



**Generation Interconnection
Feasibility Study Report
for
Queue Project AF2-344
MAYSVILLE 138 KV IV
12 MW Capacity / 20 MW Energy**

July 2020

Table of Contents

1	Introduction.....	4
2	Preface.....	4
3	General	5
4	Point of Interconnection.....	6
4.1	Primary POI.....	6
4.2	Secondary POI	6
5	Cost Summary	6
6	Transmission Owner Scope of Work.....	8
7	Schedule.....	9
8	Transmission Owner Analysis.....	9
9	Interconnection Customer Requirements.....	11
9.1	System Protection.....	11
9.2	Compliance Issues and Interconnection Customer Requirements	11
9.3	Power Factor Requirements.....	12
10	Revenue Metering and SCADA Requirements	12
10.1	PJM Requirements	12
10.2	Meteorological Data Reporting Requirements	12
10.3	Interconnected Transmission Owner Requirements.....	12
11	Summer Peak - Load Flow Analysis - Primary POI	13
11.1	Generation Deliverability	14
11.2	Multiple Facility Contingency	14
11.3	Contribution to Previously Identified Overloads.....	14
11.4	Potential Congestion due to Local Energy Deliverability.....	14
11.5	System Reinforcements - Summer Peak Load Flow - Primary POI.....	15
11.6	Flow Gate Details - Primary POI	16
11.7	Queue Dependencies	17
11.8	Contingency Descriptions - Primary POI.....	18
12	Short Circuit Analysis - Primary POI.....	19
13	Summer Peak - Load Flow Analysis - Secondary POI	20
13.1	Generation Deliverability	21
13.2	Multiple Facility Contingency	21

13.3	Contribution to Previously Identified Overloads.....	21
13.4	Potential Congestion due to Local Energy Deliverability.....	21
13.5	Flow Gate Details - Secondary POI.....	23
13.5.1	Index 1	24
13.5.2	Index 2	25
13.6	Contingency Descriptions - Secondary POI.....	26
14	Affected Systems	27
14.1	NYISO	27
14.2	MISO	27

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.

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.

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 Solar generating facility located in Mercer County, Pennsylvania. This project is an increase to the Interconnection Customer's AF2-341/AF2-342/AF2-343 projects, which will share the same point of interconnection. The AF2-344 queue position is a 20 MW uprate (12 MW Capacity uprate) to the previous project. The total installed facilities will have a capability of 80 MW with 48 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	AF2-344
Project Name	MAYSVILLE 138 KV IV
State	Pennsylvania
County	Mercer
Transmission Owner	ATSI
MFO	80
MWE	20
MWC	12
Fuel	Solar
Basecase Study Year	2023

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 POI

AF2-343 will interconnect with the ATSI transmission system as an uprate to the AF2-341/AF2-342/AF2-343 projects which is a direct connection at the Maysville 138 kV substation for the Primary POI selected.

The interconnection of the AF2-341 project at the Primary POI will be accomplished by extending the Maysville 138 kV Bus, installing one (1) 138 kV circuit breaker and extending a new line exit to the Primary POI. Additionally, new 138 kV breakers will be installed at the Masury-Maysville 138 kV Line exit and on the high side of the Maysville 138/69 kV Transformer #1 at the Maysville Substation. The IC will be responsible for acquiring all easements, properties, and permits that may be required to expand the Maysville substation and associated attachment facilities.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AF2-341/AF2-342/AF2-343/AF2-344 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's direct connection facilities.

4.2 Secondary POI

The secondary POI is an interconnection to the Maysville-Masury 138 kV line approximately 3.5 miles from Maysville Substation as an uprate to AF2-341/AF2-342/AF2-343. No physical interconnection costs are provided for the secondary POI by the ITO, only analysis results are provided. If the customer chooses the secondary POI for the System Impact phase, then the costs will be provided at that time.

5 Cost Summary

The AF2-344 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	\$0
Total Transmission Owner Analysis Impacts (<100 kV/Non-BES)	\$117,997,270 ¹
Total System Reinforcement Costs	\$0
Total Costs	\$117,997,270 ¹

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 88-129. If at a future date it is determined

¹ The Transmission Owner identified overloads will be reviewed by PJM and FirstEnergy in the Impact Study phase to determine whether the queue customer has a cost responsibility for any reinforcements.

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.

6 Transmission Owner Scope of Work

AF2-344 will interconnect with the ATSI transmission system as an uprate to the AF2-341/AF2-342/AF2-343 projects which is a direct connection at the Maysville 138 kV substation for the Primary POI selected.

The interconnection of the AF2-341 project at the Primary POI will be accomplished by extending the Maysville 138 kV Bus, installing one (1) 138 kV circuit breaker and extending a new line exit to the Primary POI. Additionally, new 138 kV breakers will be installed at the Masury-Maysville 138 kV Line exit and on the high side of the Maysville 138/69 kV Transformer #1 at the Maysville Substation. The IC will be responsible for acquiring all easements, properties, and permits that may be required to expand the Maysville substation and associated attachment facilities.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AF2-341/AF2-342/AF2-343/AF2-344 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’s direct connection facilities.

There are no additional physical interconnection costs for this project. If AF2-341, AF2-342 and AF2-343 withdraw from the interconnection queue, then this project will be responsible for the interconnection work identified in the AF2-341 Feasibility Study Report and the analysis results will need to be retooled for any required system reinforcements.

The total physical interconnection costs for AF2-344 is given in the table below:

Description	Total Cost
Total Physical Interconnection Costs	\$0

7 Schedule

The AF2-344 project is the same POI as AF2-341/AF2-342/AF2-343 and requires no additional facilities.

If the customer is ultimately responsible for any 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.¹

8 Transmission Owner Analysis

At the Primary POI, the AF2-344 project contributes to overloads on the FE Transmission <100 kV System as shown below. The estimated cost of system reinforcements necessary to mitigate these overloads is shown below.

These transmission owner identified overloads will be reviewed by PJM and First Energy in the Impact Study phase to determine whether the queue customer has a cost responsibility to these overloads.

Contingency Description	Overloaded Element	Rating (MVA)	AF2-344 MW Contrib.	FE Comments /Reinforcements
ATSI-P1-2-OEE-138-012-A	AE1-079 Tap-Camp Reynolds 69 kV Line	43	8.19	OEE-011B
ATSI-P1-2-OEE-138-012-A	Maysville-AE1-079 Tap 69 kV Line	43	8.19	OEE-012B
ATSI-P1-2-OEE-138-012-A	Maysville-Y299 Tap 69 kV Line	53	8.15	OEE-014A
Maysville-AF1-305 Tap 138 kV Line	AE1-079 Tap-Camp Reynolds 69 kV Line	43	8.19	OEE-011B
Base Case	AE1-079 Tap-Camp Reynolds 69 kV Line	27	2.39	OEE-011B
Maysville-AF1-305 Tap 138 kV Line	Maysville-AE1-079 Tap 69 kV Line	43	8.19	OEE-012B
Base Case	Maysville-AE1-079 Tap 69 kV Line	27	8.19	OEE-012B
ATSI-P1-2-OEE-69-024	AE1-079 Tap-Camp Reynolds 69 kV Line	43	3.45	OEE-011A
ATSI-P1-2-OEE-138-012-A	Camp Reynolds-Sharon 69 kV Line	72	8.19	OEE-013B
ATSI-P1-2-OEE-69-024	Maysville-AE1-079 Tap 69 kV Line	43	3.45	OEE-012A
Maysville-AF1-305 Tap 138 kV Line	Maysville-Y299 Tap 69 kV Line	53	8.15	OEE-014A
ATSI-P1-2-OEE-138-012-A	Y299 Tap-Sharon 69 kV Line	76	8.15	OEE-015A
ATSI-P1-2-OEE-138-012-A	AE1-183 Tap-Henderson 69 kV Line	46	3.66	OEE-016A
ATSI-P1-2-OEE-138-012-A	Greenville-Hempfield 69 kV Line	46	3.66	OEE-017A
Base Case	Maysville-Y299 Tap 69 kV Line	32	2.38	OEE-014A
ATSI-P1-2-OEE-138-012-A	Henderson-McDowell 69 kV Line	46	3.66	OEE-018B
Camp Reynolds-AE1-079 Tap 69 kV Line	Maysville-Y299 Tap 69 kV Line	53	3.44	OEE-014A
ATSI-P1-2-OEE-138-012-A	Hempfield-Werner Tap 69 kV Line	46	3.66	OEE-019A
Maysville-AF1-305 Tap 138 kV Line	AE1-183 Tap-Henderson 69 kV Line	46	3.66	OEE-016A
Maysville-AF1-305 Tap 138 kV Line	Camp Reynolds-Sharon 69 kV Line	72	8.19	OEE-013A
Maysville-AF1-305 Tap 138 kV Line	Greenville-Hempfield 69 kV Line	46	3.66	OEE-017A
Maysville-AF1-305 Tap 138 kV Line	Henderson-McDowell 69 kV Line	46	3.66	OEE-018A

Project ID	Facility Description	Reinforcement Description	Cost
OEE-011A	938580 AE1-079 TAP - 239681 02CP.REYN+ 69.0 kV Ckt Id 1	Reconductor the portion of the AE1-079 Tap-Camp Reynolds 69 kV Line segment that is 336.4 ACSR built with a design temperature of 120° F with 336 ACSR built with a design temperature of 212° F. The AE1-079 generator is roughly 1.25 miles from Maysville and 2.35 from Camp Reynolds (near structure 62 of the Maysville-Sharon Y-301 69 kV Line) .	\$5,997,519
OEE-011B	938580 AE1-079 TAP - 239681 02CP.REYN+ 69.0 kV Ckt Id 1	Reconductor the AE1-079 Tap-Camp Reynolds 69 kV Line segment (2.35 miles) using 556 ACSR 26/7. The AE1-079 generator is roughly 1.25 miles from Maysville and 2.35 from Camp Reynolds (near structure 62 of the Maysville-Sharon Y-301 69 kV Line) .	\$5,903,318
OEE-012A	238949 02MAYSVL - 938580 AE1-079 TAP 69.0 kV Ckt 1	Reconductor the portion of the Maysville-AE1-079 Tap 69 kV Line segment that is 336.4 ACSR built with a design temperature of 120° F with 336 ACSR built with a design temperature of 212° F. The AE1-079 generator is roughly 1.25 miles from Maysville and 2.35 from Camp Reynolds (near structure 62 of the Maysville-Sharon Y-301 69 kV Line) .	\$3,234,264
OEE-012B	238949 02MAYSVL - 938580 AE1-079 TAP 69.0 kV Ckt 1	Reconductor the Maysville-AE1-079 Tap 69 kV Line segment (1.25 miles) using 556 ACSR 26/7. The AE1-079 generator is roughly 1.25 miles from Maysville and 2.35 from Camp Reynolds (near structure 62 of the Maysville-Sharon Y-301 69 kV Line) .	\$3,140,063
OEE-013A	239861 02CP.REYN+ - 239104 02SHARON 69.0 kV Ckt Id 1	Upgrade the RT at Sharon so that the TL is limiting the circuit.	\$376,808
OEE-013B	239861 02CP.REYN+ - 239104 02SHARON 69.0 kV Ckt Id 1	Reconductor the Camp Reynolds-Sharon 69 kV Line segment (9.1 miles) using 556 ACSR 26/7. Upgrade remote ends so that the TL is the most limiting element of the circuit.	\$23,644,671
OEE-014A	238949 02MAYSVL - 239893 02Y299+ 69.0 kV Ckt Id 1	Reconductor the Maysville-Sharon Tap 69 kV Line segment (9.4 miles) using 556 ACSR 26/7. Upgrade remote ends so that the TL is the most limiting element of the circuit.	\$23,707,472
OEE-015A	239893 02Y299+ - 239104 02SHARON 69.0 kV Ckt Id 1	Reconductor the Sharon-Sharon Tap 69 kV Line segment (3.3 miles) using 556 ACSR 26/7. Upgrade remote ends so that the TL is the most limiting element of the circuit.	\$9,074,781
OEE-016A	939540 AE1-183 TAP - 239941 02HNDERSN 69.0 kV Ckt Id 1	Reconductor the portion of the AE1-183 Tap-Henderson Tap 69 kV Line segment that is currently 3/0 ACSR using 336 ACSR 26/7. The AE1-183 generator is roughly 8.1 miles from McDowell (near structure 108 of the Maysville-McDowell 69 kV Line) .	\$5,024,100
OEE-017A	239869 02GRNVLY80 - 239870 02HEMPFIEL 69.0 kV Ckt Id 1	Reconductor the Greenville-Hempfield 69 kV Line segment (2.1 miles) using 336 ACSR 26/7. Upgrade remote ends so that the TL is the most limiting element of the circuit.	\$5,997,519
OEE-018A	239941 02HNDERSN - 238955 02MCDOWL 69.0 kV Ckt Id 1	Replace the metering ay McDowell so that the TL is the most limiting element	\$376,808
OEE-018B	239941 02HNDERSN - 238955 02MCDOWL 69.0 kV Ckt Id 1	Reconductor the portion of the Hempfield-McDowell 69 kV Line segment that is currently 3/0 ACSR using 336 ACSR 26/7. Upgrade remote ends so that the TL is the most limiting element of the circuit.	\$29,007,897

Project ID	Facility Description	Reinforcement Description	Cost
OEE-019A	239870 02HEMPFIEL - 239871 02HART.TAP 69.0 kV Ckt Id 1	Reconductor the Hempfield-Werner Tap 69 kV Line segment (1 mile) using 336 ACSR 26/7.	\$2,512,050
Total			\$117,997,270

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 AF2-344 generator lead line. A single circuit breaker must be used to protect this line; if the project has several GSU transformers, the individual GSU transformer breakers cannot be used to protect this line.
2. The purchase and installation of the minimum required FE generation interconnection relaying and control facilities. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.
3. The purchase and installation of supervisory control and data acquisition ("SCADA") equipment to provide information in a compatible format to the FE Transmission System Control Center.
4. Compliance with the FE and PJM generator power factor and voltage control requirements.
5. The execution of a back-up service agreement to serve the customer load supplied from the AF2-344 generation project metering point when the units are out-of-service. This assumes the intent of the IC is to net the generation with the load.

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

submission of the generator model and protection data required to satisfy the PJM and ReliabilityFirst audits. Failure to comply with these requirements may result in a disconnection of service if the violation is found to compromise the reliability of the FE 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)
- Irradiance (Watts/meter²)
- 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 AF2-344 was evaluated as a 20.0 MW (Capacity 12.0 MW) uprate to AF2-343 which is a direct connection at the Maysville 138 kV substation in the ATSI area. Project AF2-344 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-344 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)

None

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	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC DC	MW IMPACT
100771132	238944	02MASURY	138.0	ATSI	239120	02SSPRNG	138.0	ATSI	1	ATSI-P1-2-SYS-345-874	operation	189.0	97.91	100.36	DC	4.62
100771048	238948	02MAYSVL	138.0	ATSI	946410	AF1-305 TAP	138.0	ATSI	1	ATSI-P1-2-OEE-69-022-B	operation	110.0	92.6	106.33	DC	15.1
100770936	946410	AF1-305 TAP	138.0	ATSI	238944	02MASURY	138.0	ATSI	1	ATSI-P1-2-OEE-69-022-B	operation	110.0	162.87	176.6	DC	15.1
100770941	946410	AF1-305 TAP	138.0	ATSI	238944	02MASURY	138.0	ATSI	1	Base Case	operation	110.0	142.93	155.72	DC	14.06

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

None

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".

None

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.

None

11.8 Contingency Descriptions - Primary POI

Contingency Name	Contingency Definition
Base Case	
ATSI-P1-2-OEE-69-022-B	CONTINGENCY 'ATSI-P1-2-OEE-69-022-B' /* MAYSVILLE - SHARON 69 [Y-301] DISCONNECT BRANCH FROM BUS 938580 TO BUS 239861 CKT 1 /* AE1-079 TAP 69 02CP.REYN+ 69 DISCONNECT BRANCH FROM BUS 239104 TO BUS 239861 CKT 1 /* 02SHARON 69 02CP.REYN+ 69 DISCONNECT BUS 239894 /* 02CP.REYNL 69 DISCONNECT BUS 239890 /* 02GRNV MTL 69 END
ATSI-P1-2-SYS-345-874	CONTINGENCY 'ATSI-P1-2-SYS-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

Short circuit analysis to be performed in the System Impact Study phase.

13 Summer Peak - Load Flow Analysis - Secondary POI

The Queue Project AF2-344 was evaluated as a 20.0 MW (Capacity 12.0 MW) uprate to AF2-343 which is tapping the Maysville to Masury 138 kV line in the ATSI area. Project AF2-344 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-344 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	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
151942145	946410	AF1-305 TAP	138.0	ATSI	238944	02MASURY	138.0	ATSI	1	238948 02MAYSVL 138 960500 AF2-341 TAP 138 1	single	110.0	89.82	100.73	DC	12.0
151942146	946410	AF1-305 TAP	138.0	ATSI	238944	02MASURY	138.0	ATSI	1	ATSI-P1-2-OEE-138-012-A	single	110.0	89.82	100.73	DC	12.0
151942168	960500	AF2-341 TAP	138.0	ATSI	238948	02MAYSVL	138.0	ATSI	1	ATSI-P1-2-OEE-138-012-C	single	110.0	89.82	100.73	DC	12.0

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	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
100771132	238944	02MASURY	138.0	ATSI	239120	02SSPRNG	138.0	ATSI	1	ATSI-P1-2-SYS-345-874	operation	189.0	98.06	100.55	DC	4.71

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CK T ID	CONT NAM E	Type	Ratin g MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPAC T
10077093 6	94641 0	AF1-305 TAP	138. 0	ATSI	23894 4	02MASUR Y	138. 0	ATSI	1	ATSI- P1-2- OEE- 69- 022-B	operatio n	110.0	165.18	179.68	DC	15.95
10077094 1	94641 0	AF1-305 TAP	138. 0	ATSI	23894 4	02MASUR Y	138. 0	ATSI	1	Base Case	operatio n	110.0	145.75	159.47	DC	15.1
15194216 7	96050 0	AF2-341 TAP	138. 0	ATSI	23894 8	02MAYSVL	138. 0	ATSI	1	ATSI- P1-2- OEE- 138- 012-C	operatio n	110.0	149.82	168.0	DC	20.0
15194228 8	96050 0	AF2-341 TAP	138. 0	ATSI	94641 0	AF1-305 TAP	138. 0	ATSI	1	ATSI- P1-2- OEE- 69- 022-B	operatio n	110.0	94.82	109.32	DC	15.95

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
151942146	946410	AF1-305 TAP	ATSI	238944	02MASURY	ATSI	1	ATSI-P1-2-OEE-138-012-A	single	110.0	89.82	100.73	DC	12.0

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
946411	AF1-305 C O1	21.0000	80/20	21.0000
958851	AF2-176 C	42.0000	80/20	42.0000
960501	AF2-341 C O2	12.0000	80/20	12.0000
960511	AF2-342 C O2	12.0000	80/20	12.0000
960521	AF2-343 C O2	12.0000	80/20	12.0000
960531	AF2-344 C O2	12.0000	80/20	12.0000
960541	AF2-345 C O2	12.0000	80/20	12.0000

13.5.2 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
151942168	960500	AF2-341 TAP	ATSI	238948	02MAYSVL	ATSI	1	ATSI-P1-2-OEE-138-012-C	single	110.0	89.82	100.73	DC	12.0

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
946411	AF1-305 C O1	21.0000	80/20	21.0000
958851	AF2-176 C	42.0000	80/20	42.0000
960501	AF2-341 C O2	12.0000	80/20	12.0000
960511	AF2-342 C O2	12.0000	80/20	12.0000
960521	AF2-343 C O2	12.0000	80/20	12.0000
960531	AF2-344 C O2	12.0000	80/20	12.0000
960541	AF2-345 C O2	12.0000	80/20	12.0000

13.6 Contingency Descriptions - Secondary POI

Contingency Name	Contingency Definition
238948 02MAYSVL 138 960500 AF2-341 TAP 138 1	CONTINGENCY '238948 02MAYSVL 138 960500 AF2-341 TAP 138 1' OPEN BRANCH FROM BUS 238948 TO BUS 960500 CKT 1 END
ATSI-P1-2-OEE-138-012-C	CONTINGENCY 'ATSI-P1-2-OEE-138-012-C' /* 02MASURY TO 02MAYSVL 138.0 DISCONNECT BRANCH FROM BUS 238944 TO BUS 946410 CKT 1 /* 02MASURY 138 02MAYSVL 138 /* 02MAYSVL 138 END
ATSI-P1-2-OEE-138-012-A	CONTINGENCY 'ATSI-P1-2-OEE-138-012-A' /* 02MASURY TO 02MAYSVL 138.0 DISCONNECT BRANCH FROM BUS 960500 TO BUS 238948 CKT 1 /* AF2-341 TAP 138 02MAYSVL 138 DISCONNECT BRANCH FROM BUS 238948 TO BUS 238949 CKT 1 /* 02MAYSVL 138 02MAYSVL 69 DISCONNECT BUS 238948 /* 02MAYSVL 138 END
Base Case	
ATSI-P1-2-OEE-69-022-B	CONTINGENCY 'ATSI-P1-2-OEE-69-022-B' /* MAYSVILLE - SHARON 69 [Y-301] DISCONNECT BRANCH FROM BUS 938580 TO BUS 239861 CKT 1 /* AE1-079 TAP 69 02CP.REYN+ 69 DISCONNECT BRANCH FROM BUS 239104 TO BUS 239861 CKT 1 /* 02SHARON 69 02CP.REYN+ 69 DISCONNECT BUS 239894 /* 02CP.REYNL 69 DISCONNECT BUS 239890 /* 02GRNV MTL 69 END
ATSI-P1-2-SYS-345-874	CONTINGENCY 'ATSI-P1-2-SYS-345-874' /* LINE 02SHNAGO TO 02NILES 345 CK 1 DISCONNECT BRANCH FROM BUS 239106 TO BUS 239303 CKT 1 /* 02SHNAGO 345 02NILES 345 END

14 Affected Systems

14.1 NYISO

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

14.2 MISO

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