Generation Interconnection

Feasibility Study Report

for

Queue Project AG1-056

STRYKER-RIDGEVILLE 138 KV

32.4 MW Capacity / 54 MW Energy

January 2021

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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 ATSI – Toledo Edison zone.

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.

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 an uprate to a planned/existing Solar generating facility located in Williams, Ohio. This project is an increase to the Interconnection Customer's AF2-321 project, which will share the same point of interconnection. The AG1-056 queue position is a 54 MW uprate (32.4 MW Capacity uprate) to the previous project. The total installed facilities will have a capability of 202 MW with 121.2 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this uprate project is December 31, 2023. This study does not imply a TO commitment to this in-service date.

Queue Number	AG1-056
Project Name	STRYKER-RIDGEVILLE 138 KV
State	Ohio
County	Williams
Transmission Owner	ATSI – Toledo Edison
MFO	202
MWE	54
MWC	32.4
Fuel	Solar
Basecase Study Year	2024

Any new service customers who can feasibly be commercially operable prior to June 1st of the basecase study year are required to request interim deliverability analysis.

4 Point of Interconnection

AG1-056 will interconnect with the ATSI system as an uprate to AF2-321 which is tapping the Stryker to Ridgeville 138 kV line. The IC will be responsible for acquiring all easements, properties, and permits that may be required.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AG1-056 generation project to connect to the FirstEnergy ("FE") transmission system. 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.

5 Cost Summary

The AG1-056 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$40,000
Total System Network Upgrade Costs	$273,547,728[1]
Total Costs	**$273,587,728**

This cost excludes a Federal Income Tax Gross Up charges. This tax may or may not be charged based on whether this project meets the eligibility requirements of IRS Notice 2016-36, 2016-25 I.R.B. (6/20/2016). If at a future date it is determined that the Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

Cost allocations for any System Upgrades will be provided in the System Impact Study Report.

[1] This project currently causes and/or contributes to overloads of the Transmission System (see Summer Peak Load Flow Analysis section below) and therefore has potential to have cost allocation for the system reinforcements listed in the report. This will be re-evaluated in the System Impact phase. The results may vary with queue customers withdrawing from the queue and other generators deactivating over time. If a customer is the first to cause the need for a project (causes loading to exceed 100% of rating), then the customer is responsible. If a customer contributes to a facility that is already overloaded by a prior queue, then they may receive cost allocation.

6 Transmission Owner Scope of Work

AG1-056 will interconnect with the ATSI transmission system as an uprate to AF2-321 which is tapping the Stryker to Ridgeville 138 kV line.

The total physical interconnection costs is given in the table below:

Description	Total Cost
Relay setting changes required to accommodate higher generation output at AF2-321 FE Switchyard	$20,000
Commission customer equipment and provide nameplates for interconnection at Customer Substation	$20,000
Total Physical Interconnection Costs	**$40,000**

7 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 5 months after the signing of an Interconnection Construction Service Agreement to complete the installation. This includes the requirement for the IC to make a preliminary payment that compensates FE for the first three months of the engineering design work that is related to the construction of the interconnection substation. This assumes that there will be no environmental issues with any of the new properties associated with this project, that there will be no delays in acquiring the necessary permits for implementing the defined direct connection and network upgrades, and that all transmission system outages will be allowed when requested.

If the customer is ultimately responsible for network upgrades, then the schedule for those upgrades will be refined in future study phases. The customer would need to wait for those upgrades to be completed prior to commercial operation unless determined deliverable by an interim deliverability study. The elapsed time to complete any network upgrades is provided in the System Reinforcements table of this report[1].

8 Transmission Owner Analysis

8.1 Power Flow Analysis

FE performed an analysis of its underlying transmission <100 kV system. The AG1-056 project did not contribute to any overloads on the FE transmission <100 kV system.

9 Interconnection Customer Requirements

9.1 System Protection

The IC must design it's 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.

All new generator only and new generator plus load facilities must be isolated from the FE transmission System by a Power Transformer. Section 14.2.6 of FE's "Requirements for Transmission Connected Facilities" document specifies the winding configurations of the transformer connecting to a non-effectively grounded portion of the FE Transmission system shall be determined by FE on a case-by-case basis.

9.2 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 138 kV circuit breaker to protect the AG1-056 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 AG1-056 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.

9.3 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.

10 Revenue Metering and SCADA Requirements

10.1 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.

10.2 Meteorological Data Reporting Requirements

The solar generation facility shall provide the Transmission Provider with site-specific meteorological data including:

- Back Panel temperature (Fahrenheit) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Irradiance (Watts/meter2) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Ambient air temperature (Fahrenheit) - (Accepted, not required)
- Wind speed (meters/second) - (Accepted, not required)
- Wind direction (decimal degrees from true north) - (Accepted, not required)

10.3 Interconnected Transmission Owner 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

11 Summer Peak - Load Flow Analysis

The Queue Project AG1-056 was evaluated as a 54.0 MW (Capacity 32.4 MW) injection as an uprate to AF2-321 which is tapping the Stryker to Ridgeville 138 kV line in the ATSI area. Project AG1-056 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-056 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

11.1 Generation Deliverability

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
16780620 3	23907 0	02RICHL D	138. 0	ATSI	23916 5	02WAUSE O	138. 0	ATSI	1	ATSI-P1-2-TE-138-031B-A	singl e	190.0	97.07	102.25	DC	9.84

11.2 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	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
16726672 3	23906 0	02RDGV L	138. 0	ATSI	23907 0	02RICHL D	138. 0	ATSI	1	ATSI-P2-4-TE-138-015	breake r	194.0	87.64	102.93	DC	29.66
16726672 4	23906 0	02RDGV L	138. 0	ATSI	23907 0	02RICHL D	138. 0	ATSI	1	ATSI-P2-3-TE-138-013	breake r	194.0	86.73	102.11	DC	29.82
16703785 3	96030 0	AF2-321 TAP	138. 0	ATSI	23906 0	02RDGVL	138. 0	ATSI	1	ATSI-P2-4-TE-138-015	breake r	181.0	97.47	113.86	DC	29.66
16703785 4	96030 0	AF2-321 TAP	138. 0	ATSI	23906 0	02RDGVL	138. 0	ATSI	1	ATSI-P2-3-TE-138-013	breake r	181.0	96.44	112.92	DC	29.82

11.3 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	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
1654901 32	23871 2	02FAYET	138. 0	ATSI	23851 7	02LYONS	138. 0	ATSI	1	ATSI-P7-1-TE-138-016	tower	266. 0	103.79	110.48	DC	17.79
1672667 55	23871 2	02FAYET	138. 0	ATSI	23851 7	02LYONS	138. 0	ATSI	1	ATSI-P2-4-TE-138-015	break er	266. 0	102.9	109.63	DC	17.92
1654898 21	23897 9	02NAPMU N	138. 0	ATSI	23896 2	02MIDWA Y	138. 0	ATSI	1	ATSI-P2-2-TE-138-023	bus	194. 0	145.06	156.32	DC	21.85
1654898 22	23897 9	02NAPMU N	138. 0	ATSI	23896 2	02MIDWA Y	138. 0	ATSI	1	ATSI-P2-2-TE-138-012	bus	194. 0	115.07	125.05	DC	19.37
1654900 71	23897 9	02NAPMU N	138. 0	ATSI	23896 2	02MIDWA Y	138. 0	ATSI	1	AEP_P7-1_#10983-B	tower	194. 0	129.28	139.63	DC	20.09
1654900 72	23897 9	02NAPMU N	138. 0	ATSI	23896 2	02MIDWA Y	138. 0	ATSI	1	AEP_P7-1_#10983-A	tower	194. 0	112.77	123.12	DC	20.09
1614178 17	23907 0	02RICHLD	138. 0	ATSI	24302 9	05LCKWR D	138. 0	AEP	1	AEP_P7-1_#10984-B	tower	223. 0	100.09	105.37	DC	11.78

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
165489891	239070	02RICHLD	138.0	ATSI	239165	02WAUSEO	138.0	ATSI	1	ATSI-P2-2-TE-138-004	bus	190.0	120.25	128.84	DC	16.3
165490101	239070	02RICHLD	138.0	ATSI	239165	02WAUSEO	138.0	ATSI	1	AEP_P7-1_#10983-B	tower	190.0	135.99	141.61	DC	10.63
167266757	239070	02RICHLD	138.0	ATSI	239165	02WAUSEO	138.0	ATSI	1	ATSI-P2-3-TE-138-010C	breaker	190.0	120.58	129.17	DC	16.3
165490116	239351	02EASTFAYT	138.0	ATSI	238712	02FAYET	138.0	ATSI	1	ATSI-P7-1-TE-138-016	tower	262.0	107.7	114.49	DC	17.79
161417561	940840	AE2-072 TAP	138.0	ATSI	242993	05E.LEIPSIC2	138.0	AEP	1	ATSI-P2-2-TE-138-005	bus	223.0	109.82	113.2	DC	7.53
161417769	940840	AE2-072 TAP	138.0	ATSI	242993	05E.LEIPSIC2	138.0	AEP	1	ATSI-P7-1-TE-138-016	tower	223.0	114.3	117.9	DC	8.02
164211775	940840	AE2-072 TAP	138.0	ATSI	242993	05E.LEIPSIC2	138.0	AEP	1	AEP_P4_#12461_05S HICKSV 69.0_E	breaker	223.0	115.38	119.16	DC	8.4
165490076	960300	AF2-321 TAP	138.0	ATSI	239127	02STRYKE	138.0	ATSI	1	AEP_P7-1_#10983-B	tower	181.0	162.8	184.36	DC	39.02
167806016	960300	AF2-321 TAP	138.0	ATSI	239127	02STRYKE	138.0	ATSI	1	ATSI-P1-2-TE-138-001B	single	181.0	118.5	129.81	DC	20.48
167806017	960300	AF2-321 TAP	138.0	ATSI	239127	02STRYKE	138.0	ATSI	1	ATSI-P1-3-TE-138-022	single	181.0	112.74	123.56	DC	19.58
167806018	960300	AF2-321 TAP	138.0	ATSI	239127	02STRYKE	138.0	ATSI	1	Base Case	single	153.0	105.39	118.19	DC	19.59

11.4 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	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
167806208	238712	02FAYET	138.0	ATSI	238517	02LYONS	138.0	ATSI	1	ATSI-P1-3-TE-138-012A	operation	266.0	101.48	107.94	DC	17.2
167805977	238979	02NAPMUN	138.0	ATSI	238962	02MIDWAY	138.0	ATSI	1	Base Case	operation	161.0	116.14	126.54	DC	16.75
167805978	238979	02NAPMUN	138.0	ATSI	238962	02MIDWAY	138.0	ATSI	1	AEP_P1-2_#7097_4883-B	operation	194.0	112.22	121.26	DC	17.54
167806118	239060	02RDGVL	138.0	ATSI	239070	02RICHLD	138.0	ATSI	1	ATSI-P1-3-TE-138-012A	operation	194.0	86.27	101.64	DC	29.82
164212151	239070	02RICHLD	138.0	ATSI	243029	05LCKWRD	138.0	AEP	1	AEP_P1-2_#7097_4883-B	operation	223.0	99.68	104.97	DC	11.78
167806202	239070	02RICHLD	138.0	ATSI	239165	02WAUSEO	138.0	ATSI	1	ATSI-P1-2-TE-138-031B-A	operation	190.0	119.44	128.08	DC	16.4
167806095	239127	02STRYKE	138.0	ATSI	238979	02NAPMUN	138.0	ATSI	1	ATSI-P1-2-TE-138-039	operation	181.0	137.69	149.75	DC	21.85

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
167806097	239127	02STRYKE	138.0	ATSI	238979	02NAPMUN	138.0	ATSI	1	Base Case	operation	153.0	98.52	109.46	DC	16.75
167806173	239351	02EASTFAYT	138.0	ATSI	238712	02FAYET	138.0	ATSI	1	ATSI-P1-3-TE-138-012A	operation	262.0	105.39	111.96	DC	17.2
164212121	940840	AE2-072 TAP	138.0	ATSI	242993	05E.LEIPSIC2	138.0	AEP	1	AEP_P1-2_#14793-A	operation	223.0	115.22	119.0	DC	8.41
164212126	940840	AE2-072 TAP	138.0	ATSI	242993	05E.LEIPSIC2	138.0	AEP	1	Base Case	operation	223.0	100.79	103.4	DC	5.8
167806013	960300	AF2-321 TAP	138.0	ATSI	239127	02STRYKE	138.0	ATSI	1	ATSI-P1-2-TE-138-001B	operation	181.0	151.32	170.2	DC	34.14
167806015	960300	AF2-321 TAP	138.0	ATSI	239127	02STRYKE	138.0	ATSI	1	Base Case	operation	153.0	138.02	159.37	DC	32.65
167806045	960300	AF2-321 TAP	138.0	ATSI	239060	02RDGVL	138.0	ATSI	1	ATSI-P1-2-TE-138-041	operation	181.0	95.97	112.45	DC	29.83

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
167266757,167806203,165490101,165489891	1	02RICHLD 138.0 kV - 02WAUSEO 138.0 kV Ckt 1	**ATSI** **TE-011A (939) : Reconductor the Richland-Wauseon 138 kV line. This project is dependant on the s1698 project Richland-Wauseon-Midway 138 kV Three-Terminal Elimination project (ISD 12/31/2020)** **Project Type : FAC** **Cost : $66,891,420** **Time Estimate : 36.0 Months** **TE-011B (940) : Reconductor the Richland-Wauseon 138 kV line. Replace the Wauseon Circuit Breaker B13416. This project is dependant on the s1698 project Richland-Wauseon-Midway 138 kV Three-Terminal Elimination project (ISD 12/31/2020)** **Project Type : FAC** **Cost : $83,926,586** **Time Estimate : 72.0 Months** **TE-011C (941) : Reconductor (3) existing sections of subconductor circular with a conductor about to meet or exceed 273 MVA STE. This project is dependant on the s1698 project Richland-Wauseon-Midway 138 kV Three-Terminal Elimination project (ISD 12/31/2020)** **Project Type : FAC** **Cost : $376,800** **Time Estimate : 12.0 Months**	$151,194,806
167037853,167037854	3	AF2-321 TAP 138.0 kV - 02RDGVL 138.0 kV Ckt 1	**ATSI** **TE-020A (945) : Reconductor the line from Stryker 138 kV substation to the new 3 breaker ring for the AF2-321 gen queue project of the Richland-Stryker 138 kV line. Upgrade the existing substation conductor at Stryker 138 kV. Reconductor the existing line drop at Stryker 138 kV. Reconductor the existing mixed transmission line conductor.** **Project Type : Facility** **Cost : $7,099,054** **Time Estimate : 30.0 Months**	$7,099,054
165490132,167266755	4	02FAYET 138.0 kV - 02LYONS 138.0 kV Ckt 1	**ATSI** **TE-AG1-F-0001 (954) :** **1) Reconductor (1) existing section of subconductor circular with a conductor about to meet or exceed 351 MVA STE.** **2) Replace (1)switcher at Lyons.** **Project Type : FAC** **Cost : $314,000** **Time Estimate : 12.0 Months**	$314,000

ID	Idx	Facility	Upgrade Description	Cost
161417817	6	02RICHLD 138.0 kV - 05LCKWRD 138.0 kV Ckt 1	**AEP** **AEPO0048a (588) : 1) A sag study will be required on the 0.06 miles of ACSR ~ 636 ~ 26/7 ~ GROSBEAK - Conductor Section 1 to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between $20,000 (no remediation required, just sag study) and $4.6 million (complete line reconductor/rebuild). New rating after sag study: S/N:223 S/E: 310. Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement.** **Project Type : FAC** **Cost : $20,000** **Time Estimate : 6-12 months** **ATSI** **TE-AG1-F-0004 (959) : Reconductor 10.87 miles of transmission line from Lockwood Road to Richland with a conductor able to meet or exceed 232 MVA STE.** **Project Type : FAC** **Cost : $27,305,440** **Time Estimate : 54.0 Months**	$27,325,440
165489822,165489821,165490072,165490071	5	02NAPMUN 138.0 kV - 02MIDWAY 138.0 kV Ckt 1	**ATSI** **TE-AG1-F-0002a (955) : Reconductor 10.16 miles of transmission line from Midway to Napoleon Municipal to meet or exceed 430 MVA STE.** **Project Type : FAC** **Cost : $25,521,920** **Time Estimate : 54.0 Months**	$25,521,920
167266724,167266723	2	02RDGVL 138.0 kV - 02RICHLD 138.0 kV Ckt 1	**ATSI** **TE-AG1-F-0003a (957) : Reconductor section of 8.5 miles of transmission line from Richland to Ridgeville Tap to meet or exceed 286 MVA STE.** **Project Type : FAC** **Cost : $21,352,000** **Time Estimate : 48.0 Months**	$21,352,000
165490116	7	02EASTFAYT 138.0 kV - 02FAYET 138.0 kV Ckt 1	**ATSI** **TE-AG1-F-0006a (961) : Reconductor (2) existing sections of subconductor circular with a conductor able to meet or exceed 359 MVA STE.** **Project Type : FAC** **Cost : $125,600** **Time Estimate : 12.0 Months**	$125,600

ID	Idx	Facility	Upgrade Description	Cost
165490076,167806016,167806017,167806018	9	AF2-321 TAP 138.0 kV - 02STRYKE 138.0 kV Ckt 1	**ATSI** **TE-020A (945) : Reconductor the line from Stryker 138 kV substation to the new 3 breaker ring for the AF2-321 gen queue project of the Richland-Stryker 138 kV line. Upgrade the existing substation conductor at Stryker 138 kV. Reconductor the existing line drop at Stryker 138 kV. Reconductor the existing mixed transmission line conductor.** **Project Type : Facility** **Cost : $7,099,054** **Time Estimate : 30.0 Months** **TE-020B (946) : Reconductor the line from Stryker 138 kV substation to the new 3 breaker ring for the AF2-321 gen queue project of the Richland-Stryker 138 kV line. Reconductor the existing substation conductor at Stryker 138 kV. Reconductor the existing line drop at Stryker 138 kV. Reconductor the existing mixed transmission line conductor. Reconductor the existing transmission line conductor.** **Project Type : Facility** **Cost : $7,099,054** **Time Estimate : 30.0 Months** **TE-AG1-F-0007 (963) :** **1) Reconductor (1) existing section of subconductor circular at Stryker with a conductor able to meet or exceed 291 MVA STE.** **2) Reconductor 10.4 miles of transmission line from Ridgeville Tap to Styker, as well as the limiting sections at Stryker, with a conductor able to meet or exceed 291 MVA STE.** **3) Reconductor existing section of transmission line at Ridgeville Tap with a conductor able to meet or exceed 291 MVA STE.** **4) Replace switcher at Ridgeville.** **Project Type : FAC** **Cost : $26,376,000** **Time Estimate : 84.0 Months**	$40,574,108
161417561,161417769,164211775	8	AE2-072 TAP 138.0 kV - 05E.LPSC 138.0 kV Ckt 1	**AEP** **AEPO0043a (522) : Perform Sag Study on 10.2 miles of line with ACSR " 636 " 26/7 " GROSBEAK-Conductor to mitigate the overload. Depending on sag study results, the cost for this upgrade is expected to be between $40,800 (no remediations required, just sag study) and $ 15.3 million (complete line reconductor/rebuild). New rating after sag study: S/N: 223 S/E: 310. Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement.** **Project Type : CON** **Cost : $40,800** **Time Estimate : 6-12 months Months** **ATSI** **Not a violation for ATSI portion**	$40,800
			TOTAL COST	**$273,547,728**

11.6 Flow Gate Details

The following indices contain additional information about each facility presented in the body of the report. For each index, a description of the flowgate and its contingency was included for convenience. The intent of the indices is to provide more details on which projects/generators have contributions to the flowgate in question. All New Service Queue Requests, through the end of the Queue under study, that are contributors to a flowgate will be listed in the indices. Please note that there may be contributors that are subsequently queued after the queue under study that are not listed in the indices. Although this information is not used "as is" for cost allocation purposes, it can be used to gage the impact of other projects/generators. It should be noted the project/generator MW contributions presented in the body of the report are Full MW Impact contributions which are also noted in the indices column named "Full MW Impact", whereas the loading percentages reported in the body of the report, take into consideration the PJM Generator Deliverability Test rules such as commercial probability of each project as well as the ramping impact of "Adder" contributions. The MW Impact found and used in the analysis is shown in the indices column named "Gendeliv MW Impact".

11.6.1 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
165490101	239070	02RICHLD	ATSI	239165	02WAUSEO	ATSI	1	AEP_P7-1_#10983-B	tower	190.0	135.99	141.61	DC	10.63

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
238979	02NAPMUN	2.0034	Adder	2.36
239064	02RICHG1	0.7415	50/50	0.7415
239065	02RICHG2&3	1.4754	50/50	1.4754
239067	02RICHG4	8.0659	50/50	8.0659
239068	02RICHG5	8.0666	50/50	8.0666
239069	02RICHG6	8.0666	50/50	8.0666
239202	02STRYCT	0.3245	50/50	0.3245
940841	AE2-072 C	38.2554	50/50	38.2554
940842	AE2-072 E	25.5036	50/50	25.5036
941781	AE2-181 C	3.4457	50/50	3.4457
941782	AE2-181 E	2.2971	50/50	2.2971
942661	AE2-282 C	4.7675	50/50	4.7675
942662	AE2-282 E	2.5087	50/50	2.5087
943961	AF1-064 C O1	2.2374	Adder	2.63
943962	AF1-064 E O1	1.1120	Adder	1.31
944551	AF1-120 C	2.8888	50/50	2.8888
944552	AF1-120 E	1.4552	50/50	1.4552
945401	AF1-205 C	1.2995	Adder	1.53
945402	AF1-205 E	0.8663	Adder	1.02
945411	AF1-206 C O1	12.9668	50/50	12.9668
945412	AF1-206 E O1	8.6446	50/50	8.6446
958321	AF2-126 C	2.2776	Adder	2.68
958322	AF2-126 E	1.1388	Adder	1.34
960301	AF2-321 C	17.4794	50/50	17.4794
960302	AF2-321 E	11.6529	50/50	11.6529
962121	AG1-056 C	6.3776	50/50	6.3776
962122	AG1-056 E	4.2517	50/50	4.2517
964561	AG1-319 C	2.8582	Adder	6.34
964562	AG1-319 E	1.9055	Adder	4.23
CALDERWOOD	CALDERWOOD	0.0452	Confirmed LTF	0.0452
NY	NY	0.0487	Confirmed LTF	0.0487
PRAIRIE	PRAIRIE	0.2402	Confirmed LTF	0.2402
O-066	O-066	0.5922	Confirmed LTF	0.5922
CHEOAH	CHEOAH	0.0455	Confirmed LTF	0.0455
COTTONWOOD	COTTONWOOD	0.1932	Confirmed LTF	0.1932
G-007	G-007	0.0924	Confirmed LTF	0.0924
HAMLET	HAMLET	0.0520	Confirmed LTF	0.0520
GIBSON	GIBSON	0.0508	Confirmed LTF	0.0508
BLUEG	BLUEG	0.1597	Confirmed LTF	0.1597
TRIMBLE	TRIMBLE	0.0512	Confirmed LTF	0.0512
CATAWBA	CATAWBA	0.0319	Confirmed LTF	0.0319

11.6.2 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
167266724	239060	02RDGVL	ATSI	239070	02RICHLD	ATSI	1	ATSI-P2-3-TE-138-013	breaker	194.0	86.73	102.11	DC	29.82

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
238979	02NAPMUN	19.1231	50/50	19.1231
239202	02STRYCT	1.0107	50/50	1.0107
941781	AE2-181 C	11.8899	50/50	11.8899
941782	AE2-181 E	7.9266	50/50	7.9266
942661	AE2-282 C	15.2280	50/50	15.2280
942662	AE2-282 E	8.0129	50/50	8.0129
944551	AF1-120 C	9.2270	50/50	9.2270
944552	AF1-120 E	4.6482	50/50	4.6482
945401	AF1-205 C	12.4042	50/50	12.4042
945402	AF1-205 E	8.2694	50/50	8.2694
945411	AF1-206 C O1	41.4175	50/50	41.4175
945412	AF1-206 E O1	27.6116	50/50	27.6116
960301	AF2-321 C	49.0371	50/50	49.0371
960302	AF2-321 E	32.6914	50/50	32.6914
962121	AG1-056 C	17.8919	50/50	17.8919
962122	AG1-056 E	11.9280	50/50	11.9280
964561	AG1-319 C	51.4773	50/50	51.4773
964562	AG1-319 E	34.3182	50/50	34.3182
G-007A	G-007A	0.2469	Confirmed LTF	0.2469
VFT	VFT	0.6644	Confirmed LTF	0.6644
CALDERWOOD	CALDERWOOD	0.0522	Confirmed LTF	0.0522
PRAIRIE	PRAIRIE	0.4908	Confirmed LTF	0.4908
CHEOAH	CHEOAH	0.0521	Confirmed LTF	0.0521
CBM-N	CBM-N	0.1248	Confirmed LTF	0.1248
COTTONWOOD	COTTONWOOD	0.3066	Confirmed LTF	0.3066
HAMLET	HAMLET	0.0271	Confirmed LTF	0.0271
GIBSON	GIBSON	0.1179	Confirmed LTF	0.1179
BLUEG	BLUEG	0.3229	Confirmed LTF	0.3229
TRIMBLE	TRIMBLE	0.1030	Confirmed LTF	0.1030
CATAWBA	CATAWBA	0.0210	Confirmed LTF	0.0210
CBM-W1	CBM-W1	1.8366	Confirmed LTF	1.8366

11.6.3 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
167037853	960300	AF2-321 TAP	ATSI	239060	02RDGVL	ATSI	1	ATSI-P2-4-TE-138-015	breaker	181.0	97.47	113.86	DC	29.66

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
238979	02NAPMUN	19.0187	50/50	19.0187
239202	02STRYCT	1.0051	50/50	1.0051
941781	AE2-181 C	11.8150	50/50	11.8150
941782	AE2-181 E	7.8767	50/50	7.8767
942661	AE2-282 C	15.1464	50/50	15.1464
942662	AE2-282 E	7.9700	50/50	7.9700
944551	AF1-120 C	9.1775	50/50	9.1775
944552	AF1-120 E	4.6233	50/50	4.6233
945401	AF1-205 C	12.3365	50/50	12.3365
945402	AF1-205 E	8.2243	50/50	8.2243
945411	AF1-206 C O1	41.1954	50/50	41.1954
945412	AF1-206 E O1	27.4636	50/50	27.4636
960301	AF2-321 C	48.7761	50/50	48.7761
960302	AF2-321 E	32.5174	50/50	32.5174
962121	AG1-056 C	17.7967	50/50	17.7967
962122	AG1-056 E	11.8644	50/50	11.8644
964561	AG1-319 C	51.1964	50/50	51.1964
964562	AG1-319 E	34.1309	50/50	34.1309
G-007A	G-007A	0.2541	Confirmed LTF	0.2541
VFT	VFT	0.6837	Confirmed LTF	0.6837
CALDERWOOD	CALDERWOOD	0.0527	Confirmed LTF	0.0527
PRAIRIE	PRAIRIE	0.4985	Confirmed LTF	0.4985
CHEOAH	CHEOAH	0.0526	Confirmed LTF	0.0526
CBM-N	CBM-N	0.1296	Confirmed LTF	0.1296
COTTONWOOD	COTTONWOOD	0.3108	Confirmed LTF	0.3108
HAMLET	HAMLET	0.0271	Confirmed LTF	0.0271
GIBSON	GIBSON	0.1201	Confirmed LTF	0.1201
BLUEG	BLUEG	0.3281	Confirmed LTF	0.3281
TRIMBLE	TRIMBLE	0.1052	Confirmed LTF	0.1052
CATAWBA	CATAWBA	0.0210	Confirmed LTF	0.0210
CBM-W1	CBM-W1	1.8927	Confirmed LTF	1.8927

11.6.4 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
165490132	238712	02FAYET	ATSI	238517	02LYONS	ATSI	1	ATSI-P7-1-TE-138-016	tower	266.0	103.79	110.48	DC	17.79

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
238979	02NAPMUN	13.0536	50/50	13.0536
239064	02RICHG1	0.2401	50/50	0.2401
239065	02RICHG2&3	0.4730	50/50	0.4730
239067	02RICHG4	2.6115	50/50	2.6115
239068	02RICHG5	2.6117	50/50	2.6117
239069	02RICHG6	2.6117	50/50	2.6117
239202	02STRYCT	0.7015	50/50	0.7015
940841	AE2-072 C	6.3908	Adder	7.52
940842	AE2-072 E	4.2605	Adder	5.01
941781	AE2-181 C	11.7315	50/50	11.7315
941782	AE2-181 E	7.8210	50/50	7.8210
942661	AE2-282 C	24.4716	50/50	24.4716
942662	AE2-282 E	12.8769	50/50	12.8769
943951	AF1-063 C O1	1.5403	Adder	1.81
943952	AF1-063 E O1	0.8539	Adder	1.0
944551	AF1-120 C	14.8279	50/50	14.8279
944552	AF1-120 E	7.4697	50/50	7.4697
945401	AF1-205 C	8.4672	50/50	8.4672
945402	AF1-205 E	5.6448	50/50	5.6448
945411	AF1-206 C O1	66.5583	50/50	66.5583
945412	AF1-206 E O1	44.3722	50/50	44.3722
958331	AF2-127 C	1.9872	Adder	2.34
958332	AF2-127 E	1.0455	Adder	1.23
960301	AF2-321 C	29.2552	50/50	29.2552
960302	AF2-321 E	19.5034	50/50	19.5034
962121	AG1-056 C	10.6742	50/50	10.6742
962122	AG1-056 E	7.1161	50/50	7.1161
964561	AG1-319 C	35.1389	50/50	35.1389
964562	AG1-319 E	23.4259	50/50	23.4259
WEC	WEC	0.0589	Confirmed LTF	0.0589
LGEE	LGEE	0.0961	Confirmed LTF	0.0961
CPLE	CPLE	0.0184	Confirmed LTF	0.0184
CBM-W2	CBM-W2	1.2902	Confirmed LTF	1.2902
NY	NY	0.0625	Confirmed LTF	0.0625
TVA	TVA	0.1554	Confirmed LTF	0.1554
O-066	O-066	0.6394	Confirmed LTF	0.6394
SIGE	SIGE	0.0279	Confirmed LTF	0.0279
CBM-S2	CBM-S2	0.4698	Confirmed LTF	0.4698
CBM-S1	CBM-S1	0.0452	Confirmed LTF	0.0452
G-007	G-007	0.0987	Confirmed LTF	0.0987
MEC	MEC	0.2717	Confirmed LTF	0.2717

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
LAGN	LAGN	0.2118	Confirmed LTF	0.2118

11.6.5 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
165489821	238979	02NAPMUN	ATSI	238962	02MIDWAY	ATSI	1	ATSI-P2-2-TE-138-023	bus	194.0	145.06	156.32	DC	21.85

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
238979	02NAPMUN	28.1008	50/50	28.1008
239064	02RICHG1	0.2635	50/50	0.2635
239065	02RICHG2&3	0.5186	50/50	0.5186
239067	02RICHG4	2.8667	50/50	2.8667
239068	02RICHG5	2.8670	50/50	2.8670
239069	02RICHG6	2.8670	50/50	2.8670
239202	02STRYCT	0.8565	50/50	0.8565
940841	AE2-072 C	6.9952	Adder	8.23
940842	AE2-072 E	4.6634	Adder	5.49
941781	AE2-181 C	11.5560	50/50	11.5560
941782	AE2-181 E	7.7040	50/50	7.7040
942661	AE2-282 C	18.8015	50/50	18.8015
942662	AE2-282 E	9.8933	50/50	9.8933
943951	AF1-063 C O1	1.9914	50/50	1.9914
943952	AF1-063 E O1	1.1040	50/50	1.1040
944551	AF1-120 C	11.3922	50/50	11.3922
944552	AF1-120 E	5.7390	50/50	5.7390
945401	AF1-205 C	18.2275	50/50	18.2275
945402	AF1-205 E	12.1517	50/50	12.1517
945411	AF1-206 C O1	51.1366	50/50	51.1366
945412	AF1-206 E O1	34.0911	50/50	34.0911
958331	AF2-127 C	2.5692	50/50	2.5692
958332	AF2-127 E	1.3517	50/50	1.3517
960301	AF2-321 C	35.9240	50/50	35.9240
960302	AF2-321 E	23.9494	50/50	23.9494
962121	AG1-056 C	13.1074	50/50	13.1074
962122	AG1-056 E	8.7383	50/50	8.7383
964561	AG1-319 C	75.6442	50/50	75.6442
964562	AG1-319 E	50.4295	50/50	50.4295
WEC	WEC	0.0781	Confirmed LTF	0.0781
LGEE	LGEE	0.1162	Confirmed LTF	0.1162
CPLE	CPLE	0.0218	Confirmed LTF	0.0218
CBM-W2	CBM-W2	1.6218	Confirmed LTF	1.6218
NY	NY	0.0763	Confirmed LTF	0.0763
TVA	TVA	0.1932	Confirmed LTF	0.1932
O-066	O-066	0.7807	Confirmed LTF	0.7807
SIGE	SIGE	0.0342	Confirmed LTF	0.0342
CBM-S2	CBM-S2	0.5638	Confirmed LTF	0.5638
CBM-S1	CBM-S1	0.0555	Confirmed LTF	0.0555
G-007	G-007	0.1218	Confirmed LTF	0.1218
MEC	MEC	0.3559	Confirmed LTF	0.3559

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
LAGN	LAGN	0.2660	Confirmed LTF	0.2660

11.6.6 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
161417817	239070	02RICHLD	ATSI	243029	05LCKWRD	AEP	1	AEP_P7-1_#10984-B	tower	223.0	100.09	105.37	DC	11.78

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
238979	02NAPMUN	4.6638	50/50	4.6638
239064	02RICHG1	0.6303	50/50	0.6303
239065	02RICHG2&3	1.2554	50/50	1.2554
239067	02RICHG4	6.8564	50/50	6.8564
239068	02RICHG5	6.8569	50/50	6.8569
239069	02RICHG6	6.8569	50/50	6.8569
239202	02STRYCT	0.3980	50/50	0.3980
240968	02BG2 GEN	0.4781	Adder	0.56
240969	02BG4 G1	0.1097	Adder	0.13
240973	02BG6 AMPO	1.7231	Adder	2.03
240975	02PGE GEN	2.2924	Adder	2.7
240997	02BG10	1.2199	Adder	1.44
940841	AE2-072 C	32.5341	50/50	32.5341
940842	AE2-072 E	21.6894	50/50	21.6894
941781	AE2-181 C	5.1965	50/50	5.1965
941782	AE2-181 E	3.4643	50/50	3.4643
942661	AE2-282 C	6.5411	50/50	6.5411
942662	AE2-282 E	3.4419	50/50	3.4419
943793	AF1-047 BAT	3.3968	Merchant Transmission	3.3968
943961	AF1-064 C O1	4.1002	50/50	4.1002
943962	AF1-064 E O1	2.0378	50/50	2.0378
944551	AF1-120 C	3.9634	50/50	3.9634
944552	AF1-120 E	1.9966	50/50	1.9966
945401	AF1-205 C	3.0252	50/50	3.0252
945402	AF1-205 E	2.0168	50/50	2.0168
945411	AF1-206 C O1	17.7906	50/50	17.7906
945412	AF1-206 E O1	11.8604	50/50	11.8604
958321	AF2-126 C	4.1738	50/50	4.1738
958322	AF2-126 E	2.0869	50/50	2.0869
960301	AF2-321 C	19.3646	50/50	19.3646
960302	AF2-321 E	12.9097	50/50	12.9097
962121	AG1-056 C	7.0655	50/50	7.0655
962122	AG1-056 E	4.7103	50/50	4.7103
964561	AG1-319 C	12.5546	50/50	12.5546
964562	AG1-319 E	8.3697	50/50	8.3697
G-007A	G-007A	0.4915	Confirmed LTF	0.4915
VFT	VFT	1.3287	Confirmed LTF	1.3287
CALDERWOOD	CALDERWOOD	0.2435	Confirmed LTF	0.2435
PRAIRIE	PRAIRIE	2.2420	Confirmed LTF	2.2420
CHEOAH	CHEOAH	0.2422	Confirmed LTF	0.2422
CBM-N	CBM-N	0.2520	Confirmed LTF	0.2520

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
COTTONWOOD	COTTONWOOD	1.4196	Confirmed LTF	1.4196
HAMLET	HAMLET	0.1617	Confirmed LTF	0.1617
GIBSON	GIBSON	0.5007	Confirmed LTF	0.5007
BLUEG	BLUEG	1.3124	Confirmed LTF	1.3124
TRIMBLE	TRIMBLE	0.4185	Confirmed LTF	0.4185
CATAWBA	CATAWBA	0.1138	Confirmed LTF	0.1138

11.6.7 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
165490116	239351	02EASTFAYT	ATSI	238712	02FAYET	ATSI	1	ATSI-P7-1-TE-138-016	tower	262.0	107.7	114.49	DC	17.79

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
238979	02NAPMUN	13.0536	50/50	13.0536
239064	02RICHG1	0.2401	50/50	0.2401
239065	02RICHG2&3	0.4730	50/50	0.4730
239067	02RICHG4	2.6115	50/50	2.6115
239068	02RICHG5	2.6117	50/50	2.6117
239069	02RICHG6	2.6117	50/50	2.6117
239202	02STRYCT	0.7015	50/50	0.7015
940841	AE2-072 C	6.3908	Adder	7.52
940842	AE2-072 E	4.2605	Adder	5.01
941781	AE2-181 C	11.7315	50/50	11.7315
941782	AE2-181 E	7.8210	50/50	7.8210
942661	AE2-282 C	24.4716	50/50	24.4716
942662	AE2-282 E	12.8769	50/50	12.8769
943951	AF1-063 C O1	1.5403	Adder	1.81
943952	AF1-063 E O1	0.8539	Adder	1.0
944551	AF1-120 C	14.8279	50/50	14.8279
944552	AF1-120 E	7.4697	50/50	7.4697
945401	AF1-205 C	8.4672	50/50	8.4672
945402	AF1-205 E	5.6448	50/50	5.6448
945411	AF1-206 C O1	66.5583	50/50	66.5583
945412	AF1-206 E O1	44.3722	50/50	44.3722
958331	AF2-127 C	1.9872	Adder	2.34
958332	AF2-127 E	1.0455	Adder	1.23
960301	AF2-321 C	29.2552	50/50	29.2552
960302	AF2-321 E	19.5034	50/50	19.5034
962121	AG1-056 C	10.6742	50/50	10.6742
962122	AG1-056 E	7.1161	50/50	7.1161
964561	AG1-319 C	35.1389	50/50	35.1389
964562	AG1-319 E	23.4259	50/50	23.4259
WEC	WEC	0.0589	Confirmed LTF	0.0589
LGEE	LGEE	0.0961	Confirmed LTF	0.0961
CPLE	CPLE	0.0184	Confirmed LTF	0.0184
CBM-W2	CBM-W2	1.2902	Confirmed LTF	1.2902
NY	NY	0.0625	Confirmed LTF	0.0625
TVA	TVA	0.1554	Confirmed LTF	0.1554
O-066	O-066	0.6394	Confirmed LTF	0.6394
SIGE	SIGE	0.0279	Confirmed LTF	0.0279
CBM-S2	CBM-S2	0.4698	Confirmed LTF	0.4698
CBM-S1	CBM-S1	0.0452	Confirmed LTF	0.0452
G-007	G-007	0.0987	Confirmed LTF	0.0987
MEC	MEC	0.2717	Confirmed LTF	0.2717

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
LAGN	LAGN	0.2118	Confirmed LTF	0.2118

11.6.8 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
164211775	940840	AE2-072 TAP	ATSI	242993	05E.LEIPSIC2	AEP	1	AEP_P4_#12461_05SHICKSV 69.0_E	breaker	223.0	115.38	119.16	DC	8.4

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
238979	02NAPMUN	2.7541	Adder	3.24
239064	02RICHG1	0.4556	50/50	0.4556
239065	02RICHG2&3	0.9316	50/50	0.9316
239067	02RICHG4	4.9566	50/50	4.9566
239068	02RICHG5	4.9570	50/50	4.9570
239069	02RICHG6	4.9570	50/50	4.9570
239202	02STRYCT	0.2830	50/50	0.2830
240968	02BG2 GEN	0.3187	Adder	0.37
940841	AE2-072 C	49.6548	50/50	49.6548
940842	AE2-072 E	33.1032	50/50	33.1032
941781	AE2-181 C	3.6785	50/50	3.6785
941782	AE2-181 E	2.4524	50/50	2.4524
942661	AE2-282 C	4.5976	50/50	4.5976
942662	AE2-282 E	2.4193	50/50	2.4193
943951	AF1-063 C O1	5.0647	50/50	5.0647
943952	AF1-063 E O1	2.8079	50/50	2.8079
943961	AF1-064 C O1	2.4452	Adder	2.88
943962	AF1-064 E O1	1.2153	Adder	1.43
944551	AF1-120 C	2.7858	50/50	2.7858
944552	AF1-120 E	1.4034	50/50	1.4034
945401	AF1-205 C	1.7864	Adder	2.1
945402	AF1-205 E	1.1910	Adder	1.4
945411	AF1-206 C O1	12.5048	50/50	12.5048
945412	AF1-206 E O1	8.3365	50/50	8.3365
958321	AF2-126 C	2.4892	Adder	2.93
958322	AF2-126 E	1.2446	Adder	1.46
958331	AF2-127 C	6.5343	50/50	6.5343
958332	AF2-127 E	3.4377	50/50	3.4377
960301	AF2-321 C	13.8128	50/50	13.8128
960302	AF2-321 E	9.2086	50/50	9.2086
962121	AG1-056 C	5.0398	50/50	5.0398
962122	AG1-056 E	3.3599	50/50	3.3599
964561	AG1-319 C	3.9292	Adder	8.72
964562	AG1-319 E	2.6195	Adder	5.81
CALDERWOOD	CALDERWOOD	0.1163	Confirmed LTF	0.1163
PRAIRIE	PRAIRIE	0.6173	Confirmed LTF	0.6173
O-066	O-066	0.0135	Confirmed LTF	0.0135
CHEOAH	CHEOAH	0.1166	Confirmed LTF	0.1166
COTTONWOOD	COTTONWOOD	0.4872	Confirmed LTF	0.4872
G-007	G-007	0.0031	Confirmed LTF	0.0031
HAMLET	HAMLET	0.1063	Confirmed LTF	0.1063

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
GIBSON	GIBSON	0.1627	Confirmed LTF	0.1627
BLUEG	BLUEG	0.5625	Confirmed LTF	0.5625
TRIMBLE	TRIMBLE	0.1814	Confirmed LTF	0.1814
CATAWBA	CATAWBA	0.0693	Confirmed LTF	0.0693
CBM-W1	CBM-W1	3.6873	Confirmed LTF	3.6873

11.6.9 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
165490076	960300	AF2-321 TAP	ATSI	239127	02STRYKE	ATSI	1	AEP_P7-1_#10983-B	tower	181.0	162.8	184.36	DC	39.02

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
238979	02NAPMUN	-2.7368	Adder	-3.22
239064	02RICHG1	0.7157	50/50	0.7157
239065	02RICHG2&3	1.4241	50/50	1.4241
239067	02RICHG4	7.7860	50/50	7.7860
239068	02RICHG5	7.7866	50/50	7.7866
239069	02RICHG6	7.7866	50/50	7.7866
940841	AE2-072 C	36.9261	50/50	36.9261
940842	AE2-072 E	24.6174	50/50	24.6174
943961	AF1-064 C O1	2.0827	Adder	2.45
943962	AF1-064 E O1	1.0351	Adder	1.22
958321	AF2-126 C	2.1201	Adder	2.49
958322	AF2-126 E	1.0601	Adder	1.25
960301	AF2-321 C	64.1740	50/50	64.1740
960302	AF2-321 E	42.7827	50/50	42.7827
962121	AG1-056 C	23.4148	50/50	23.4148
962122	AG1-056 E	15.6099	50/50	15.6099
CALDERWOOD	CALDERWOOD	0.0427	Confirmed LTF	0.0427
NY	NY	0.0442	Confirmed LTF	0.0442
PRAIRIE	PRAIRIE	0.2325	Confirmed LTF	0.2325
O-066	O-066	0.5451	Confirmed LTF	0.5451
CHEOAH	CHEOAH	0.0430	Confirmed LTF	0.0430
COTTONWOOD	COTTONWOOD	0.1848	Confirmed LTF	0.1848
G-007	G-007	0.0850	Confirmed LTF	0.0850
HAMLET	HAMLET	0.0485	Confirmed LTF	0.0485
GIBSON	GIBSON	0.0486	Confirmed LTF	0.0486
BLUEG	BLUEG	0.1510	Confirmed LTF	0.1510
TRIMBLE	TRIMBLE	0.0484	Confirmed LTF	0.0484
CATAWBA	CATAWBA	0.0298	Confirmed LTF	0.0298

11.7 Queue Dependencies

The Queue Projects below are listed in one or more indices for the overloads identified in your report. These projects contribute to the loading of the overloaded facilities identified in your report. The percent overload of a facility and cost allocation you may have towards a particular reinforcement could vary depending on the action of these earlier projects. The status of each project at the time of the analysis is presented in the table. This list may change as earlier projects withdraw or modify their requests.

Queue Number	Project Name	Status
AE2-072	East Leipsic-Richland 138 kV	Active
AE2-181	Snyder 69kV	Active
AE2-282	East Fayette 138 kV	Active
AF1-047	Mark Center 69 kV	Active
AF1-063	Lockwood Road 138 kV	Active
AF1-064	Weston 69 kV	Active
AF1-120	East Fayette 2 138 kV	Active
AF1-205	Napolean Muni 138 kV	Active
AF1-206	East Fayette 138 kV	Active
AF2-126	Weston 69 kV II	Active
AF2-127	Lockwood Road 138 kV	Active
AF2-321	Stryker-Ridgeville 138 kV	Active
AG1-056	Stryker-Ridgeville 138 kV	Active
AG1-319	Northside 138 kV	Active

11.8 Contingency Descriptions

Contingency Name	Contingency Definition
ATSI-P1-2-TE-138-001B	CONTINGENCY 'ATSI-P1-2-TE-138-001B' /* RICHLAND-WAUSEON 138 DISCONNECT BRANCH FROM BUS 239070 TO BUS 239165 CKT 1 /* 02RICHLD 138 02WAUSEO 138 END
AEP_P1-2_#7097_4883-B	CONTINGENCY 'AEP_P1-2_#7097_4883-B' OPEN BRANCH FROM BUS 940840 TO BUS 242993 CKT 1 / 940840 AE2-072 TAP 138 242993 05E.LEIPSIC2 138 1 END
ATSI-P1-2-TE-138-039	CONTINGENCY 'ATSI-P1-2-TE-138-039' /* LINE ALLEN JCT TO E FAYETTE 138 DISCONNECT BRANCH FROM BUS 238531 TO BUS 239345 CKT 1 /* 02ALLNJ 138 02SIL_AE+ 138 DISCONNECT BRANCH FROM BUS 239345 TO BUS 239346 CKT 1 /* 02SIL_AE+ 138 02SILICA+ 138 DISCONNECT BRANCH FROM BUS 239345 TO BUS 238517 CKT 1 /* 02SIL_AE+ 138 02LYONS 138 DISCONNECT BRANCH FROM BUS 238712 TO BUS 238517 CKT 1 /* 02FAYET 138 02LYONS 138 DISCONNECT BRANCH FROM BUS 238712 TO BUS 239351 CKT 1 /* 02FAYET 138 02EASTFAYT 138 REMOVE LOAD O FROM BUS 238517 /* 02LYONS 138 REMOVE LOAD O FROM BUS 238712 /* 02FAYET 138 END
ATSI-P2-2-TE-138-005	CONTINGENCY 'ATSI-P2-2-TE-138-005' /* MIDWAY 138 J BUS DISCONNECT BRANCH FROM BUS 238963 TO BUS 238962 CKT 1 /* 02MIDWAY 69 02MIDWAY 138 DISCONNECT BRANCH FROM BUS 238962 TO BUS 238979 CKT 1 /* 02MIDWAY 138 02NAPMUN 138 DISCONNECT BRANCH FROM BUS 238962 TO BUS 238502 CKT 1 /* 02MIDWAY 138 02BRIM 138 DISCONNECT BRANCH FROM BUS 238962 TO BUS 239263 CKT 1 /* 02MIDWAY 138 02STLUKE 138 REDUCE BUS 238962 SHUNT BY 100 PERCENT /* 02MIDWAY 138 END
ATSI-P7-1-TE-138-016	CONTINGENCY 'ATSI-P7-1-TE-138-016' /* MIDWAY-NAPMUNI & MIDWAY-RICHL-WAUS 138 DISCONNECT BRANCH FROM BUS 238960 TO BUS 239165 CKT 1 /* 02MIDWY K 138 02WAUSEON 138 DISCONNECT BRANCH FROM BUS 238962 TO BUS 238979 CKT 1 /* 02MIDWAY 138 02NAPMUN 138 END

Contingency Name	Contingency Definition
AEP_P1-2_#14793-A	CONTINGENCY 'AEP_P1-2_#14793-A' OPEN BRANCH FROM BUS 243086 TO BUS 959180 CKT 1 / 243086 05S HICK 138 959180 AF2-209 TAP 138 1 OPEN BRANCH FROM BUS 243086 TO BUS 243179 CKT 1 / 243086 05S HICK 138 243179 05S HICKSV 69.0 1 OPEN BRANCH FROM BUS 243029 TO BUS 243086 CKT 1 / 243029 05LCKWRD 138 243086 05S HICK 138 1 END
ATSI-P1-3-TE-138-012A	CONTINGENCY 'ATSI-P1-3-TE-138-012A' /* XFMR FAULT: 02MIDWAY 69KV TO 02MIDWAY 138KV 1 DISCONNECT BRANCH FROM BUS 238963 TO BUS 238962 CKT 1 /* 02MIDWAY 69 02MIDWAY 138 DISCONNECT BRANCH FROM BUS 238962 TO BUS 239263 CKT 1 /* 02MIDWAY 138 02STLUKE 138 DISCONNECT BRANCH FROM BUS 238962 TO BUS 238979 CKT 1 /* 02MIDWAY 138 02NAPMUN 138 DISCONNECT BRANCH FROM BUS 238962 TO BUS 238502 CKT 1 /* 02MIDWAY 138 02BRIM 138 REDUCE BUS 238962 SHUNT BY 100 PERCENT /* 02MIDWAY 138 END
ATSI-P2-3-TE-138-013	CONTINGENCY 'ATSI-P2-3-TE-138-013' /* MIDWAY 13308 BREAKER TO ANGOLA VIA ST LUKE DISCONNECT BUS 239263 /* 02STLUKE 138 DISCONNECT BUS 238651 /* 02DANA 138 DISCONNECT BUS 238786 /* 02HAWTHO 138 DISCONNECT BRANCH FROM BUS 238963 TO BUS 238962 CKT 1 /* 02MIDWAY 69 02MIDWAY 138 DISCONNECT BRANCH FROM BUS 238962 TO BUS 238979 CKT 1 /* 02MIDWAY 138 02NAPMUN 138 DISCONNECT BRANCH FROM BUS 238962 TO BUS 238502 CKT 1 /* 02MIDWAY 138 02BRIM 138 REDUCE BUS 238962 SHUNT BY 100 PERCENT /* 02MIDWAY 138 END
ATSI-P2-2-TE-138-004	CONTINGENCY 'ATSI-P2-2-TE-138-004' /* STRYKER 138 BUS DISCONNECT BUS 239127 /* 02STRYKE 138 DISCONNECT BUS 239202 /* 02STRYCT 13 END
ATSI-P2-2-TE-138-023	CONTINGENCY 'ATSI-P2-2-TE-138-023' /* FAYETTE 138 DISCONNECT BUS 238712 /* 02FAYET 138 DISCONNECT BUS 238517 /* 02LYONS 138 END

Contingency Name	Contingency Definition
ATSI-P1-2-TE-138-041	CONTINGENCY 'ATSI-P1-2-TE-138-041' /* LINE 02MIDWAY TO 02NAPMUN 138 DISCONNECT BRANCH FROM BUS 238962 TO BUS 238979 CKT 1 /* 02MIDWAY 138 02NAPMUN 138 END
AEP_P4_#12461_05S HICKSV 69.0_E	CONTINGENCY 'AEP_P4_#12461_05S HICKSV 69.0_E' DISCONNECT BUS 243179 / 243179 05S HICKSV 69.0 DISCONNECT BUS 243086 / 243086 05S HICK 138 END
ATSI-P1-2-TE-138-031B-A	CONTINGENCY 'ATSI-P1-2-TE-138-031B-A' /* LINE STRYKE-RICHLN 138 DISCONNECT BRANCH FROM BUS 960300 TO BUS 239127 CKT 1 /* AF2-321 TAP 138 02STRYKE 138 END
ATSI-P2-4-TE-138-015	CONTINGENCY 'ATSI-P2-4-TE-138-015' /* MIDWAY 13303 TIE-BREAKER DISCONNECT BUS 238962 /* 02MIDWAY 138 DISCONNECT BUS 238960 /* 02MIDW K 138 END
Base Case	
ATSI-P2-3-TE-138-010C	CONTINGENCY '"ATSI-P2-3-TE-138-010C"' / 1200 OPEN BRANCH FROM BUS 239127 TO BUS 960300 CKT 1 / 239127 02STRYKE 138 960300 AF2-321 TAP 138 1 OPEN BRANCH FROM BUS 238979 TO BUS 239127 CKT 1 / 238979 02NAPMUN 138 239127 02STRYKE 138 1 OPEN BRANCH FROM BUS 239127 TO BUS 239351 CKT 1 / 239127 02STRYKE 138 239351 02EASTFAYT 138 1 OPEN THREEWINDING AT BUS 239127 TO BUS 239126 TO BUS 239202 CKT 3/ OPEN THREEWINDING AT BUS 239202 TO BUS 239126 TO BUS 239127 CKT 3/ REMOVE MACHINE 1 FROM BUS 239202 /* 239202 02STRYCT 13.2 DEFAULT DISPATCH END
AEP_P7-1_#10984-B	CONTINGENCY 'AEP_P7-1_#10984-B' OPEN BRANCH FROM BUS 940840 TO BUS 242993 CKT 1 / 940840 AE2-072 TAP 138 242993 05E.LPSC 138 1 OPEN BRANCH FROM BUS 242957 TO BUS 243080 CKT 1 / 242957 05BASEL8 138 243080 05RILEYC 138 1 OPEN BRANCH FROM BUS 242989 TO BUS 243083 CKT 1 / 242989 05E LIMA 138 243083 05CAMPSS 138 1 OPEN BRANCH FROM BUS 243083 TO BUS 243121 CKT 1 / 243083 05CAMPSS 138 243121 05ROCKPO 138 1 OPEN BRANCH FROM BUS 243080 TO BUS 247000 CKT 1 / 243080 05RILEYC 138 247000 05YELLWC 138 1 END

Contingency Name	Contingency Definition
ATSI-P2-2-TE-138-012	CONTINGENCY 'ATSI-P2-2-TE-138-012' /* WAUSEON 138 BUS DISCONNECT BUS 239165 /* 02WAUSEO 138 END
AEP_P7-1_#10983-B	CONTINGENCY 'AEP_P7-1_#10983-B' OPEN BRANCH FROM BUS 239070 TO BUS 243029 CKT 1 / 239070 02RICHLD 138 243029 05LCKWRD 138 1 OPEN BRANCH FROM BUS 940840 TO BUS 242993 CKT 1 / 239269 AE2-072 TAP 138 242993 05E.LPSC 138 1 OPEN BRANCH FROM BUS 242971 TO BUS 243029 CKT 1 / 242971 05BRYAN 138 243029 05LCKWRD 138 1 REMOVE SWSHUNT FROM BUS 243029 / 243029 05LCKWRD 138 END
AEP_P7-1_#10983-A	CONTINGENCY 'AEP_P7-1_#10983-A' OPEN BRANCH FROM BUS 239070 TO BUS 243029 CKT 1 / 239070 02RICHLD 138 243029 05LCKWRD 138 1 OPEN BRANCH FROM BUS 239269 TO BUS 940840 CKT 1 / 239269 02RICHLJ 138 242993 AE2-072 TAP 138 1 OPEN BRANCH FROM BUS 242971 TO BUS 243029 CKT 1 / 242971 05BRYAN 138 243029 05LCKWRD 138 1 REMOVE SWSHUNT FROM BUS 243029 / 243029 05LCKWRD 138 END
ATSI-P1-3-TE-138-022	CONTINGENCY 'ATSI-P1-3-TE-138-022' /* XFMR FAULT: 02WAUS 69KV TO 02WAUSEO 138KV CK 2 DISCONNECT BRANCH FROM BUS 239164 TO BUS 239165 CKT 2 /* 02WAUS 69 02WAUSEO 138 DISCONNECT BUS 239165 /* 02WAUSEO 138 END

12 Short Circuit Analysis

The following Breakers are overdutied:

None.

12.1 System Reinforcements - Short Circuit

No short circuit impacts were identified for this project.

13 Affected Systems

13.1 NYISO

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

13.2 MISO

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

14 Attachment 1: One Line Diagram