



**Generation Interconnection
Feasibility Study Report
for
Queue Project AE2-013
HIGHLAND-LORDSTOWN 345 KV
1025 MW Capacity / 1170 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 American Transmission Systems, Inc. (ATSI).

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.

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 Natural Gas generating facility located in Trumbull County, Lordstown, Ohio. The installed facilities will have a total capability of 1170 MW with 1025 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is November 1, 2023. This study does not imply a Transmission Owner (TO) commitment to this in-service date.

Queue Number	AE2-013
Project Name	HIGHLAND-LORDSTOWN 345 KV
Interconnection Customer	
State	Ohio
County	Trumbull
Transmission Owner	ATSI
MFO	1170
MWE	1170
MWC	1025
Fuel	Natural Gas
Basecase Study Year	2022

4 Point of Interconnection

4.1 Primary POI

The interconnection of the project at the Primary POI will be accomplished by constructing a new 345 kV eleven (11) breaker breaker-and-a-half substation looping the Highland-Lordstown #1, Highland-Lordstown #2, and Hanna-Highland 345 kV lines into the new substation, and extending a new 345 kV line exit to the Primary POI. The new substation will be located approximately 1.5 miles from Highland 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 substation site. The project will also require non-direct connection upgrades at Hanna, Highland, and Lordstown substations.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AE2-013 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.

4.2 Secondary POI

The interconnection of the project at a Secondary POI can be accomplished by tapping the Highland to Lordstown #1 & #2 345 kV lines in the ATSI area. 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.

5 Cost Summary

The AE2-013 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	\$ 989,288
Direct Connection Network Upgrade	\$ 38,582,213
Non Direct Connection Network Upgrades	\$ 13,207,600
Total Costs	\$ 52,779,101

In addition, the AE2-013 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	\$79,900,300

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 AE2-013 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.

6 Transmission Owner Scope of Work

The interconnection of the project at the Primary POI will be accomplished by constructing a new 345 kV eleven (11) breaker breaker-and-a-half substation looping the Highland-Lordstown #1, Highland-Lordstown #2, and Hanna-Highland 345 kV Lines into the new substation, and extending a new 345 kV line exit to the Primary POI. The new substation will be located approximately 1.5 miles from Highland 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 substation site. The project will also require non-direct connection upgrades at Hanna, Highland, and Lordstown substations.

7 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 breaker-and-a-half substation.	\$989,288
Total Attachment Facility Costs	\$989,288

8 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 greenfield 345kV (11) breaker, breaker and a half switching station	\$38,582,213
Total Direct Connection Facility Costs	\$38,582,213

9 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
Update nameplates and drawings for new AE2-013 substation connection at Lordstown SS	\$ 49,600
Update nameplates and drawings for new AE2-013 substation connection at Hanna SS	\$ 41,500
Update nameplates and drawings for new AE2-013 substation connection at Highland SS	\$ 66,300
Loop the Highland-Lordstown No. 1 345kV line into the proposed AE2-013 substation	\$ 3,756,400
Loop the Highland-Lordstown No. 2 345kV line into the proposed AE2-013 substation	\$ 4,691,000
Loop the Hanna-Highland 345kV line into the proposed AE2-013 substation	\$ 4,602,800
Total Non-Direct Connection Facility Costs	\$13,207,600

10 System Reinforcements Cost Estimate

Upgrade Description	Cost
<p>OEE-006A : Actual emergency rating of the Hanna-Highland 345 kV Line is 1743 MVA. Reconductor roughly 0.15 miles of the existing 3000 AAC transmission line with 48/7 with dual conductor 636 ACSS 45/7. Upgrade terminals as required.</p> <p>Project Type : Facility Cost : \$650,000 Time Estimate : 24.0 Months</p>	\$650,000
<p>OEE-004B : Reconductor roughly 6.8 miles of transmission line of the Highland-Commerce segment of the Bluebell-Highland 138 kV Line. Replace existing transmission line conductor size 336.4 ACSR 30/7 with 336 ACSS</p> <p>Project Type : Facility Cost : \$13,650,000 Time Estimate : 30.0 Months</p>	\$13,650,000
<p>OEE-005A : Reconductor roughly 0.4 miles of transmission line of the Commerce-Republic Special Metals segment of the Bluebell-Highland 138 kV Line. Replace existing transmission line conductor size 336.4 ACSR 30/7 with 336 ACSS</p> <p>Project Type : Facility Cost : \$975,000 Time Estimate : 18.0 Months</p>	\$975,000
<p>OEE-003A : Actual emergency rating of this line segment is 147 MVA. Reconductor roughly 15.6 miles of transmission line of the Bluebell-Republic Special Metals segment of the Bluebell-Highland 138 kV Line. Replace existing transmission line conductor with 336.4 ACSR (a few spans of this conductor are already on this line segment).</p> <p>Project Type : Facility Cost : \$24,375,000 Time Estimate : 36.0 Months</p>	\$24,375,000

Upgrade Description	Cost
<p>OEE-001A : Reconductor the Hanna-Juniper 345 kV (2) 954 kcmil ACSR conductor with (2) 954 kcmil ACSS conductor , reconductor the 3500 SAC substation conductor at Hanna & Juniper, the substation conductor SPS AL 4.0 PIPE and the 954 kcmil 48/7 line drop at Juniper with (2) 954 kcmil ACSS. Upgrade terminals as required.</p> <p>Project Type : Facility Cost : \$35,960,300 Time Estimate : 25.0 Months</p>	<p>\$35,960,300</p>
<p>OEE-002A : Reconductor roughly 1.3 miles of the existing 3000 AAC transmission line with 48/7 with dual conductor 636 ACSS 45/7. Upgrade terminals as required.</p> <p>Project Type : Facility Cost : \$4,290,000 Time Estimate : 24.0 Months</p>	<p>\$4,290,000</p>
<p>TOTAL COST</p>	<p>\$79,900,300</p>

11 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 **38 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. Full initial deposit will be 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.

12 Transmission Owner Analysis

12.1 Power Flow Analysis

FE performed an analysis of its underlying transmission <100 kV system. The AE2-013 project did not contribute to any overloads on the FE transmission system.

13 Interconnection Customer Requirements

13.1 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.

13.2 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 fully rated 345 kV circuit breakers to protect the AE2-013 generator lead lines. A single circuit breaker must be used to protect each 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 AE2-013 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.

13.3 Power Factor Requirements

The IC shall design its Customer Facility with the ability to maintain a power factor of at least 0.95 leading (absorbing VARs) to 0.90 lagging (supplying VARs) measured at the generator's terminals.

14 Revenue Metering and SCADA Requirements

14.1 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.

14.2 ATSI 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>

15 Network Impacts – Primary Point of Interconnection

The Queue Project AE2-013 was evaluated as a 1044.0 MW (Capacity 1025.0 MW) injection tapping the Highland to Lordstown #1 & #2 345 kV lines and Hanna to Highland 345 kV line in the ATSI area. Project AE2-013 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-013 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
8584401	238634	02COMERC	ATSI	239306	02REPUBLICSM	ATSI	1	ATSI-P1-2-SYS-345-816-A	single	185.0	76.84	104.88	DC	51.89
8584413	238781	02HANNA	ATSI	238850	02JUNIBE	ATSI	1	ATSI-P1-2-SYS-345-813	single	1892.0	94.36	101.16	DC	128.65
8584140	238797	02HGHLND	ATSI	238634	02COMERC	ATSI	1	ATSI-P1-2-SYS-345-816-A	single	158.0	95.66	128.5	DC	51.89
8584142	238797	02HGHLND	ATSI	238634	02COMERC	ATSI	1	ATSI-P1-2-SYS-345-816-B	single	158.0	68.38	101.22	DC	51.89
8584060	239306	02REPUBLICSM	ATSI	238575	02BLUBEL	ATSI	1	ATSI-P1-2-SYS-345-816-B	single	132.0	70.78	110.09	DC	51.89
2099416	930600	AB1-105 TAP	ATSI	238781	02HANNA	ATSI	1	Base Case	single	1413.0	92.51	116.17	DC	334.41
2099555	940140	AE2-013 TAP	ATSI	930600	AB1-105 TAP	ATSI	1	DLC_P12_320	single	1672.0	85.33	104.12	DC	328.64
8584373	940140	AE2-013 TAP	ATSI	930600	AB1-105 TAP	ATSI	1	ATSI-P1-2-SYS-345-812	single	1672.0	85.94	104.77	DC	329.31

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
2099150	238781	02HANNA	ATSI	238850	02JUNIBE	ATSI	1	ATSI-P2-3-OEC-345-006	breaker	1892.0	97.22	104.24	DC	132.63
2099151	238781	02HANNA	ATSI	238850	02JUNIBE	ATSI	1	ATSI-P2-3-OEC-345-009	breaker	1892.0	94.37	101.33	DC	131.67
2099161	238797	02HGHLND	ATSI	238634	02COMERC	ATSI	1	ATSI-P2-3-OEC-345-002	breaker	158.0	93.21	108.31	DC	52.94

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
2099097	239306	02REPUBLICSM	ATSI	238575	02BLUBEL	ATSI	1	ATSI-P2-3-OEC-345-002	breaker	132.0	100.51	118.58	DC	52.94
8584058	239306	02REPUBLICSM	ATSI	238575	02BLUBEL	ATSI	1	ATSI-P1-2-SYS-345-816-A	single	132.0	103.45	142.75	DC	51.89
2099414	930600	AB1-105 TAP	ATSI	238781	02HANNA	ATSI	1	DLC_P12_320	single	1672.0	104.94	124.6	DC	328.64
8584164	930600	AB1-105 TAP	ATSI	238781	02HANNA	ATSI	1	ATSI-P1-2-SYS-345-812	single	1672.0	103.68	123.38	DC	329.31

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	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
8584412	238781	02HANNA	ATSI	238850	02JUNIP	ATSI	1	ATSI-P1-2-SYS-345-813	operation	1892.0	94.36	101.29	DC	131.03
8584141	238797	02HGHLND	ATSI	238634	02COMERC	ATSI	1	ATSI-P1-2-SYS-345-816-A	operation	158.0	92.27	107.34	DC	52.85
8584059	239306	02REPUBLICSM	ATSI	238575	02BLUBEL	ATSI	1	ATSI-P1-2-SYS-345-816-A	operation	132.0	99.38	117.42	DC	52.85
2099413	930600	AB1-105 TAP	ATSI	238781	02HANNA	ATSI	1	DLC_P12_320	operation	1672.0	100.61	120.39	DC	334.73
2099415	930600	AB1-105 TAP	ATSI	238781	02HANNA	ATSI	1	Base Case	operation	1413.0	90.37	114.25	DC	340.6
8584375	940140	AE2-013 TAP	ATSI	930600	AB1-105 TAP	ATSI	1	ATSI-P1-2-SYS-345-880A_FSA	operation	1672.0	72.63	97.32	DC	416.46

15.5 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
8584373,2099555	6	AE2-013 TAP 345.0 kV - AB1-105 TAP 345.0 kV Ckt 1	OEE-006A : Actual emergency rating of the Hanna-Highland 345 kV Line is 1743 MVA. Reconductor roughly 0.15 miles of the existing 3000 AAC transmission line with 48/7 with dual conductor 636 ACSS 45/7. Upgrade terminals as required. Project Type : Facility Cost : \$650,000 Time Estimate : 24.0 Months	\$650,000
8584140,8584142,2099161	3	02HGLND 138.0 kV - 02COMERC 138.0 kV Ckt 1	OEE-004A : Reconductor roughly 6.8 miles of transmission line of the Highland-Commerce segment of the Bluebell-Highland 138 kV Line. Replace existing transmission line conductor size 336.4 ACSR 30/7 with 336.4 ACSR 26/7 (a few spans of this conductor are already on this line segment). Project Type : Facility Cost : \$11,375,000 Time Estimate : 30.0 Months OEE-004B : Reconductor roughly 6.8 miles of transmission line of the Highland-Commerce segment of the Bluebell-Highland 138 kV Line. Replace existing transmission line conductor size 336.4 ACSR 30/7 with 336 ACSS Project Type : Facility Cost : \$13,650,000 Time Estimate : 30.0 Months	\$13,650,000
8584401	1	02COMERC 138.0 kV - 02REPUBLICSM 138.0 kV Ckt 1	OEE-005A : Reconductor roughly 0.4 miles of transmission line of the Commerce-Republic Special Metals segment of the Bluebell-Highland 138 kV Line. Replace existing transmission line conductor size 336.4 ACSR 30/7 with 336 ACSS Project Type : Facility Cost : \$975,000 Time Estimate : 18.0 Months	\$975,000
8584060,2099097,8584058	4	02REPUBLICSM 138.0 kV - 02BLUBEL 138.0 kV Ckt 1	OEE-003A : Actual emergency rating of this line segment is 147 MVA. Reconductor roughly 15.6 miles of transmission line of the Bluebell-Republic Special Metals segment of the Bluebell-Highland 138 kV Line. Replace existing transmission line conductor with 336.4 ACSR (a few spans of this conductor are already on this line segment). Project Type : Facility Cost : \$24,375,000 Time Estimate : 36.0 Months	\$24,375,000
8584413,2099151,2099150	2	02HANNA 345.0 kV - 02JUNIP 345.0 kV Ckt 1	OEE-001A : Reconductor the Hanna-Juniper 345 kV (2) 954 kcmil ACSR conductor with (2) 954 kcmil ACSS conductor , reconductor the 3500 SAC substation conductor at Hanna & Juniper, the substation conductor SPS AL 4.0 PIPE and the 954 kcmil 48/7 line drop at Juniper with (2) 954 kcmil ACSS. Upgrade terminals as required. Project Type : Facility Cost : \$35,960,300 Time Estimate : 25.0 Months	\$35,960,300

ID	Index	Facility	Upgrade Description	Cost
8584164,2099414,2099416	5	AB1-105 TAP 345.0 kV - 02HANNA 345.0 kV Ckt 1	<p>OEE-002A : Reconductor roughly 1.3 miles of the existing 3000 AAC transmission line with 48/7 with dual conductor 636 ACSS 45/7. Upgrade terminals as required.</p> <p>Project Type : Facility Cost : \$4,290,000 Time Estimate : 24.0 Months</p>	\$4,290,000
			TOTAL COST	\$79,900,300

15.6 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.

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15.7 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
8584401	238634	02COMERC	ATSI	239306	02REPUBLICSM	ATSI	1	ATSI-P1-2-SYS-345-816-A	single	185.0	76.84	104.88	DC	51.89

Bus #	Bus	MW Impact
930601	AB1-105 O1	43.11
940121	AE2-013 C	51.89
BLUEG	BLUEG	1.58
CALDERWOOD	CALDERWOOD	0.13
CANNELTON	CANNELTON	0.09
CATAWBA	CATAWBA	0.07
CBM-N	CBM-N	0.14
CHEOAH	CHEOAH	0.12
CHILHOWEE	CHILHOWEE	0.04
COFFEEN	COFFEEN	0.16
COTTONWOOD	COTTONWOOD	0.56
DUCKCREEK	DUCKCREEK	0.36
EDWARDS	EDWARDS	0.17
ELMERSMITH	ELMERSMITH	0.16
FARMERCITY	FARMERCITY	0.11
G-007A	G-007A	0.41
GIBSON	GIBSON	0.07
HAMLET	HAMLET	0.1
NEWTON	NEWTON	0.43
NYISO	NYISO	0.6
PRAIRIE	PRAIRIE	0.77
SANTEETLA	SANTEETLA	0.04
SMITHLAND	SMITHLAND	0.06
TATANKA	TATANKA	0.19
TILTON	TILTON	0.2
TRIMBLE	TRIMBLE	0.18
TVA	TVA	0.46
UNIONPOWER	UNIONPOWER	0.2
VFT	VFT	1.12

15.8 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
2099150	238781	02HANNA	ATSI	238850	02JUNIP	ATSI	1	ATSI-P2-3-OEC-345-006	breaker	1892.0	97.22	104.24	DC	132.63

Bus #	Bus	MW Impact
238965	02MNF DG1	64.71
238966	02MNF DG2	64.71
238967	02MNF DG3	64.71
239085	02SAM MG1	9.84
239086	02SAM MG2	9.57
239214	02NILE-A	0.32
239292	02SAM-EMD	0.71
253900	15BVRVL1	71.95
253901	15BVRVL2	72.34
915692	Y3-103 E	7.54
915952	Y3-092 FTWR	75.73
915953	Y3-092 NFWR	75.73
917131	Z2-028 OP1	11.98
923821	AB2-019	4.24
930072	AB1-015 E	1.87
930081	AB1-017	0.96
930601	AB1-105 O1	117.29
933532	AC2-168 E	0.47
934021	AD1-026	12.13
935022	AD1-135 E	0.33
936951	AD2-120 C O1	4.62
936952	AD2-120 E O1	6.39
938202	AE1-029 E	0.43
938581	AE1-079 C O1	1.06
938582	AE1-079 E O1	0.57
938583	AE1-079 CBAT	0.08
939541	AE1-183 C	0.94
939542	AE1-183 E	0.63
939971	AE1-237 C1	1.06
939972	AE1-237 E1	0.57
939973	AE1-237 C2	0.08
940121	AE2-013 C	130.22
940122	AE2-013 E	2.41
940511	AE2-036 C	1.23
940512	AE2-036 E	0.58
941201	AE2-114 C	0.74
941202	AE2-114 E	0.49
941211	AE2-115 C	0.74
941212	AE2-115 E	0.49
941221	AE2-116 C	0.74
941222	AE2-116 E	0.49

Bus #	Bus	MW Impact
941881	AE2-193 C	4.65
941882	AE2-193 E	6.43
942611	AE2-277 C	1.18
942612	AE2-277 E	1.63
942691	AE2-285 C O1	2.67
942692	AE2-285 E O1	1.78
942813	AE2-299 BAT	18.02
943141	AE2-343 C	1.2
943142	AE2-343 E	0.58
BLUEG	BLUEG	4.54
CALDERWOOD	CALDERWOOD	0.17
CANNELTON	CANNELTON	0.28
CARR	CARR	0.46
CBM-S2	CBM-S2	0.13
CHEOAH	CHEOAH	0.15
CHILHOWEE	CHILHOWEE	0.06
COFFEEN	COFFEEN	0.66
COTTONWOOD	COTTONWOOD	1.44
CPL	CPL	0.16
DUCKCREEK	DUCKCREEK	1.69
EDWARDS	EDWARDS	0.8
ELMERSMITH	ELMERSMITH	0.48
FARMERCITY	FARMERCITY	0.43
G-007A	G-007A	1.08
GIBSON	GIBSON	0.23
NEWTON	NEWTON	1.63
PRAIRIE	PRAIRIE	2.8
RENSSELAER	RENSSELAER	0.35
SANTEETLA	SANTEETLA	0.04
SMITHLAND	SMITHLAND	0.18
TATANKA	TATANKA	0.85
TILTON	TILTON	0.85
TRIMBLE	TRIMBLE	0.5
TVA	TVA	0.96
UNIONPOWER	UNIONPOWER	0.45
VFT	VFT	2.78

15.9 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
8584140	238797	02HGLND	ATSI	238634	02COMERC	ATSI	1	ATSI-P1-2-SYS-345-816-A	single	158.0	95.66	128.5	DC	51.89

Bus #	Bus	MW Impact
930601	AB1-105 O1	43.11
940121	AE2-013 C	51.89
BLUEG	BLUEG	1.58
CALDERWOOD	CALDERWOOD	0.13
CANNELTON	CANNELTON	0.09
CATAWBA	CATAWBA	0.07
CBM-N	CBM-N	0.14
CHEOAH	CHEOAH	0.12
CHILHOWEE	CHILHOWEE	0.04
COFFEEN	COFFEEN	0.16
COTTONWOOD	COTTONWOOD	0.56
DUCKCREEK	DUCKCREEK	0.36
EDWARDS	EDWARDS	0.17
ELMERSMITH	ELMERSMITH	0.16
FARMERCITY	FARMERCITY	0.11
G-007A	G-007A	0.41
GIBSON	GIBSON	0.07
HAMLET	HAMLET	0.1
NEWTON	NEWTON	0.43
NYISO	NYISO	0.6
PRAIRIE	PRAIRIE	0.77
SANTEETLA	SANTEETLA	0.04
SMITHLAND	SMITHLAND	0.06
TATANKA	TATANKA	0.19
TILTON	TILTON	0.2
TRIMBLE	TRIMBLE	0.18
TVA	TVA	0.46
UNIONPOWER	UNIONPOWER	0.2
VFT	VFT	1.12

15.10 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
8584058	239306	02REPUBLICSM	ATSI	238575	02BLUBEL	ATSI	1	ATSI-P1-2-SYS-345-816-A	single	132.0	103.45	142.75	DC	51.89

Bus #	Bus	MW Impact
930601	AB1-105 O1	43.11
940121	AE2-013 C	51.89
BLUEG	BLUEG	1.58
CALDERWOOD	CALDERWOOD	0.13
CANNELTON	CANNELTON	0.09
CATAWBA	CATAWBA	0.07
CBM-N	CBM-N	0.14
CHEOAH	CHEOAH	0.12
CHILHOWEE	CHILHOWEE	0.04
COFFEEN	COFFEEN	0.16
COTTONWOOD	COTTONWOOD	0.56
DUCKCREEK	DUCKCREEK	0.36
EDWARDS	EDWARDS	0.17
ELMERSMITH	ELMERSMITH	0.16
FARMERCITY	FARMERCITY	0.11
G-007A	G-007A	0.41
GIBSON	GIBSON	0.07
HAMLET	HAMLET	0.1
NEWTON	NEWTON	0.43
NYISO	NYISO	0.6
PRAIRIE	PRAIRIE	0.77
SANTEETLA	SANTEETLA	0.04
SMITHLAND	SMITHLAND	0.06
TATANKA	TATANKA	0.19
TILTON	TILTON	0.2
TRIMBLE	TRIMBLE	0.18
TVA	TVA	0.46
UNIONPOWER	UNIONPOWER	0.2
VFT	VFT	1.12

15.11 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
2099414	930600	AB1-105 TAP	ATSI	238781	02HANNA	ATSI	1	DLC_P12_320	single	1672.0	104.94	124.6	DC	328.64

Bus #	Bus	MW Impact
238965	02MNFDG1	48.6
238966	02MNFDG2	48.6
238967	02MNFDG3	48.6
238995	02NCUNTD	0.04
239022	02NWCAG3	1.41
239023	02NWCAG4	1.51
239024	02NWCAG5	2.21
239085	02SAMMG1	13.3
239086	02SAMMG2	12.93
239087	02SAMMG3	9.97
239088	02SAMMG4	9.81
239089	02SAMMG5	15.54
239090	02SAMMG6	32.0
239091	02SAMMG7	32.0
239214	02NILE-A	0.72
239292	02SAM-EMD	0.96
240195	02CARBONLM	0.33
240213	02MHNGLFH093	0.09
253900	15BVRVL1	53.24
253901	15BVRVL2	53.53
915952	Y3-092 FTWR	32.72
917131	Z2-028 OP1	29.56
918321	AA1-044 C	18.21
919011	AA1-123	14.91
923821	AB2-019	1.83
930081	AB1-017	2.36
930601	AB1-105 O1	312.19
934021	AD1-026	22.33
936951	AD2-120 C O1	9.44
938581	AE1-079 C O1	2.17
938583	AE1-079 CBAT	0.29
939541	AE1-183 C	1.9
939971	AE1-237 C1	2.17
939973	AE1-237 C2	0.29
940121	AE2-013 C	328.64
940511	AE2-036 C	2.52
941881	AE2-193 C	9.5
942611	AE2-277 C	2.36
942691	AE2-285 C O1	5.47
943141	AE2-343 C	2.46
BLUEG	BLUEG	8.47
CALDERWOOD	CALDERWOOD	0.63

Bus #	Bus	MW Impact
CANNELTON	CANNELTON	0.51
CATAWBA	CATAWBA	0.28
CBM-N	CBM-N	0.12
CHEOAH	CHEOAH	0.58
CHILHOWEE	CHILHOWEE	0.21
COFFEEN	COFFEEN	0.96
COTTONWOOD	COTTONWOOD	2.98
DUCKCREEK	DUCKCREEK	2.24
EDWARDS	EDWARDS	1.04
ELMERSMITH	ELMERSMITH	0.87
FARMERCITY	FARMERCITY	0.63
G-007A	G-007A	2.09
GIBSON	GIBSON	0.37
HAMLET	HAMLET	0.38
NEWTON	NEWTON	2.48
NYISO	NYISO	0.47
PRAIRIE	PRAIRIE	4.42
SANTEETLA	SANTEETLA	0.17
SMITHLAND	SMITHLAND	0.32
TATANKA	TATANKA	1.17
TILTON	TILTON	1.2
TRIMBLE	TRIMBLE	0.94
TVA	TVA	2.35
UNIONPOWER	UNIONPOWER	1.03
VFT	VFT	5.61

15.12 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
8584373	940140	AE2-013 TAP	ATSI	930600	AB1-105 TAP	ATSI	1	ATSI-P1-2-SYS-345-812	single	1672.0	85.94	104.77	DC	329.31

Bus #	Bus	MW Impact
238965	02MNF DG1	51.58
238966	02MNF DG2	51.58
238967	02MNF DG3	51.58
238995	02NCUNTD	0.04
239022	02NWCAG3	1.42
239023	02NWCAG4	1.52
239024	02NWCAG5	2.24
239085	02SAMMG1	13.32
239086	02SAMMG2	12.95
239090	02SAMMG6	31.86
239091	02SAMMG7	31.86
239214	02NILE-A	0.72
239292	02SAM-EMD	0.96
240195	02CARBONLM	0.33
240213	02MHNGLFH093	0.09
253900	15BVRVL1	52.48
253901	15BVRVL2	52.76
915952	Y3-092 FTWR	32.73
917131	Z2-028 OP1	29.63
918321	AA1-044 C	18.4
919011	AA1-123	14.91
923821	AB2-019	1.83
930081	AB1-017	2.37
934021	AD1-026	22.56
936951	AD2-120 C O1	9.5
938581	AE1-079 C O1	2.18
938583	AE1-079 CBAT	0.29
939541	AE1-183 C	1.91
939971	AE1-237 C1	2.18
939973	AE1-237 C2	0.29
940121	AE2-013 C	329.31
940511	AE2-036 C	2.53
941881	AE2-193 C	9.56
942611	AE2-277 C	2.37
942691	AE2-285 C O1	5.5
943141	AE2-343 C	2.47
BLUEG	BLUEG	8.52
CALDERWOOD	CALDERWOOD	0.64
CANNELTON	CANNELTON	0.51
CATAWBA	CATAWBA	0.28
CBM-N	CBM-N	0.12

Bus #	Bus	MW Impact
CHEOAH	CHEOAH	0.58
CHILHOWEE	CHILHOWEE	0.21
COFFEEN	COFFEEN	0.97
COTTONWOOD	COTTONWOOD	3.0
DUCKCREEK	DUCKCREEK	2.25
EDWARDS	EDWARDS	1.04
ELMERSMITH	ELMERSMITH	0.87
FARMERCITY	FARMERCITY	0.63
G-007A	G-007A	2.1
GIBSON	GIBSON	0.37
HAMLET	HAMLET	0.38
NEWTON	NEWTON	2.49
NYISO	NYISO	0.49
PRAIRIE	PRAIRIE	4.45
SANTEETLA	SANTEETLA	0.17
SMITHLAND	SMITHLAND	0.32
TATANKA	TATANKA	1.18
TILTON	TILTON	1.2
TRIMBLE	TRIMBLE	0.95
TVA	TVA	2.36
UNIONPOWER	UNIONPOWER	1.04
VFT	VFT	5.65

Affected Systems

15.13 Affected Systems

15.13.1 LG&E

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

15.13.2 MISO

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

15.13.3 TVA

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

15.13.4 Duke Energy Progress

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

15.13.5 NYISO

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

15.14 Contingency Descriptions

Contingency Name	Contingency Definition
DLC_P12_320	CONTINGENCY 'DLC_P12_320' DISCONNECT BRANCH FROM BUS 253902 TO BUS 238781 CKT 1 /* 15BVRVAL 345.00 02HANNA 345.00 END
ATSI-P1-2-SYS-345-880A_FSA	CONTINGENCY 'ATSI-P1-2-SYS-345-880A_FSA' /* LINE 02SAMMIS TO Z2-028 345 CK 1 DISCONNECT BRANCH FROM BUS 239092 TO BUS 919010 CKT 1 /* 02SAMMIS 345 AA1-123 345 END
ATSI-P2-3-OEC-345-009	CONTINGENCY 'ATSI-P2-3-OEC-345-009' /* CHAMBERLIN 345KV BRK B-88 DISCONNECT BRANCH FROM BUS 238615 TO BUS 238781 CKT 1 /* 02CHAMBR 345 02HANNA 345 DISCONNECT BRANCH FROM BUS 238615 TO BUS 238617 CKT 4 /* 02CHAMBR 345 02CHMBER 138 END
ATSI-P2-3-OEC-345-002	CONTINGENCY 'ATSI-P2-3-OEC-345-002' /* HANNA 345KV BRK B-194 DISCONNECT BRANCH FROM BUS 238781 TO BUS 930600 CKT 1 /* 02HANNA 345 AB1-105 TAP 345 /* CONTINGENCY LINE ADDED FOR AE1 BUILD DISCONNECT BRANCH FROM BUS 238781 TO BUS 238850 CKT 1 /* 02HANNA 345 02JUNIPÉ 345 END
ATSI-P1-2-SYS-345-816-B	CONTINGENCY 'ATSI-P1-2-SYS-345-816-B' /* LINE AB1-105 TAP TO AE2-013 TAP 345 CK 1 DISCONNECT BRANCH FROM BUS 930600 TO BUS 940140 CKT 1 /* AB1-105 TAP 345 AE2-013 TAP 345 END
ATSI-P1-2-SYS-345-816-A	CONTINGENCY 'ATSI-P1-2-SYS-345-816-A' /* LINE 02HANNA TO AB1-105 TAP 345 CK 1 DISCONNECT BRANCH FROM BUS 238781 TO BUS 930600 CKT 1 /* 02HANNA 345 AB1-105 TAP 345 END
ATSI-P2-3-OEC-345-006	CONTINGENCY 'ATSI-P2-3-OEC-345-006' /* HANNA 345KV BRK B-106 DISCONNECT BRANCH FROM BUS 238781 TO BUS 238615 CKT 1 /* 02HANNA 345 02CHAMBR 345 DISCONNECT BRANCH FROM BUS 238781 TO BUS 238782 CKT 2 /* 02HANNA 345 02HANNA 138 END
Base Case	
ATSI-P1-2-SYS-345-812	CONTINGENCY 'ATSI-P1-2-SYS-345-812' /* LINE 02MANSFD TO 02HANNA 345 CK 1 DISCONNECT BRANCH FROM BUS 238941 TO BUS 238781 CKT 1 /* 02MANSFD 345 02HANNA 345 END
ATSI-P1-2-SYS-345-813	CONTINGENCY 'ATSI-P1-2-SYS-345-813' /* LINE 02HANNA TO 02CHAMBR 345 CK 1 DISCONNECT BRANCH FROM BUS 238615 TO BUS 238781 CKT 1 /* 02CHAMBR 345 02HANNA 345 END

Short Circuit

15.15 Short Circuit

The following Breakers are overduty:

Bus Number	Bus Name	BREAKER	Type	Capacity (Amps)	Duty Percentage Post Queue	Duty Percentage Pre Queue
238797	HIGHLAND 138	*B-111	S	56517.3	101.11%	94.36%
238797	HIGHLAND 138	*B-158	S	56517.3	101.11%	94.36%
238797	HIGHLAND 138	*B-18	S	56517.3	101.11%	94.36%
238797	HIGHLAND 138	*B-2	S	56517.3	101.11%	94.36%
238797	HIGHLAND 138	*B-24	S	56517.3	101.11%	94.36%
238797	HIGHLAND 138	*B-30	S	56517.3	101.11%	94.36%
238797	HIGHLAND 138	*B-40	S	56517.3	101.11%	94.36%
238797	HIGHLAND 138	*B-82	S	56517.3	101.11%	94.36%
238797	HIGHLAND 138	*B-92	S	56517.3	101.11%	94.36%
238708	EVERGREEN138	B-16	S	37386.7	100.82%	97.47%
238708	EVERGREEN138	B-20	S	37386.7	100.39%	97.47%
238708	EVERGREEN138	B-21	S	37386.7	100.49%	96.89%
238708	EVERGREEN138	B-6	S	37386.7	100.59%	97.00%
238708	EVERGREEN138	B-65	S	37386.7	100.24%	96.64%

*If the Customer chooses to move forward with the System Impact Study, FE will require an additional study to verify the fault current capability of the Highland 138 kV substation equipment. This study may uncover additional required upgrades not identified as part of the Feasibility Study. The Customer will be responsible for any upgrades to the Highland 138 kV substation to meet the increased fault current requirements.

16 Network Impacts – Secondary Point of Interconnection

The Queue Project AE2-013 was evaluated as a 1044.0 MW (Capacity 1025.0 MW) injection tapping the Highland to Lordstown #1 & #2 345 kV lines in the ATSI area. Project AE2-013 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-013 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

16.1 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
8584401	238634	02COMERC	ATSI	239306	02REPUBLICSM	ATSI	1	ATSI-P1-2-SYS-345-816-A	single	185.0	73.76	100.1	AC	51.89
8584413	238781	02HANNA	ATSI	238850	02JUNIPÉ	ATSI	1	ATSI-P1-2-SYS-345-813	single	1892.0	96.3	103.49	AC	128.65
8584440	238781	02HANNA	ATSI	238615	02CHAMBR	ATSI	1	ATSI-P1-2-SYS-345-714	single	1646.0	94.09	100.51	AC	100.26
8584140	238797	02HGHLND	ATSI	238634	02COMERC	ATSI	1	ATSI-P1-2-SYS-345-816-A	single	158.0	91.75	122.53	AC	51.89
8584058	239306	02REPUBLICSM	ATSI	238575	02BLUBEL	ATSI	1	ATSI-P1-2-SYS-345-816-A	single	132.0	99.27	136.27	AC	51.89
8584060	239306	02REPUBLICSM	ATSI	238575	02BLUBEL	ATSI	1	ATSI-P1-2-SYS-345-816-B	single	132.0	68.95	105.52	AC	51.89
2099416	930600	AB1-105 TAP	ATSI	238781	02HANNA	ATSI	1	Base Case	single	1413.0	92.62	116.6	AC	334.41
2099555	940140	AE2-013 TAP	ATSI	930600	AB1-105 TAP	ATSI	1	DLC_P12_320	single	1672.0	86.7	105.72	AC	328.64
8584373	940140	AE2-013 TAP	ATSI	930600	AB1-105 TAP	ATSI	1	ATSI-P1-2-SYS-345-812	single	1672.0	87.23	106.31	AC	329.31

16.2 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
2099150	238781	02HANNA	ATSI	238850	02JUNIPÉ	ATSI	1	ATSI-P2-3-OEC-345-006	breaker	1892.0	98.68	105.93	AC	132.63
2099151	238781	02HANNA	ATSI	238850	02JUNIPÉ	ATSI	1	ATSI-P2-3-OEC-345-009	breaker	1892.0	95.68	102.88	AC	131.67
2099152	238781	02HANNA	ATSI	238850	02JUNIPÉ	ATSI	1	ATSI-P2-3-OEC-345-011	breaker	1892.0	95.68	102.87	AC	131.67
8583896	238781	02HANNA	ATSI	238615	02CHAMBR	ATSI	1	ATSI-P2-3-CEI-345-025	breaker	1646.0	94.27	99.34	AC	98.26
8583897	238781	02HANNA	ATSI	238615	02CHAMBR	ATSI	1	ATSI-P2-3-CEI-345-024	breaker	1646.0	93.23	98.5	AC	102.11
2099161	238797	02HGHLND	ATSI	238634	02COMERC	ATSI	1	ATSI-P2-3-OEC-345-002	breaker	158.0	91.57	120.05	AC	52.94

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
2099097	239306	02REPUBLICSM	ATSI	238575	02BLUBEL	ATSI	1	ATSI-P2-3-OEC-345-002	breaker	132.0	98.71	132.81	AC	52.94

16.3 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
2099414	930600	AB1-105 TAP	ATSI	238781	02HANNA	ATSI	1	DLC_P12_320	single	1672.0	106.4	126.35	AC	328.64
8584164	930600	AB1-105 TAP	ATSI	238781	02HANNA	ATSI	1	ATSI-P1-2-SYS-345-812	single	1672.0	105.06	125.06	AC	329.31

16.4 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
8584412	238781	02HANNA	ATSI	238850	02JUNIBE	ATSI	1	ATSI-P1-2-SYS-345-813	operation	1892.0	95.7	102.86	AC	131.03
8584441	238781	02HANNA	ATSI	238615	02CHAMBR	ATSI	1	ATSI-P1-2-SYS-345-714	operation	1646.0	93.18	98.45	AC	102.11
8584141	238797	02HGHLND	ATSI	238634	02COMERC	ATSI	1	ATSI-P1-2-SYS-345-816-A	operation	158.0	90.64	119.07	AC	52.85
8584059	239306	02REPUBLICSM	ATSI	238575	02BLUBEL	ATSI	1	ATSI-P1-2-SYS-345-816-A	operation	132.0	97.59	131.62	AC	52.85
2099413	930600	AB1-105 TAP	ATSI	238781	02HANNA	ATSI	1	DLC_P12_320	operation	1672.0	100.69	120.68	AC	334.73
2099415	930600	AB1-105 TAP	ATSI	238781	02HANNA	ATSI	1	Base Case	operation	1413.0	90.35	114.47	AC	340.6
8584375	940140	AE2-013 TAP	ATSI	930600	AB1-105 TAP	ATSI	1	ATSI-P1-2-SYS-345-880A_FSA	operation	1672.0	72.47	97.66	AC	416.46

16.5 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.

16.6 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
8584401	238634	02COMERC	ATSI	239306	02REPUBLICSM	ATSI	1	ATSI-P1-2-SYS-345-816-A	single	185.0	73.76	100.1	AC	51.89

Bus #	Bus	MW Impact
930601	AB1-105 O1	43.11
940121	AE2-013 C	51.89
BLUEG	BLUEG	1.58
CALDERWOOD	CALDERWOOD	0.13
CANNELTON	CANNELTON	0.09
CATAWBA	CATAWBA	0.07
CBM-N	CBM-N	0.14
CHEOAH	CHEOAH	0.12
CHILHOWEE	CHILHOWEE	0.04
COFFEEN	COFFEEN	0.16
COTTONWOOD	COTTONWOOD	0.56
DUCKCREEK	DUCKCREEK	0.36
EDWARDS	EDWARDS	0.17
ELMERSMITH	ELMERSMITH	0.16
FARMERCITY	FARMERCITY	0.11
G-007A	G-007A	0.41
GIBSON	GIBSON	0.07
HAMLET	HAMLET	0.1
NEWTON	NEWTON	0.43
NYISO	NYISO	0.6
PRAIRIE	PRAIRIE	0.77
SANTEETLA	SANTEETLA	0.04
SMITHLAND	SMITHLAND	0.06
TATANKA	TATANKA	0.19
TILTON	TILTON	0.2
TRIMBLE	TRIMBLE	0.18
TVA	TVA	0.46
UNIONPOWER	UNIONPOWER	0.2
VFT	VFT	1.12

16.7 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
2099150	238781	02HANNA	ATSI	238850	02JUNIP	ATSI	1	ATSI-P2-3-OEC-345-006	breaker	1892.0	98.68	105.93	AC	132.63

Bus #	Bus	MW Impact
238965	02MNF DG1	64.71
238966	02MNF DG2	64.71
238967	02MNF DG3	64.71
239085	02SAM MG1	9.84
239086	02SAM MG2	9.57
239214	02NILE-A	0.32
239292	02SAM-EMD	0.71
253900	15BVRV L1	71.95
253901	15BVRV L2	72.34
915692	Y3-103 E	7.54
915952	Y3-092 FTWR	75.73
915953	Y3-092 NFTWR	75.73
917131	Z2-028 OP1	11.98
923821	AB2-019	4.24
930072	AB1-015 E	1.87
930081	AB1-017	0.96
930601	AB1-105 O1	117.29
933532	AC2-168 E	0.47
934021	AD1-026	12.13
935022	AD1-135 E	0.33
936951	AD2-120 C O1	4.62
936952	AD2-120 E O1	6.39
938202	AE1-029 E	0.81
938581	AE1-079 C O1	1.06
938582	AE1-079 E O1	0.57
938583	AE1-079 CBAT	0.14
939541	AE1-183 C	0.94
939542	AE1-183 E	0.63
939971	AE1-237 C1	1.06
939972	AE1-237 E1	0.57
939973	AE1-237 C2	0.14
940121	AE2-013 C	130.22
940122	AE2-013 E	2.41
940511	AE2-036 C	1.23
940512	AE2-036 E	0.58
941201	AE2-114 C	0.74
941202	AE2-114 E	0.49
941211	AE2-115 C	0.74
941212	AE2-115 E	0.49
941221	AE2-116 C	0.74
941222	AE2-116 E	0.49

Bus #	Bus	MW Impact
941881	AE2-193 C	4.65
941882	AE2-193 E	6.43
942611	AE2-277 C	1.18
942612	AE2-277 E	1.63
942691	AE2-285 C O1	2.67
942692	AE2-285 E O1	1.78
942813	AE2-299 BAT	18.02
943141	AE2-343 C	1.2
943142	AE2-343 E	0.58
BLUEG	BLUEG	4.54
CALDERWOOD	CALDERWOOD	0.17
CANNELTON	CANNELTON	0.28
CARR	CARR	0.46
CBM-S2	CBM-S2	0.13
CHEOAH	CHEOAH	0.15
CHILHOWEE	CHILHOWEE	0.06
COFFEEN	COFFEEN	0.66
COTTONWOOD	COTTONWOOD	1.44
CPL	CPL	0.16
DUCKCREEK	DUCKCREEK	1.69
EDWARDS	EDWARDS	0.8
ELMERSMITH	ELMERSMITH	0.48
FARMERCITY	FARMERCITY	0.43
G-007A	G-007A	1.08
GIBSON	GIBSON	0.23
NEWTON	NEWTON	1.63
PRAIRIE	PRAIRIE	2.8
RENSSELAER	RENSSELAER	0.35
SANTEETLA	SANTEETLA	0.04
SMITHLAND	SMITHLAND	0.18
TATANKA	TATANKA	0.85
TILTON	TILTON	0.85
TRIMBLE	TRIMBLE	0.5
TVA	TVA	0.96
UNIONPOWER	UNIONPOWER	0.45
VFT	VFT	2.78

16.8 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
8584440	238781	02HANNA	ATSI	238615	02CHAMBR	ATSI	1	ATSI-P1-2-SYS-345-714	single	1646.0	94.09	100.51	AC	100.26

Bus #	Bus	MW Impact
238965	02MNFDDG1	49.94
238966	02MNFDDG2	49.94
238967	02MNFDDG3	49.94
238995	02NCUNTD	0.02
239022	02NWCAG3	0.64
239023	02NWCAG4	0.66
239024	02NWCAG5	1.01
239214	02NILE-A	0.25
240195	02CARBONLM	0.13
240213	02MHNGLFH093	0.04
253900	15BVRVL1	55.51
253901	15BVRVL2	55.81
915691	Y3-103 C	0.64
915952	Y3-092 FTWR	60.03
917131	Z2-028 OP1	9.22
918321	AA1-044 C	7.62
919011	AA1-123	6.83
923821	AB2-019	3.36
930081	AB1-017	0.74
930601	AB1-105 O1	90.24
933531	AC2-168 C	0.03
934021	AD1-026	9.34
935021	AD1-135 C	0.02
936951	AD2-120 C O1	3.56
938581	AE1-079 C O1	0.81
938583	AE1-079 CBAT	0.11
939541	AE1-183 C	0.72
939971	AE1-237 C1	0.81
939973	AE1-237 C2	0.11
940121	AE2-013 C	100.26
940511	AE2-036 C	0.94
941201	AE2-114 C	0.57
941211	AE2-115 C	0.57
941221	AE2-116 C	0.57
941881	AE2-193 C	3.58
942611	AE2-277 C	0.9
942691	AE2-285 C O1	2.05
943141	AE2-343 C	0.92
BLUEG	BLUEG	3.3
CALDERWOOD	CALDERWOOD	0.12
CANNELTON	CANNELTON	0.21

Bus #	Bus	MW Impact
CARR	CARR	0.38
CBM-S2	CBM-S2	0.12
CHEOAH	CHEOAH	0.1
CHILHOWEE	CHILHOWEE	0.04
COFFEEN	COFFEEN	0.48
COTTONWOOD	COTTONWOOD	1.04
CPL	CPL	0.13
DUCKCREEK	DUCKCREEK	1.25
EDWARDS	EDWARDS	0.59
ELMERSMITH	ELMERSMITH	0.35
FARMERCITY	FARMERCITY	0.31
G-007A	G-007A	0.73
GIBSON	GIBSON	0.17
NEWTON	NEWTON	1.19
PRAIRIE	PRAIRIE	2.05
RENSSELAER	RENSSELAER	0.29
SANTEETLA	SANTEETLA	0.03
SMITHLAND	SMITHLAND	0.13
TATANKA	TATANKA	0.62
TILTON	TILTON	0.63
TRIMBLE	TRIMBLE	0.37
TVA	TVA	0.69
UNIONPOWER	UNIONPOWER	0.32
VFT	VFT	1.88

16.9 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
8584140	238797	02HGLND	ATSI	238634	02COMERC	ATSI	1	ATSI-P1-2-SYS-345-816-A	single	158.0	91.75	122.53	AC	51.89

Bus #	Bus	MW Impact
930601	AB1-105 O1	43.11
940121	AE2-013 C	51.89
BLUEG	BLUEG	1.58
CALDERWOOD	CALDERWOOD	0.13
CANNELTON	CANNELTON	0.09
CATAWBA	CATAWBA	0.07
CBM-N	CBM-N	0.14
CHEOAH	CHEOAH	0.12
CHILHOWEE	CHILHOWEE	0.04
COFFEEN	COFFEEN	0.16
COTTONWOOD	COTTONWOOD	0.56
DUCKCREEK	DUCKCREEK	0.36
EDWARDS	EDWARDS	0.17
ELMERSMITH	ELMERSMITH	0.16
FARMERCITY	FARMERCITY	0.11
G-007A	G-007A	0.41
GIBSON	GIBSON	0.07
HAMLET	HAMLET	0.1
NEWTON	NEWTON	0.43
NYISO	NYISO	0.6
PRAIRIE	PRAIRIE	0.77
SANTEETLA	SANTEETLA	0.04
SMITHLAND	SMITHLAND	0.06
TATANKA	TATANKA	0.19
TILTON	TILTON	0.2
TRIMBLE	TRIMBLE	0.18
TVA	TVA	0.46
UNIONPOWER	UNIONPOWER	0.2
VFT	VFT	1.12

16.10 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
8584058	239306	02REPUBLICSM	ATSI	238575	02BLUBEL	ATSI	1	ATSI-P1-2-SYS-345-816-A	single	132.0	99.27	136.27	AC	51.89

Bus #	Bus	MW Impact
930601	AB1-105 O1	43.11
940121	AE2-013 C	51.89
BLUEG	BLUEG	1.58
CALDERWOOD	CALDERWOOD	0.13
CANNELTON	CANNELTON	0.09
CATAWBA	CATAWBA	0.07
CBM-N	CBM-N	0.14
CHEOAH	CHEOAH	0.12
CHILHOWEE	CHILHOWEE	0.04
COFFEEN	COFFEEN	0.16
COTTONWOOD	COTTONWOOD	0.56
DUCKCREEK	DUCKCREEK	0.36
EDWARDS	EDWARDS	0.17
ELMERSMITH	ELMERSMITH	0.16
FARMERCITY	FARMERCITY	0.11
G-007A	G-007A	0.41
GIBSON	GIBSON	0.07
HAMLET	HAMLET	0.1
NEWTON	NEWTON	0.43
NYISO	NYISO	0.6
PRAIRIE	PRAIRIE	0.77
SANTEETLA	SANTEETLA	0.04
SMITHLAND	SMITHLAND	0.06
TATANKA	TATANKA	0.19
TILTON	TILTON	0.2
TRIMBLE	TRIMBLE	0.18
TVA	TVA	0.46
UNIONPOWER	UNIONPOWER	0.2
VFT	VFT	1.12

16.11 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
2099414	930600	AB1-105 TAP	ATSI	238781	02HANNA	ATSI	1	DLC_P12_320	single	1672.0	106.4	126.35	AC	328.64

Bus #	Bus	MW Impact
238965	02MNFDG1	48.6
238966	02MNFDG2	48.6
238967	02MNFDG3	48.6
238995	02NCUNTD	0.04
239022	02NWCAG3	1.41
239023	02NWCAG4	1.51
239024	02NWCAG5	2.21
239085	02SAMMG1	13.3
239086	02SAMMG2	12.93
239087	02SAMMG3	9.97
239088	02SAMMG4	9.81
239089	02SAMMG5	15.54
239090	02SAMMG6	32.0
239091	02SAMMG7	32.0
239214	02NILE-A	0.72
239292	02SAM-EMD	0.96
240195	02CARBONLM	0.33
240213	02MHNGLFH093	0.09
253900	15BVRVL1	53.24
253901	15BVRVL2	53.53
915952	Y3-092 FTWR	32.72
917131	Z2-028 OP1	29.56
918321	AA1-044 C	18.21
919011	AA1-123	14.91
923821	AB2-019	1.83
930081	AB1-017	2.36
930601	AB1-105 O1	312.19
934021	AD1-026	22.33
936951	AD2-120 C O1	9.44
938581	AE1-079 C O1	2.17
938583	AE1-079 CBAT	0.29
939541	AE1-183 C	1.9
939971	AE1-237 C1	2.17
939973	AE1-237 C2	0.29
940121	AE2-013 C	328.64
940511	AE2-036 C	2.52
941881	AE2-193 C	9.5
942611	AE2-277 C	2.36
942691	AE2-285 C O1	5.47
943141	AE2-343 C	2.46
BLUEG	BLUEG	8.47
CALDERWOOD	CALDERWOOD	0.63

Bus #	Bus	MW Impact
CANNELTON	CANNELTON	0.51
CATAWBA	CATAWBA	0.28
CBM-N	CBM-N	0.12
CHEOAH	CHEOAH	0.58
CHILHOWEE	CHILHOWEE	0.21
COFFEEN	COFFEEN	0.96
COTTONWOOD	COTTONWOOD	2.98
DUCKCREEK	DUCKCREEK	2.24
EDWARDS	EDWARDS	1.04
ELMERSMITH	ELMERSMITH	0.87
FARMERCITY	FARMERCITY	0.63
G-007A	G-007A	2.09
GIBSON	GIBSON	0.37
HAMLET	HAMLET	0.38
NEWTON	NEWTON	2.48
NYISO	NYISO	0.47
PRAIRIE	PRAIRIE	4.42
SANTEETLA	SANTEETLA	0.17
SMITHLAND	SMITHLAND	0.32
TATANKA	TATANKA	1.17
TILTON	TILTON	1.2
TRIMBLE	TRIMBLE	0.94
TVA	TVA	2.35
UNIONPOWER	UNIONPOWER	1.03
VFT	VFT	5.61

16.12 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
8584373	940140	AE2-013 TAP	ATSI	930600	AB1-105 TAP	ATSI	1	ATSI-P1-2-SYS-345-812	single	1672.0	87.23	106.31	AC	329.31

Bus #	Bus	MW Impact
238965	02MNF DG1	51.58
238966	02MNF DG2	51.58
238967	02MNF DG3	51.58
238995	02NCUNTD	0.04
239022	02NWCAG3	1.42
239023	02NWCAG4	1.52
239024	02NWCAG5	2.24
239085	02SAMMG1	13.32
239086	02SAMMG2	12.95
239090	02SAMMG6	31.86
239091	02SAMMG7	31.86
239214	02NILE-A	0.72
239292	02SAM-EMD	0.96
240195	02CARBONLM	0.33
240213	02MHNGLFH093	0.09
253900	15BVRVL1	52.48
253901	15BVRVL2	52.76
915952	Y3-092 FTWR	32.73
917131	Z2-028 OP1	29.63
918321	AA1-044 C	18.4
919011	AA1-123	14.91
923821	AB2-019	1.83
930081	AB1-017	2.37
934021	AD1-026	22.56
936951	AD2-120 C O1	9.5
938581	AE1-079 C O1	2.18
938583	AE1-079 CBAT	0.29
939541	AE1-183 C	1.91
939971	AE1-237 C1	2.18
939973	AE1-237 C2	0.29
940121	AE2-013 C	329.31
940511	AE2-036 C	2.53
941881	AE2-193 C	9.56
942611	AE2-277 C	2.37
942691	AE2-285 C O1	5.5
943141	AE2-343 C	2.47
BLUEG	BLUEG	8.52
CALDERWOOD	CALDERWOOD	0.64
CANNELTON	CANNELTON	0.51
CATAWBA	CATAWBA	0.28
CBM-N	CBM-N	0.12

Bus #	Bus	MW Impact
CHEOAH	CHEOAH	0.58
CHILHOWEE	CHILHOWEE	0.21
COFFEEN	COFFEEN	0.97
COTTONWOOD	COTTONWOOD	3.0
DUCKCREEK	DUCKCREEK	2.25
EDWARDS	EDWARDS	1.04
ELMERSMITH	ELMERSMITH	0.87
FARMERCITY	FARMERCITY	0.63
G-007A	G-007A	2.1
GIBSON	GIBSON	0.37
HAMLET	HAMLET	0.38
NEWTON	NEWTON	2.49
NYISO	NYISO	0.49
PRAIRIE	PRAIRIE	4.45
SANTEETLA	SANTEETLA	0.17
SMITHLAND	SMITHLAND	0.32
TATANKA	TATANKA	1.18
TILTON	TILTON	1.2
TRIMBLE	TRIMBLE	0.95
TVA	TVA	2.36
UNIONPOWER	UNIONPOWER	1.04
VFT	VFT	5.65

Affected Systems

16.13 Affected Systems

16.13.1 LG&E

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

16.13.2 MISO

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

16.13.3 TVA

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

16.13.4 Duke Energy Progress

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

16.13.5 NYISO

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

16.14 Contingency Descriptions

Contingency Name	Contingency Definition
DLC_P12_320	CONTINGENCY 'DLC_P12_320' DISCONNECT BRANCH FROM BUS 253902 TO BUS 238781 CKT 1 /* 15BVRVAL 345.00 02HANNA 345.00 END
ATSI-P2-3-OEC-345-002	CONTINGENCY 'ATSI-P2-3-OEC-345-002' /* HANNA 345KV BRK B-194 DISCONNECT BRANCH FROM BUS 238781 TO BUS 930600 CKT 1 /* 02HANNA 345 AB1-105 TAP 345 /* CONTINGENCY LINE ADDED FOR AE1 BUILD DISCONNECT BRANCH FROM BUS 238781 TO BUS 238850 CKT 1 /* 02HANNA 345 02JUNIP E 345 END
ATSI-P1-2-SYS-345-880A_FSA	CONTINGENCY 'ATSI-P1-2-SYS-345-880A_FSA' /* LINE 02SAMMIS TO Z2-028 345 CK 1 DISCONNECT BRANCH FROM BUS 239092 TO BUS 919010 CKT 1 /* 02SAMMIS 345 AA1-123 345 END
ATSI-P2-3-CEI-345-025	CONTINGENCY 'ATSI-P2-3-CEI-345-025' /* BREAKER FAILURE ON S4910 BREAKER AT JUNIPER 345KV DISCONNECT BRANCH FROM BUS 238781 TO BUS 238850 CKT 1 /* 02HANNA 345 02JUNIP E 345 DISCONNECT BRANCH FROM BUS 238551 TO BUS 238850 CKT 1 /* 02AVON 345 02JUNIP E 345 END
ATSI-P2-3-CEI-345-024	CONTINGENCY 'ATSI-P2-3-CEI-345-024' /* BREAKER FAILURE ON S478 BREAKER AT JUNIPER 345KV DISCONNECT BRANCH FROM BUS 238850 TO BUS 238840 CKT 5 /* 02JUNIP E 345 02JNPRQ1 138 DISCONNECT BRANCH FROM BUS 238781 TO BUS 238850 CKT 1 /* 02HANNA 345 02JUNIP E 345 END
ATSI-P1-2-SYS-345-714	CONTINGENCY 'ATSI-P1-2-SYS-345-714' /* LINE 02JUNIP E TO 02HANNA 345 CK 1 DISCONNECT BRANCH FROM BUS 238850 TO BUS 238781 CKT 1 /* 02JUNIP E 345 02HANNA 345 END
ATSI-P2-3-OEC-345-009	CONTINGENCY 'ATSI-P2-3-OEC-345-009' /* CHAMBERLIN 345KV BRK B-88 DISCONNECT BRANCH FROM BUS 238615 TO BUS 238781 CKT 1 /* 02CHAMBR 345 02HANNA 345 DISCONNECT BRANCH FROM BUS 238615 TO BUS 238617 CKT 4 /* 02CHAMBR 345 02CHMBER 138 END
ATSI-P2-3-OEC-345-011	CONTINGENCY 'ATSI-P2-3-OEC-345-011' /* CHAMBERLIN 345KV BRK B-F DISCONNECT BRANCH FROM BUS 238615 TO BUS 238781 CKT 1 /* 02CHAMBR 345 02HANNA 345 DISCONNECT BRANCH FROM BUS 238615 TO BUS 238617 CKT 3 /* 02CHAMBR 345 02CHMBER 138 END
ATSI-P1-2-SYS-345-816-B	CONTINGENCY 'ATSI-P1-2-SYS-345-816-B' /* LINE AB1-105 TAP TO AE2-013 TAP 345 CK 1 DISCONNECT BRANCH FROM BUS 930600 TO BUS 940140 CKT 1 /* AB1-105 TAP 345 AE2-013 TAP 345 END
ATSI-P1-2-SYS-345-816-A	CONTINGENCY 'ATSI-P1-2-SYS-345-816-A' /* LINE 02HANNA TO AB1-105 TAP 345 CK 1 DISCONNECT BRANCH FROM BUS 238781 TO BUS 930600 CKT 1 /* 02HANNA 345 AB1-105 TAP 345 END

Contingency Name	Contingency Definition
ATSI-P2-3-OEC-345-006	CONTINGENCY 'ATSI-P2-3-OEC-345-006' /* HANNA 345KV BRK B-106 DISCONNECT BRANCH FROM BUS 238781 TO BUS 238615 CKT 1 /* 02HANNA 345 02CHAMBR 345 DISCONNECT BRANCH FROM BUS 238781 TO BUS 238782 CKT 2 /* 02HANNA 345 02HANNA 138 END
Base Case	
ATSI-P1-2-SYS-345-812	CONTINGENCY 'ATSI-P1-2-SYS-345-812' /* LINE 02MANSFD TO 02HANNA 345 CK 1 DISCONNECT BRANCH FROM BUS 238941 TO BUS 238781 CKT 1 /* 02MANSFD 345 02HANNA 345 END
ATSI-P1-2-SYS-345-813	CONTINGENCY 'ATSI-P1-2-SYS-345-813' /* LINE 02HANNA TO 02CHAMBR 345 CK 1 DISCONNECT BRANCH FROM BUS 238615 TO BUS 238781 CKT 1 /* 02CHAMBR 345 02HANNA 345 END

Short Circuit

16.15 Short Circuit

Similar to the primary POI short circuit results, overdutied breakers have been identified by the Secondary POI as well.

*If the Customer chooses to move forward with the System Impact Study, FE will require an additional study to verify the fault current capability of the Highland 138 kV substation equipment. This study may uncover additional required upgrades not identified as part of the Feasibility Study. The Customer will be responsible for any upgrades to the Highland 138 kV substation to meet the increased fault current requirements.

17 Attachment 1: One Line Diagram (Primary POI)

18 Attachment 2 – Project Location (Primary POI)