatio n	621.0	113.0	127.35	DC	89.08
7047526	200927	26FOURMILE	PENELE C	200820	26ERIE SE	PENELE C	1	PN-P1-2-PN-230-027	operatio n	245.0	74.89	75.87	DC	5.29
11948325	200940	26SCOTCHHLL W	PENELE C	200675	26E.TWANDA	PENELE C	1	AP-P1-2-WP-230-324T-A	operatio n	570.0	123.68	140.8	DC	97.57
1514876	903645	W3-099 TAP	PENELE C	200928	26FOURMILE	PENELE C	1	Base Case	operatio n	488.0	82.53	83.42	DC	9.66
7047133	903645	W3-099 TAP	PENELE C	200928	26FOURMILE	PENELE C	1	PN-P1-2-PN-345-003	operatio n	592.0	106.39	107.08	DC	9.86
11948443	919200	AA1-144 TAP	PENELE C	200940	26SCOTCHHLL W	PENELE C	1	AP-P1-2-WP-230-324T-A	operatio n	621.0	114.96	130.67	DC	97.57
1515159	919490	AA2-000 TAP	PENELE C	200908	26CHAPMAN+	PENELE C	1	Base Case	operatio n	546.0	102.66	107.32	DC	25.46
11948614	919490	AA2-000 TAP	PENELE C	200908	26CHAPMAN+	PENELE C	1	PN-P1-2-PN-230-012B_FS A	operatio n	666.0	105.43	118.8	DC	89.08
11948841	941420	AE2-139 TAP	PENELE C	919200	AA1-144 TAP	PENELE C	1	AP-P1-2-WP-230-324T-A	operatio n	621.0	89.13	104.85	DC	97.57

15.5 Flow Gate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact. It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

15.6 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
11948486	200908	26CHAPMAN+	PENELEC	235220	01MOSHAN	AP	1	PN-P1-2- PN-230- 012B_FSA	single	621.0	104.91	113.51	DC	53.45

Bus #	Bus	MW Impact
200887	26ARMNA MT	0.13
203261	26BLOSSBCT	0.67
916541	Z1-110	1.57
917072	Z2-011	1.57
919201	AA1-144 O1	144.5
919491	AA2-000	435.77
930511	AB1-092	16.0
934801	AD1-108	0.12
934811	AD1-109	0.09
936421	AD2-055	32.94
941421	AE2-139 C O2	53.45
BLUEG	BLUEG	0.28
CALDERWOOD	CALDERWOOD	0.03
CANNELTON	CANNELTON	0.02
CATAWBA	CATAWBA	0.02
CBM-N	CBM-N	0.39
CHEOAH	CHEOAH	0.03
CHILHOWEE	CHILHOWEE	0.01
COFFEEN	COFFEEN	0.03
COTTONWOOD	COTTONWOOD	0.11
DUCKCREEK	DUCKCREEK	0.06
EDWARDS	EDWARDS	0.03
ELMERSMITH	ELMERSMITH	0.03
FARMERCITY	FARMERCITY	0.02
G-007A	G-007A	0.17
GIBSON	GIBSON	0.01
HAMLET	HAMLET	0.03
NEWTON	NEWTON	0.08
NYISO	NYISO	1.64
PRAIRIE	PRAIRIE	0.14
SANTEETLA	SANTEETLA	0.01
SMITHLAND	SMITHLAND	0.01
TATANKA	TATANKA	0.03
TILTON	TILTON	0.04
TRIMBLE	TRIMBLE	0.03
TVA	TVA	0.09
UNIONPOWER	UNIONPOWER	0.04
VFT	VFT	0.5

15.7 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
11948616	919490	AA2-000 TAP	PENELEC	200908	26CHAPMAN+	PENELEC	1	PN-P1-2-PN-230-012B_FSA	single	666.0	97.88	105.9	DC	53.45

Bus #	Bus	MW Impact
200887	26ARMNA MT	0.13
203261	26BLOSSBCT	0.67
916541	Z1-110	1.57
917072	Z2-011	1.57
919201	AA1-144 O1	144.5
919491	AA2-000	435.77
930511	AB1-092	16.0
934801	AD1-108	0.12
934811	AD1-109	0.09
936421	AD2-055	32.94
941421	AE2-139 C O2	53.45
BLUEG	BLUEG	0.28
CALDERWOOD	CALDERWOOD	0.03
CANNELTON	CANNELTON	0.02
CATAWBA	CATAWBA	0.02
CBM-N	CBM-N	0.39
CHEOAH	CHEOAH	0.03
CHILHOWEE	CHILHOWEE	0.01
COFFEEN	COFFEEN	0.03
COTTONWOOD	COTTONWOOD	0.11
DUCKCREEK	DUCKCREEK	0.06
EDWARDS	EDWARDS	0.03
ELMERSMITH	ELMERSMITH	0.03
FARMERCITY	FARMERCITY	0.02
G-007A	G-007A	0.17
GIBSON	GIBSON	0.01
HAMLET	HAMLET	0.03
NEWTON	NEWTON	0.08
NYISO	NYISO	1.64
PRAIRIE	PRAIRIE	0.14
SANTEETLA	SANTEETLA	0.01
SMITHLAND	SMITHLAND	0.01
TATANKA	TATANKA	0.03
TILTON	TILTON	0.04
TRIMBLE	TRIMBLE	0.03
TVA	TVA	0.09
UNIONPOWER	UNIONPOWER	0.04
VFT	VFT	0.5

15.8 Index 3

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7046495	135251	S RIPLEY	NYISO	200654	26ERIE E	PENELEC	1	PN-P2-3-PN-345-003A	breaker	607.0	99.48	100.21	DC	9.89

Bus #	Bus	MW Impact
200823	26MHP_X3-003	5.52
200887	26ARMNA MT	0.29
200894	26K02	4.53
200949	26X1-109	10.07
203261	26BLOSSBCT	0.25
203283	26MANOR_T86	0.02
203999	P-047 E	9.48
294573	P-028 E	11.17
915952	Y3-092 FTWR	58.38
915953	Y3-092 NFTWR	58.38
916201	Z1-069 C	0.17
916202	Z1-069 E	5.91
916351	Z1-091	2.55
916361	Z1-092	0.36
918682	AA1-082 E	6.21
919201	AA1-144 O1	17.3
919491	AA2-000	24.05
920341	AA2-132	2.92
923821	AB2-019	3.27
930411	AB1-082	1.81
930511	AB1-092	0.88
931091	AB1-160 C	0.05
931092	AB1-160 E	1.69
932571	AC2-077	2.1
935061	AD1-142	0.02
936421	AD2-055	1.82
940801	AE2-067 C	1.83
940802	AE2-067 E	0.01
940861	AE2-074 C O2	1.37
940862	AE2-074 E O2	1.81
941421	AE2-139 C O2	5.94
941422	AE2-139 E O2	3.96
941491	AE2-146 C	7.51
941492	AE2-146 E	10.59
942813	AE2-299 BAT	44.43
AA3-300	AA3-300	18.41
AA3-700	AA3-700	14.21
BLUEG	BLUEG	6.3
CALDERWOOD	CALDERWOOD	0.55
CANNELTON	CANNELTON	0.38

Bus #	Bus	MW Impact
CATAWBA	CATAWBA	0.29
CBM-N	CBM-N	6.12
CHEOAH	CHEOAH	0.5
CHILHOWEE	CHILHOWEE	0.18
COFFEEN	COFFEEN	0.67
COTTONWOOD	COTTONWOOD	2.34
DUCKCREEK	DUCKCREEK	1.51
EDWARDS	EDWARDS	0.69
ELMERSMITH	ELMERSMITH	0.65
FARMERCITY	FARMERCITY	0.44
G-007A	G-007A	3.95
GIBSON	GIBSON	0.26
HAMLET	HAMLET	0.43
NEWTON	NEWTON	1.75
NYISO	NYISO	27.06
PRAIRIE	PRAIRIE	3.18
SANTEETLA	SANTEETLA	0.15
SMITHLAND	SMITHLAND	0.24
TATANKA	TATANKA	0.81
TILTON	TILTON	0.82
TRIMBLE	TRIMBLE	0.7
TVA	TVA	1.9
UNIONPOWER	UNIONPOWER	0.83
VFT	VFT	10.99

15.9 Index 4

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7046373	200654	26ERIE E	PENELEC	903645	W3-099 TAP	PENELEC	1	PN-P2-3-PN-345-003A	breaker	592.0	97.48	98.23	DC	9.89

Bus #	Bus	MW Impact
200823	26MHP_X3-003	5.52
200887	26ARMNA MT	0.29
200894	26K02	4.53
200949	26X1-109	10.07
203261	26BLOSSBCT	0.25
203283	26MANOR_T86	0.02
203999	P-047 E	9.48
294573	P-028 E	11.17
915952	Y3-092 FTWR	58.38
915953	Y3-092 NFTWR	58.38
916202	Z1-069 E	5.91
916351	Z1-091	2.55
916361	Z1-092	0.36
918682	AA1-082 E	6.21
919201	AA1-144 O1	17.3
919491	AA2-000	24.05
920341	AA2-132	2.92
923821	AB2-019	3.27
930411	AB1-082	1.81
930511	AB1-092	0.88
931092	AB1-160 E	1.69
932571	AC2-077	2.1
935061	AD1-142	0.02
936421	AD2-055	1.82
940801	AE2-067 C	1.83
940802	AE2-067 E	0.01
940861	AE2-074 C O2	1.37
940862	AE2-074 E O2	1.81
941421	AE2-139 C O2	5.94
941422	AE2-139 E O2	3.96
941491	AE2-146 C	7.51
941492	AE2-146 E	10.59
942811	AE2-299 C	23.11
942812	AE2-299 E	92.53
AA3-300	AA3-300	18.41
AA3-700	AA3-700	14.21
BLUEG	BLUEG	6.3
CALDERWOOD	CALDERWOOD	0.55
CANNELTON	CANNELTON	0.38
CATAWBA	CATAWBA	0.29

Bus #	Bus	MW Impact
CBM-N	CBM-N	6.12
CHEOAH	CHEOAH	0.5
CHILHOWEE	CHILHOWEE	0.18
COFFEEN	COFFEEN	0.67
COTTONWOOD	COTTONWOOD	2.34
DUCKCREEK	DUCKCREEK	1.51
EDWARDS	EDWARDS	0.69
ELMERSMITH	ELMERSMITH	0.65
FARMERCITY	FARMERCITY	0.44
G-007A	G-007A	3.95
GIBSON	GIBSON	0.26
HAMLET	HAMLET	0.43
NEWTON	NEWTON	1.75
NYISO	NYISO	27.06
PRAIRIE	PRAIRIE	3.18
SANTEETLA	SANTEETLA	0.15
SMITHLAND	SMITHLAND	0.24
TATANKA	TATANKA	0.81
TILTON	TILTON	0.82
TRIMBLE	TRIMBLE	0.7
TVA	TVA	1.9
UNIONPOWER	UNIONPOWER	0.83
VFT	VFT	10.99

15.10 Index 5

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1514337	200674	26TOWANDA	PENELEC	200677	26NO MESHO	PENELEC	1	PN-P2-3-PN-230-3C	breaker	172.0	99.89	110.45	DC	18.05

Bus #	Bus	MW Impact
200887	26ARMNA MT	0.41
200894	26K02	8.27
200949	26X1-109	18.42
203261	26BLOSSBCT	0.34
203283	26MANOR_T86	0.04
203999	P-047 E	13.55
916201	Z1-069 C	0.17
916202	Z1-069 E	6.01
916361	Z1-092	0.42
916541	Z1-110	0.4
917072	Z2-011	0.4
918682	AA1-082 E	11.36
919201	AA1-144 O1	31.63
919491	AA2-000	44.62
930411	AB1-082	1.58
930511	AB1-092	1.64
931091	AB1-160 C	0.05
931092	AB1-160 E	1.72
932571	AC2-077	2.15
934801	AD1-108	0.03
934811	AD1-109	0.02
935061	AD1-142	0.02
936421	AD2-055	3.37
940861	AE2-074 C O2	1.2
940862	AE2-074 E O2	1.58
941191	AE2-113 C O2	3.29
941192	AE2-113 E O2	3.55
941421	AE2-139 C O2	10.83
941422	AE2-139 E O2	7.22
941491	AE2-146 C	7.25
941492	AE2-146 E	10.22
942491	AE2-262 C	2.54
942492	AE2-262 E	1.71
942501	AE2-263 C	2.39
942502	AE2-263 E	1.59
CBM-N	CBM-N	1.27
CBM-S1	CBM-S1	1.96
CBM-S2	CBM-S2	0.76
CBM-W1	CBM-W1	4.16
CBM-W2	CBM-W2	14.95
CIN	CIN	1.66

Bus #	Bus	MW Impact
CPLE	CPLE	0.27
G-007	G-007	1.95
IPL	IPL	1.07
LGEE	LGEE	0.47
MEC	MEC	3.09
MECS	MECS	2.8
NYISO	NYISO	5.43
O-066	O-066	13.54
WEC	WEC	0.46

15.11 Index 6

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1514522	208009	LACK	PPL	200074	LACKAW	PJM	3	PL:02:P42:001057	breaker	1165.0	98.7	99.55	DC	21.42

Bus #	Bus	MW Impact
200823	26MHP_X3-003	17.38
200894	26K02	9.79
203999	P-047 E	14.14
208055	LAEN	75.67
209009	PEIP 2	2.41
210706	HOLD	9.02
294573	P-028 E	35.17
916202	Z1-069 E	6.92
916351	Z1-091	4.83
917661	WAYM E	25.2
918601	AA1-077 C	1.88
918602	AA1-077 E	35.81
918682	AA1-082 E	13.51
919201	AA1-144 O1	37.59
919491	AA2-000	52.68
920341	AA2-132	4.29
930511	AB1-092	1.93
931092	AB1-160 E	1.98
931942	AB1-182 E	4.7
932571	AC2-077	2.48
936421	AD2-055	3.98
938331	AE1-051	2.4
938401	AE1-059 C O1	86.88
938402	AE1-059 E O1	86.88
940801	AE2-067 C	5.86
940802	AE2-067 E	0.03
941421	AE2-139 C O2	12.85
941422	AE2-139 E O2	8.57
941491	AE2-146 C	8.44
941492	AE2-146 E	11.89
942301	AE2-243 C	1.04
942302	AE2-243 E	6.44
942311	AE2-244 C	1.04
942312	AE2-244 E	6.44
CBM-N	CBM-N	0.34
CBM-S1	CBM-S1	0.78
CBM-S2	CBM-S2	0.04
CBM-W1	CBM-W1	2.33
CBM-W2	CBM-W2	6.56
CIN	CIN	0.85
G-007	G-007	4.66
HAMLET	HAMLET	0.01
IPL	IPL	0.55

Bus #	Bus	MW Impact
LGEE	LGEE	0.23
MEC	MEC	1.52
MECS	MECS	1.83
NYISO	NYISO	1.23
O-066	O-066	32.38
WEC	WEC	0.24

15.12 Index 7

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7046606	235248	01SHINGL	AP	200513	26LEWISTWN	PENELEC	1	AP-P2-2-WP-230-001T	breaker	554.0	86.17	87.41	DC	15.2

Bus #	Bus	MW Impact
200665	26SHAWVL 3	9.75
200666	26SHAWVL 4	9.52
200715	26SHAWVL 1	6.01
200722	26SHAWVL 2	6.15
200894	26K02	13.02
200905	26Q36	0.24
200913	26SHAW-D	0.25
236828	01GRAYMONT	2.38
290086	Q-036 E	7.81
917072	Z2-011	0.38
918682	AA1-082 E	6.13
919201	AA1-144 O1	18.82
919491	AA2-000	169.28
925512	AC1-025 E	0.92
930511	AB1-092	6.22
936421	AD2-055	12.8
936991	AD2-133 C	3.51
936992	AD2-133 E	16.06
939171	AE1-147 C	7.1
939172	AE1-147 E	4.74
940201	AE2-001 C	7.12
940202	AE2-001 E	4.75
940681	AE2-055 C	7.38
940682	AE2-055 E	4.92
941191	AE2-113 C O2	6.17
941192	AE2-113 E O2	6.64
941251	AE2-119 C	4.08
941252	AE2-119 E	2.72
941261	AE2-120 C	7.13
941262	AE2-120 E	4.75
941271	AE2-121 C	3.76
941272	AE2-121 E	2.51
941321	AE2-126 C	2.78
941322	AE2-126 E	1.86
941331	AE2-129 C	3.12
941332	AE2-129 E	2.08
941351	AE2-131 C	3.12
941352	AE2-131 E	2.08
941421	AE2-139 C O2	9.12
941422	AE2-139 E O2	6.08

Bus #	Bus	MW Impact
942351	AE2-248 C	5.82
942352	AE2-248 E	3.88
942491	AE2-262 C	26.05
942492	AE2-262 E	17.5
942501	AE2-263 C	24.48
942502	AE2-263 E	16.35
CATAWBA	CATAWBA	0.01
CBM-N	CBM-N	1.32
CBM-S1	CBM-S1	0.38
CBM-W1	CBM-W1	1.36
CBM-W2	CBM-W2	3.4
CIN	CIN	0.47
G-007	G-007	0.89
HAMLET	HAMLET	0.04
IPL	IPL	0.31
LGEE	LGEE	0.13
MEC	MEC	0.84
MECS	MECS	1.13
NYISO	NYISO	5.67
O-066	O-066	5.22
WEC	WEC	0.14

15.13 Index 8

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7046957	200674	26TOWANDA	PENELEC	200676	26E.SAYRE	PENELEC	1	PN-P1-2-PN-230-101T	single	246.0	135.11	137.47	DC	5.79

Bus #	Bus	MW Impact
200823	26MHP_X3-003	4.36
200851	26MEHOOP3	0.53
200917	26MTNTP_P28	0.27
200949	26X1-109	10.23
203283	26MANOR_T86	0.02
913191	Y1-047 OP1	0.18
914041	Y2-042	0.14
916541	Z1-110	0.16
917072	Z2-011	0.16
917631	Z2-104	0.01
919201	AA1-144 O1	17.45
920351	AA2-133	0.29
934801	AD1-108	0.01
934811	AD1-109	0.01
934821	AD1-110	0.01
940801	AE2-067 C	1.65
941421	AE2-139 C O2	5.79
AA3-200	AA3-200	35.16
AA3-700	AA3-700	7.07
BLUEG	BLUEG	2.45
CALDERWOOD	CALDERWOOD	0.23
CANNELTON	CANNELTON	0.15
CARR	CARR	1.23
CATAWBA	CATAWBA	0.13
CHEOAH	CHEOAH	0.21
CHILHOWEE	CHILHOWEE	0.08
COFFEEN	COFFEEN	0.26
COTTONWOOD	COTTONWOOD	0.94
DUCKCREEK	DUCKCREEK	0.57
EDWARDS	EDWARDS	0.26
ELMERSMITH	ELMERSMITH	0.25
FARMERCITY	FARMERCITY	0.17
G-007A	G-007A	2.19
GIBSON	GIBSON	0.1
HAMLET	HAMLET	0.2
NEWTON	NEWTON	0.68
PRAIRIE	PRAIRIE	1.24
RENSSELAER	RENSSELAER	0.99
SANTEETLA	SANTEETLA	0.06
SMITHLAND	SMITHLAND	0.1

Bus #	Bus	MW Impact
TATANKA	TATANKA	0.31
TILTON	TILTON	0.31
TRIMBLE	TRIMBLE	0.27
TVA	TVA	0.77
UNIONPOWER	UNIONPOWER	0.34
VFT	VFT	6.2

15.14 Index 9

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1515463	200675	26E.TWANDA	PENELEC	130763	HILSD230	NYISO	1	PL:03:P71:001017	tower	531.0	143.77	147.53	DC	21.82

Bus #	Bus	MW Impact
200823	26MHP_X3-003	7.64
200851	26MEHOOP3	0.93
200894	26K02	9.25
200917	26MTNTP_P28	0.47
200949	26X1-109	23.15
203283	26MANOR_T86	0.03
210706	HOLD	1.27
294573	P-028 E	15.46
916541	Z1-110	0.32
917072	Z2-011	0.32
917661	WAYM E	3.56
918602	AA1-077 E	5.05
918682	AA1-082 E	14.28
919201	AA1-144 O1	39.47
919491	AA2-000	40.05
920351	AA2-133	0.35
925951	AC1-071 C	0.55
925952	AC1-071 E	3.71
930511	AB1-092	1.47
934801	AD1-108	0.02
934811	AD1-109	0.02
936421	AD2-055	3.03
938331	AE1-051	0.34
938401	AE1-059 C O1	14.19
938402	AE1-059 E O1	14.19
940801	AE2-067 C	2.62
940802	AE2-067 E	0.01
941421	AE2-139 C O2	13.09
941422	AE2-139 E O2	8.73
942301	AE2-243 C	0.15
942302	AE2-243 E	0.91
942311	AE2-244 C	0.15
942312	AE2-244 E	0.91
942813	AE2-299 BAT	5.83
AA3-200	AA3-200	47.57
AA3-300	AA3-300	7.92
AA3-700	AA3-700	11.33
BLUEG	BLUEG	4.41
CALDERWOOD	CALDERWOOD	0.42
CANNELTON	CANNELTON	0.26
CARR	CARR	2.27
CATAWBA	CATAWBA	0.24
CHEOAH	CHEOAH	0.38

Bus #	Bus	MW Impact
CHILHOWEE	CHILHOWEE	0.14
COFFEEN	COFFEEN	0.47
COTTONWOOD	COTTONWOOD	1.69
DUCKCREEK	DUCKCREEK	1.03
EDWARDS	EDWARDS	0.47
ELMERSMITH	ELMERSMITH	0.45
FARMERCITY	FARMERCITY	0.3
G-007A	G-007A	2.41
GIBSON	GIBSON	0.18
HAMLET	HAMLET	0.36
NEWTON	NEWTON	1.22
PRAIRIE	PRAIRIE	2.23
RENSSELAER	RENSSELAER	1.83
SANTEETLA	SANTEETLA	0.11
SMITHLAND	SMITHLAND	0.17
TATANKA	TATANKA	0.56
TILTON	TILTON	0.56
TRIMBLE	TRIMBLE	0.49
TVA	TVA	1.39
UNIONPOWER	UNIONPOWER	0.61
VFT	VFT	6.39

15.15 Index 10

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
11779027	200675	26E.TWANDA	PENELEC	200674	26TOWANDA	PENELEC	4	PN-P2-3-PN-115-19E	breaker	226.0	104.84	106.69	DC	9.19

Bus #	Bus	MW Impact
200894	26K02	3.72
200949	26X1-109	10.15
918682	AA1-082 E	6.26
919201	AA1-144 O1	17.19
941421	AE2-139 C O2	5.52
941422	AE2-139 E O2	3.68
BLUEG	BLUEG	1.77
CALDERWOOD	CALDERWOOD	0.17
CANNELTON	CANNELTON	0.11
CARR	CARR	0.51
CATAWBA	CATAWBA	0.09
CHEOAH	CHEOAH	0.15
CHILHOWEE	CHILHOWEE	0.05
COFFEEN	COFFEEN	0.19
COTTONWOOD	COTTONWOOD	0.68
DUCKCREEK	DUCKCREEK	0.41
EDWARDS	EDWARDS	0.19
ELMERSMITH	ELMERSMITH	0.18
FARMERCITY	FARMERCITY	0.12
G-007A	G-007A	1.63
GIBSON	GIBSON	0.07
HAMLET	HAMLET	0.14
NEWTON	NEWTON	0.49
PRAIRIE	PRAIRIE	0.89
RENSSELAER	RENSSELAER	0.41
SANTEETLA	SANTEETLA	0.04
SMITHLAND	SMITHLAND	0.07
TATANKA	TATANKA	0.22
TILTON	TILTON	0.23
TRIMBLE	TRIMBLE	0.2
TVA	TVA	0.56
UNIONPOWER	UNIONPOWER	0.25
VFT	VFT	4.63

15.16 Index 11

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
11948657	200675	26E.TWANDA	PENELEC	200674	26TOWANDA	PENELEC	3	PN-P1-2-PN-230-101T	single	296.0	108.35	111.37	DC	8.94

Bus #	Bus	MW Impact
200949	26X1-109	15.97
919201	AA1-144 O1	27.19
919491	AA2-000	28.21
930511	AB1-092	1.04
936421	AD2-055	2.13
941421	AE2-139 C O2	8.94
BLUEG	BLUEG	1.92
CALDERWOOD	CALDERWOOD	0.18
CANNELTON	CANNELTON	0.12
CARR	CARR	0.8
CATAWBA	CATAWBA	0.1
CHEOAH	CHEOAH	0.17
CHILHOWEE	CHILHOWEE	0.06
COFFEEN	COFFEEN	0.2
COTTONWOOD	COTTONWOOD	0.74
DUCKCREEK	DUCKCREEK	0.45
EDWARDS	EDWARDS	0.21
ELMERSMITH	ELMERSMITH	0.2
FARMERCITY	FARMERCITY	0.13
G-007A	G-007A	1.51
GIBSON	GIBSON	0.08
HAMLET	HAMLET	0.16
NEWTON	NEWTON	0.53
PRAIRIE	PRAIRIE	0.97
RENSSELAER	RENSSELAER	0.65
SANTEETLA	SANTEETLA	0.05
SMITHLAND	SMITHLAND	0.08
TATANKA	TATANKA	0.24
TILTON	TILTON	0.25
TRIMBLE	TRIMBLE	0.21
TVA	TVA	0.61
UNIONPOWER	UNIONPOWER	0.27
VFT	VFT	4.28

15.17 Index 12

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7046732	200676	26E.SAYRE	PENELEC	130836	N.WAV115	NYISO	1	PN-P1-2-PN-230-101T	single	128.0	234.74	239.26	DC	5.79

Bus #	Bus	MW Impact
200823	26MHP_X3-003	4.35
200851	26MEHOOP3	0.53
200917	26MTNTP_P28	0.27
200949	26X1-109	10.22
203283	26MANOR_T86	0.02
913191	Y1-047 OP1	0.18
914041	Y2-042	0.14
916361	Z1-092	1.38
916541	Z1-110	0.16
917072	Z2-011	0.16
917631	Z2-104	0.01
919201	AA1-144 O1	17.43
920351	AA2-133	0.29
934801	AD1-108	0.01
934811	AD1-109	0.01
934821	AD1-110	0.01
935061	AD1-142	0.08
940801	AE2-067 C	1.65
941421	AE2-139 C O2	5.79
AA3-200	AA3-200	35.16
AA3-700	AA3-700	7.07
BLUEG	BLUEG	2.52
CALDERWOOD	CALDERWOOD	0.24
CANNELTON	CANNELTON	0.15
CARR	CARR	1.23
CATAWBA	CATAWBA	0.13
CHEOAH	CHEOAH	0.22
CHILHOWEE	CHILHOWEE	0.08
COFFEEN	COFFEEN	0.27
COTTONWOOD	COTTONWOOD	0.96
DUCKCREEK	DUCKCREEK	0.59
EDWARDS	EDWARDS	0.27
ELMERSMITH	ELMERSMITH	0.26
FARMERCITY	FARMERCITY	0.17
G-007A	G-007A	2.16
GIBSON	GIBSON	0.1
HAMLET	HAMLET	0.2
NEWTON	NEWTON	0.69
PRAIRIE	PRAIRIE	1.27
RENSSELAER	RENSSELAER	0.99

Bus #	Bus	MW Impact
SANTEETLA	SANTEETLA	0.06
SMITHLAND	SMITHLAND	0.1
TATANKA	TATANKA	0.32
TILTON	TILTON	0.32
TRIMBLE	TRIMBLE	0.28
TVA	TVA	0.79
UNIONPOWER	UNIONPOWER	0.35
VFT	VFT	6.12

15.18 Index 13

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1514362	200677	26NO MESHO	PENELEC	200706	26N.MESHPN	PENELEC	4	PN-P2-3-PN-230-17B19	breaker	189.0	101.67	105.39	DC	16.16

Bus #	Bus	MW Impact
200823	26MHP_X3-003	29.39
200851	26MEHOOP3	3.56
200894	26K02	7.48
200917	26MTNTP_P28	1.81
203999	P-047 E	12.87
294573	P-028 E	59.48
913191	Y1-047 OP1	1.2
916202	Z1-069 E	6.31
916351	Z1-091	7.25
918682	AA1-082 E	10.12
919201	AA1-144 O1	28.2
919491	AA2-000	41.45
920341	AA2-132	5.85
920351	AA2-133	0.72
930411	AB1-082	1.72
930511	AB1-092	1.52
931092	AB1-160 E	1.8
932571	AC2-077	2.26
934821	AD1-110	0.09
936421	AD2-055	3.13
940801	AE2-067 C	7.39
940802	AE2-067 E	0.04
940861	AE2-074 C O2	1.3
940862	AE2-074 E O2	1.72
941421	AE2-139 C O2	9.69
941422	AE2-139 E O2	6.46
941491	AE2-146 C	7.7
941492	AE2-146 E	10.85
CBM-N	CBM-N	2.19
CBM-S1	CBM-S1	2.2
CBM-S2	CBM-S2	0.84
CBM-W1	CBM-W1	4.71
CBM-W2	CBM-W2	16.81
CIN	CIN	1.88
CPL	CPL	0.3
G-007	G-007	2.28
IPL	IPL	1.21
LGEE	LGEE	0.53
MEC	MEC	3.48
MECS	MECS	3.19

Bus #	Bus	MW Impact
NYISO	NYISO	9.25
O-066	O-066	15.8
WEC	WEC	0.52

15.19 Index 14

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
1513952	200927	26FOURMILE	PENELEC	200820	26ERIE SE	PENELEC	1	PN-P2-3-PN-230-6G	breaker	245.0	125.12	126.24	DC	6.11

Bus #	Bus	MW Impact
200642	26SENECA#1	3.09
200643	26SENECA#2	3.29
200644	26SENECA#3	0.25
200823	26MHP_X3-003	3.14
200894	26K02	3.21
201201	26WRREN CT	1.05
203999	P-047 E	5.52
294573	P-028 E	6.36
903643	W3-099 C OP1	4.3
903644	W3-099 E OP1	28.79
914101	Y2-055	4.38
916202	Z1-069 E	4.37
916351	Z1-091	1.39
918682	AA1-082 E	3.6
919201	AA1-144 O1	10.15
919491	AA2-000	23.96
920341	AA2-132	1.57
930411	AB1-082	1.65
930511	AB1-092	0.88
931092	AB1-160 E	1.25
932571	AC2-077	1.54
936421	AD2-055	1.81
940801	AE2-067 C	1.04
940802	AE2-067 E	0.01
940861	AE2-074 C O2	1.25
940862	AE2-074 E O2	1.65
941191	AE2-113 C O2	4.48
941192	AE2-113 E O2	4.82
941321	AE2-126 C	0.64
941322	AE2-126 E	0.43
941421	AE2-139 C O2	3.67
941422	AE2-139 E O2	2.44
941491	AE2-146 C	6.04
941492	AE2-146 E	8.51
942811	AE2-299 C	10.31
942812	AE2-299 E	41.29
AA3-300	AA3-300	8.07
AA3-700	AA3-700	6.92
BLUEG	BLUEG	4.04
CALDERWOOD	CALDERWOOD	0.36
CANNELTON	CANNELTON	0.24

Bus #	Bus	MW Impact
CATAWBA	CATAWBA	0.19
CBM-N	CBM-N	3.25
CHEOAH	CHEOAH	0.33
CHILHOWEE	CHILHOWEE	0.12
COFFEEN	COFFEEN	0.43
COTTONWOOD	COTTONWOOD	1.51
DUCKCREEK	DUCKCREEK	0.96
EDWARDS	EDWARDS	0.44
ELMERSMITH	ELMERSMITH	0.41
FARMERCITY	FARMERCITY	0.28
G-007A	G-007A	2.38
GIBSON	GIBSON	0.17
HAMLET	HAMLET	0.29
NEWTON	NEWTON	1.12
NYISO	NYISO	14.36
PRAIRIE	PRAIRIE	2.04
SANTEETLA	SANTEETLA	0.1
SMITHLAND	SMITHLAND	0.16
TATANKA	TATANKA	0.52
TILTON	TILTON	0.53
TRIMBLE	TRIMBLE	0.45
TVA	TVA	1.23
UNIONPOWER	UNIONPOWER	0.54
VFT	VFT	6.62

15.20 Index 15

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
11948326	200940	26SCOTCHILLW	PENELEC	200675	26E.TWANDA	PENELEC	1	AP-P1-2-WP-230-324T-A	single	570.0	114.15	124.42	DC	58.54

Bus #	Bus	MW Impact
203261	26BLOSSBCT	0.7
916541	Z1-110	1.68
917072	Z2-011	1.68
919201	AA1-144 O1	160.35
919491	AA2-000	443.48
930511	AB1-092	16.28
934801	AD1-108	0.13
934811	AD1-109	0.09
936421	AD2-055	33.52
941421	AE2-139 C O2	58.54
CARR	CARR	0.02
CBM-S1	CBM-S1	0.06
CBM-S2	CBM-S2	0.02
CBM-W1	CBM-W1	0.14
CBM-W2	CBM-W2	0.5
CIN	CIN	0.06
CPL	CPL	0.01
IPL	IPL	0.04
LGEE	LGEE	0.02
MEC	MEC	0.11
MECS	MECS	0.1
RENSSELAER	RENSSELAER	0.02
WEC	WEC	0.02

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
7046229	903645	W3-099 TAP	PENELEC	200928	26FOURMILE	PENELEC	1	PN-P2-3-PN-345-003A	breaker	592.0	107.67	108.36	DC	9.89

Bus #	Bus	MW Impact
200823	26MHP_X3-003	5.52
200887	26ARMNA MT	0.29
200894	26K02	4.53
200949	26X1-109	10.07
203261	26BLOSSBCT	0.25
203283	26MANOR_T86	0.02
203999	P-047 E	9.48
294573	P-028 E	11.17
903643	W3-099 C OP1	9.67
903644	W3-099 E OP1	64.7
915952	Y3-092 FTWR	58.38
915953	Y3-092 NFTWR	58.38
916202	Z1-069 E	5.91
916351	Z1-091	2.55
916361	Z1-092	0.36
918682	AA1-082 E	6.21
919201	AA1-144 O1	17.3
920341	AA2-132	2.92
923821	AB2-019	3.27
930411	AB1-082	1.81
931092	AB1-160 E	1.69
932571	AC2-077	2.1
935061	AD1-142	0.02
940801	AE2-067 C	1.83
940802	AE2-067 E	0.01
940861	AE2-074 C O2	1.37
940862	AE2-074 E O2	1.81
941421	AE2-139 C O2	5.94
941422	AE2-139 E O2	3.96
941491	AE2-146 C	7.51
941492	AE2-146 E	10.59
942811	AE2-299 C	23.11
942812	AE2-299 E	92.53
AA3-300	AA3-300	18.41
AA3-700	AA3-700	14.21
BLUEG	BLUEG	6.3
CALDERWOOD	CALDERWOOD	0.55
CANNELTON	CANNELTON	0.38
CATAWBA	CATAWBA	0.29
CBM-N	CBM-N	6.12

Bus #	Bus	MW Impact
CHEOAH	CHEOAH	0.5
CHILHOWEE	CHILHOWEE	0.18
COFFEEN	COFFEEN	0.67
COTTONWOOD	COTTONWOOD	2.34
DUCKCREEK	DUCKCREEK	1.51
EDWARDS	EDWARDS	0.69
ELMERSMITH	ELMERSMITH	0.65
FARMERCITY	FARMERCITY	0.44
G-007A	G-007A	3.95
GIBSON	GIBSON	0.26
HAMLET	HAMLET	0.43
NEWTON	NEWTON	1.75
NYISO	NYISO	27.06
PRAIRIE	PRAIRIE	3.18
SANTEETLA	SANTEETLA	0.15
SMITHLAND	SMITHLAND	0.24
TATANKA	TATANKA	0.81
TILTON	TILTON	0.82
TRIMBLE	TRIMBLE	0.7
TVA	TVA	1.9
UNIONPOWER	UNIONPOWER	0.83
VFT	VFT	10.99

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
11948444	919200	AA1-144 TAP	PENELEC	200940	26SCOTCHHLLW	PENELEC	1	AP-P1-2-WP-230-324T-A	single	621.0	106.21	115.63	DC	58.54

Bus #	Bus	MW Impact
203261	26BLOSSBCT	0.7
916541	Z1-110	1.68
917072	Z2-011	1.68
919201	AA1-144 O1	160.35
919491	AA2-000	443.48
930511	AB1-092	16.28
934801	AD1-108	0.13
934811	AD1-109	0.09
936421	AD2-055	33.52
941421	AE2-139 C O2	58.54
CARR	CARR	0.02
CBM-S1	CBM-S1	0.06
CBM-S2	CBM-S2	0.02
CBM-W1	CBM-W1	0.14
CBM-W2	CBM-W2	0.5
CIN	CIN	0.06
CPL	CPL	0.01
IPL	IPL	0.04
LGEE	LGEE	0.02
MEC	MEC	0.11
MECS	MECS	0.1
RENSSELAER	RENSSELAER	0.02
WEC	WEC	0.02

Affected Systems

15.23 Affected Systems

15.23.1 LG&E

LG&E Impacts to be determined during later study phases (as applicable).

15.23.2 MISO

MISO Impacts to be determined during later study phases (as applicable).

15.23.3 TVA

TVA Impacts to be determined during later study phases (as applicable).

15.23.4 Duke Energy Progress

Duke Energy Progress Impacts to be determined during later study phases (as applicable).

15.23.5 NYISO

NYISO Impacts to be determined during later study phases (as applicable).

15.24 Contingency Descriptions

Contingency Name	Contingency Definition
PN-P2-3-PN-345-003A	CONTINGENCY 'PN-P2-3-PN-345-003A' /* WAYNE 345KV STUCK BREAKER DISCONNECT BUS 200595 /* 26WAYNE 345 END
AP-P2-3-WP-230-443T *	CONTINGENCY 'AP-P2-3-WP-230-443T *' / UPDATED CON AJK 3-31-16 DISCONNECT BRANCH FROM BUS 200726 TO BUS 235175 CKT 1 DISCONNECT BRANCH FROM BUS 235175 TO BUS 235236 CKT 1 DISCONNECT BUS 235158 END
AP-P1-2-WP-230-324T-A	CONTINGENCY 'AP-P1-2-WP-230-324T-A' /* MOSHANNON-MARSHALL 230KV APS-PN TIE DISCONNECT BRANCH FROM BUS 235220 TO BUS 200908 CKT 1 /* 01MOSHAN 230 26CHAPMAN+ 230 DISCONNECT BRANCH FROM BUS 200908 TO BUS 919490 CKT 1 /* 26CHAPMAN+ 230 AA2-000 TAP 230 END
PN-P2-3-PN-230-3C	CONTINGENCY 'PN-P2-3-PN-230-3C' /* EAST TOWANDA 230KV SB62 OR SB44 (SAME AS LINE) DISCONNECT BRANCH FROM BUS 200675 TO BUS 200924 CKT 1 /* 26E.TWANDA 230 26CANYON 230 DISCONNECT BRANCH FROM BUS 200706 TO BUS 200924 CKT 1 /* 26N.MESHPN 230 26CANYON 230 END
PN-P1-2-PN-230-013	CONTINGENCY 'PN-P1-2-PN-230-013' /* EAST TOWANDA - NORTH MESHOPPEN 230KV DISCONNECT BRANCH FROM BUS 200675 TO BUS 200924 CKT 1 /* 26E.TWANDA 230 26CANYON 230 DISCONNECT BRANCH FROM BUS 200924 TO BUS 200706 CKT 1 /* 26CANYON 230 26N.MESHPN 230 DISCONNECT BRANCH FROM BUS 200706 TO BUS 200677 CKT 4 /* 26N.MESHPN 230 26NO MESHO 115 END
PN-P1-2-PN-230-012B_FSA	CONTINGENCY 'PN-P1-2-PN-230-012B_FSA' /* EAST TOWANDA - MARSHALL 230KV DISCONNECT BRANCH FROM BUS 919200 TO BUS 200940 CKT 1 /* AA1-144 230 26SCOTCHHLLW230 DISCONNECT BRANCH FROM BUS 200940 TO BUS 200675 CKT 1 /* 26SCOTCHHLLW230 26E.TWANDA 230 END
AP-P2-2-WP-230-001T	CONTINGENCY 'AP-P2-2-WP-230-001T' /* ELKO #2 230KV BUS DISCONNECT BRANCH FROM BUS 235175 TO BUS 235158 CKT 1 /* 01ELKO 230 01CARB 230 DISCONNECT BRANCH FROM BUS 235175 TO BUS 235236 CKT 1 /* 01ELKO 230 01QUEHAN 230 DISCONNECT BRANCH FROM BUS 235175 TO BUS 200726 CKT 1 /* 01ELKO 230 26SHAWVL 2 230 REDUCE BUS 237007 SHUNT BY 100 PERCENT /* 01ELKO CAP 138 DISCONNECT BUS 237007 /* 01ELKO CAP 138 END

Contingency Name	Contingency Definition
PN-P1-2-PN-115-038	CONTINGENCY 'PN-P1-2-PN-115-038' /* EAST TOWANDA - EAST SAYRE 115KV DISCONNECT BRANCH FROM BUS 200674 TO BUS 200676 CKT 1 /* 26TOWANDA 115 26E.SAYRE 115 END
PL:02:P42:001057	CONTINGENCY 'PL:02:P42:001057' /* LACK-PAUP 230KV; PAUP_E CB @ LACK DISCONNECT BRANCH FROM BUS 208009 TO BUS 925950 CKT 1 /* LACK-AC1-071 TAP 230 /* CONTINGENCY LINE ADDED FOR AE1 BUILD DISCONNECT BRANCH FROM BUS 208009 TO BUS 211681 CKT 2 /* LACK-LACK 230/69KV T2 DISCONNECT BRANCH FROM BUS 208009 TO BUS 200074 CKT 4 /* LACK-LACKAW 500/230KV T4 END
PN-P2-3-PN-345-002A	CONTINGENCY 'PN-P2-3-PN-345-002A' /* HANDSOME LAKE 345KV STUCK BREAKER DISCONNECT BUS 200826 /* 26HANDSMLK 345 DISCONNECT BUS 200830 /* 26HNSMLK 3 14 DISCONNECT BUS 200828 /* 26HNSMLK 1 14 DISCONNECT BUS 200829 /* 26HNSMLK 2 14 DISCONNECT BUS 200831 /* 26HNSMLK 4 14 DISCONNECT BUS 200832 /* 26HNSMLK 5 14 END
PL:03:P71:001017	CONTINGENCY 'PL:03:P71:001017' /* LACK-HOPA 500KV & PAUP-BLGR 230KV DISCONNECT BRANCH FROM BUS 200074 TO BUS 200098 CKT 1 /* LACKAW-LACHOP_T 500 DISCONNECT BRANCH FROM BUS 200091 TO BUS 200098 CKT 1 /* HOPAKONG-LACHOP_T 500 DISCONNECT BRANCH FROM BUS 208049 TO BUS 207919 CKT 1 /* PAUP-BLGR TR2 230 DISCONNECT BRANCH FROM BUS 207919 TO BUS 211394 CKT 2 /* BLGR-BLGR 230/69KV T2 END
PN-P2-3-PN-230-17B19	CONTINGENCY 'PN-P2-3-PN-230-17B19' /* NORTH MESHOPPEN 230KV SB 19 DISCONNECT BRANCH FROM BUS 200677 TO BUS 200706 CKT 3 /* 26NO MESHO 115 26N.MESHPN 230 DISCONNECT BRANCH FROM BUS 200706 TO BUS 200924 CKT 1 /* 26N.MESHPN 230 26CANYON 230 DISCONNECT BRANCH FROM BUS 200675 TO BUS 200924 CKT 1 /* 26E.TWANDA 230 26CANYON 230 END
PN-P2-3-PN-230-6G	CONTINGENCY 'PN-P2-3-PN-230-6G' /* ERIE SOUTH 230KV SB 35 OPEN BUS 200819 /*ERIE SOUTH 1 230KV BUS OPEN BUS 200918 /*ERIE SOUTH 230 KV BUS TIE END
Base Case	
PN-P1-2-PN-230-101T	CONTINGENCY 'PN-P1-2-PN-230-101T' /* EAST TOWANDA - HILLSIDE 230KV DISCONNECT BRANCH FROM BUS 200675 TO BUS 130763 CKT 1 /* 26E.TWANDA 230 HILSD230 230 END
PN-P1-2-PN-230-027	CONTINGENCY 'PN-P1-2-PN-230-027' /* ERIE SOUTH - FOUR MILE JCT. 230KV LINE DISCONNECT BRANCH FROM BUS 200928 TO BUS 200819 CKT 1 /* 26FOURMILE 230 26ERIE SE 230 END

Contingency Name	Contingency Definition
PN-P1-2-PN-345-003	CONTINGENCY 'PN-P1-2-PN-345-003' /* HANDSOME LAKE - WAYNE 345KV DISCONNECT BRANCH FROM BUS 200826 TO BUS 200595 CKT 1 /* 26HANDSMLK 345 26WAYNE 345 END
PN-P2-3-PN-115-19E	CONTINGENCY 'PN-P2-3-PN-115-19E' /* EAST TOWANDA STUCK 115KV BKR (NORTH MESHOPPEN/#3 XFMR) OPEN BRANCH FROM BUS 200674 TO BUS 200677 CKT 1 /* EAST TOWANDA - NORTH MESHOPPEN 115KV LINE OPEN BRANCH FROM BUS 200674 TO BUS 200675 CKT 3 /* EAST TOWANDA #3 230/115KV XFMR END
AP-P1-2-WP-345-311T	CONTINGENCY 'AP-P1-2-WP-345-311T' /* ARMSTRONG -HOMERCITY 345KV DISCONNECT BRANCH FROM BUS 235129 TO BUS 200769 CKT 1 /* 01ARMSTRONG 345 26HOMER CY 345 END
PN-P2-3-PN-115-19H	CONTINGENCY 'PN-P2-3-PN-115-19H' /* EAST TOWANDA STUCK 115KV BKR (BUS 2/EAST SAYRE) OPEN BRANCH FROM BUS 200674 TO BUS 200676 CKT 1 /* EAST TOWANDA - EAST SAYRE 115KV LINE OPEN BRANCH FROM BUS 200674 TO BUS 200689 CKT 5 /* EAST TOWANDA #5 115/34.5KV XFMR REDUCE BUS 200674 SHUNT BY 100 PERCENT /* EAST TOWANDA 115KV CAP END
PN-P1-2-PN-345-104T	CONTINGENCY 'PN-P1-2-PN-345-104T' /* MAINESBURG - WATERCURE ROAD (NYSEG) 345KV LINE DISCONNECT BRANCH FROM BUS 200930 TO BUS 130757 CKT 1 /* 26MAINESBURG345 WATRC345 345 END
PN-P2-3-PN-345-3A	CONTINGENCY 'PN-P2-3-PN-345-3A' /* 724 DISCONNECT BRANCH FROM BUS 200826 TO BUS 200828 TO BUS 200829 CKT 1/* 26HANDSMLK 345 26HNSMLK 1 14 26HNSMLK 2 13.80 DISCONNECT BRANCH FROM BUS 200826 TO BUS 200830 CKT 1 /* 26HANDSMLK 345 26HNSMLK 3 14 DISCONNECT BRANCH FROM BUS 200826 TO BUS 200831 TO BUS 200832 CKT 1/* 26HANDSMLK 345 26HNSMLK 4 14 26HNSMLK 5 13.80 DISCONNECT BRANCH FROM BUS 200595 TO BUS 200826 CKT 1 /* 26WAYNE 345 26HANDSMLK 345 REMOVE MACHINE 1 FROM BUS 200828 /* 26HNSMLK 1 14 REMOVE MACHINE 2 FROM BUS 200829 /* 26HNSMLK 2 14 REMOVE MACHINE 3 FROM BUS 200830 /* 26HNSMLK 3 14 REMOVE MACHINE 4 FROM BUS 200831 /* 26HNSMLK 4 14 REMOVE MACHINE 5 FROM BUS 200832 /* 26HNSMLK 5 14 END

Contingency Name	Contingency Definition
AP-P2-3-WP-230-446T	CONTINGENCY 'AP-P2-3-WP-230-446T' /* ELKO-MOSHANNON STK BKR AT ELKO DISCONNECT BRANCH FROM BUS 200726 TO BUS 235175 CKT 1 /* 26SHAWVL 2 230 01ELKO 230 DISCONNECT BRANCH FROM BUS 235158 TO BUS 235175 CKT 1 /* 01CARB 230 01ELKO 230 DISCONNECT BRANCH FROM BUS 235175 TO BUS 235236 CKT 1 /* 01ELKO 230 01QUEHAN 230 DISCONNECT BRANCH FROM BUS 235220 TO BUS 235236 CKT 1 /* 01MOSHAN 230 01QUEHAN 230 DISCONNECT BRANCH FROM BUS 235236 TO BUS 236732 CKT 81 /* 01QUEHAN 230 01QUEHANNA 46 END

Short Circuit

15.25 Short Circuit

The following Breakers are overduty:

None

16 Attachment 1 – One Line

17 Attachment 2 – Project Location