Generation Interconnection

Feasibility Study Report

for

Queue Project AG1-490

SHENANGO-MCDOWELL 138 KV

105 MW Capacity / 125 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.

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 a Solar; Storage generating facility located in Mercer County, Pennsylvania. The installed facilities will have a total capability of 125 MW with 105 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is June 01, 2023. This study does not imply a TO commitment to this in-service date.

Queue Number	AG1-490
Project Name	SHENANGO-MCDOWELL 138 KV
State	Pennsylvania
County	Mercer
Transmission Owner	ATSI
MFO	125
MWE	125
MWC	105
Fuel	Solar; Storage
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

4.1 Primary Point of Interconnection

AG1-490 will interconnect with the ATSI transmission system. The interconnection of the project at the Primary POI will be accomplished by constructing a new 138 kV three (3) breaker ring bus substation and looping the Shenango-McDowell 138 kV line into the new station. The new substation will be located approximately 8.2 miles from Shenango Substation.

4.2 Secondary Point of Interconnection

AG1-490 will interconnect with the ATSI transmission system as a direct connection to the Shenango 345 kV substation. A full scope of work or estimated cost is not provided for the proposed Secondary POI. Only network impacts are provided for the Secondary POI in this report.

5 Cost Summary

The AG1-490 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$8,630,000
Total System Network Upgrade Costs (TO identified)	$35,639,7100[1]
Total System Network Upgrade Costs (PJM identified)	$125,602[2]
Total Costs	$44,395,312

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 TO system (see Transmission Owner 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.

[2] 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

The interconnection of the project at the Primary POI will be accomplished by constructing a new 138 kV three (3) breaker ring bus substation and looping the Shenango-McDowell 138 kV line into the new station. The new substation will be located approximately 8.2 miles from Shenango Substation. The IC will be responsible for acquiring all easements, properties, and permits that may be required to construct both the new interconnection switching station and the associated facilities. The IC will also be responsible for the rough grade of the property and an access road to the proposed three-breaker ring bus site. The project will also require Non-Direct Connection upgrades at Shenango Substation and McDowell Substation.

Attachment 1 shows a one-line diagram of the proposed primary Direct Connection facilities for the AG1-490 generation project to connect to the FirstEnergy ("FE") Transmission System. The IC will be responsible for constructing the facilities on its side of the POI, including the Attachment Facilities which connect the generator to the FE Transmission System's Direct Connection facilities.

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

Description	**Total Cost**
Install disconnect switch, dead-end structure, and associated facilities for generator lead line exit at interconnection substation.	$320,000
Construct 138 kV three breaker ring bus interconnection substation.	$5,970,000
Loop the Shenango - McDowell 138 kV line into the new substation.	$820,000
Upgrade relaying at Shenango.	$760,000
Upgrade relaying at McDowell.	$760,000
Total Physical Interconnection Costs	**$8,630,000**

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 24 months after the signing of an Interconnection Construction Service Agreement to complete the installation. 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[3]

8.1 Transmission Owner Identified Network Impacts to Distribution Facilities

Potential TO identified network impacts to Transmission Owner distribution facilities were as follows:

None

8.2 Transmission Owner Identified Network Impacts to Sub-Regional Facilities

At the Primary POI, the AG1-490 project contributes to overloads on the FE Transmission <100 kV System as shown below. Potential TO identified network impacts to Transmission Owner Sub-Regional facilities were as follows:

Idx	Overloaded Element	Contingency	Rating [MVA]	Loading Before %	Loading After %	Contribution [MW]
55	238955 02MCDOWL 69.0 239864 02DP CORTN 69.0 Ckt 1	ATSI-P1-2-OEE-138-005-B-A	48	93.54%	140.28%	22.43
86	238955 02MCDOWL 69.0 239948 02GE_TSD 69.0 Ckt 1	ATSI-P1-2-OEE-138-065	72	80.99%	100.07%	13.74
77	239863 02ITT-MRFR 69.0 239862 02MERCER 69.0 Ckt 1	ATSI-P1-2-OEE-138-005-B-A	56	69.04%	109.10%	22.43
71	239864 02DP CORTN 69.0 239863 02ITT-MRFR 69.0 Ckt 1	ATSI-P1-2-OEE-138-005-B-A	56	77.32%	117.38%	22.43
64	239869 02GRNVLY80 69.0 239870 02HEMPFIEL 69.0 Ckt 1	ATSI-P1-2-OEE-138-005-B-A	46	119.76%	125.14%	2.48
82	239870 02HEMPFIEL 69.0 239871 02HART.TAP 69.0 Ckt 1	ATSI-P1-2-OEE-138-005-B-A	46	101.23%	106.61%	2.48

8.3 System Reinforcements on Distribution Facilities

None

[3] For TO Distribution Facilities that need upgrades, the TO has applied their cost allocation rules. For TO Sub-Regional Facilities in need of upgrades, PJM Cost Allocation Criteria has been applied.

8.4 System Reinforcements on Sub-Regional Facilities

Idx	Facility	Upgrade ID	Upgrade Description	Cost
55	238955 02MCDOWL 69.0 239864 02DP CORTN 69.0 Ckt 1	OEE-021A, OEE-021B	**ATSI** **OEE-021A:** Upgrade RT at McDowell for the McDowell-Department of Correction line segment to exceed TL rating Time Estimate: 12 Cost: $376,808 Ratings: 47.0/56.0/56.0 MVA **OEE-021B:** Reconductor the McDowell-Department of Corrections 69 kV Line segment. Replace substation conductor at McDowell to exceed TL ratings. Time Estimate: 42 Cost: $15,072,300 Ratings: 80.0/96.0/96.0 MVA	$15,449,108
86	238955 02MCDOWL 69.0 239948 02GE_TSD 69.0 Ckt 1	OEE-022A	**ATSI** **OEE-022A:** Upgrade RT at McDowell for the McDowell-GE TSD GR tap line segment to exceed TL rating Time Estimate: 12 Cost: $376,808 Ratings: 76.0/90.0/90.0 MVA	$376,808
77	239863 02ITT-MRFR 69.0 239862 02MERCER 69.0 Ckt 1	OEE-024A	**ATSI** **OEE-024A:** Reconductor the Mercer-Reznor 69 kV Line segment. Time Estimate: 30 Cost: $3,014,460 Ratings: 80.0/96.0/96.0 MVA	$3,014,460
71	239864 02DP CORTN 69.0 239863 02ITT-MRFR 69.0 Ckt 1	OEE-025A	**ATSI** **OEE-025A:** Reconductor the Department of Corrections-Reznor 69 kV Line segment. Time Estimate: 36 Cost: $8,289,765 Ratings: 80.0/96.0/96.0 MVA	$8,289,765
64	239869 02GRNVLY80 69.0 239870 02HEMPFIEL 69.0 Ckt 1	OEE-017A	**ATSI** **OEE-017A:** Reconductor the Greenville-Hempfield 69 kV Line segment (2.1 miles). Upgrade remote ends so that the TL is the most limiting element of the circuit. Time Estimate: 30 Cost: $5,997,519 Ratings: 80.0/96.0/96.0 MVA	$5,997,519
82	239870 02HEMPFIEL 69.0 239871 02HART.TAP 69.0 Ckt 1	OEE-019A	**ATSI** **OEE-019A:** Reconductor the Hempfield-Werner Tap 69 kV Line segment. Time Estimate: 24 Cost: $2,512,050 Ratings: 80.0/96.0/96.0 MVA	$2,512,050
			TOTAL COST	**$35,639,710**

9 Interconnection Customer Requirements

9.1 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.

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 AG1-490 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 AG1-490 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 Transmission 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 Interconnected Transmission Owner's revenue metering requirements for generation interconnection customers located at the following link:

http://www.pjm.com/planning/design-engineering/to-tech-standards/

11 Summer Peak - Load Flow Analysis - Primary POI

The Queue Project AG1-490 was evaluated as a 125.0 MW (Capacity 105.0 MW) injection tapping the Shenango to McDowell 138 kV line in the ATSI area. Project AG1-490 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-490 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)

None

11.2 Multiple Facility Contingency

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

None

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	CONTNAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
168022194	238944	02MASURY	138.0	ATSI	239120	02SSPRNG	138.0	ATSI	1	ATSI-P1-2-OEE-345-874	single	165.0	100.38	108.84	DC	13.96

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	CONTNAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
168022193	238944	02MASURY	138.0	ATSI	239120	02SSPRNG	138.0	ATSI	1	ATSI-P1-2-OEE-345-874	operation	165.0	121.22	131.3	DC	16.62
164727417	923061	AB1-105 TAP	345.0	ATSI	238781	02HANNA	345.0	ATSI	1	Base Case	operation	1413.0	98.63	100.04	DC	19.84

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
168022194	1	**02MASURY 138.0 kV - 02SSPRNG 138.0 kV Ckt 1**	**ATSI** **OEE-027A (950) : Replace substation conductor at Masury to exceed TL ratings** **Project Type : Facility** **Cost : $125,602** **Time Estimate : 12.0 Months**	$125,602
			TOTAL COST	**$125,602**

11.6 Flow Gate Details - Primary POI

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
168022194	238944	02MASURY	ATSI	239120	02SSPRNG	ATSI	1	ATSI-P1-2-OEE-345-874	single	165.0	100.38	108.84	DC	13.96

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
238995	02NCUNTD	0.0283	80/20	0.0283
239022	02NWCAG3	0.8769	80/20	0.8769
239023	02NWCAG4	1.0258	80/20	1.0258
239024	02NWCAG5	1.5176	80/20	1.5176
241937	AA1-044 CT1	3.8001	80/20	3.8001
241938	AA1-044 CT2	3.8001	80/20	3.8001
241939	AA1-044 ST	5.2816	80/20	5.2816
938581	AE1-079 C O1	2.6225	80/20	2.6225
939541	AE1-183 C	1.6942	80/20	1.6942
939971	AE1-237 C	2.6475	80/20	2.6475
941881	AE2-193 C	7.5388	80/20	7.5388
942611	AE2-277 C	1.8587	80/20	1.8587
942691	AE2-285 C O1	5.8833	80/20	5.8833
943141	AE2-343 C	2.4122	80/20	2.4122
944251	AF1-093 C	1.6942	80/20	1.6942
944811	AF1-146 C	8.7957	80/20	8.7957
945061	**AF1-171 C (Withdrawn : 12/15/2020)**	**2.3533**	**80/20**	**2.3533**
945251	AF1-190	0.0112	80/20	0.0112
945261	AF1-191	0.0431	80/20	0.0431
945851	AF1-250 C	2.1180	80/20	2.1180
958351	AF2-129 C	2.0370	80/20	2.0370
958851	AF2-176 C	8.1529	80/20	8.1529
960311	AF2-322 C	8.6970	80/20	8.6970
960501	AF2-341 C O1	2.6557	80/20	2.6557
960511	AF2-342 C	2.6557	80/20	2.6557
960521	AF2-343 C	2.6557	80/20	2.6557
960531	AF2-344 C	2.6557	80/20	2.6557
960541	AF2-345 C	2.6557	80/20	2.6557
962071	AG1-051	3.9222	80/20	3.9222
962101	AG1-054 C	2.3509	80/20	2.3509
963431	AG1-192 C	1.8778	80/20	1.8778
963971	AG1-251 C	0.2858	80/20	0.2858
963981	AG1-252 C	0.3157	80/20	0.3157
964321	AG1-293 C O1	0.9609	80/20	0.9609
964661	AG1-329 C	0.8629	80/20	0.8629
964681	AG1-331 C	0.8629	80/20	0.8629
964711	AG1-334 C	0.8825	80/20	0.8825
964721	AG1-335 C	0.4938	80/20	0.4938
965521	AG1-420 C O1	3.5855	80/20	3.5855

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
965941	AG1-463 C O1	3.9222	80/20	3.9222
966201	AG1-489 C O1	9.3148	80/20	9.3148
966211	AG1-490 C O1	13.9608	80/20	13.9608
G-007A	G-007A	0.7768	Confirmed LTF	0.7768
VFT	VFT	2.1027	Confirmed LTF	2.1027
CALDERWOOD	CALDERWOOD	0.1257	Confirmed LTF	0.1257
PRAIRIE	PRAIRIE	0.8550	Confirmed LTF	0.8550
CHEOAH	CHEOAH	0.1256	Confirmed LTF	0.1256
CBM-N	CBM-N	0.3948	Confirmed LTF	0.3948
COTTONWOOD	COTTONWOOD	0.6069	Confirmed LTF	0.6069
HAMLET	HAMLET	0.0918	Confirmed LTF	0.0918
GIBSON	GIBSON	0.1900	Confirmed LTF	0.1900
BLUEG	BLUEG	0.5937	Confirmed LTF	0.5937
TRIMBLE	TRIMBLE	0.1903	Confirmed LTF	0.1903
CATAWBA	CATAWBA	0.0655	Confirmed LTF	0.0655

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
AA1-044	Shenango-Hoytdale 345kV	In Service
AE1-079	Maysville-Sharon 69 kV	Active
AE1-183	Maysville-McDowell 69 kV	Active
AE1-237	Andover (Maysville) 69kV I	Active
AE2-193	Shenango 138 kV	Active
AE2-277	McDowell 138 kV	Active
AE2-285	Maysville 69 kV	Active
AE2-343	Andover (Maysville) 69 kV II	Active
AF1-093	Henderson-Stoneboro 69 kV	Active
AF1-146	Hoytdale -McClelland 345 kV	Active
AF1-171	Jamestown-Hartstown 69 kV	Withdrawn
AF1-190	New Castle 4 69 kV	Partially in Service - Under Construction
AF1-191	New Castle 5 138 kV	Partially in Service - Under Construction
AF1-250	Maysville 69 kV II	Active
AF2-129	Sharon-Mercer 69 kV	Active
AF2-176	Masury-Maysville 138 kV	Active
AF2-322	Hoytdale-McClelland 345 kV	Active
AF2-341	Maysville138 kV	Active
AF2-342	Maysville138 kV II	Active
AF2-343	Maysville 138 kV III	Active
AF2-344	Maysville 138 kV IV	Active
AF2-345	Maysville 138 kV V	Active
AG1-051	Maysville 69 kV III	Active
AG1-054	Potter-Harlan 69 kV	Active
AG1-192	Perry-Stoneboro 69 kV	Active
AG1-251	McDowell 12.47 kV	Active
AG1-252	Henderson 12.47 kV	Active
AG1-293	Hartstown 12.47 kV	Active
AG1-329	Conneaut 12.47 kV	Active
AG1-331	Conneaut-Conneaut Tap 69 kV	Active
AG1-334	Canal 12.47 kV	Active
AG1-335	Wheatland 12.47 kV	Active
AG1-420	Campbell-Kiesters 138 kV	Active
AG1-463	Maysville 69 kV	Active
AG1-489	McClelland-Hoytdale 345 kV	Active
AG1-490	Shenango-McDowell 138 kV	Active

11.8 Contingency Descriptions - Primary POI

Contingency Name	Contingency Definition
Base Case	
ATSI-P1-2-OEE-345-874	CONTINGENCY 'ATSI-P1-2-OEE-345-874' /* LINE 02SHNAGO TO 02NILES 345 CK 1 DISCONNECT BRANCH FROM BUS 239106 TO BUS 239303 CKT 1 /* 02SHNAGO 345 02NILES 345 END

12 Short Circuit Analysis - Primary POI

The following Breakers are overdutied:

None

12.1 System Reinforcements - Short Circuit

None

13 Summer Peak - Load Flow Analysis - Secondary POI

The Queue Project AG1-490 was evaluated as a 125.1 MW (Capacity 105.0 MW) injection at the Shenango 345 kV substation in the ATSI area. Project AG1-490 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-490 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

13.1 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	CONTNAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
16802219 4	238944	02MASURY	138.0	ATSI	239120	02SSPRNG	138.0	ATSI	1	ATSI-P1-2-OEE-345-874	single	165.0	94.93	101.39	DC	10.65

13.2 Multiple Facility Contingency

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

None

13.3 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)

None

13.4 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	CONTNAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
168022193	238944	02MASURY	138.0	ATSI	239120	02SSPRNG	138.0	ATSI	1	ATSI-P1-2-OEE-345-874	operation	165.0	118.86	126.55	DC	12.68
164727417	923061	AB1-105 TAP	345.0	ATSI	238781	02HANNA	345.0	ATSI	1	Base Case	operation	1413.0	98.21	100.04	DC	25.8

13.5 Flow Gate Details - Secondary POI

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".

13.5.1 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
168022194	238944	02MASURY	ATSI	239120	02SSPRNG	ATSI	1	ATSI-P1-2-OEE-345-874	single	165.0	94.93	101.39	DC	10.65

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
238995	02NCUNTD	0.0283	80/20	0.0283
239022	02NWCAG3	0.8771	80/20	0.8771
239023	02NWCAG4	1.0259	80/20	1.0259
239024	02NWCAG5	1.5176	80/20	1.5176
241937	AA1-044 CT1	3.8020	80/20	3.8020
241938	AA1-044 CT2	3.8020	80/20	3.8020
241939	AA1-044 ST	5.2842	80/20	5.2842
938581	AE1-079 C O1	2.6228	80/20	2.6228
939541	AE1-183 C	1.6944	80/20	1.6944
939971	AE1-237 C	2.6478	80/20	2.6478
941881	AE2-193 C	7.5398	80/20	7.5398
942611	AE2-277 C	1.8590	80/20	1.8590
942691	AE2-285 C O1	5.8839	80/20	5.8839
943141	AE2-343 C	2.4124	80/20	2.4124
944251	AF1-093 C	1.6944	80/20	1.6944
944811	AF1-146 C	8.8018	80/20	8.8018
945061	**AF1-171 C (Withdrawn : 12/15/2020)**	**2.3536**	**80/20**	**2.3536**
945251	AF1-190	0.0112	80/20	0.0112
945261	AF1-191	0.0431	80/20	0.0431
945851	AF1-250 C	2.1182	80/20	2.1182
958351	AF2-129 C	2.0372	80/20	2.0372
958851	AF2-176 C	8.1536	80/20	8.1536
960311	AF2-322 C	8.7030	80/20	8.7030
960501	AF2-341 C O1	2.6560	80/20	2.6560
960511	AF2-342 C	2.6560	80/20	2.6560
960521	AF2-343 C	2.6560	80/20	2.6560
960531	AF2-344 C	2.6560	80/20	2.6560
960541	AF2-345 C	2.6560	80/20	2.6560
962071	AG1-051	3.9226	80/20	3.9226
962101	AG1-054 C	2.3512	80/20	2.3512
963431	AG1-192 C	1.8780	80/20	1.8780
963971	AG1-251 C	0.2858	80/20	0.2858
963981	AG1-252 C	0.3157	80/20	0.3157
964321	AG1-293 C O2	0.9610	80/20	0.9610
964661	AG1-329 C	0.8630	80/20	0.8630
964681	AG1-331 C	0.8630	80/20	0.8630
964711	AG1-334 C	0.8826	80/20	0.8826
964721	AG1-335 C	0.4938	80/20	0.4938
965521	AG1-420 C O2	3.2798	80/20	3.2798

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
965941	AG1-463 C O2	4.4266	80/20	4.4266
966211	AG1-490 C O2	10.6543	80/20	10.6543
G-007A	G-007A	0.7768	Confirmed LTF	0.7768
VFT	VFT	2.1027	Confirmed LTF	2.1027
CALDERWOOD	CALDERWOOD	0.1257	Confirmed LTF	0.1257
PRAIRIE	PRAIRIE	0.8550	Confirmed LTF	0.8550
CHEOAH	CHEOAH	0.1256	Confirmed LTF	0.1256
CBM-N	CBM-N	0.3948	Confirmed LTF	0.3948
COTTONWOOD	COTTONWOOD	0.6069	Confirmed LTF	0.6069
HAMLET	HAMLET	0.0918	Confirmed LTF	0.0918
GIBSON	GIBSON	0.1900	Confirmed LTF	0.1900
BLUEG	BLUEG	0.5937	Confirmed LTF	0.5937
TRIMBLE	TRIMBLE	0.1903	Confirmed LTF	0.1903
CATAWBA	CATAWBA	0.0655	Confirmed LTF	0.0655

13.6 Contingency Descriptions - Secondary POI

Contingency Name	Contingency Definition
Base Case	
ATSI-P1-2-OEE-345-874	CONTINGENCY 'ATSI-P1-2-OEE-345-874' / 597 OPEN BRANCH FROM BUS 239106 TO BUS 239303 CKT 1 / 239106 02SHNAGO 345 239303 02NILES 345 1 END

14 Affected Systems

None