Generation Interconnection

Combined Feasibility / Impact Study Report

for

Queue Project AG1-114

MEYERSDALE NORTH 115 KV

10 MW Capacity / 0 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 Mid-Atlantic Interstate Transmission, LLC (MAIT) (PENELEC 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 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 Storage generating facility located in Somerset, Pennsylvania. This project is an increase to the Interconnection Customer's AE1-053 project, which will share the same point of interconnection. The AG1-114 queue position is a 0 MW uprate (10 MW Capacity uprate) to the previous project. The total installed facilities will have a capability of 30 MW with 26 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this uprate project is November 01, 2022. This study does not imply a TO commitment to this in-service date.

Queue Number	AG1-114
Project Name	MEYERSDALE NORTH 115 KV
State	Pennsylvania
County	Somerset
Transmission Owner	MAIT (PENELEC)
MFO	30
MWE	0
MWC	10
Fuel	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

The AG1-114 project is a capacity-only uprate to the proposed AE1-053 project and the Point of Interconnection will remain unchanged. The IC will not incur any interconnection facility upgrade costs for this project.

Attachment 1 shows a one-line diagram of the proposed primary interconnection facilities for the AG1-114 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 interconnection facilities.

5 Cost Summary

The AG1-114 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$0
Total System Network Upgrade Costs	$0
Total Costs	$0

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.

6 Transmission Owner Scope of Work

The AG1-114 project is a capacity-only uprate to the proposed AE1-053 project and the Point of Interconnection will remain unchanged. The IC will not incur any interconnection facility upgrade costs for this project.

There is no interconnection facility scope of work required.

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

Description	Total Cost
Total Physical Interconnection Costs	$0

7 Schedule

The project is an uprate to the proposed AE1-053 project and the Point of Interconnection will remain unchanged. There is no interconnection facility scope of work.

The schedule for the required Network Impact Reinforcements will be more clearly identified in future study phases. The estimated time to complete each of the required reinforcements is identified in the "System Reinforcements" section of the report.

8 Transmission Owner Analysis

FE performed an analysis of its underlying transmission <100 kV system. The AG1-114 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 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 115 kV circuit breaker to protect the 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 AG1-391 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 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

The Queue Project AG1-114 was evaluated as a 0.0 MW (Capacity 10.0 MW) injection as an uprate to G21, K23, Z2-108 & AE1-030 which is a direct connection at the Berkly 0.6 kV substation in the PENELEC area. Project AG1-114 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-114 was studied with a commercial probability of 100.0 %. 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	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
166142421	200742	26TOWER 51	115.0	PENELEC	200741	26SEWARD	115.0	PENELEC	1	AP-P1-3-PE-115-010	operation	185.0	133.19	134.99	DC	3.34
166142425	200742	26TOWER 51	115.0	PENELEC	200741	26SEWARD	115.0	PENELEC	1	Base Case	operation	147.0	113.07	114.62	DC	2.28
166142378	200743	26HOOVERSV	115.0	PENELEC	200742	26TOWER 51	115.0	PENELEC	1	AP-P1-3-PE-115-010	operation	172.0	157.91	159.87	DC	3.39
166142382	200743	26HOOVERSV	115.0	PENELEC	200742	26TOWER 51	115.0	PENELEC	1	Base Case	operation	137.0	137.64	139.33	DC	2.31
166142505	200744	26SOMERST	115.0	PENELEC	200743	26HOOVERSV	115.0	PENELEC	1	AP-P1-3-PE-115-010	operation	190.0	106.9	109.26	DC	4.49
166142601	200744	26SOMERST	115.0	PENELEC	965880	AG1-457 TAP	115.0	PENELEC	1	Base Case	operation	148.0	100.18	104.8	DC	6.84
166142391	200746	26ROCKWOOD	115.0	PENELEC	965880	AG1-457 TAP	115.0	PENELEC	1	AP-P1-3-PE-115-010	operation	179.0	172.4	177.99	DC	10.0

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
166142395	200746	26ROCKWOOD	115.0	PENELEC	965880	AG1-457 TAP	115.0	PENELEC	1	Base Case	operation	148.0	124.76	129.38	DC	6.84
166142368	200747	26PENN-MAR	115.0	PENELEC	200762	26GARRETT	115.0	PENELEC	1	PN-P1-2-PN-115-068-A	operation	179.0	161.51	167.1	DC	10.0
166142369	200747	26PENN-MAR	115.0	PENELEC	200762	26GARRETT	115.0	PENELEC	1	PN-P1-3-PN-115-025-A	operation	179.0	161.51	167.1	DC	10.0
166142370	200747	26PENN-MAR	115.0	PENELEC	200762	26GARRETT	115.0	PENELEC	1	Base Case	operation	148.0	155.67	157.8	DC	3.16
164277648	200762	26GARRETT	115.0	PENELEC	235470	01GARRET	115.0	AP	1	PN-P1-3-PN-115-025-A	operation	197.0	156.65	161.72	DC	10.0
164277649	200762	26GARRETT	115.0	PENELEC	235470	01GARRET	115.0	AP	1	PN-P1-2-PN-115-068-A	operation	197.0	156.65	161.72	DC	10.0
164277652	200762	26GARRETT	115.0	PENELEC	235470	01GARRET	115.0	AP	1	Base Case	operation	169.0	142.91	144.78	DC	3.16
166142396	200856	26LICK RUN	115.0	PENELEC	200746	26ROCKWOOD	115.0	PENELEC	1	Base Case	operation	137.0	173.04	180.34	DC	10.0
167833639	235469	01GARRET	138.0	AP	934440	AD1-068 TAP	138.0	AP	1	PN-P1-2-PN-115-068-A	operation	191.0	123.06	126.58	DC	6.72
167833640	235469	01GARRET	138.0	AP	934440	AD1-068 TAP	138.0	AP	1	PN-P1-3-PN-115-025-A	operation	191.0	123.06	126.58	DC	6.72
167833641	235469	01GARRET	138.0	AP	934440	AD1-068 TAP	138.0	AP	1	Base Case	operation	164.0	103.43	104.72	DC	2.11
167833521	235470	01GARRET	115.0	AP	235469	01GARRET	138.0	AP	1	PN-P1-2-PN-115-068-A	operation	197.0	156.65	161.72	DC	10.0
167833522	235470	01GARRET	115.0	AP	235469	01GARRET	138.0	AP	1	PN-P1-3-PN-115-025-A	operation	197.0	156.65	161.72	DC	10.0
167833523	235470	01GARRET	115.0	AP	235469	01GARRET	138.0	AP	1	Base Case	operation	169.0	142.91	144.78	DC	3.16
167833700	237310	01DANSMTN	138.0	AP	235504	01RIDGLY	138.0	AP	1	FE-P1-2-MP-138-160_NON	operation	182.0	122.8	124.07	DC	2.32
169572551	934440	AD1-068 TAP	138.0	AP	235120	01ALBRIG	138.0	AP	1	PN-P1-3-PN-115-025-A	operation	191.0	156.99	160.51	DC	6.72
169572553	934440	AD1-068 TAP	138.0	AP	235120	01ALBRIG	138.0	AP	1	Base Case	operation	164.0	140.27	141.56	DC	2.11
166142362	965880	AG1-457 TAP	115.0	PENELEC	200744	26SOMERST	115.0	PENELEC	1	AP-P1-3-PE-115-010	operation	179.0	172.4	177.99	DC	10.0
166142366	965880	AG1-457 TAP	115.0	PENELEC	200744	26SOMERST	115.0	PENELEC	1	Base Case	operation	148.0	124.69	129.31	DC	6.84
166142551	965880	AG1-457 TAP	115.0	PENELEC	200746	26ROCKWOOD	115.0	PENELEC	1	Base Case	operation	148.0	100.11	104.73	DC	6.84

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

None

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".

None

11.7 Queue Dependencies

None

11.8 Contingency Descriptions

Contingency Name	Contingency Definition
PN-P1-2-PN-115-068-A	CONTINGENCY 'PN-P1-2-PN-115-068-A' /* ROCKWOOD - SOMERSET 115KV DISCONNECT BRANCH FROM BUS 200744 TO BUS 965880 CKT 1 /* 26SOMERST 115 AG1-457 TAP 115 END
FE-P1-2-MP-138-160_NON	CONTINGENCY 'FE-P1-2-MP-138-160_NON' /* ALBRIGHT - AD1-068 -GARRETT 138KV DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1 /* 01ALBRIG 138 AD1-068 TAP 138 DISCONNECT BRANCH FROM BUS 934440 TO BUS 235469 CKT 1 /* AD1-068 TAP 138 01GARRET 138 END
AP-P1-3-PE-115-010	CONTINGENCY 'AP-P1-3-PE-115-010' /* GARRETT 138/115KV XFMR FAULT OPEN BRANCH FROM BUS 235469 TO BUS 235470 CKT 1 /* 01GARRET 138.00 01GARRET 115.00 END
Base Case	
PN-P1-3-PN-115-025-A	CONTINGENCY 'PN-P1-3-PN-115-025-A' /* SOMERSET #1 XFMR FAULT DISCONNECT BRANCH FROM BUS 200744 TO BUS 200774 CKT 1 /* 26SOMERST 115 26SOMRSET1 23 DISCONNECT BRANCH FROM BUS 200744 TO BUS 965880 CKT 1 /* 26SOMERST 115 AG1-457 TAP 115 DISCONNECT BRANCH FROM BUS 200744 TO BUS 202637 CKT 1 /* 26SOMERST 115 26PRIDE 115 DISCONNECT BRANCH FROM BUS 202637 TO BUS 964920 CKT 1 /* 26PRIDE 115 AF1-232 TAP 115 DISCONNECT BRANCH FROM BUS 200744 TO BUS 200743 CKT 1 /* 26SOMERST 115 26HOOVERSV 115 END

12 Light Load Analysis

Not Required

13 Short Circuit Analysis

The following Breakers are overdutied:

None

14 Stability Analysis

Not Required

15 Affected Systems

15.1 14.1 NYISO

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

15.2 14.2 MISO

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

16 Attachment 1: One Line Diagram