Generation Interconnection

Feasibility Study Report

for

Queue Project AF1-309

NORTH HANOVER 115 KV

19.2 MW Capacity / 32 MW Energy

January 2020

Table of Contents

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 (MAIT – Meted 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.

PJM utilizes manufacturer models to ensure the performance of turbines is properly captured during the simulations performed for stability verification and, where applicable, for compliance with low voltage ride through requirements. Turbine manufacturers provide such models to their customers. The list of manufacturer models PJM has already validated is contained in Attachment B of Manual 14G. Manufacturer models may be updated from time to time, for various reasons such as to reflect changes to the control systems or to more accurately represent the capabilities turbines and controls which are currently available in the field. Additionally, as new turbine models are developed, turbine manufacturers provide such new models which must be used in the conduct of these studies. PJM needs adequate time to evaluate the new models in order to reduce delays to the System Impact Study process timeline for the Interconnection Customer as well as other Interconnection Customers in the study group. Therefore, PJM will require that any Interconnection Customer with a new manufacturer model must supply that model to PJM, along with a $10,000 fully refundable deposit, no later than three (3) months prior to the starting date of the System Impact Study (See Section 4.3 for starting dates) for the Interconnection Request which shall specify the use of the new model.

The Interconnection Customer will be required to submit a completed dynamic model study request form (Attachment B-1 of Manual 14G) in order to document the request for the study.

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

3 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Adams County, Pennsylvania. The installed facilities will have a total capability of 32 MW with 19.2 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is December 31, 2023. This study does not imply a TO commitment to this in-service date.

Queue Number	**AF1-309**
Project Name	NORTH HANOVER 115 KV
State	Pennsylvania
County	Adams
Transmission Owner	ME
MFO	32
MWE	32
MWC	19.2
Fuel	Solar
Basecase Study Year	2023

3.1 Point of Interconnection

3.1.1 Primary POI

The interconnection of the project at the Primary POI will be accomplished by constructing a new 115 kV line terminal and dead-end structure at the existing North Hanover 115 kV substation.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AF1-309 generation project to connect to the FirstEnergy ("FE") transmission system. 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.

3.1.2 Secondary POI

The interconnection of the project at a Secondary POI can be accomplished by constructing a new 230 kV three (3) breaker ring bus substation and looping the Hunterstown - Jackson 230 kV line into the new station. The new substation would be located approximately 7.5 miles from Hunterstown substation. A full scope of work or estimated cost is not provided for the proposed Secondary POI.

3.2 Cost Summary

The AF1-309 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$0
Direct Connection Network Upgrade	$0
Non Direct Connection Network Upgrades	$2,176,700
Total Costs	$2,176,700

In addition, the AF1-309 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	$**7,364,000**

Cost allocations for these upgrades will be provided in the System Impact Study Report.

The Feasibility Study is used to make a preliminary determination of the type and scope of Attachment Facilities, Local Upgrades, and Network Upgrades that will be necessary to accommodate the Interconnection Request and to provide the Interconnection Customer a preliminary estimate of the time that will be required to construct any necessary facilities and upgrades and the Interconnection Customer's cost responsibility. The System Impact Study provides refined and comprehensive estimates of cost responsibility and construction lead times for new facilities and system upgrades. Facilities Studies will include, commensurate with the

degree of engineering specificity as provided in the Facilities Study Agreement, good faith estimates of the cost, determined in accordance with Section 217 of the Tariff,

(a) to be charged to each affected New Service Customer for the Facilities and System Upgrades that are necessary to accommodate this queue project;

(b) the time required to complete detailed design and construction of the facilities and upgrades; and

(c) a description of any site-specific environmental issues or requirements that could reasonably be anticipated to affect the cost or time required to complete construction of such facilities and upgrades.

The costs provided above exclude the Contribution in Aid of Construction ("CIAC") Federal Income Tax Gross Up charge. If, at a future date, it is determined that the CIAC Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

The required Attachment Facilities and Direct and Non-Direct Connection work for the interconnection of the AF1-309 generation project to the FE Transmission System is detailed in the following sections. The associated one-line with the generation project Attachment Facilities and the Primary Direct and Non-Direct Connection facilities are shown in Attachment 1.

4 Transmission Owner Scope of Work

The interconnection of the project at the Primary POI will be accomplished by constructing a new 115 kV line terminal and dead-end structure at the existing North Hanover 115 kV substation.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AF1-309 generation project to connect to the FirstEnergy ("FE") transmission system. 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.

5 Attachment Facilities

There are no Attachment Facilities for this project.

6 Direct Connection Cost Estimate

There are no Direct Connection upgrades for this project.

7 Non-Direct Connection Cost Estimate

The total preliminary cost estimate for the Non-Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Install new line position for AF1-309 generator interconnection. @ North Hanover	$2,109,800
Review Nameplates and Drawings	$66,900
Total Non-Direct Connection Facility Costs	$2,176,700

8 Schedule

Based on the scope of work for the Non-Direct Connection facilities, it is expected to take a minimum of **13 months** after the signing of an Interconnection Construction Service Agreement to complete the installation. This includes the requirement for the IC to make full initial payment for the Non-Direct Connection work. This assumes that there will be no environmental issues with any of the new properties associated with this project, that there will be no delays in acquiring the necessary permits for implementing the defined interconnection work, and that all transmission system outages will be allowed when requested.

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

9 Transmission Owner Analysis

FE performed an analysis of its underlying transmission <100 kV system. The AF1-309 project did not contribute to any overloads on the FE transmission <100 kV system.

10 Interconnection Customer Requirements

10.1 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.

The IC has requested a non-standard GSU transformer winding configuration. This transformer is in violation of section 14.2.6 of FE's "Requirements for Transmission Connected Facilities" document and will not be accepted. The GSU transformer must have a grounded wye connection on the high (utility) side and a delta connection on the low (generator) side.

10.2 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 AF1-309 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 AF1-309 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.

10.3 Power Factor Requirements

The IC shall design its solar-powered 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.

11 Revenue Metering and SCADA Requirements

11.1 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.

11.1.1 Meteorological Data Reporting Requirement

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

- Temperature (degrees Fahrenheit)
- Atmospheric pressure (hectopascals)
- Irradiance
- Forced outage data

11.2 ME 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

12 Network Impacts – Primary POI

The Queue Project AF1-309 was evaluated as a 32.0 MW (Capacity 19.2 MW) injection at the North Hanover 115 kV substation in the ME area. Project AF1-309 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-309 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

12.1 Generation Deliverability

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

None

12.2 Multiple Facility Contingency

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

None

12.3 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
41410032	204539	27HUNTRS TN	115.0	METED	933970	AD1-020 TAP	115.0	METED	1	TS P1-2_#1	single	160.0	119.02	120.07	DC	1.68
50736512	204539	27HUNTRS TN	115.0	METED	933970	AD1-020 TAP	115.0	METED	1	PJM_500_BG_P1_5011	single	160.0	105.55	106.61	DC	1.7
50736513	204539	27HUNTRS TN	115.0	METED	933970	AD1-020 TAP	115.0	METED	1	Base Case	single	133.0	103.13	104.37	DC	1.64
41075265	204668	27TEX E TP	115.0	METED	204528	27GARDNERS	115.0	METED	1	ME-P7-1-ME-230-003	tower	185.0	104.14	104.72	DC	2.4
41075266	204668	27TEX E TP	115.0	METED	204528	27GARDNERS	115.0	METED	1	ME-P7-1-ME-230-004	tower	185.0	102.88	103.46	DC	2.4
41409851	933970	AD1-020 TAP	115.0	METED	204544	27LINCOLN	115.0	METED	1	TS P1-2_#1	single	160.0	125.71	126.76	DC	1.68
41409856	933970	AD1-020 TAP	115.0	METED	204544	27LINCOLN	115.0	METED	1	Base Case	single	133.0	111.15	112.39	DC	1.64
50736489	933970	AD1-020 TAP	115.0	METED	204544	27LINCOLN	115.0	METED	1	PJM_500_BG_P1_5011	single	160.0	112.29	113.35	DC	1.7

12.4 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
41410031	204539	27HUNTRSTN	115.0	METED	933970	AD1-020 TAP	115.0	METED	1	TS P1-2_#1	operation	160.0	131.43	132.22	DC	2.8

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
5073650 8	204539	27HUNTRSTN	115.0	METED	933970	AD1-020 TAP	115.0	METED	1	Base Case	operation	133.0	118.27	119.2	DC	2.74
4140985 0	933970	AD1-020 TAP	115.0	METED	204544	27LINCOLN	115.0	METED	1	TS P1-2_#1	operation	160.0	134.15	134.94	DC	2.8
4140985 2	933970	AD1-020 TAP	115.0	METED	204544	27LINCOLN	115.0	METED	1	Base Case	operation	133.0	121.46	122.39	DC	2.74
5073675 3	939100	AE1-139 TAP	115.0	METED	204544	27LINCOLN	115.0	METED	1	204539 27HUNTRSTN 115 933970 AD1-020 TAP 115 1	operation	152.0	100.69	101.29	DC	2.03

12.5 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
41075265,41075266	2	27TEX E TP 115.0 kV - 27GARDNERS 115.0 kV Ckt 1	ME-0005a (6) : At Gardners, replace wave traps (Qty. 2). Project Type : FAC Cost : $177,750 Time Estimate : 9.0 Months ME-0005b (7) : At Gardners, replace thermal relay. Project Type : FAC Cost : $296,250 Time Estimate : 12.0 Months	$474,000
41409856,41409851, 50736489	3	AD1-020 TAP 115.0 kV - 27LINCOLN 115.0 kV Ckt 1	ME-0001a (1) : Hunterstown-Lincoln 115 kV Line: Reconductor 115 kV Line 962 from AD1-020 TAP to Lincoln with 795 ACSR conductor (1.5 miles). Project Type : FAC Cost : $3,900,000 Time Estimate : 18.0 Months ME-0001b (9) : At Lincoln, replace the wave trap, 350 CU MTDL, and RT. Project Type : FAC Cost : $130,000 Time Estimate : 9.0 Months	$4,030,000
50736513,41410032, 50736512	1	27HUNTRSTN 115.0 kV - AD1-020 TAP 115.0 kV Ckt 1	ME-0002 (10) : Hunterstown-Lincoln 115 kV: Reconductor 115 kV Line 962 from Hunterstown to AD1-020 TAP with 795 ACSR conductor (1.1 miles). Project Type : FAC Cost : $2,860,000 Time Estimate : 18.0 Months	$2,860,000
			TOTAL COST	**$7,364,000**

12.6 Flow Gate Details

The following indices contain additional information about each flowgate presented in the body of the report. For each index, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact. It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

12.6.1 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
41410032	204539	27HUNTRSTN	METED	933970	AD1-020 TAP	METED	1	TS P1-2_#1	single	160.0	119.02	120.07	DC	1.68

Bus #	Bus	MW Impact
204639	27GLATFLTR	0.3652
204642	27YK SOLID	0.2119
204646	27HAM CT	0.2461
204647	27HUNTR CT	1.0227
204648	27MOUNT CT	0.4234
204650	27TOLNA CT	0.2820
936921	AD2-116 C O1	0.6848
939021	AE1-131 C O1	3.9885
939091	AE1-138 C	1.1876
939561	AE1-185 C	0.6899
939661	AE1-196 C	0.6691
942391	AE2-252 C	0.9383
943161	AE2-345 C	6.3034
945131	AF1-178	0.0783
945141	AF1-179	0.0522
945271	AF1-192	0.0764
945281	AF1-193	0.4884
945291	AF1-194	0.0900
946451	AF1-309 C O1	1.6806
DUCKCREEK	DUCKCREEK	0.6517
NEWTON	NEWTON	0.6221
FARMERCITY	FARMERCITY	0.0331
G-007A	G-007A	3.3109
VFT	VFT	8.9268
PRAIRIE	PRAIRIE	1.5421
COFFEEN	COFFEEN	0.3055
EDWARDS	EDWARDS	0.1967
CHEOAH	CHEOAH	0.3488
TILTON	TILTON	0.3553
GIBSON	GIBSON	0.3134
CALDERWOOD	CALDERWOOD	0.3449
BLUEG	BLUEG	0.9982
TRIMBLE	TRIMBLE	0.3189
CATAWBA	CATAWBA	0.2772

12.6.2 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
41075265	204668	27TEX E TP	METED	204528	27GARDNERS	METED	1	ME-P7-1-ME-230-003	tower	185.0	104.14	104.72	DC	2.4

Bus #	Bus	MW Impact
204646	27HAM CT	0.4898
204647	27HUNTR CT	1.4994
204649	27ORTAN CT	0.4704
205902	27W2-094	0.1728
903052	W2-094 E	0.2985
925721	AC1-048 C	1.6888
925722	AC1-048 E	2.7555
932371	AC2-053 C	0.9650
932372	AC2-053 E	1.5746
933971	AD1-020 C	9.2428
933972	AD1-020 E	8.0012
938041	AE1-006 C	0.9650
938042	AE1-006 E	1.5746
939021	AE1-131 C O1	13.0166
939022	AE1-131 E O1	8.6778
939091	AE1-138 C	2.3632
939092	AE1-138 E	1.5755
939101	AE1-139 C O1	6.6007
939102	AE1-139 E O1	4.4005
941871	AE2-192 C	6.7408
941872	AE2-192 E	4.4938
943161	AE2-345 C	17.0276
943162	AE2-345 E	11.3517
945231	AF1-188	0.1728
945281	AF1-193	0.7161
945291	AF1-194	0.1790
946312	AF1-295 BAT	0.7943
946451	AF1-309 C O1	0.6490
946452	AF1-309 E O1	0.4327
LGEE	LGEE	0.0183
CPLE	CPLE	0.0589
WEC	WEC	0.0091
CBM-W2	CBM-W2	0.3276
NY	NY	0.1206
CBM-W1	CBM-W1	0.3128
TVA	TVA	0.0672
O-066	O-066	0.9946
CBM-S2	CBM-S2	0.4393
CBM-S1	CBM-S1	0.3834
G-007	G-007	0.1331
MADISON	MADISON	0.0121

Bus #	Bus	MW Impact
MEC	MEC	0.0524

12.6.3 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
41409851	933970	AD1-020 TAP	METED	204544	27LINCOLN	METED	1	TS P1-2_#1	single	160.0	125.71	126.76	DC	1.68

Bus #	Bus	MW Impact
204639	27GLATFLTR	0.3652
204642	27YK SOLID	0.2119
204646	27HAM CT	0.2461
204647	27HUNTR CT	1.0227
204648	27MOUNT CT	0.4234
204650	27TOLNA CT	0.2820
933971	AD1-020 C	11.0121
936921	AD2-116 C O1	0.6848
939021	AE1-131 C O1	3.9885
939091	AE1-138 C	1.1876
939561	AE1-185 C	0.6899
939661	AE1-196 C	0.6691
942391	AE2-252 C	0.9383
943161	AE2-345 C	6.3034
945131	AF1-178	0.0783
945141	AF1-179	0.0522
945271	AF1-192	0.0764
945281	AF1-193	0.4884
945291	AF1-194	0.0900
946451	AF1-309 C O1	1.6806
DUCKCREEK	DUCKCREEK	0.6517
NEWTON	NEWTON	0.6221
FARMERCITY	FARMERCITY	0.0331
G-007A	G-007A	3.3109
VFT	VFT	8.9268
PRAIRIE	PRAIRIE	1.5421
COFFEEN	COFFEEN	0.3055
EDWARDS	EDWARDS	0.1967
CHEOAH	CHEOAH	0.3488
TILTON	TILTON	0.3553
GIBSON	GIBSON	0.3134
CALDERWOOD	CALDERWOOD	0.3449
BLUEG	BLUEG	0.9982
TRIMBLE	TRIMBLE	0.3189
CATAWBA	CATAWBA	0.2772

Affected Systems

12.7 Affected Systems

12.7.1 LG&E

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

12.7.2 MISO

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

12.7.3 TVA

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

12.7.4 Duke Energy Progress

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

12.7.5 NYISO

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

12.8 Contingency Definitions

Contingency Name	Contingency Definition
ME-P7-1-ME-230-003	CONTINGENCY 'ME-P7-1-ME-230-003' /* HUNTERSTOWN-JACKSON 230 KV & HAMILTON-JACKSON 115 KV DISCONNECT BRANCH FROM BUS 204575 TO BUS 204502 CKT 1 /* 27HUNTRST1 230 27JACKSON 230 DISCONNECT BRANCH FROM BUS 204535 TO BUS 204700 CKT 1 /* 27HAMILTON 115 27JACKSON6 115 END
ME-P7-1-ME-230-004	CONTINGENCY 'ME-P7-1-ME-230-004' /* HUNTRSTWN-JACKSN 230 KV & HUNTRSTWN-HAMILTON 115 KV DISCONNECT BRANCH FROM BUS 204575 TO BUS 204502 CKT 1 /* 27HUNTRST1 230 27JACKSON 230 DISCONNECT BRANCH FROM BUS 204535 TO BUS 204539 CKT 1 /* 27HAMILTON 115 27HUNTRSTN 115 END
Base Case	
204539 27HUNTRSTN 115 933970 AD1-020 TAP 115 1	CONTINGENCY '204539 27HUNTRSTN 115 933970 AD1-020 TAP 115 1' OPEN BRANCH FROM BUS 204539 TO BUS 933970 CKT 1 END
PJM_500_BG_P1_5011	CONTINGENCY 'PJM_500_BG_P1_5011' /* CONASTONE TO BRIGHTON CKT #5011 OPEN LINE FROM BUS 200004 TO BUS 200003 CKT 1 /* CONASTONE TO BRIGHTON 5011 END
TS P1-2_#1	CONTINGENCY 'TS P1-2_#1' OPEN BRANCH FROM BUS 270071 TO BUS 235506 CKT 1 / 270071 RICE_230 230 TO 235506 01RINGLD 230 1 END

Short Circuit

12.9 Short Circuit

The following Breakers are overduty:

None

13 Network Impacts – Secondary POI

The Queue Project AF1-309 was evaluated as a 32.0 MW (Capacity 19.2 MW) injection tapping the Hunterstown to Jackson 230 kV line in the ME area. Project AF1-309 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-309 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

13.1 Generation Deliverability

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

None

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)

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
55438970	204668	27TEXE TP	115.0	METED	204528	27GARDNERS	115.0	METED	1	ME-P7-1-ME-230-003-B	tower	185.0	104.14	106.59	DC	4.54
55438971	204668	27TEXE TP	115.0	METED	204528	27GARDNERS	115.0	METED	1	ME-P7-1-ME-230-004-B	tower	185.0	102.88	105.33	DC	4.54

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
41410031	204539	27HUNTRSTN	115.0	METED	933970	AD1-020 TAP	115.0	METED	1	TS P1-2_#1	operation	160.0	131.49	132.13	DC	2.27
50736508	204539	27HUNTRSTN	115.0	METED	933970	AD1-020 TAP	115.0	METED	1	Base Case	operation	133.0	118.27	119.01	DC	2.19
41409850	933970	AD1-020 TAP	115.0	METED	204544	27LINCOLN	115.0	METED	1	TS P1-2_#1	operation	160.0	134.21	134.85	DC	2.27
41409852	933970	AD1-020 TAP	115.0	METED	204544	27LINCOLN	115.0	METED	1	Base Case	operation	133.0	121.46	122.2	DC	2.19

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
5073675 3	939100	AE1-139 TAP	115.0	METED	204544	27LINCOLN	115.0	METED	1	204539 27HUNTRST N 115 933970 AD1-020 TAP 115 1	operation	152.0	100.76	101.24	DC	1.62

13.5 Flow Gate Details

The following indices contain additional information about each flowgate presented in the body of the report. For each index, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact. It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

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
55438970	204668	27TEX E TP	METED	204528	27GARDNERS	METED	1	ME-P7-1-ME-230-003-B	tower	185.0	104.14	106.59	DC	4.54

Bus #	Bus	MW Impact
204646	27HAM CT	0.4898
204647	27HUNTR CT	1.4994
204649	27ORTAN CT	0.4704
205902	27W2-094	0.1728
903052	W2-094 E	0.2985
925721	AC1-048 C	1.6888
925722	AC1-048 E	2.7555
932371	AC2-053 C	0.9650
932372	AC2-053 E	1.5746
933971	AD1-020 C	9.2428
933972	AD1-020 E	8.0012
938041	AE1-006 C	0.9650
938042	AE1-006 E	1.5746
939021	AE1-131 C O1	13.0166
939022	AE1-131 E O1	8.6778
939091	AE1-138 C	2.3632
939092	AE1-138 E	1.5755
939101	AE1-139 C O1	6.6007
939102	AE1-139 E O1	4.4005
941871	AE2-192 C	6.7408
941872	AE2-192 E	4.4938
943161	AE2-345 C	17.0276
943162	AE2-345 E	11.3517
945231	AF1-188	0.1728
945281	AF1-193	0.7161
945291	AF1-194	0.1790
946312	AF1-295 BAT	0.7943
946451	AF1-309 C O2	2.7258
946452	AF1-309 E O2	1.8172
LGEE	LGEE	0.0183
CPLE	CPLE	0.0589
WEC	WEC	0.0091
CBM-W2	CBM-W2	0.3276
NY	NY	0.1206
CBM-W1	CBM-W1	0.3128
TVA	TVA	0.0672
O-066	O-066	0.9946
CBM-S2	CBM-S2	0.4393
CBM-S1	CBM-S1	0.3834
G-007	G-007	0.1331
MADISON	MADISON	0.0121

Bus #	Bus	MW Impact
MEC	MEC	0.0524

Affected Systems

13.6 Affected Systems

13.6.1 LG&E

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

13.6.2 MISO

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

13.6.3 TVA

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

13.6.4 Duke Energy Progress

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

13.6.5 NYISO

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

13.7 Contingency Definitions

Contingency Name	Contingency Definition
Base Case	
204539 27HUNTRSTN 115 933970 AD1-020 TAP 115 1	CONTINGENCY '204539 27HUNTRSTN 115 933970 AD1-020 TAP 115 1' OPEN BRANCH FROM BUS 204539 TO BUS 933970 CKT 1 END
ME-P7-1-ME-230-004-B	CONTINGENCY 'ME-P7-1-ME-230-004-B' /* HUNTRSTWN-JACKSN 230 KV & HUNTRSTWN-HAMILTON 115 KV DISCONNECT BRANCH FROM BUS 946450 TO BUS 204502 CKT 1 /* AF1-309 TAP 230 27JACKSON 230 DISCONNECT BRANCH FROM BUS 204535 TO BUS 204539 CKT 1 /* 27HAMILTON 115 27HUNTRSTN 115 END
ME-P7-1-ME-230-003-B	CONTINGENCY 'ME-P7-1-ME-230-003-B' /* HUNTERSTOWN-JACKSON 230 KV & HAMILTON-JACKSON 115 KV DISCONNECT BRANCH FROM BUS 946450 TO BUS 204502 CKT 1 /* AF1-309 TAP 230 27JACKSON 230 DISCONNECT BRANCH FROM BUS 204535 TO BUS 204700 CKT 1 /* 27HAMILTON 115 27JACKSON6 115 END
TS P1-2_#1	CONTINGENCY 'TS P1-2_#1' OPEN BRANCH FROM BUS 270071 TO BUS 235506 CKT 1 / 270071 RICE_230 230 TO 235506 01RINGLD 230 1 END

Short Circuit

13.8 Short Circuit

The following Breakers are overduty:

None

14 Attachment One: One Line Diagram