Generation Interconnection

Feasibility Study Report

for

Queue Project AE2-344

EDINBORO SOUTH 115 KV

69.9 MW Capacity / 116.5 MW Energy

July, 2019

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1 Introduction

This Feasibility Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 36.2, as well as the Feasibility Study Agreement between the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is Pennsylvania Electric Company (Penelec).

2 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.

3 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Crawford County, Pennsylvania. The installed facilities will have a total capability of **116.5 MW** with **69.9 MW** of this output being recognized by PJM as Capacity. The proposed in-service date for this project is **October 1, 2021**. **This study does not imply an ITO commitment to this in-service date.**

Queue Number	**AE2-344**
Project Name	EDINBORO SOUTH 115 KV
Interconnection Customer	
State	Pennsylvania
County	Crawford
Transmission Owner	PENELEC
MFO	116.5
MWE	116.5
MWC	69.9
Fuel	Solar
Basecase Study Year	2022

3.1 Point of Interconnection

Primary POI

The interconnection of the project at the Primary POI will be accomplished by upgrading the existing Edinboro South 115 kV Substation to a five (5) breaker ring bus substation. The IC will be responsible for acquiring all easements, properties, and permits that may be required to expand the substation. The project will also require non-direct connection upgrades at Erie South substation.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AE2-344 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 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.

The interconnection of the project at the Primary POI will be accomplished by upgrading the existing Edinboro South 115 kV Substation to a five (5) breaker ring bus substation.

Secondary POI

The interconnection of the project at a Secondary POI can be accomplished by tapping the Edinboro South – Venango Junction 115 kV line. A full scope of work or estimated cost is not provided for the proposed Secondary POI. Only network impacts were provided for the Secondary POI found in the "Network Impacts – Secondary Point of Interconnection" section of this report.

3.2 Cost Summary

The AE2-344 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$785,810
Direct Connection Network Upgrade	$7,072,290
Non Direct Connection Network Upgrades	$102,500
Total Costs	$7,960,600

In addition, the AE2-344 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	$254,280,000

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 AE2-344 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.

4 Transmission Owner Scope of Work

The interconnection of the project at the Primary POI will be accomplished by upgrading the existing Edinboro South 115 kV Substation to a five (5) breaker ring bus substation. The IC will be responsible for acquiring all easements, properties, and permits that may be required to expand the substation. The project will also require non-direct connection upgrades at Erie South substation.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AE2-344 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 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.

5 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.	$785,810
Total Attachment Facility Costs	$785,810

6 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
Expand Edinboro South substation to a five (5) breaker 115 kV ring bus.	$7,072,290
Total Direct Connection Facility Costs	$7,072,290

The total Direct Connection cost estimate for the AE2-344 project is approximately $7,072,290.

7 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 an anti-islanding (transfer trip) equipment at Erie South substation.	$102,500
Total Non-Direct Connection Facility Costs	$102,500

The total Non-Direct Connection cost estimate for the AE2-344 project is approximately $102,500.

8 System Reinforcements Cost Estimate

Facility	Upgrade Description	Cost
01GAR RN 138.0 kV - 01COLMBGPN 138.0 kV Ckt 1	WP-0006 (177) : Reconductor 4/0 Cu Line Project Type : FAC Cost : $20,150,000 Time Estimate : 22.0 Months	$20,150,000
01KISSNG 138.0 kV - 01KARNSC 138.0 kV Ckt 1	WP-0008 (183) : Replace 556 Line Condcutor Project Type : FAC Cost : $13,000,000 Time Estimate : 9.0 Months	$13,000,000
02PERRY 345.0 kV - 02L.CENTER 345.0 kV Ckt 1	CEI-002A (286) : Reconductor the Leroy Center-Perry S6 345 kV Line (~10 miles from Leroy Center to Perry). The existing conductor is (2) 954 ACSR conductor and the new conductor is (2) 954 kcmil ACSS conductor. Upgrade terminals as required. Project Type : FAC Cost : $28,600,000 Time Estimate : 30.0 Months	$28,600,000
02PERRY 345.0 kV - 02EASTLK 345.0 kV Ckt 1	CEI-003A (287) : Reconductor the Eastlake-Perry S8 345 kV Line (~22 miles from Eastlake to Perry). The existing conductor is (2) 954 ACSR conductor and the new conductor is (2) 954 kcmil ACSS conductor. Upgrade terminals as required. Project Type : FAC Cost : $65,000,000 Time Estimate : 48.0 Months	$65,000,000
01KITTAN 138.0 kV - 01AL&D6T 138.0 kV Ckt 1	WP-0009 (184) : Reconductor 4/0 Cu Line Project Type : FAC Cost : $15,600,000 Time Estimate : 20.0 Months WP-0009a (185) : Replace line drops into All Dam 6 Project Type : FAC Cost : $130,000 Time Estimate : 9.0 Months	$15,730,000
01AL&D6T 138.0 kV - 01AL 4J 138.0 kV Ckt 1	WP-0001 (169) : Reconductor 7.3 miles of 4/0 Cu Line Conductor Project Type : FAC Cost : $13,000,000 Time Estimate : 20.0 Months WP-0001a (170) : Replace 4/0 Line Exit Project Type : FAC Cost : $130,000 Time Estimate : 9.0 Months	$13,130,000

Facility	Upgrade Description	Cost
01KARNSC 138.0 kV - 01BUTLER 138.0 kV Ckt 1	**WP-0007 (178) : Reconductor 336 ACSR Line** **Project Type : FAC** **Cost : $26,000,000** **Time Estimate : 30.0 Months** **WP-0007a (179) : Replace line and bus side disconnect switches at Butler** **Project Type : FAC** **Cost : $130,000** **Time Estimate : 9.0 Months** **WP-0007b (180) : Replace Bus Side Disconnect Switches at Butler** **Project Type : FAC** **Cost : $130,000** **Time Estimate : 9.0 Months** **WP-0007c (181) : Replace Wavetrap at Butler** **Project Type : FAC** **Cost : $130,000** **Time Estimate : 9.0 Months** **WP-0007d (182) : Replace Wavetrap Leads at Butler** **Project Type : FAC** **Cost : $130,000** **Time Estimate : 9.0 Months**	$26,520,000
26ERIE W 345.0 kV - 02AT 345.0 kV Ckt 1	**ATSI** **CEI-001A (285) : Reconductor the ATSI owned portion of the Erie West-Ashtabula 3-point tap 345 kV Line (~ 15 miles from Ashtabula to structure 13083). The existing conductor is (2) 954 ACSR conductor and the new conductor is (2) 954 kcmil ACSS conductor.** **Project Type : FAC** **Cost : $42,900,000** **Time Estimate : 36.0 Months** **PENELEC** **PN-0004 (790) : Reconductor line with high temperatre conductor (MAIT Portion - 7.17 miles)** **Project Type : FAC** **Cost : $20,800,000** **Time Estimate : 20.0 Months**	$63,700,000
01COLMBGPN 138.0 kV - 01KISKIV 138.0 kV Ckt 1	**WP-0004 (174) : Reconductor 4/0 Cu Line** **Project Type : FAC** **Cost : $7,800,000** **Time Estimate : 18.0 Months** **WP-0004a (175) : Replace KD-4** **Project Type : FAC** **Cost : $325,000** **Time Estimate : 12.0 Months** **WP-0004b (176) : Replace KD-41 Line Relays** **Project Type : FAC** **Cost : $325,000** **Time Estimate : 12.0 Months**	$8,450,000
	TOTAL COST	**$254,280,000**

9 Schedule

Based on the scope of work for the Attachment Facilities and the Direct and/or Non-Direct Connection facilities, it is expected to take a minimum of **twenty-two (22) 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 expansion of the Interconnection Substation. Full initial deposit is required for the Non-Direct Connection and Network Upgrade work. 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.

10 Transmission Owner Analysis

10.1 Power Flow Analysis

PJM performed a power flow analysis of the transmission system using a 2022 summer peak load flow model and the results were verified by FE. At the Primary POI, the AE2-344 project contributes to overloads on the FE transmission system as shown in the "Network Impacts – Primary Point of Interconnection" section of this report. The estimated cost of system reinforcements necessary to mitigate these overloads are also provided. Additionally, FE performed an analysis of its underlying transmission <100 kV system. At the Primary POI, the AE2-344 project did not contribute to overloads on the FE transmission <100 kV system.

At the proposed Secondary POI, the AE2-344 project contributes to overloads on the FE transmission system as shown in the "Network Impacts – Secondary Point of Interconnection" section of this report. Additionally, the AE2-344 project contributes to overloads on the FE transmission <100 kV system as shown below. Cost estimates are not provided for the secondary POI.

10.2 Short Circuit Analysis

PJM performed a short circuit analysis and the results were verified by FE. The connection of AE2-344 project to the system does not result in any newly overdutied circuit breakers on the FE transmission system and does not have a significant fault current contribution to existing overdutied circuit breakers.

10.3 Stability Analysis

PJM will complete a dynamic stability analysis, if necessary, as part of the System Impact Study. The results of this analysis will be reviewed by FE. Should stability concerns be identified in PJM's study, FE will develop appropriate system reinforcement(s) and included the estimated cost of any reinforcement(s) in FE's System Impact Study report.

11 Interconnection Customer Requirements

11.1 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.

11.2 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 AE2-344 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 AE2-344 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.

11.3 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.

12 Revenue Metering and SCADA Requirements

12.1 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.

12.2 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.

13 Network Impacts: Primary POI

The Queue Project AE2-344 was evaluated as a 116.5 MW (Capacity 69.9 MW) injection at the Edinboro South 115kV substation in the PENELEC area. Project AE2-344 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-344 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

14 Generation Deliverability

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

None

15 Multiple Facility Contingency

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

None

16 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
7475623	200599	26ERIE W	PENELEC	238547	02AT	ATSI	1	Base Case	single	1560.0	112.58	114.74	DC	33.47
7475628	200599	26ERIE W	PENELEC	238547	02AT	ATSI	1	235104 01CABOT 500 239280 02CRNBRY 500 1	single	1900.0	101.22	102.99	DC	33.57
7475774	235139	01AL&D6T	AP	235138	01AL 4J	AP	1	PN-P1-2-PN-345-107T	single	151.0	112.07	115.0	DC	4.43
7475775	235139	01AL&D6T	AP	235138	01AL 4J	AP	1	ATSI-P1-2-CEI-345-700T	single	151.0	112.07	115.0	DC	4.43
7475466	235197	01KARNSC	AP	235152	01BUTLER	AP	1	PN-P1-2-PN-345-107T	single	179.0	134.88	138.37	DC	6.23
7475467	235197	01KARNSC	AP	235152	01BUTLER	AP	1	ATSI-P1-2-CEI-345-700T	single	179.0	134.88	138.37	DC	6.23
7475851	235203	01KISSNG	AP	235197	01KARNSC	AP	1	ATSI-P1-2-CEI-345-700T	single	268.0	107.78	110.24	DC	6.56
7475852	235203	01KISSNG	AP	235197	01KARNSC	AP	1	PN-P1-2-PN-345-107T	single	268.0	107.78	110.24	DC	6.56
7475922	235204	01KITTAN	AP	235139	01AL&D6T	AP	1	ATSI-P1-2-CEI-345-700T	single	151.0	103.46	106.4	DC	4.43
7475923	235204	01KITTAN	AP	235139	01AL&D6T	AP	1	PN-P1-2-PN-345-107T	single	151.0	103.46	106.4	DC	4.43
7475522	235240	01COLMBGPN	AP	235202	01KISKIV	AP	1	PN-P1-2-PN-345-107T	single	151.0	129.64	133.12	DC	5.25
7475523	235240	01COLMBGPN	AP	235202	01KISKIV	AP	1	ATSI-P1-2-CEI-345-700T	single	151.0	129.64	133.12	DC	5.25
7475447	235282	01GAR RN	AP	235240	01COLMBGPN	AP	1	ATSI-P1-2-CEI-345-700T	single	151.0	137.85	141.33	DC	5.25

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
7475448	235282	01GAR RN	AP	235240	01COLMBGPN	AP	1	PN-P1-2-PN-345-107T	single	151.0	137.85	141.33	DC	5.25
9012506	239036	02PERRY	ATSI	239334	02L.CENTER	ATSI	1	ATSI-P7-1-CEI-345-012	tower	1667.0	131.36	133.78	DC	40.9
9012518	239036	02PERRY	ATSI	238684	02EASTLK	ATSI	1	ATSI-P7-1-CEI-345-016	tower	1667.0	124.23	126.58	DC	39.64
9012541	239082	02S8-ATT	ATSI	238544	02ASH_3	ATSI	8	ATSI-P7-1-CEI-345-016	tower	423.0	117.62	118.81	DC	11.13

17 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
7475622	200599	26ERIE W	PENELEC	238547	02AT	ATSI	1	Base Case	operation	1560.0	122.75	126.29	DC	55.78
7475624	200599	26ERIE W	PENELEC	238547	02AT	ATSI	1	235104 01CABOT 500 239280 02CRNBRY 500 1	operation	1900.0	109.84	112.75	DC	55.95
7475981	235129	01ARMSTRONG	AP	235121	01ARMSTR	AP	2	PN-P1-2-PN-345-107T	operation	659.0	99.29	100.44	DC	16.69
7475982	235129	01ARMSTRONG	AP	235121	01ARMSTR	AP	2	ATSI-P1-2-CEI-345-700T	operation	659.0	99.29	100.44	DC	16.69
7475468	235197	01KARNSC	AP	235152	01BUTLER	AP	1	PN-P1-2-PN-345-107T	operation	179.0	104.36	106.98	DC	10.38
7475469	235197	01KARNSC	AP	235152	01BUTLER	AP	1	ATSI-P1-2-CEI-345-700T	operation	179.0	104.36	106.98	DC	10.38
9012390	238547	02AT	ATSI	239036	02PERRY	ATSI	1	Base Case	operation	1534.0	101.06	104.19	DC	48.54
9012391	238547	02AT	ATSI	239036	02PERRY	ATSI	1	ATSI-P1-3-SYS-345-722	operation	1891.0	97.64	100.49	DC	54.5

18 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
7475447,7475448	7	01GAR RN 138.0 kV - 01COLMBGPN 138.0 kV Ckt 1	WP-0006 (177) : Reconductor 4/0 Cu Line Project Type : FAC Cost : $20,150,000 Time Estimate : 22.0 Months	$20,150,000
7475852,7475851	4	01KISSNG 138.0 kV - 01KARNSC 138.0 kV Ckt 1	WP-0008 (183) : Replace 556 Line Condcutor Project Type : FAC Cost : $13,000,000 Time Estimate : 9.0 Months	$13,000,000
9012506	8	02PERRY 345.0 kV - 02L.CENTER 345.0 kV Ckt 1	CEI-002A (286) : Reconductor the Leroy Center-Perry S6 345 kV Line (~10 miles from Leroy Center to Perry). The existing conductor is (2) 954 ACSR conductor and the new conductor is (2) 954 kcmil ACSS conductor. Upgrade terminals as required. Project Type : FAC Cost : $28,600,000 Time Estimate : 30.0 Months	$28,600,000
9012518	9	02PERRY 345.0 kV - 02EASTLK 345.0 kV Ckt 1	CEI-003A (287) : Reconductor the Eastlake-Perry S8 345 kV Line (~22 miles from Eastlake to Perry). The existing conductor is (2) 954 ACSR conductor and the new conductor is (2) 954 kcmil ACSS conductor. Upgrade terminals as required. Project Type : FAC Cost : $65,000,000 Time Estimate : 48.0 Months	$65,000,000
9012541	10	02S8-ATT 345.0 kV - 02ASH_3 138.0 kV Ckt 8	9012541 ATSI Rating Correction: [Rate A: 620, Rate B: 701, Rate C: 896]	$0
7475923,7475922	5	01KITTAN 138.0 kV - 01AL&D6T 138.0 kV Ckt 1	WP-0009 (184) : Reconductor 4/0 Cu Line Project Type : FAC Cost : $15,600,000 Time Estimate : 20.0 Months WP-0009a (185) : Replace line drops into All Dam 6 Project Type : FAC Cost : $130,000 Time Estimate : 9.0 Months	$15,730,000

ID	Index	Facility	Upgrade Description	Cost
7475774,7475775	2	01AL&D6T 138.0 kV - 01AL 4J 138.0 kV Ckt 1	WP-0001 (169) : Reconductor 7.3 miles of 4/0 Cu Line Conductor Project Type : FAC Cost : $13,000,000 Time Estimate : 20.0 Months WP-0001a (170) : Replace 4/0 Line Exit Project Type : FAC Cost : $130,000 Time Estimate : 9.0 Months	$13,130,000
7475466,7475467	3	01KARNSC 138.0 kV - 01BUTLER 138.0 kV Ckt 1	WP-0007 (178) : Reconductor 336 ACSR Line Project Type : FAC Cost : $26,000,000 Time Estimate : 30.0 Months WP-0007a (179) : Replace line and bus side disconnect switches at Butler Project Type : FAC Cost : $130,000 Time Estimate : 9.0 Months WP-0007b (180) : Replace Bus Side Disconnect Switches at Butler Project Type : FAC Cost : $130,000 Time Estimate : 9.0 Months WP-0007c (181) : Replace Wavetrap at Butler Project Type : FAC Cost : $130,000 Time Estimate : 9.0 Months WP-0007d (182) : Replace Wavetrap Leads at Butler Project Type : FAC Cost : $130,000 Time Estimate : 9.0 Months	$26,520,000
7475628,7475623	1	26ERIE W 345.0 kV - 02AT 345.0 kV Ckt 1	ATSI CEI-001A (285) : Reconductor the ATSI owned portion of the Erie West-Ashtabula 3-point tap 345 kV Line (~ 15 miles from Ashtabula to structure 13083). The existing conductor is (2) 954 ACSR conductor and the new conductor is (2) 954 kcmil ACSS conductor. Project Type : FAC Cost : $42,900,000 Time Estimate : 36.0 Months PENELEC PN-0004 (790) : Reconductor line with high temperatre conductor (MAIT Portion - 7.17 miles) Project Type : FAC Cost : $20,800,000 Time Estimate : 20.0 Months	$63,700,000

ID	Index	Facility	Upgrade Description	Cost
7475523,7475522	6	01COLMBGPN 138.0 kV - 01KISKIV 138.0 kV Ckt 1	WP-0004 (174) : Reconductor 4/0 Cu Line Project Type : FAC Cost : $7,800,000 Time Estimate : 18.0 Months WP-0004a (175) : Replace KD-4 Project Type : FAC Cost : $325,000 Time Estimate : 12.0 Months WP-0004b (176) : Replace KD-41 Line Relays Project Type : FAC Cost : $325,000 Time Estimate : 12.0 Months	$8,450,000
			TOTAL COST	$254,280,000

19 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.

19.1 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
7475623	200599	26ERIE W	PENELEC	238547	02AT	ATSI	1	Base Case	single	1560.0	112.58	114.74	DC	33.47

Bus #	Bus	MW Impact
200608	26PINEY #1	0.86
200642	26SENECA#1	8.33
200643	26SENECA#2	8.88
200644	26SENECA#3	0.67
200662	26SCRUB GR	3.35
200805	26COLVER13	14.89
200823	26MHP_X3-003	7.81
200828	26HNSMLK 1	2.31
200829	26HNSMLK 2	2.31
200830	26HNSMLK 3	2.31
200831	26HNSMLK 4	2.31
200832	26HNSMLK 5	2.31
200849	26LAKVU GN	0.29
201201	26WRREN CT	2.4
903643	W3-099 C OP1	5.82
914101	Y2-055	10.02
915951	Y3-092 FTIR	566.29
916351	Z1-091	3.19
919201	AA1-144 O1	25.26
919491	AA2-000	77.21
920341	AA2-132	3.5
930411	AB1-082	4.46
930511	AB1-092	2.83
932571	AC2-077	4.09
935191	AD1-154	3.67
936421	AD2-055	5.84
936991	AD2-133 C	2.51
938951	AE1-123	3.96
939171	AE1-147 C	1.72
939291	AE1-160 C	4.43
939381	AE1-169 C O1	17.22
940201	AE2-001 C	1.72
940681	AE2-055 C	1.66
940801	AE2-067 C	2.6
940861	AE2-074 C O1	3.39
941191	AE2-113 C O1	14.31
941251	AE2-119 C	1.99
941261	AE2-120 C	1.71
941271	AE2-121 C	0.92
941321	AE2-126 C	2.26
941331	AE2-129 C	1.81
941351	AE2-131 C	1.81

Bus #	Bus	MW Impact
941421	AE2-139 C O1	9.84
941491	AE2-146 C	16.18
942351	AE2-248 C	1.35
942491	AE2-262 C	7.95
942501	AE2-263 C	7.48
942811	AE2-299 C	14.06
942961	AE2-316 C	7.77
943151	AE2-344 C O1	33.47
BLUEG	BLUEG	19.12
CALDERWOOD	CALDERWOOD	1.64
CANNELTON	CANNELTON	1.14
CATAWBA	CATAWBA	0.84
CBM-N	CBM-N	7.61
CHEOAH	CHEOAH	1.5
CHILHOWEE	CHILHOWEE	0.54
COFFEEN	COFFEEN	2.05
COTTONWOOD	COTTONWOOD	7.02
DUCKCREEK	DUCKCREEK	4.63
EDWARDS	EDWARDS	2.13
ELMERSMITH	ELMERSMITH	1.95
FARMERCITY	FARMERCITY	1.34
G-007A	G-007A	9.61
GIBSON	GIBSON	0.8
HAMLET	HAMLET	1.24
NEWTON	NEWTON	5.34
NYISO	NYISO	33.32
PRAIRIE	PRAIRIE	9.67
SANTEETLA	SANTEETLA	0.44
SMITHLAND	SMITHLAND	0.73
TATANKA	TATANKA	2.46
TILTON	TILTON	2.52
TRIMBLE	TRIMBLE	2.13
TVA	TVA	5.69
UNIONPOWER	UNIONPOWER	2.49
VFT	VFT	26.4

19.2 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
7475775	235139	01AL&D6T	AP	235138	01AL 4J	AP	1	ATSI-P1-2-CEI-345-700T	single	151.0	112.07	115.0	DC	4.43

Bus #	Bus	MW Impact
200608	26PINEY #1	0.32
200642	26SENECA#1	1.48
200643	26SENECA#2	1.57
200644	26SENECA#3	0.12
200662	26SCRUB GR	0.78
200828	26HNSMLK 1	0.49
200829	26HNSMLK 2	0.49
200830	26HNSMLK 3	0.49
200831	26HNSMLK 4	0.49
200832	26HNSMLK 5	0.49
200849	26LAKVU GN	0.04
201201	26WRREN CT	0.38
235030	01MHNG-T155	0.13
235134	01AL&D6	0.75
903643	W3-099 C OP1	0.75
914101	Y2-055	1.59
915951	Y3-092 FTIR	62.98
935191	AD1-154	1.25
938951	AE1-123	1.46
939291	AE1-160 C	0.91
939381	AE1-169 C O1	3.72
942811	AE2-299 C	1.83
942961	AE2-316 C	3.47
943151	AE2-344 C O1	4.43
BLUEG	BLUEG	2.55
CALDERWOOD	CALDERWOOD	0.24
CANNELTON	CANNELTON	0.15
CATAWBA	CATAWBA	0.14
CBM-N	CBM-N	1.32
CHEOAH	CHEOAH	0.22
CHILHOWEE	CHILHOWEE	0.08
COFFEEN	COFFEEN	0.27
COTTONWOOD	COTTONWOOD	0.98
DUCKCREEK	DUCKCREEK	0.59
EDWARDS	EDWARDS	0.27
ELMERSMITH	ELMERSMITH	0.26
FARMERCITY	FARMERCITY	0.17
G-007A	G-007A	1.47
GIBSON	GIBSON	0.11
HAMLET	HAMLET	0.21

Bus #	Bus	MW Impact
NEWTON	NEWTON	0.7
NYISO	NYISO	5.74
PRAIRIE	PRAIRIE	1.28
SANTEETLA	SANTEETLA	0.07
SMITHLAND	SMITHLAND	0.1
TATANKA	TATANKA	0.32
TILTON	TILTON	0.32
TRIMBLE	TRIMBLE	0.28
TVA	TVA	0.81
UNIONPOWER	UNIONPOWER	0.36
VFT	VFT	4.07

19.3 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
7475467	235197	01KARNSC	AP	235152	01BUTLER	AP	1	ATSI-P1-2-CEI-345-700T	single	179.0	134.88	138.37	DC	6.23

Bus #	Bus	MW Impact
200608	26PINEY #1	0.63
200642	26SENECA#1	2.06
200643	26SENECA#2	2.2
200644	26SENECA#3	0.17
200662	26SCRUB GR	1.32
200805	26COLVER13	7.31
200828	26HNSMLK 1	0.62
200829	26HNSMLK 2	0.62
200830	26HNSMLK 3	0.62
200831	26HNSMLK 4	0.62
200832	26HNSMLK 5	0.62
200849	26LAKVU GN	0.05
201201	26WRREN CT	0.53
235030	01MHNG-T155	0.14
903643	W3-099 C OP1	1.03
914101	Y2-055	2.21
915951	Y3-092 FTIR	85.82
919491	AA2-000	26.52
930411	AB1-082	1.22
930511	AB1-092	0.97
932571	AC2-077	1.12
935191	AD1-154	2.38
936421	AD2-055	2.0
936991	AD2-133 C	0.92
938951	AE1-123	2.87
939171	AE1-147 C	0.62
939291	AE1-160 C	1.54
939381	AE1-169 C O1	6.35
940201	AE2-001 C	0.62
940861	AE2-074 C O1	0.93
941191	AE2-113 C O1	4.25
941251	AE2-119 C	0.75
941261	AE2-120 C	0.62
941271	AE2-121 C	0.33
941321	AE2-126 C	0.8
941331	AE2-129 C	0.67
941351	AE2-131 C	0.67
941491	AE2-146 C	4.43
942351	AE2-248 C	0.48
942491	AE2-262 C	2.91

Bus #	Bus	MW Impact
942501	AE2-263 C	2.74
942811	AE2-299 C	2.52
942961	AE2-316 C	4.42
943151	AE2-344 C O1	6.23
BLUEG	BLUEG	3.44
CALDERWOOD	CALDERWOOD	0.32
CANNELTON	CANNELTON	0.21
CATAWBA	CATAWBA	0.18
CBM-N	CBM-N	1.7
CHEOAH	CHEOAH	0.29
CHILHOWEE	CHILHOWEE	0.11
COFFEEN	COFFEEN	0.36
COTTONWOOD	COTTONWOOD	1.31
DUCKCREEK	DUCKCREEK	0.8
EDWARDS	EDWARDS	0.37
ELMERSMITH	ELMERSMITH	0.35
FARMERCITY	FARMERCITY	0.24
G-007A	G-007A	1.67
GIBSON	GIBSON	0.14
HAMLET	HAMLET	0.27
NEWTON	NEWTON	0.94
NYISO	NYISO	7.42
PRAIRIE	PRAIRIE	1.73
SANTEETLA	SANTEETLA	0.09
SMITHLAND	SMITHLAND	0.13
TATANKA	TATANKA	0.43
TILTON	TILTON	0.44
TRIMBLE	TRIMBLE	0.38
TVA	TVA	1.08
UNIONPOWER	UNIONPOWER	0.47
VFT	VFT	4.64

19.4 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
7475852	235203	01KISSNG	AP	235197	01KARNSC	AP	1	PN-P1-2-PN-345-107T	single	268.0	107.78	110.24	DC	6.56

Bus #	Bus	MW Impact
200608	26PINEY #1	0.66
200642	26SENECA#1	2.17
200643	26SENECA#2	2.32
200644	26SENECA#3	0.17
200662	26SCRUB GR	1.39
200805	26COLVER13	7.71
200828	26HNSMLK 1	0.65
200829	26HNSMLK 2	0.65
200830	26HNSMLK 3	0.65
200831	26HNSMLK 4	0.65
200832	26HNSMLK 5	0.65
200849	26LAKVU GN	0.05
201201	26WRREN CT	0.56
903643	W3-099 C OP1	1.09
914101	Y2-055	2.33
915951	Y3-092 FTIR	90.39
919491	AA2-000	27.96
930411	AB1-082	1.29
930511	AB1-092	1.03
932571	AC2-077	1.18
935191	AD1-154	2.51
936421	AD2-055	2.11
936991	AD2-133 C	0.97
938951	AE1-123	3.02
939171	AE1-147 C	0.65
939291	AE1-160 C	1.62
939381	AE1-169 C O1	6.69
940201	AE2-001 C	0.65
940681	AE2-055 C	0.63
940861	AE2-074 C O1	0.98
941191	AE2-113 C O1	4.48
941251	AE2-119 C	0.79
941261	AE2-120 C	0.65
941271	AE2-121 C	0.35
941321	AE2-126 C	0.84
941331	AE2-129 C	0.71
941351	AE2-131 C	0.71
941491	AE2-146 C	4.67
942351	AE2-248 C	0.51
942491	AE2-262 C	3.07

Bus #	Bus	MW Impact
942501	AE2-263 C	2.89
942811	AE2-299 C	2.66
942961	AE2-316 C	4.65
943151	AE2-344 C O1	6.56
BLUEG	BLUEG	3.7
CALDERWOOD	CALDERWOOD	0.35
CANNELTON	CANNELTON	0.22
CATAWBA	CATAWBA	0.19
CBM-N	CBM-N	1.8
CHEOAH	CHEOAH	0.32
CHILHOWEE	CHILHOWEE	0.11
COFFEEN	COFFEEN	0.39
COTTONWOOD	COTTONWOOD	1.41
DUCKCREEK	DUCKCREEK	0.86
EDWARDS	EDWARDS	0.39
ELMERSMITH	ELMERSMITH	0.38
FARMERCITY	FARMERCITY	0.25
G-007A	G-007A	1.8
GIBSON	GIBSON	0.15
HAMLET	HAMLET	0.29
NEWTON	NEWTON	1.01
NYISO	NYISO	7.87
PRAIRIE	PRAIRIE	1.85
SANTEETLA	SANTEETLA	0.09
SMITHLAND	SMITHLAND	0.14
TATANKA	TATANKA	0.46
TILTON	TILTON	0.47
TRIMBLE	TRIMBLE	0.41
TVA	TVA	1.16
UNIONPOWER	UNIONPOWER	0.51
VFT	VFT	5.0

19.5 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
7475923	235204	01KITTAN	AP	235139	01AL&D6T	AP	1	PN-P1-2-PN-345-107T	single	151.0	103.46	106.4	DC	4.43

Bus #	Bus	MW Impact
200608	26PINEY #1	0.32
200642	26SENECA#1	1.48
200643	26SENECA#2	1.58
200644	26SENECA#3	0.12
200662	26SCRUB GR	0.78
200828	26HNSMLK 1	0.49
200829	26HNSMLK 2	0.49
200830	26HNSMLK 3	0.49
200831	26HNSMLK 4	0.49
200832	26HNSMLK 5	0.49
200849	26LAKVU GN	0.04
201201	26WRREN CT	0.38
235030	01MHNG-T155	0.13
903643	W3-099 C OP1	0.75
914101	Y2-055	1.59
915951	Y3-092 FTIR	63.05
935191	AD1-154	1.25
938951	AE1-123	1.46
939291	AE1-160 C	0.91
939381	AE1-169 C O1	3.72
942811	AE2-299 C	1.83
942961	AE2-316 C	3.48
943151	AE2-344 C O1	4.43
BLUEG	BLUEG	2.51
CALDERWOOD	CALDERWOOD	0.24
CANNELTON	CANNELTON	0.15
CATAWBA	CATAWBA	0.14
CBM-N	CBM-N	1.32
CHEOAH	CHEOAH	0.22
CHILHOWEE	CHILHOWEE	0.08
COFFEEN	COFFEEN	0.26
COTTONWOOD	COTTONWOOD	0.97
DUCKCREEK	DUCKCREEK	0.58
EDWARDS	EDWARDS	0.26
ELMERSMITH	ELMERSMITH	0.26
FARMERCITY	FARMERCITY	0.17
G-007A	G-007A	1.49
GIBSON	GIBSON	0.1
HAMLET	HAMLET	0.21
NEWTON	NEWTON	0.69

Bus #	Bus	MW Impact
NYISO	NYISO	5.77
PRAIRIE	PRAIRIE	1.26
SANTEETLA	SANTEETLA	0.06
SMITHLAND	SMITHLAND	0.1
TATANKA	TATANKA	0.31
TILTON	TILTON	0.32
TRIMBLE	TRIMBLE	0.28
TVA	TVA	0.8
UNIONPOWER	UNIONPOWER	0.35
VFT	VFT	4.12

19.6 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
7475523	235240	01COLMBGPN	AP	235202	01KISKIV	AP	1	ATSI-P1-2-CEI-345-700T	single	151.0	129.64	133.12	DC	5.25

Bus #	Bus	MW Impact
200608	26PINEY #1	0.38
200642	26SENECA#1	1.73
200643	26SENECA#2	1.84
200644	26SENECA#3	0.14
200662	26SCRUB GR	0.92
200828	26HNSMLK 1	0.58
200829	26HNSMLK 2	0.58
200830	26HNSMLK 3	0.58
200831	26HNSMLK 4	0.58
200832	26HNSMLK 5	0.58
200849	26LAKVU GN	0.04
201201	26WRREN CT	0.45
235030	01MHNG-T155	0.15
235134	01AL&D6	0.27
903643	W3-099 C OP1	0.88
914101	Y2-055	1.86
915951	Y3-092 FTIR	74.81
930411	AB1-082	1.04
935191	AD1-154	1.43
938951	AE1-123	1.74
939291	AE1-160 C	1.09
939381	AE1-169 C O1	4.42
940861	AE2-074 C O1	0.79
941191	AE2-113 C O1	3.53
941321	AE2-126 C	0.63
942811	AE2-299 C	2.16
942961	AE2-316 C	4.19
943151	AE2-344 C O1	5.25
BLUEG	BLUEG	2.71
CALDERWOOD	CALDERWOOD	0.26
CANNELTON	CANNELTON	0.16
CATAWBA	CATAWBA	0.15
CBM-N	CBM-N	1.46
CHEOAH	CHEOAH	0.24
CHILHOWEE	CHILHOWEE	0.09
COFFEEN	COFFEEN	0.28
COTTONWOOD	COTTONWOOD	1.05
DUCKCREEK	DUCKCREEK	0.62
EDWARDS	EDWARDS	0.28
ELMERSMITH	ELMERSMITH	0.28

Bus #	Bus	MW Impact
FARMERCITY	FARMERCITY	0.18
G-007A	G-007A	1.44
GIBSON	GIBSON	0.11
HAMLET	HAMLET	0.23
NEWTON	NEWTON	0.74
NYISO	NYISO	6.37
PRAIRIE	PRAIRIE	1.36
SANTEETLA	SANTEETLA	0.07
SMITHLAND	SMITHLAND	0.11
TATANKA	TATANKA	0.34
TILTON	TILTON	0.34
TRIMBLE	TRIMBLE	0.3
TVA	TVA	0.86
UNIONPOWER	UNIONPOWER	0.38
VFT	VFT	3.99

19.7 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
7475448	235282	01GARRN	AP	235240	01COLMBGPN	AP	1	PN-P1-2-PN-345-107T	single	151.0	137.85	141.33	DC	5.25

Bus #	Bus	MW Impact
200608	26PINEY #1	0.38
200642	26SENECA#1	1.73
200643	26SENECA#2	1.84
200644	26SENECA#3	0.14
200662	26SCRUB GR	0.92
200828	26HNSMLK 1	0.58
200829	26HNSMLK 2	0.58
200830	26HNSMLK 3	0.58
200831	26HNSMLK 4	0.58
200832	26HNSMLK 5	0.58
200849	26LAKVU GN	0.04
201201	26WRREN CT	0.45
235030	01MHNG-T155	0.15
235134	01AL&D6	0.27
903643	W3-099 C OP1	0.88
914101	Y2-055	1.86
915951	Y3-092 FTIR	74.81
930411	AB1-082	1.04
935191	AD1-154	1.43
938951	AE1-123	1.74
939291	AE1-160 C	1.09
939381	AE1-169 C O1	4.42
940861	AE2-074 C O1	0.79
941191	AE2-113 C O1	3.53
941321	AE2-126 C	0.63
942811	AE2-299 C	2.16
942961	AE2-316 C	4.19
943151	AE2-344 C O1	5.25
BLUEG	BLUEG	2.71
CALDERWOOD	CALDERWOOD	0.26
CANNELTON	CANNELTON	0.16
CATAWBA	CATAWBA	0.15
CBM-N	CBM-N	1.46
CHEOAH	CHEOAH	0.24
CHILHOWEE	CHILHOWEE	0.09
COFFEEN	COFFEEN	0.28
COTTONWOOD	COTTONWOOD	1.05
DUCKCREEK	DUCKCREEK	0.62
EDWARDS	EDWARDS	0.28
ELMERSMITH	ELMERSMITH	0.28

Bus #	Bus	MW Impact
FARMERCITY	FARMERCITY	0.18
G-007A	G-007A	1.44
GIBSON	GIBSON	0.11
HAMLET	HAMLET	0.23
NEWTON	NEWTON	0.74
NYISO	NYISO	6.37
PRAIRIE	PRAIRIE	1.36
SANTEETLA	SANTEETLA	0.07
SMITHLAND	SMITHLAND	0.11
TATANKA	TATANKA	0.34
TILTON	TILTON	0.34
TRIMBLE	TRIMBLE	0.3
TVA	TVA	0.86
UNIONPOWER	UNIONPOWER	0.38
VFT	VFT	3.99

19.8 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
9012506	239036	02PERRY	ATSI	239334	02L.CENTER	ATSI	1	ATSI-P7-1-CEI-345-012	tower	1667.0	131.36	133.78	DC	40.9

Bus #	Bus	MW Impact
200805	26COLVER13	10.93
200823	26MHP_X3-003	5.73
200828	26HNSMLK 1	1.69
200829	26HNSMLK 2	1.69
200830	26HNSMLK 3	1.69
200831	26HNSMLK 4	1.69
200832	26HNSMLK 5	1.69
200849	26LAKVU GN	0.22
200894	26K02	6.61
203999	P-047 E	10.43
236828	01GRAYMONT	0.42
239035	02PERRG1	844.93
290086	Q-036 E	4.08
294573	P-028 E	11.59
903643	W3-099 C OP1	4.27
903644	W3-099 E OP1	28.55
914101	Y2-055	7.35
915951	Y3-092 FTIR	415.19
916202	Z1-069 E	8.55
916351	Z1-091	2.34
918682	AA1-082 E	6.52
919201	AA1-144 O1	18.53
919491	AA2-000	56.63
920341	AA2-132	2.57
925512	AC1-025 E	0.15
930411	AB1-082	3.27
930511	AB1-092	2.08
931092	AB1-160 E	2.44
932571	AC2-077	3.0
935191	AD1-154	2.69
936421	AD2-055	4.28
936991	AD2-133 C	1.84
936992	AD2-133 E	8.4
938951	AE1-123	2.91
939171	AE1-147 C	1.26
939172	AE1-147 E	0.84
939291	AE1-160 C	3.25
939292	AE1-160 E	1.87
939381	AE1-169 C O1	12.63
939382	AE1-169 E O1	8.42
940201	AE2-001 C	1.26

Bus #	Bus	MW Impact
940202	AE2-001 E	0.84
940681	AE2-055 C	1.22
940682	AE2-055 E	0.81
940801	AE2-067 C	1.91
940802	AE2-067 E	0.01
940861	AE2-074 C O1	2.48
940862	AE2-074 E O1	3.27
941191	AE2-113 C O1	10.49
941192	AE2-113 E O1	11.3
941251	AE2-119 C	1.46
941252	AE2-119 E	0.97
941261	AE2-120 C	1.26
941262	AE2-120 E	0.84
941271	AE2-121 C	0.67
941272	AE2-121 E	0.45
941321	AE2-126 C	1.66
941322	AE2-126 E	1.11
941331	AE2-129 C	1.33
941332	AE2-129 E	0.89
941351	AE2-131 C	1.33
941352	AE2-131 E	0.89
941421	AE2-139 C O1	7.22
941422	AE2-139 E O1	4.81
941491	AE2-146 C	11.87
941492	AE2-146 E	16.72
942351	AE2-248 C	0.99
942352	AE2-248 E	0.66
942491	AE2-262 C	5.83
942492	AE2-262 E	3.92
942501	AE2-263 C	5.48
942502	AE2-263 E	3.66
942811	AE2-299 C	10.31
942812	AE2-299 E	41.27
942961	AE2-316 C	5.7
942962	AE2-316 E	8.13
943151	AE2-344 C O1	24.54
943152	AE2-344 E O1	16.36
BLUEG	BLUEG	14.06
CALDERWOOD	CALDERWOOD	1.21
CANNELTON	CANNELTON	0.84
CATAWBA	CATAWBA	0.62
CBM-N	CBM-N	5.58
CHEOAH	CHEOAH	1.1
CHILHOWEE	CHILHOWEE	0.4
COFFEEN	COFFEEN	1.51
COTTONWOOD	COTTONWOOD	5.16
DUCKCREEK	DUCKCREEK	3.4
EDWARDS	EDWARDS	1.56
ELMERSMITH	ELMERSMITH	1.44
FARMERCITY	FARMERCITY	0.98
G-007A	G-007A	7.06
GIBSON	GIBSON	0.59

Bus #	Bus	MW Impact
HAMLET	HAMLET	0.91
NEWTON	NEWTON	3.93
NYISO	NYISO	24.45
PRAIRIE	PRAIRIE	7.11
SANTEETLA	SANTEETLA	0.32
SMITHLAND	SMITHLAND	0.54
TATANKA	TATANKA	1.81
TILTON	TILTON	1.85
TRIMBLE	TRIMBLE	1.56
TVA	TVA	4.19
UNIONPOWER	UNIONPOWER	1.83
VFT	VFT	19.4

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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
9012518	239036	02PERRY	ATSI	238684	02EASTLK	ATSI	1	ATSI-P7-1-CEI-345-016	tower	1667.0	124.23	126.58	DC	39.64

Bus #	Bus	MW Impact
200805	26COLVER13	10.57
200823	26MHP_X3-003	5.55
200828	26HNSMLK 1	1.64
200829	26HNSMLK 2	1.64
200830	26HNSMLK 3	1.64
200831	26HNSMLK 4	1.64
200832	26HNSMLK 5	1.64
200849	26LAKVU GN	0.21
200894	26K02	6.4
203999	P-047 E	10.1
236828	01GRAYMONT	0.41
239035	02PERRG1	804.58
290086	Q-036 E	3.95
294573	P-028 E	11.22
903643	W3-099 C OP1	4.13
903644	W3-099 E OP1	27.67
914101	Y2-055	7.12
915951	Y3-092 FTIR	402.42
916202	Z1-069 E	8.28
916351	Z1-091	2.27
918682	AA1-082 E	6.31
919201	AA1-144 O1	17.94
919491	AA2-000	54.83
920341	AA2-132	2.49
925512	AC1-025 E	0.15
930411	AB1-082	3.17
930511	AB1-092	2.01
931092	AB1-160 E	2.37
932571	AC2-077	2.9
935191	AD1-154	2.61
936421	AD2-055	4.15
936991	AD2-133 C	1.78
936992	AD2-133 E	8.13
938951	AE1-123	2.81
939171	AE1-147 C	1.22
939172	AE1-147 E	0.81
939291	AE1-160 C	3.15
939292	AE1-160 E	1.81
939381	AE1-169 C O1	12.23
939382	AE1-169 E O1	8.16
940201	AE2-001 C	1.22

Bus #	Bus	MW Impact
940202	AE2-001 E	0.81
940681	AE2-055 C	1.18
940682	AE2-055 E	0.79
940801	AE2-067 C	1.85
940802	AE2-067 E	0.01
940861	AE2-074 C O1	2.41
940862	AE2-074 E O1	3.17
941191	AE2-113 C O1	10.16
941192	AE2-113 E O1	10.94
941251	AE2-119 C	1.41
941252	AE2-119 E	0.94
941261	AE2-120 C	1.22
941262	AE2-120 E	0.81
941271	AE2-121 C	0.65
941272	AE2-121 E	0.44
941321	AE2-126 C	1.61
941322	AE2-126 E	1.07
941331	AE2-129 C	1.29
941332	AE2-129 E	0.86
941351	AE2-131 C	1.29
941352	AE2-131 E	0.86
941421	AE2-139 C O1	6.99
941422	AE2-139 E O1	4.66
941491	AE2-146 C	11.49
941492	AE2-146 E	16.2
942351	AE2-248 C	0.96
942352	AE2-248 E	0.64
942491	AE2-262 C	5.65
942492	AE2-262 E	3.8
942501	AE2-263 C	5.31
942502	AE2-263 E	3.54
942811	AE2-299 C	9.99
942812	AE2-299 E	39.99
942961	AE2-316 C	5.52
942962	AE2-316 E	7.87
943151	AE2-344 C O1	23.78
943152	AE2-344 E O1	15.85
BLUEG	BLUEG	13.55
CALDERWOOD	CALDERWOOD	1.16
CANNELTON	CANNELTON	0.81
CATAWBA	CATAWBA	0.6
CBM-N	CBM-N	5.4
CHEOAH	CHEOAH	1.06
CHILHOWEE	CHILHOWEE	0.38
COFFEEN	COFFEEN	1.45
COTTONWOOD	COTTONWOOD	4.97
DUCKCREEK	DUCKCREEK	3.28
EDWARDS	EDWARDS	1.51
ELMERSMITH	ELMERSMITH	1.39
FARMERCITY	FARMERCITY	0.95
G-007A	G-007A	6.81
GIBSON	GIBSON	0.57

Bus #	Bus	MW Impact
HAMLET	HAMLET	0.88
NEWTON	NEWTON	3.78
NYISO	NYISO	23.65
PRAIRIE	PRAIRIE	6.85
SANTEETLA	SANTEETLA	0.31
SMITHLAND	SMITHLAND	0.52
TATANKA	TATANKA	1.75
TILTON	TILTON	1.78
TRIMBLE	TRIMBLE	1.51
TVA	TVA	4.04
UNIONPOWER	UNIONPOWER	1.77
VFT	VFT	18.7

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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
9012541	239082	02S8-ATT	ATSI	238544	02ASH_3	ATSI	8	ATSI-P7-1-CEI-345-016	tower	423.0	117.62	118.81	DC	11.13

Bus #	Bus	MW Impact
239035	02PERRG1	85.1
903643	W3-099 C OP1	1.16
903644	W3-099 E OP1	7.77
914101	Y2-055	2.0
915951	Y3-092 FTIR	112.97
939291	AE1-160 C	0.88
939292	AE1-160 E	0.51
939381	AE1-169 C O1	3.44
939382	AE1-169 E O1	2.29
942811	AE2-299 C	2.81
942812	AE2-299 E	11.23
943151	AE2-344 C O1	6.68
943152	AE2-344 E O1	4.45
BLUEG	BLUEG	3.87
CALDERWOOD	CALDERWOOD	0.33
CANNELTON	CANNELTON	0.23
CATAWBA	CATAWBA	0.17
CBM-N	CBM-N	1.53
CHEOAH	CHEOAH	0.3
CHILHOWEE	CHILHOWEE	0.11
COFFEEN	COFFEEN	0.42
COTTONWOOD	COTTONWOOD	1.42
DUCKCREEK	DUCKCREEK	0.94
EDWARDS	EDWARDS	0.43
ELMERSMITH	ELMERSMITH	0.4
FARMERCITY	FARMERCITY	0.27
G-007A	G-007A	1.94
GIBSON	GIBSON	0.16
HAMLET	HAMLET	0.25
NEWTON	NEWTON	1.08
NYISO	NYISO	6.68
PRAIRIE	PRAIRIE	1.96
SANTEETLA	SANTEETLA	0.09
SMITHLAND	SMITHLAND	0.15
TATANKA	TATANKA	0.5
TILTON	TILTON	0.51
TRIMBLE	TRIMBLE	0.43
TVA	TVA	1.15
UNIONPOWER	UNIONPOWER	0.5
VFT	VFT	5.33

Affected Systems

20 Affected Systems

20.1 LG&E

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

20.2 MISO

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

20.3 TVA

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

20.4 Duke Energy Progress

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

20.5 NYISO

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

21 Contingency Descriptions

Contingency Name	Contingency Definition
ATSI-P1-3-SYS-345-722	CONTINGENCY 'ATSI-P1-3-SYS-345-722' /* TRAN 02S8-ATT 345 TO 02ASH_3 138 CK 8 DISCONNECT BRANCH FROM BUS 239082 TO BUS 238544 CKT 8 /* 02S8-ATT 345 02ASH_3 138 END
ATSI-P1-2-CEI-345-700T	CONTINGENCY 'ATSI-P1-2-CEI-345-700T' /* PN/ATSI ERIE WEST - ASHTABULA - PERRY 345KV DISCONNECT BRANCH FROM BUS 239036 TO BUS 238547 CKT 1 /* 02PERRY 345 02AT 345 DISCONNECT BRANCH FROM BUS 238547 TO BUS 239082 CKT 1 /* 02AT 345 02S8-ATT 345 DISCONNECT BRANCH FROM BUS 239082 TO BUS 238544 CKT 8 /* 02S8-ATT 345 02ASH_3 138 DISCONNECT BRANCH FROM BUS 238547 TO BUS 200599 CKT 1 /* 02AT 345 26ERIE W 345 END
ATSI-P7-1-CEI-345-012	CONTINGENCY 'ATSI-P7-1-CEI-345-012' /* PERRY-EASTLAKE AND PERRY-NORTHFIELD 345KV LINE OUTAGES DISCONNECT BRANCH FROM BUS 238684 TO BUS 239036 CKT 1 /* 02EASTLK 345 02PERRY 345 DISCONNECT BRANCH FROM BUS 239358 TO BUS 239036 CKT 1 /* 02NFIELD 345 02PERRY 345 END
235104 01CABOT 500 239280 02CRNBRY 500 1	CONTINGENCY '235104 01CABOT 500 239280 02CRNBRY 500 1' / 8388 OPEN BRANCH FROM BUS 235104 TO BUS 239280 CKT 1 / 235104 01CABOT 500 239280 02CRNBRY 500 1 END
ATSI-P7-1-CEI-345-016	CONTINGENCY 'ATSI-P7-1-CEI-345-016' /* PERRY-NORTHFEILD AND PERRY-LC 345KV LINE OUTAGES DISCONNECT BRANCH FROM BUS 239036 TO BUS 239358 CKT 1 /* 02PERRY 345 02NFIELD 345 DISCONNECT BRANCH FROM BUS 239036 TO BUS 239334 CKT 1 /* 02PERRY 345 02L.CENTER 345 END
Base Case	
PN-P1-2-PN-345-107T	CONTINGENCY 'PN-P1-2-PN-345-107T' /* ERIE WEST - ASHTABULA - PERRY 345KV DISCONNECT BRANCH FROM BUS 200599 TO BUS 238547 CKT 1 /* 26ERIE W 345 02AT 345 DISCONNECT BRANCH FROM BUS 238547 TO BUS 239082 CKT 1 /* 02AT 345 02S8-ATT 345 DISCONNECT BRANCH FROM BUS 238547 TO BUS 239036 CKT 1 /* 02AT 345 02PERRY 345 DISCONNECT BUS 238547 /* 02AT 345 END

Short Circuit

22 Short Circuit

The following Breakers are overduty:

None

23 Network Impacts: Secondary POI

The Queue Project AE2-344 was evaluated as a 116.5 MW (Capacity 69.9 MW) injection tapping the Edinboro South to Venago Jct 115kV line in the PENELEC area. Project AE2-344 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-344 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

24 Generation Deliverability

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

None

25 Multiple Facility Contingency

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

None

26 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
7475623	200599	26ERIE W	PENELEC	238547	02AT	ATSI	1	Base Case	single	1560.0	112.52	114.68	DC	33.48
7475628	200599	26ERIE W	PENELEC	238547	02AT	ATSI	1	235104 01CABOT 500 239280 02CRNBRY 500 1	single	1900.0	101.17	102.94	DC	33.58
7475774	235139	01AL&D6T	AP	235138	01AL 4J	AP	1	PN-P1-2-PN-345-107T	single	151.0	112.01	114.94	DC	4.44
7475775	235139	01AL&D6T	AP	235138	01AL 4J	AP	1	ATSI-P1-2-CEI-345-700T	single	151.0	112.01	114.94	DC	4.44
7475466	235197	01KARNSC	AP	235152	01BUTLER	AP	1	PN-P1-2-PN-345-107T	single	179.0	134.86	138.36	DC	6.25
7475467	235197	01KARNSC	AP	235152	01BUTLER	AP	1	ATSI-P1-2-CEI-345-700T	single	179.0	134.86	138.36	DC	6.25
7475851	235203	01KISSNG	AP	235197	01KARNSC	AP	1	ATSI-P1-2-CEI-345-700T	single	268.0	107.77	110.23	DC	6.58
7475852	235203	01KISSNG	AP	235197	01KARNSC	AP	1	PN-P1-2-PN-345-107T	single	268.0	107.77	110.23	DC	6.58
7475922	235204	01KITTAN	AP	235139	01AL&D6T	AP	1	ATSI-P1-2-CEI-345-700T	single	151.0	103.4	106.34	DC	4.44
7475923	235204	01KITTAN	AP	235139	01AL&D6T	AP	1	PN-P1-2-PN-345-107T	single	151.0	103.4	106.34	DC	4.44
7475522	235240	01COLMBGPN	AP	235202	01KISKIV	AP	1	PN-P1-2-PN-345-107T	single	151.0	129.65	133.14	DC	5.26
7475523	235240	01COLMBGPN	AP	235202	01KISKIV	AP	1	ATSI-P1-2-CEI-345-700T	single	151.0	129.65	133.14	DC	5.26
7475447	235282	01GAR RN	AP	235240	01COLMBGPN	AP	1	ATSI-P1-2-CEI-345-700T	single	151.0	137.8	141.29	DC	5.26

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
7475448	235282	01GAR RN	AP	235240	01COLMBGPN	AP	1	PN-P1-2-PN-345-107T	single	151.0	137.8	141.29	DC	5.26
9012506	239036	02PERRY	ATSI	239334	02L.CENTER	ATSI	1	ATSI-P7-1-CEI-345-012	tower	1667.0	131.32	133.74	DC	40.91
9012518	239036	02PERRY	ATSI	238684	02EASTLK	ATSI	1	ATSI-P7-1-CEI-345-016	tower	1667.0	124.19	126.54	DC	39.65
9012541	239082	02S8-ATT	ATSI	238544	02ASH_3	ATSI	8	ATSI-P7-1-CEI-345-016	tower	423.0	117.6	118.78	DC	11.13

27 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
7475622	200599	26ERIE W	PENELEC	238547	02AT	ATSI	1	Base Case	operation	1560.0	122.69	126.22	DC	55.8
7475624	200599	26ERIE W	PENELEC	238547	02AT	ATSI	1	235104 01CABOT 500 239280 02CRNBRY 500 1	operation	1900.0	109.79	112.7	DC	55.97
7475468	235197	01KARNSC	AP	235152	01BUTLER	AP	1	PN-P1-2-PN-345-107T	operation	179.0	104.38	107.0	DC	10.41
7475469	235197	01KARNSC	AP	235152	01BUTLER	AP	1	ATSI-P1-2-CEI-345-700T	operation	179.0	104.38	107.0	DC	10.41
9012390	238547	02AT	ATSI	239036	02PERRY	ATSI	1	Base Case	operation	1534.0	101.0	104.13	DC	48.55
9012391	238547	02AT	ATSI	239036	02PERRY	ATSI	1	ATSI-P1-3-SYS-345-722	operation	1891.0	97.58	100.43	DC	54.52

28 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.

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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
7475623	200599	26ERIE W	PENELEC	238547	02AT	ATSI	1	Base Case	single	1560.0	112.52	114.68	DC	33.48

Bus #	Bus	MW Impact
200608	26PINEY #1	0.86
200642	26SENECA#1	8.33
200643	26SENECA#2	8.88
200644	26SENECA#3	0.67
200662	26SCRUB GR	3.35
200805	26COLVER13	14.89
200823	26MHP_X3-003	7.81
200828	26HNSMLK 1	2.31
200829	26HNSMLK 2	2.31
200830	26HNSMLK 3	2.31
200831	26HNSMLK 4	2.31
200832	26HNSMLK 5	2.31
200849	26LAKVU GN	0.29
201201	26WRREN CT	2.4
903643	W3-099 C OP1	5.82
914101	Y2-055	10.02
915951	Y3-092 FTIR	566.28
916351	Z1-091	3.19
919201	AA1-144 O1	25.26
919491	AA2-000	77.21
920341	AA2-132	3.5
930411	AB1-082	4.46
930511	AB1-092	2.83
932571	AC2-077	4.09
935191	AD1-154	3.67
936421	AD2-055	5.84
936991	AD2-133 C	2.51
938951	AE1-123	3.96
939171	AE1-147 C	1.72
939291	AE1-160 C	4.43
939381	AE1-169 C O1	17.22
940201	AE2-001 C	1.72
940681	AE2-055 C	1.66
940801	AE2-067 C	2.6
940861	AE2-074 C O2	3.39
941191	AE2-113 C O2	13.77
941251	AE2-119 C	1.99
941261	AE2-120 C	1.71
941271	AE2-121 C	0.92
941321	AE2-126 C	2.26
941331	AE2-129 C	1.81
941351	AE2-131 C	1.81

Bus #	Bus	MW Impact
941421	AE2-139 C O2	9.46
941491	AE2-146 C	16.18
942351	AE2-248 C	1.35
942491	AE2-262 C	7.95
942501	AE2-263 C	7.48
942811	AE2-299 C	14.06
942961	AE2-316 C	7.77
943151	AE2-344 C O2	33.48
BLUEG	BLUEG	19.12
CALDERWOOD	CALDERWOOD	1.64
CANNELTON	CANNELTON	1.14
CATAWBA	CATAWBA	0.84
CBM-N	CBM-N	7.61
CHEOAH	CHEOAH	1.5
CHILHOWEE	CHILHOWEE	0.54
COFFEEN	COFFEEN	2.05
COTTONWOOD	COTTONWOOD	7.02
DUCKCREEK	DUCKCREEK	4.63
EDWARDS	EDWARDS	2.13
ELMERSMITH	ELMERSMITH	1.95
FARMERCITY	FARMERCITY	1.34
G-007A	G-007A	9.61
GIBSON	GIBSON	0.8
HAMLET	HAMLET	1.24
NEWTON	NEWTON	5.34
NYISO	NYISO	33.32
PRAIRIE	PRAIRIE	9.67
SANTEETLA	SANTEETLA	0.44
SMITHLAND	SMITHLAND	0.73
TATANKA	TATANKA	2.46
TILTON	TILTON	2.52
TRIMBLE	TRIMBLE	2.13
TVA	TVA	5.69
UNIONPOWER	UNIONPOWER	2.49
VFT	VFT	26.39

28.2 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
7475775	235139	01AL&D6T	AP	235138	01AL 4J	AP	1	ATSI-P1-2-CEI-345-700T	single	151.0	112.01	114.94	DC	4.44

Bus #	Bus	MW Impact
200608	26PINEY #1	0.32
200642	26SENECA#1	1.48
200643	26SENECA#2	1.57
200644	26SENECA#3	0.12
200662	26SCRUB GR	0.78
200828	26HNSMLK 1	0.49
200829	26HNSMLK 2	0.49
200830	26HNSMLK 3	0.49
200831	26HNSMLK 4	0.49
200832	26HNSMLK 5	0.49
200849	26LAKVU GN	0.04
201201	26WRREN CT	0.38
235030	01MHNG-T155	0.13
235134	01AL&D6	0.75
903643	W3-099 C OP1	0.75
914101	Y2-055	1.59
915951	Y3-092 FTIR	62.98
935191	AD1-154	1.25
938951	AE1-123	1.46
939291	AE1-160 C	0.91
939381	AE1-169 C O1	3.72
942811	AE2-299 C	1.83
942961	AE2-316 C	3.47
943151	AE2-344 C O2	4.44
BLUEG	BLUEG	2.55
CALDERWOOD	CALDERWOOD	0.24
CANNELTON	CANNELTON	0.15
CATAWBA	CATAWBA	0.14
CBM-N	CBM-N	1.32
CHEOAH	CHEOAH	0.22
CHILHOWEE	CHILHOWEE	0.08
COFFEEN	COFFEEN	0.27
COTTONWOOD	COTTONWOOD	0.98
DUCKCREEK	DUCKCREEK	0.59
EDWARDS	EDWARDS	0.27
ELMERSMITH	ELMERSMITH	0.26
FARMERCITY	FARMERCITY	0.17
G-007A	G-007A	1.47
GIBSON	GIBSON	0.11
HAMLET	HAMLET	0.21

Bus #	Bus	MW Impact
NEWTON	NEWTON	0.7
NYISO	NYISO	5.74
PRAIRIE	PRAIRIE	1.28
SANTEETLA	SANTEETLA	0.07
SMITHLAND	SMITHLAND	0.1
TATANKA	TATANKA	0.32
TILTON	TILTON	0.32
TRIMBLE	TRIMBLE	0.28
TVA	TVA	0.81
UNIONPOWER	UNIONPOWER	0.36
VFT	VFT	4.08

28.3 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
7475467	235197	01KARNSC	AP	235152	01BUTLER	AP	1	ATSI-P1-2-CEI-345-700T	single	179.0	134.86	138.36	DC	6.25

Bus #	Bus	MW Impact
200608	26PINEY #1	0.63
200642	26SENECA#1	2.06
200643	26SENECA#2	2.2
200644	26SENECA#3	0.17
200662	26SCRUB GR	1.32
200805	26COLVER13	7.31
200828	26HNSMLK 1	0.62
200829	26HNSMLK 2	0.62
200830	26HNSMLK 3	0.62
200831	26HNSMLK 4	0.62
200832	26HNSMLK 5	0.62
200849	26LAKVU GN	0.05
201201	26WRREN CT	0.53
235030	01MHNG-T155	0.14
903643	W3-099 C OP1	1.03
914101	Y2-055	2.21
915951	Y3-092 FTIR	85.82
919491	AA2-000	26.52
930411	AB1-082	1.22
930511	AB1-092	0.97
932571	AC2-077	1.12
935191	AD1-154	2.38
936421	AD2-055	2.0
936991	AD2-133 C	0.92
938951	AE1-123	2.87
939171	AE1-147 C	0.62
939291	AE1-160 C	1.54
939381	AE1-169 C O1	6.35
940201	AE2-001 C	0.62
940861	AE2-074 C O2	0.93
941191	AE2-113 C O2	4.38
941251	AE2-119 C	0.75
941261	AE2-120 C	0.62
941271	AE2-121 C	0.33
941321	AE2-126 C	0.8
941331	AE2-129 C	0.67
941351	AE2-131 C	0.67
941491	AE2-146 C	4.43
942351	AE2-248 C	0.48
942491	AE2-262 C	2.91

Bus #	Bus	MW Impact
942501	AE2-263 C	2.74
942811	AE2-299 C	2.52
942961	AE2-316 C	4.42
943151	AE2-344 C O2	6.25
BLUEG	BLUEG	3.45
CALDERWOOD	CALDERWOOD	0.32
CANNELTON	CANNELTON	0.21
CATAWBA	CATAWBA	0.18
CBM-N	CBM-N	1.7
CHEOAH	CHEOAH	0.29
CHILHOWEE	CHILHOWEE	0.11
COFFEEN	COFFEEN	0.36
COTTONWOOD	COTTONWOOD	1.31
DUCKCREEK	DUCKCREEK	0.8
EDWARDS	EDWARDS	0.37
ELMERSMITH	ELMERSMITH	0.35
FARMERCITY	FARMERCITY	0.24
G-007A	G-007A	1.67
GIBSON	GIBSON	0.14
HAMLET	HAMLET	0.28
NEWTON	NEWTON	0.95
NYISO	NYISO	7.42
PRAIRIE	PRAIRIE	1.73
SANTEETLA	SANTEETLA	0.09
SMITHLAND	SMITHLAND	0.13
TATANKA	TATANKA	0.43
TILTON	TILTON	0.44
TRIMBLE	TRIMBLE	0.38
TVA	TVA	1.08
UNIONPOWER	UNIONPOWER	0.47
VFT	VFT	4.63

28.4 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
7475852	235203	01KISSNG	AP	235197	01KARNSC	AP	1	PN-P1-2-PN-345-107T	single	268.0	107.77	110.23	DC	6.58

Bus #	Bus	MW Impact
200608	26PINEY #1	0.66
200642	26SENECA#1	2.17
200643	26SENECA#2	2.32
200644	26SENECA#3	0.17
200662	26SCRUB GR	1.39
200805	26COLVER13	7.71
200828	26HNSMLK 1	0.65
200829	26HNSMLK 2	0.65
200830	26HNSMLK 3	0.65
200831	26HNSMLK 4	0.65
200832	26HNSMLK 5	0.65
200849	26LAKVU GN	0.05
201201	26WRREN CT	0.56
903643	W3-099 C OP1	1.09
914101	Y2-055	2.33
915951	Y3-092 FTIR	90.39
919491	AA2-000	27.96
930411	AB1-082	1.29
930511	AB1-092	1.03
932571	AC2-077	1.18
935191	AD1-154	2.51
936421	AD2-055	2.11
936991	AD2-133 C	0.97
938951	AE1-123	3.02
939171	AE1-147 C	0.65
939291	AE1-160 C	1.62
939381	AE1-169 C O1	6.69
940201	AE2-001 C	0.65
940681	AE2-055 C	0.63
940861	AE2-074 C O2	0.98
941191	AE2-113 C O2	4.62
941251	AE2-119 C	0.79
941261	AE2-120 C	0.65
941271	AE2-121 C	0.35
941321	AE2-126 C	0.84
941331	AE2-129 C	0.71
941351	AE2-131 C	0.71
941491	AE2-146 C	4.67
942351	AE2-248 C	0.51
942491	AE2-262 C	3.07

Bus #	Bus	MW Impact
942501	AE2-263 C	2.89
942811	AE2-299 C	2.66
942961	AE2-316 C	4.65
943151	AE2-344 C O2	6.58
BLUEG	BLUEG	3.7
CALDERWOOD	CALDERWOOD	0.35
CANNELTON	CANNELTON	0.22
CATAWBA	CATAWBA	0.19
CBM-N	CBM-N	1.8
CHEOAH	CHEOAH	0.32
CHILHOWEE	CHILHOWEE	0.11
COFFEEN	COFFEEN	0.39
COTTONWOOD	COTTONWOOD	1.41
DUCKCREEK	DUCKCREEK	0.86
EDWARDS	EDWARDS	0.39
ELMERSMITH	ELMERSMITH	0.38
FARMERCITY	FARMERCITY	0.25
G-007A	G-007A	1.8
GIBSON	GIBSON	0.15
HAMLET	HAMLET	0.29
NEWTON	NEWTON	1.01
NYISO	NYISO	7.87
PRAIRIE	PRAIRIE	1.85
SANTEETLA	SANTEETLA	0.09
SMITHLAND	SMITHLAND	0.14
TATANKA	TATANKA	0.46
TILTON	TILTON	0.47
TRIMBLE	TRIMBLE	0.41
TVA	TVA	1.16
UNIONPOWER	UNIONPOWER	0.51
VFT	VFT	5.0

28.5 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
7475923	235204	01KITTAN	AP	235139	01AL&D6T	AP	1	PN-P1-2-PN-345-107T	single	151.0	103.4	106.34	DC	4.44

Bus #	Bus	MW Impact
200608	26PINEY #1	0.32
200642	26SENECA#1	1.48
200643	26SENECA#2	1.58
200644	26SENECA#3	0.12
200662	26SCRUB GR	0.78
200828	26HNSMLK 1	0.49
200829	26HNSMLK 2	0.49
200830	26HNSMLK 3	0.49
200831	26HNSMLK 4	0.49
200832	26HNSMLK 5	0.49
200849	26LAKVU GN	0.04
201201	26WRREN CT	0.38
235030	01MHNG-T155	0.13
903643	W3-099 C OP1	0.75
914101	Y2-055	1.59
915951	Y3-092 FTIR	63.05
935191	AD1-154	1.25
938951	AE1-123	1.46
939291	AE1-160 C	0.91
939381	AE1-169 C O1	3.72
942811	AE2-299 C	1.83
942961	AE2-316 C	3.48
943151	AE2-344 C O2	4.44
BLUEG	BLUEG	2.51
CALDERWOOD	CALDERWOOD	0.24
CANNELTON	CANNELTON	0.15
CATAWBA	CATAWBA	0.14
CBM-N	CBM-N	1.32
CHEOAH	CHEOAH	0.22
CHILHOWEE	CHILHOWEE	0.08
COFFEEN	COFFEEN	0.26
COTTONWOOD	COTTONWOOD	0.97
DUCKCREEK	DUCKCREEK	0.58
EDWARDS	EDWARDS	0.26
ELMERSMITH	ELMERSMITH	0.26
FARMERCITY	FARMERCITY	0.17
G-007A	G-007A	1.49
GIBSON	GIBSON	0.1
HAMLET	HAMLET	0.21
NEWTON	NEWTON	0.69

Bus #	Bus	MW Impact
NYISO	NYISO	5.77
PRAIRIE	PRAIRIE	1.26
SANTEETLA	SANTEETLA	0.06
SMITHLAND	SMITHLAND	0.1
TATANKA	TATANKA	0.31
TILTON	TILTON	0.32
TRIMBLE	TRIMBLE	0.28
TVA	TVA	0.8
UNIONPOWER	UNIONPOWER	0.35
VFT	VFT	4.13

28.6 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
7475523	235240	01COLMBGPN	AP	235202	01KISKIV	AP	1	ATSI-P1-2-CEI-345-700T	single	151.0	129.65	133.14	DC	5.26

Bus #	Bus	MW Impact
200608	26PINEY #1	0.38
200642	26SENECA#1	1.73
200643	26SENECA#2	1.84
200644	26SENECA#3	0.14
200662	26SCRUB GR	0.92
200828	26HNSMLK 1	0.58
200829	26HNSMLK 2	0.58
200830	26HNSMLK 3	0.58
200831	26HNSMLK 4	0.58
200832	26HNSMLK 5	0.58
200849	26LAKVU GN	0.04
201201	26WRREN CT	0.45
235030	01MHNG-T155	0.15
235134	01AL&D6	0.27
903643	W3-099 C OP1	0.89
914101	Y2-055	1.86
915951	Y3-092 FTIR	74.81
930411	AB1-082	1.04
935191	AD1-154	1.43
938951	AE1-123	1.74
939291	AE1-160 C	1.09
939381	AE1-169 C O1	4.42
940861	AE2-074 C O2	0.79
941191	AE2-113 C O2	3.58
941321	AE2-126 C	0.63
942811	AE2-299 C	2.16
942961	AE2-316 C	4.19
943151	AE2-344 C O2	5.26
BLUEG	BLUEG	2.71
CALDERWOOD	CALDERWOOD	0.26
CANNELTON	CANNELTON	0.16
CATAWBA	CATAWBA	0.15
CBM-N	CBM-N	1.46
CHEOAH	CHEOAH	0.24
CHILHOWEE	CHILHOWEE	0.09
COFFEEN	COFFEEN	0.28
COTTONWOOD	COTTONWOOD	1.05
DUCKCREEK	DUCKCREEK	0.62
EDWARDS	EDWARDS	0.28
ELMERSMITH	ELMERSMITH	0.28

Bus #	Bus	MW Impact
FARMERCITY	FARMERCITY	0.18
G-007A	G-007A	1.44
GIBSON	GIBSON	0.11
HAMLET	HAMLET	0.23
NEWTON	NEWTON	0.74
NYISO	NYISO	6.37
PRAIRIE	PRAIRIE	1.36
SANTEETLA	SANTEETLA	0.07
SMITHLAND	SMITHLAND	0.11
TATANKA	TATANKA	0.34
TILTON	TILTON	0.34
TRIMBLE	TRIMBLE	0.3
TVA	TVA	0.86
UNIONPOWER	UNIONPOWER	0.38
VFT	VFT	3.99

28.7 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
7475448	235282	01GARRN	AP	235240	01COLMBGPN	AP	1	PN-P1-2-PN-345-107T	single	151.0	137.8	141.29	DC	5.26

Bus #	Bus	MW Impact
200608	26PINEY #1	0.38
200642	26SENECA#1	1.73
200643	26SENECA#2	1.84
200644	26SENECA#3	0.14
200662	26SCRUB GR	0.92
200828	26HNSMLK 1	0.58
200829	26HNSMLK 2	0.58
200830	26HNSMLK 3	0.58
200831	26HNSMLK 4	0.58
200832	26HNSMLK 5	0.58
200849	26LAKVU GN	0.04
201201	26WRREN CT	0.45
235030	01MHNG-T155	0.15
235134	01AL&D6	0.27
903643	W3-099 C OP1	0.89
914101	Y2-055	1.86
915951	Y3-092 FTIR	74.81
930411	AB1-082	1.04
935191	AD1-154	1.43
938951	AE1-123	1.74
939291	AE1-160 C	1.09
939381	AE1-169 C O1	4.42
940861	AE2-074 C O2	0.79
941191	AE2-113 C O2	3.58
941321	AE2-126 C	0.63
942811	AE2-299 C	2.16
942961	AE2-316 C	4.19
943151	AE2-344 C O2	5.26
BLUEG	BLUEG	2.71
CALDERWOOD	CALDERWOOD	0.26
CANNELTON	CANNELTON	0.16
CATAWBA	CATAWBA	0.15
CBM-N	CBM-N	1.46
CHEOAH	CHEOAH	0.24
CHILHOWEE	CHILHOWEE	0.09
COFFEEN	COFFEEN	0.28
COTTONWOOD	COTTONWOOD	1.05
DUCKCREEK	DUCKCREEK	0.62
EDWARDS	EDWARDS	0.28
ELMERSMITH	ELMERSMITH	0.28

Bus #	Bus	MW Impact
FARMERCITY	FARMERCITY	0.18
G-007A	G-007A	1.44
GIBSON	GIBSON	0.11
HAMLET	HAMLET	0.23
NEWTON	NEWTON	0.74
NYISO	NYISO	6.37
PRAIRIE	PRAIRIE	1.36
SANTEETLA	SANTEETLA	0.07
SMITHLAND	SMITHLAND	0.11
TATANKA	TATANKA	0.34
TILTON	TILTON	0.34
TRIMBLE	TRIMBLE	0.3
TVA	TVA	0.86
UNIONPOWER	UNIONPOWER	0.38
VFT	VFT	3.99

28.8 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
9012506	239036	02PERRY	ATSI	239334	02L.CENTER	ATSI	1	ATSI-P7-1-CEI-345-012	tower	1667.0	131.32	133.74	DC	40.91

Bus #	Bus	MW Impact
200805	26COLVER13	10.93
200823	26MHP_X3-003	5.73
200828	26HNSMLK 1	1.69
200829	26HNSMLK 2	1.69
200830	26HNSMLK 3	1.69
200831	26HNSMLK 4	1.69
200832	26HNSMLK 5	1.69
200849	26LAKVU GN	0.22
200894	26K02	6.61
203999	P-047 E	10.43
236828	01GRAYMONT	0.42
239035	02PERRG1	844.93
290086	Q-036 E	4.08
294573	P-028 E	11.59
903643	W3-099 C OP1	4.27
903644	W3-099 E OP1	28.55
914101	Y2-055	7.35
915951	Y3-092 FTIR	415.19
916202	Z1-069 E	8.55
916351	Z1-091	2.34
918682	AA1-082 E	6.52
919201	AA1-144 O1	18.53
919491	AA2-000	56.63
920341	AA2-132	2.57
925512	AC1-025 E	0.15
930411	AB1-082	3.27
930511	AB1-092	2.08
931092	AB1-160 E	2.44
932571	AC2-077	3.0
935191	AD1-154	2.69
936421	AD2-055	4.28
936991	AD2-133 C	1.84
936992	AD2-133 E	8.4
938951	AE1-123	2.91
939171	AE1-147 C	1.26
939172	AE1-147 E	0.84
939291	AE1-160 C	3.25
939292	AE1-160 E	1.87
939381	AE1-169 C O1	12.63
939382	AE1-169 E O1	8.42
940201	AE2-001 C	1.26

Bus #	Bus	MW Impact
940202	AE2-001 E	0.84
940681	AE2-055 C	1.22
940682	AE2-055 E	0.81
940801	AE2-067 C	1.91
940802	AE2-067 E	0.01
940861	AE2-074 C O2	2.48
940862	AE2-074 E O2	3.27
941191	AE2-113 C O2	10.1
941192	AE2-113 E O2	10.87
941251	AE2-119 C	1.46
941252	AE2-119 E	0.97
941261	AE2-120 C	1.26
941262	AE2-120 E	0.84
941271	AE2-121 C	0.67
941272	AE2-121 E	0.45
941321	AE2-126 C	1.66
941322	AE2-126 E	1.11
941331	AE2-129 C	1.33
941332	AE2-129 E	0.89
941351	AE2-131 C	1.33
941352	AE2-131 E	0.89
941421	AE2-139 C O2	6.94
941422	AE2-139 E O2	4.63
941491	AE2-146 C	11.86
941492	AE2-146 E	16.72
942351	AE2-248 C	0.99
942352	AE2-248 E	0.66
942491	AE2-262 C	5.83
942492	AE2-262 E	3.92
942501	AE2-263 C	5.48
942502	AE2-263 E	3.66
942811	AE2-299 C	10.31
942812	AE2-299 E	41.27
942961	AE2-316 C	5.7
942962	AE2-316 E	8.13
943151	AE2-344 C O2	24.55
943152	AE2-344 E O2	16.36
BLUEG	BLUEG	14.06
CALDERWOOD	CALDERWOOD	1.21
CANNELTON	CANNELTON	0.84
CATAWBA	CATAWBA	0.62
CBM-N	CBM-N	5.58
CHEOAH	CHEOAH	1.1
CHILHOWEE	CHILHOWEE	0.4
COFFEEN	COFFEEN	1.51
COTTONWOOD	COTTONWOOD	5.16
DUCKCREEK	DUCKCREEK	3.4
EDWARDS	EDWARDS	1.56
ELMERSMITH	ELMERSMITH	1.44
FARMERCITY	FARMERCITY	0.98
G-007A	G-007A	7.06
GIBSON	GIBSON	0.59

Bus #	Bus	MW Impact
HAMLET	HAMLET	0.91
NEWTON	NEWTON	3.93
NYISO	NYISO	24.44
PRAIRIE	PRAIRIE	7.11
SANTEETLA	SANTEETLA	0.32
SMITHLAND	SMITHLAND	0.54
TATANKA	TATANKA	1.81
TILTON	TILTON	1.85
TRIMBLE	TRIMBLE	1.56
TVA	TVA	4.19
UNIONPOWER	UNIONPOWER	1.83
VFT	VFT	19.39

28.9 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
9012518	239036	02PERRY	ATSI	238684	02EASTLK	ATSI	1	ATSI-P7-1-CEI-345-016	tower	1667.0	124.19	126.54	DC	39.65

Bus #	Bus	MW Impact
200805	26COLVER13	10.57
200823	26MHP_X3-003	5.55
200828	26HNSMLK 1	1.64
200829	26HNSMLK 2	1.64
200830	26HNSMLK 3	1.64
200831	26HNSMLK 4	1.64
200832	26HNSMLK 5	1.64
200849	26LAKVU GN	0.21
200894	26K02	6.4
203999	P-047 E	10.09
236828	01GRAYMONT	0.41
239035	02PERRG1	804.58
290086	Q-036 E	3.95
294573	P-028 E	11.22
903643	W3-099 C OP1	4.13
903644	W3-099 E OP1	27.67
914101	Y2-055	7.12
915951	Y3-092 FTIR	402.42
916202	Z1-069 E	8.28
916351	Z1-091	2.27
918682	AA1-082 E	6.31
919201	AA1-144 O1	17.94
919491	AA2-000	54.83
920341	AA2-132	2.49
925512	AC1-025 E	0.15
930411	AB1-082	3.17
930511	AB1-092	2.01
931092	AB1-160 E	2.37
932571	AC2-077	2.9
935191	AD1-154	2.61
936421	AD2-055	4.14
936991	AD2-133 C	1.78
936992	AD2-133 E	8.13
938951	AE1-123	2.81
939171	AE1-147 C	1.22
939172	AE1-147 E	0.81
939291	AE1-160 C	3.15
939292	AE1-160 E	1.81
939381	AE1-169 C O1	12.23
939382	AE1-169 E O1	8.16
940201	AE2-001 C	1.22

Bus #	Bus	MW Impact
940202	AE2-001 E	0.81
940681	AE2-055 C	1.18
940682	AE2-055 E	0.79
940801	AE2-067 C	1.85
940802	AE2-067 E	0.01
940861	AE2-074 C O2	2.41
940862	AE2-074 E O2	3.17
941191	AE2-113 C O2	9.78
941192	AE2-113 E O2	10.53
941251	AE2-119 C	1.41
941252	AE2-119 E	0.94
941261	AE2-120 C	1.22
941262	AE2-120 E	0.81
941271	AE2-121 C	0.65
941272	AE2-121 E	0.44
941321	AE2-126 C	1.61
941322	AE2-126 E	1.07
941331	AE2-129 C	1.29
941332	AE2-129 E	0.86
941351	AE2-131 C	1.29
941352	AE2-131 E	0.86
941421	AE2-139 C O2	6.72
941422	AE2-139 E O2	4.48
941491	AE2-146 C	11.49
941492	AE2-146 E	16.2
942351	AE2-248 C	0.96
942352	AE2-248 E	0.64
942491	AE2-262 C	5.65
942492	AE2-262 E	3.8
942501	AE2-263 C	5.31
942502	AE2-263 E	3.54
942811	AE2-299 C	9.99
942812	AE2-299 E	39.99
942961	AE2-316 C	5.52
942962	AE2-316 E	7.87
943151	AE2-344 C O2	23.79
943152	AE2-344 E O2	15.86
BLUEG	BLUEG	13.54
CALDERWOOD	CALDERWOOD	1.16
CANNELTON	CANNELTON	0.81
CATAWBA	CATAWBA	0.6
CBM-N	CBM-N	5.4
CHEOAH	CHEOAH	1.06
CHILHOWEE	CHILHOWEE	0.38
COFFEEN	COFFEEN	1.45
COTTONWOOD	COTTONWOOD	4.97
DUCKCREEK	DUCKCREEK	3.28
EDWARDS	EDWARDS	1.51
ELMERSMITH	ELMERSMITH	1.38
FARMERCITY	FARMERCITY	0.95
G-007A	G-007A	6.81
GIBSON	GIBSON	0.57

Bus #	Bus	MW Impact
HAMLET	HAMLET	0.88
NEWTON	NEWTON	3.78
NYISO	NYISO	23.65
PRAIRIE	PRAIRIE	6.84
SANTEETLA	SANTEETLA	0.31
SMITHLAND	SMITHLAND	0.52
TATANKA	TATANKA	1.74
TILTON	TILTON	1.78
TRIMBLE	TRIMBLE	1.51
TVA	TVA	4.04
UNIONPOWER	UNIONPOWER	1.77
VFT	VFT	18.71

28.10 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
9012541	239082	02S8-ATT	ATSI	238544	02ASH_3	ATSI	8	ATSI-P7-1-CEI-345-016	tower	423.0	117.6	118.78	DC	11.13

Bus #	Bus	MW Impact
239035	02PERRG1	85.1
903643	W3-099 C OP1	1.16
903644	W3-099 E OP1	7.77
914101	Y2-055	2.0
915951	Y3-092 FTIR	112.97
939291	AE1-160 C	0.88
939292	AE1-160 E	0.51
939381	AE1-169 C O1	3.44
939382	AE1-169 E O1	2.29
942811	AE2-299 C	2.81
942812	AE2-299 E	11.23
943151	AE2-344 C O2	6.68
943152	AE2-344 E O2	4.45
BLUEG	BLUEG	3.86
CALDERWOOD	CALDERWOOD	0.33
CANNELTON	CANNELTON	0.23
CATAWBA	CATAWBA	0.17
CBM-N	CBM-N	1.53
CHEOAH	CHEOAH	0.3
CHILHOWEE	CHILHOWEE	0.11
COFFEEN	COFFEEN	0.42
COTTONWOOD	COTTONWOOD	1.42
DUCKCREEK	DUCKCREEK	0.94
EDWARDS	EDWARDS	0.43
ELMERSMITH	ELMERSMITH	0.4
FARMERCITY	FARMERCITY	0.27
G-007A	G-007A	1.94
GIBSON	GIBSON	0.16
HAMLET	HAMLET	0.25
NEWTON	NEWTON	1.08
NYISO	NYISO	6.68
PRAIRIE	PRAIRIE	1.96
SANTEETLA	SANTEETLA	0.09
SMITHLAND	SMITHLAND	0.15
TATANKA	TATANKA	0.5
TILTON	TILTON	0.51
TRIMBLE	TRIMBLE	0.43
TVA	TVA	1.15
UNIONPOWER	UNIONPOWER	0.5
VFT	VFT	5.33

Affected Systems

29 Affected Systems

29.1 LG&E

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

29.2 MISO

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

29.3 TVA

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

29.4 Duke Energy Progress

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

29.5 NYISO

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

30 Contingency Descriptions

Contingency Name	Contingency Definition
ATSI-P1-3-SYS-345-722	CONTINGENCY 'ATSI-P1-3-SYS-345-722' /* TRAN 02S8-ATT 345 TO 02ASH_3 138 CK 8 DISCONNECT BRANCH FROM BUS 239082 TO BUS 238544 CKT 8 /* 02S8-ATT 345 02ASH_3 138 END
ATSI-P1-2-CEI-345-700T	CONTINGENCY 'ATSI-P1-2-CEI-345-700T' /* PN/ATSI ERIE WEST - ASHTABULA - PERRY 345KV DISCONNECT BRANCH FROM BUS 239036 TO BUS 238547 CKT 1 /* 02PERRY 345 02AT 345 DISCONNECT BRANCH FROM BUS 238547 TO BUS 239082 CKT 1 /* 02AT 345 02S8-ATT 345 DISCONNECT BRANCH FROM BUS 239082 TO BUS 238544 CKT 8 /* 02S8-ATT 345 02ASH_3 138 DISCONNECT BRANCH FROM BUS 238547 TO BUS 200599 CKT 1 /* 02AT 345 26ERIE W 345 END
ATSI-P7-1-CEI-345-012	CONTINGENCY 'ATSI-P7-1-CEI-345-012' /* PERRY-EASTLAKE AND PERRY-NORTHFIELD 345KV LINE OUTAGES DISCONNECT BRANCH FROM BUS 238684 TO BUS 239036 CKT 1 /* 02EASTLK 345 02PERRY 345 DISCONNECT BRANCH FROM BUS 239358 TO BUS 239036 CKT 1 /* 02NFIELD 345 02PERRY 345 END
235104 01CABOT 500 239280 02CRNBRY 500 1	CONTINGENCY '235104 01CABOT 500 239280 02CRNBRY 500 1' / 8388 OPEN BRANCH FROM BUS 235104 TO BUS 239280 CKT 1 / 235104 01CABOT 500 239280 02CRNBRY 500 1 END
ATSI-P7-1-CEI-345-016	CONTINGENCY 'ATSI-P7-1-CEI-345-016' /* PERRY-NORTHFEILD AND PERRY-LC 345KV LINE OUTAGES DISCONNECT BRANCH FROM BUS 239036 TO BUS 239358 CKT 1 /* 02PERRY 345 02NFIELD 345 DISCONNECT BRANCH FROM BUS 239036 TO BUS 239334 CKT 1 /* 02PERRY 345 02L.CENTER 345 END
Base Case	
PN-P1-2-PN-345-107T	CONTINGENCY 'PN-P1-2-PN-345-107T' /* ERIE WEST - ASHTABULA - PERRY 345KV DISCONNECT BRANCH FROM BUS 200599 TO BUS 238547 CKT 1 /* 26ERIE W 345 02AT 345 DISCONNECT BRANCH FROM BUS 238547 TO BUS 239082 CKT 1 /* 02AT 345 02S8-ATT 345 DISCONNECT BRANCH FROM BUS 238547 TO BUS 239036 CKT 1 /* 02AT 345 02PERRY 345 DISCONNECT BUS 238547 /* 02AT 345 END

Short Circuit

31 Short Circuit

The following Breakers are overduty:

None

32 Attachment 1: One Line

33 Attachment 2: Project Location