Generation Interconnection

Feasibility Study Report

for

Queue Project AF1-103

WARREN 34.5 KV

20 MW Capacity / 20 MW Energy

January 2020

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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 Pennsylvania Electric Company (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 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 and Storage generating facility located in Warren County, Pennsylvania. The installed facilities will have a total capability of 20 MW with 20 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is 06/01/2023. This study does not imply a TO commitment to this in-service date.

Final attachment facilities and local upgrades (if required) along with terms and conditions to interconnect AF1-103 will be specified in a separate two party Interconnection Agreement (IA) between PENELEC and the Interconnection Customer as this project is considered FERC non-jurisdictional per the PJM Open Access Transmission Tariff (OATT).

Queue Number	AF1-103
Project Name	WARREN 34.5 KV
State	Pennsylvania
County	Warren
Transmission Owner	PENELEC
MFO	20
MWE	20
MWC	20
Fuel	Solar; Storage
Basecase Study Year	2023

3.1 Point of Interconnection

3.1.1 Primary POI

AF1-103 will interconnect with the PENELEC distribution system at the Warren 34.5 kV substation.

AF1-103 will interconnect with the Penelec distribution system via a tap on the 34.5 kV #1 National Forge circuit #00580-1 at pole # NF-6141. The IC's proposed generating unit site is located at GPC: 41.8347040, -79.1927000

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AF1-103 generation project to connect to the Penelec distribution system. IC will be responsible for constructing all the facilities on its side of the POI, including the attachment facilities which connect the generator to the Penelec distribution system's direct connection facilities. The primary POI is considered FERC non-jurisdictional.

3.1.2 Secondary POI

AF1-103 will interconnect with the PENELEC transmission system at the Warren 115 kV substation. A full scope of work or estimated cost is not provided for the proposed Secondary POI. The secondary POI is considered FERC jurisdictional.

3.2 Cost Summary

Total estimated cost for the required Interconnection Facilities is **$153,400**. 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 that the Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

From the transmission perspective, the network impacts or system reinforcements were identified as detailed in the "Network Impacts" section below.

Description	Total Cost
System Upgrades	**$29,440,600**

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 AF1-103 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

AF1-103 will interconnect with the Penelec distribution system via a tap on the 34.5 kV #1 National Forge circuit #00580-1 at pole # NF-6141. The IC will be responsible for acquiring all easements, properties, and permits that may be required to construct the new interconnection station and the associated facilities.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AF1-103 generation project to connect to the Penelec distribution system. The IC will be responsible for constructing all the facilities on its side of the POI, including the attachment facilities which connect the generator to the FE distribution system's direct connection facilities.

Description	Total Cost
National Forge 34.5kV SS. Adjust Remote Relay and Metering Settings.	$14,500
Tap near pole NF-6141, new SCADA switch, new primary metering.	$138,900
Total Estimated Connection Facility Costs	**$153,400**

5 Schedule

Based on the scope of work for the interconnection facilities, it is expected to take a minimum of **6 months** after the signing of an Interconnection 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 interconnection work, and that any distribution 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.

6 Transmission Owner Analysis

Penelec performed an analysis of its distribution system. The AF1-103 project did not contribute to any overloads on the distribution system.

7 Interconnection Customer Requirements

7.1 System Protection

An analysis was conducted to assess the impact of the Warren 34.5 kV (AF1-103) Project on the system protection requirements in the area. The results of this review show that the following relay additions will be required:

Proposed single line diagrams show IC constructing a generation facility tapping Penelec's Warren - 34.5kV #1 National Forge circuit at pole NF-4161.

The 34.5kV interconnection proposal will require Developer to meet applicable "Technical Requirements" as outlined in First Energy's document titled "Technical Requirements for the Interconnection of Customer-Owned Generation to the FirstEnergy Distribution System". Anti-islanding system shall meet IEEE 1547 and UL 1741 Therefore no Direct Transfer Trip (DTT) will be required.

7.2 General Concerns

It is to be understood, for abnormal operation of the Penelec system, which could cause Developer's generation facility to be electrically isolated from the Penelec system synchronous source via the tripping of a interconnecting primary voltage line or device, Developer will, via Penelec's direction, be required to disconnect the generation from Penelec's system and remain disconnected (**units are required to be OFF LINE**), until the Penelec system normal circuitry is restored. These abnormal conditions will be reviewed by Penelec system operators as to the need for the generation facility to be disconnected.

7.3 Requirements for Owner's/Developer's generation IPP Facility

The proposed interconnection Owner's/Developer's facilities must be designed in accordance with the document titled *FirstEnergy Distribution Engineering Practices Interconnection of Customer-Owned Generation to the FirstEnergy Distribution System* dated 11/17/14 located at the following link:

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

The document is referred to as engineering practice EP(# 02-280) with section 4 part C specifically referencing the "interconnection technical requirements". Certain protection requirements are shown.

Additionally, Owner/Developer is responsible to provide adequate protection (for their equipment) under any distribution system operating condition' - which includes 'Separation from supply' (i.e. tripping of F.E. circuit breakers) and 'Re-synchronizing the generation after electric restoration of the supply' (i.e. reclosing of F.E. circuit breakers).

Owner's/Developer's protection must be designed to coordinate with the reclosing practices of FirstEnergy line protective devices. The generator must cease to energize the FirstEnergy circuit to which it is connected prior to reclosing of any (FE) automatic reclosing devices.

Owners/Developer's electrical protection and control schematics shall be provided to FE for consideration. FE may request modifications, if required, to meet the technical requirements.

7.4 Power Factor Requirements and Compliance Issues

IC will be responsible for meeting a power factor between 0.90 lagging (producing MVARs) to 0.95 leading (absorbing MVARs) and assure that voltage deviation will be less than 1.0 volt as measured at the POI under all Solar Gen operating conditions due to the inherent dynamic reactive power capability of this solar facility.

Generators with no inherent VAR (reactive power) control capability, or those that have a restricted VAR capability less than the defined requirements, must provide dynamic supplementary reactive support located at the generation facility with electrical characteristics equivalent to that provided by a similar sized synchronous generator. A Dynamic Reactive Compensation (either Static VAR Compensator (SVC) or STATCOM) or other method be applied in order to maintain the required specifications at the POI. IC is responsible for the installation of equipment on its side of the POI in order to adhere to the criteria stated above by FirstEnergy.

8 Revenue Metering and SCADA Requirements

8.1 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.

8.1.1 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

8.2 PENELEC Requirements

IC will be required to comply with all FE Revenue Metering Requirements for Generation Interconnection Customers. These FE requirements are the following:

The FE operating company (Penelec) shall provide, own, operate, test, and maintain the revenue metering equipment at the Interconnection Customer's (IC) expense. The revenue metering equipment includes, but is not limited to, current transformers, voltage transformers, secondary wires, meter socket, bidirectional revenue meter, and associated devices. The IC shall mount the instrument transformers unless otherwise agreed to by Penelec. The instrument transformers and meter socket shall be installed in a location that is readily accessible to authorized Penelec representatives. Penelec will provide the IC access to bidirectional kWh and kVARh pulses from the Penelec meter at the IC's expense if requested. The IC shall, at its expense, install, own, operate, test, and maintain any metering and telemetry equipment that may be required to provide real-time meter data to FE or PJM.

9 Network Impacts – Primary POI

The Queue Project AF1-103 was evaluated as a 20.0 MW (Capacity 20.0 MW) injection at the Warren 34.5 kV substation in the PENELEC area. Project AF1-103 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-103 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

9.1 Generation Deliverability

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

None

9.2 Multiple Facility Contingency

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

None

9.3 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
42139941	200593	26GLADE	230.0	PENELEC	200811	26WARREN	230.0	PENELEC	1	PN-P2-3-PN-345-003A	breaker	621.0	152.59	154.31	DC	10.74
46762762	200811	26WARREN	230.0	PENELEC	200918	26ERIE S TIE	230.0	PENELEC	1	PN-P2-3-PN-345-003A	breaker	621.0	115.04	116.06	DC	6.33
41524296	200927	26FOURMILE	115.0	PENELEC	200820	26ERIE SE	115.0	PENELEC	1	PN-P2-3-PN-230-6G	breaker	245.0	154.09	155.34	DC	3.06

9.4 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
42424464	200593	26GLADE	230.0	PENELEC	200811	26WARREN	230.0	PENELEC	1	Base Case	operation	520.0	149.86	151.87	DC	10.5

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
42424465	200593	26GLADE	230.0	PENELEC	200811	26WARREN	230.0	PENELEC	1	PN-P1-2-PN-345-003	operation	621.0	150.73	152.44	DC	10.73
42424824	200811	26WARREN	230.0	PENELEC	200918	26ERIE S TIE	230.0	PENELEC	1	Base Case	operation	520.0	110.08	111.33	DC	6.52
42424828	200811	26WARREN	230.0	PENELEC	200918	26ERIE S TIE	230.0	PENELEC	1	PN-P1-2-PN-345-003	operation	621.0	113.34	114.36	DC	6.33
41188068	944300	AF1-098 TAP	115.0	PENELEC	200927	26FOURMILE	115.0	PENELEC	1	PN-P1-2-PN-230-003	operation	245.0	104.72	106.59	DC	4.58

9.5 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
46762762	2	26WARREN 230.0 kV - 26ERIE S TIE 230.0 kV Ckt 1	**PENELEC** **PN-AF1-F-0011a : Replace substation conductor at Glade and Warren. Reconductor Glade - Warren 230 kV (~11.5 miles).** **Project Type : FAC** **Cost : $20,706,000** **Time Estimate : 12.0 Months** **PN-AF1-F-0011b : Replace Wave Trap at Glade** **Project Type : FAC** **Cost : $119,000** **Time Estimate : 9.0 Months** **PN-AF1-F-0011c : Replace relays at Glade** **Project Type : FAC** **Cost : $357,000** **Time Estimate : 12.0 Months** **Note: AF1-103 currently has a cost responsibility for the above upgrades. The following baseline project is "on-hold"; if the following baseline project is approved for construction, then AF1-103 will not have a cost responsibility and can take advantage of the following baseline project. If additional mitigations are required beyond the following baseline project; then AF1-103 will be responsible for the cost of those additional mitigations.** **b3017 : PJM Baseline Upgrade b3017:** • **Rebuild Glade to Warren 230 kV line with hi-temp conductor 11.53 miles. New conductor will be 1033 ACSS. Existing conductor is 1033 ACSR. (b3017.1)** • **Glade substation terminal upgrades. Replace bus conductor, wave traps, and relaying. (b3017.2)** • **Warren substation terminal upgrades. Replace bus conductor, wave traps, and relaying. (b3017.3)** **The baseline project has a projected in-service date of 06/01/2021.**	$21,182,000
42139941	1	26GLADE 230.0 kV - 26WARREN 230.0 kV Ckt 1		
41524296	3	26FOURMILE 115.0 kV - 26ERIE SE 115.0 kV Ckt 1	**PENELEC** **n5174 : New 230kV series reactor and required associated substation equipment at Erie East substation, ISD 4/08/2019** **Project Type : CON** **Cost : $0** **Time Estimate : 0.0 Months** **PN-AF1-F-0056 : Replace substation conductor at Erie South and Four Mile** **Reconductor Erie South - Four Mile 115 kV (~5 miles)** **Project Type : FAC** **Cost : $8,258,600** **Time Estimate : 6.0 Months**	$8,258,600
			TOTAL COST	**$29,440,600**

9.6 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.

9.6.1 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
42139941	200593	26GLADE	PENELEC	200811	26WARREN	PENELEC	1	PN-P2-3-PN-345-003A	breaker	621.0	152.59	154.31	DC	10.74

Bus #	Bus	MW Impact
200642	26SENECA#1	11.2398
200643	26SENECA#2	10.6153
200644	26SENECA#3	1.0612
200649	26PENNTECH	1.0703
200665	26SHAWVL 3	2.9713
200666	26SHAWVL 4	2.9187
200894	26K02	3.9122
200898	26AA1-106	1.2431
235003	AC1-025 E	0.1202
236828	01GRAYMONT	0.3311
290086	Q-036 E	2.7363
915952	Y3-092 NFTWR	143.9500
916202	Z1-069 E	5.4537
919491	AA2-000	41.4133
922932	AB1-082 OP	2.9396
923443	AB1-160 E	1.5582
923821	AB2-019 FTWR	4.0306
930511	AB1-092	1.5206
936421	AD2-055	3.1306
936991	AD2-133 C	1.2313
936992	AD2-133 E	5.6320
939171	AE1-147 C	0.9983
939172	AE1-147 E	0.6655
940201	AE2-001 C	0.9954
940202	AE2-001 E	0.6636
940681	AE2-055 C	0.9525
940682	AE2-055 E	0.6350
940861	AE2-074 C	2.2320
940862	AE2-074 E	2.9382
941191	AE2-113 C	11.0858
941192	AE2-113 E	11.9359
941251	**AE2-119 C (Withdrawn : 12/16/2019)**	**1.1559**
941252	**AE2-119 E (Withdrawn : 12/16/2019)**	**0.7706**
941261	AE2-120 C	0.9939
941262	AE2-120 E	0.6626
941271	AE2-121 C	0.5334
941272	AE2-121 E	0.3561
941321	AE2-126 C	1.7676
941322	AE2-126 E	1.1784
941331	AE2-129 C	0.9711
941332	AE2-129 E	0.6474

Bus #	Bus	MW Impact
941351	AE2-131 C	0.9711
941352	AE2-131 E	0.6474
942351	AE2-248 C	0.7763
942352	AE2-248 E	0.5176
942491	AE2-262 C	4.7536
942492	AE2-262 E	3.1944
942501	AE2-263 C	4.4684
942502	AE2-263 E	2.9834
942813	AE2-299 BAT	29.7008
942961	AE2-316 C	3.6176
942962	AE2-316 E	5.1587
943751	AF1-043	4.9776
944001	AF1-068 C O1	0.5456
944002	AF1-068 E O1	0.3069
944311	AF1-099 C	3.8245
944312	AF1-099 E	2.5497
944321	AF1-100 C O1	18.3420
944322	AF1-100 E O1	12.2280
944382	AF1-103 BAT	10.7388
944392	AF1-104 BAT	3.0956
944471	AF1-112 C	0.5168
944472	AF1-112 E	0.3445
944671	AF1-132 C O1	0.5098
944672	AF1-132 E O1	0.3399
944691	AF1-134 C O1	0.3673
944692	AF1-134 E O1	0.3673
944701	AF1-135 C	0.4408
944702	AF1-135 E	0.2939
944771	AF1-142 C	6.1192
944772	AF1-142 E	4.0794
944841	AF1-149 C	0.9938
944842	AF1-149 E	0.6625
944881	AF1-153 C O1	1.6386
944882	AF1-153 E O1	1.0924
944901	AF1-155 C	1.6288
944902	AF1-155 E	1.0858
945071	AF1-172 C	7.6042
945072	AF1-172 E	5.0695
945161	AF1-181	0.0978
945171	AF1-182	0.4891
945181	AF1-183	0.0531
945331	AF1-198	0.0858
945481	AF1-213 C	3.9764
945482	AF1-213 E	2.6509
945491	AF1-214 C	0.5268
945492	AF1-214 E	0.3512
945551	AF1-220 C	15.5337
945552	AF1-220 E	10.3615
945771	AF1-242 C	1.6288
945772	AF1-242 E	1.0858
946091	AF1-274 C	7.8581
946092	AF1-274 E	5.2387

Bus #	Bus	MW Impact
946131	AF1-278	42.0788
946381	AF1-302 C	0.8373
946382	AF1-302 E	1.1163
946421	AF1-306 C	9.4557
946422	AF1-306 E	37.8230
DUCKCREEK	DUCKCREEK	1.5845
NEWTON	NEWTON	1.4216
FARMERCITY	FARMERCITY	0.0731
G-007A	G-007A	3.6418
VFT	VFT	9.9330
PRAIRIE	PRAIRIE	3.3088
COFFEEN	COFFEEN	0.7034
EDWARDS	EDWARDS	0.4854
CHEOAH	CHEOAH	0.5090
TILTON	TILTON	0.8625
MADISON	MADISON	0.0444
GIBSON	GIBSON	0.7240
CALDERWOOD	CALDERWOOD	0.5089
BLUEG	BLUEG	2.2672
TRIMBLE	TRIMBLE	0.7285
CATAWBA	CATAWBA	0.2835

9.6.2 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
46762762	200811	26WARREN	PENELEC	200918	26ERIE S TIE	PENELEC	1	PN-P2-3-PN-345-003A	breaker	621.0	115.04	116.06	DC	6.33

Bus #	Bus	MW Impact
200642	26SENECA#1	8.8930
200643	26SENECA#2	8.3989
200644	26SENECA#3	0.8396
200649	26PENNTECH	0.8482
200894	26K02	3.1059
200898	26AA1-106	0.9872
201201	26WRREN CT	2.5169
201477	26Y2-055	9.1985
203999	P-047 E	3.7552
235003	AC1-025 E	0.0953
236828	01GRAYMONT	0.2626
290086	Q-036 E	2.1740
915952	Y3-092 NFTWR	115.7800
916202	Z1-069 E	4.3265
919491	AA2-000	32.8614
922932	AB1-082 OP	2.3303
923443	AB1-160 E	1.2361
923821	AB2-019 FTWR	3.2418
930511	AB1-092	1.2066
936421	AD2-055	2.4841
936991	AD2-133 C	0.9783
936992	AD2-133 E	4.4746
939171	AE1-147 C	0.7918
939172	AE1-147 E	0.5279
940201	AE2-001 C	0.7896
940202	AE2-001 E	0.5264
940681	AE2-055 C	0.7554
940682	AE2-055 E	0.5036
940861	AE2-074 C	1.7694
940862	AE2-074 E	2.3291
941191	AE2-113 C	8.7853
941192	AE2-113 E	9.4589
941251	**AE2-119 C (Withdrawn : 12/16/2019)**	**0.9177**
941252	**AE2-119 E (Withdrawn : 12/16/2019)**	**0.6118**
941261	AE2-120 C	0.7884
941262	AE2-120 E	0.5256
941271	AE2-121 C	0.4230
941272	AE2-121 E	0.2825
941321	AE2-126 C	1.4018
941322	AE2-126 E	0.9346
941331	AE2-129 C	0.7713

Bus #	Bus	MW Impact
941332	AE2-129 E	0.5142
941351	AE2-131 C	0.7713
941352	AE2-131 E	0.5142
941421	AE2-139 C	2.7596
941422	AE2-139 E	1.8397
942351	AE2-248 C	0.6158
942352	AE2-248 E	0.4105
942491	AE2-262 C	3.7710
942492	AE2-262 E	2.5341
942501	AE2-263 C	3.5448
942502	AE2-263 E	2.3667
942813	AE2-299 BAT	23.1728
942961	AE2-316 C	2.8790
942962	AE2-316 E	4.1055
943751	AF1-043	3.9498
944001	AF1-068 C O1	0.4327
944002	AF1-068 E O1	0.2434
944311	AF1-099 C	3.0339
944312	AF1-099 E	2.0226
944321	AF1-100 C O1	6.5555
944322	AF1-100 E O1	4.3703
944381	AF1-103 O1	6.3268
944392	AF1-104 BAT	2.3720
944471	AF1-112 C	0.4099
944472	AF1-112 E	0.2733
944671	AF1-132 C O1	0.4044
944672	AF1-132 E O1	0.2696
944691	AF1-134 C O1	0.2930
944692	AF1-134 E O1	0.2930
944701	AF1-135 C	0.3516
944702	AF1-135 E	0.2344
944771	AF1-142 C	4.8543
944772	AF1-142 E	3.2362
944841	AF1-149 C	0.7882
944842	AF1-149 E	0.5254
944881	AF1-153 C O1	1.3018
944882	AF1-153 E O1	0.8678
944901	AF1-155 C	1.2941
944902	AF1-155 E	0.8627
945071	AF1-172 C	6.0331
945072	AF1-172 E	4.0221
945121	AF1-177	1.5817
945161	AF1-181	0.0349
945171	AF1-182	0.1748
945181	AF1-183	0.0422
945331	AF1-198	0.0682
945481	AF1-213 C	3.1635
945482	AF1-213 E	2.1090
945491	AF1-214 C	0.4178
945492	AF1-214 E	0.2786
945551	AF1-220 C	12.3132
945552	AF1-220 E	8.2133

Bus #	Bus	MW Impact
945771	AF1-242 C	1.2941
945772	AF1-242 E	0.8627
946091	AF1-274 C	6.2312
946092	AF1-274 E	4.1541
946131	AF1-278	33.3216
946381	AF1-302 C	0.6663
946382	AF1-302 E	0.8884
946421	AF1-306 C	7.4982
946422	AF1-306 E	29.9930
DUCKCREEK	DUCKCREEK	1.2943
NEWTON	NEWTON	1.1615
FARMERCITY	FARMERCITY	0.0598
G-007A	G-007A	2.8602
VFT	VFT	7.8045
PRAIRIE	PRAIRIE	2.7044
COFFEEN	COFFEEN	0.5745
EDWARDS	EDWARDS	0.3966
CHEOAH	CHEOAH	0.4184
TILTON	TILTON	0.7043
MADISON	MADISON	0.0343
GIBSON	GIBSON	0.5919
CALDERWOOD	CALDERWOOD	0.4185
BLUEG	BLUEG	1.8540
TRIMBLE	TRIMBLE	0.5955
CATAWBA	CATAWBA	0.2345

9.6.3 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
41524296	200927	26FOURMILE	PENELEC	200820	26ERIE SE	PENELEC	1	PN-P2-3-PN-230-6G	breaker	245.0	154.09	155.34	DC	3.06

Bus #	Bus	MW Impact
200642	26SENECA#1	3.4420
200643	26SENECA#2	3.2507
200644	26SENECA#3	0.3250
201144	W3-099 C OP1	5.7161
201201	26WRREN CT	1.2187
201477	26Y2-055	4.4216
203910	26Z1-091	0.8507
203999	P-047 E	3.5759
903644	W3-099 E OP1	38.2539
915952	Y3-092 NFTWR	52.7800
916202	Z1-069 E	2.9992
920341	AA2-132	0.9444
922932	AB1-082 OP	1.1683
923443	AB1-160 E	0.8569
923821	AB2-019 FTWR	1.4778
940861	AE2-074 C	0.8871
940862	AE2-074 E	1.1677
941191	AE2-113 C	3.6151
941192	AE2-113 E	3.8923
942811	AE2-299 C	13.8966
942812	AE2-299 E	55.5866
944301	AF1-098 C	21.8875
944302	AF1-098 E	14.5917
944381	AF1-103 O1	3.0636
944392	AF1-104 BAT	1.0838
944411	AF1-106 O1	0.5235
944741	AF1-139 C O1	0.3018
944742	AF1-139 E O1	0.2012
945121	AF1-177	0.7659
945331	AF1-198	0.0587
945551	AF1-220 C	2.3482
945552	AF1-220 E	1.5663
946091	AF1-274 C	1.1848
946092	AF1-274 E	0.7899
946131	AF1-278	7.2284
946211	AF1-286 C O1	0.2120
946212	AF1-286 E O1	0.1440
946403	AF1-304 BAT	6.4440
946421	AF1-306 C	1.3686
946422	AF1-306 E	5.4745
DUCKCREEK	DUCKCREEK	0.6840

Bus #	Bus	MW Impact
NEWTON	NEWTON	0.6168
FARMERCITY	FARMERCITY	0.0318
G-007A	G-007A	1.7813
VFT	VFT	4.9020
AA3-300	AA3-300	5.2330
PRAIRIE	PRAIRIE	1.4387
COFFEEN	COFFEEN	0.3049
EDWARDS	EDWARDS	0.2096
CHEOAH	CHEOAH	0.2272
TILTON	TILTON	0.3730
MADISON	MADISON	0.0222
GIBSON	GIBSON	0.3145
CALDERWOOD	CALDERWOOD	0.2271
BLUEG	BLUEG	0.9878
TRIMBLE	TRIMBLE	0.3166
CATAWBA	CATAWBA	0.1295

Affected Systems

9.7 Affected Systems

9.7.1 LG&E

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

9.7.2 MISO

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

9.7.3 TVA

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

9.7.4 Duke Energy Progress

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

9.7.5 NYISO

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

9.8 Contingency Definitions

Contingency Name	Contingency Definition
Base Case	
PN-P2-3-PN-345-003A	CONTINGENCY 'PN-P2-3-PN-345-003A' /* WAYNE 345KV STUCK BREAKER DISCONNECT BUS 200595 /* 26WAYNE 345 END
PN-P1-2-PN-230-003	CONTINGENCY 'PN-P1-2-PN-230-003' /* ERIE SOUTH - WARREN 230KV DISCONNECT BRANCH FROM BUS 200918 TO BUS 200811 CKT 1 /* 26ERIE S TIE230 26WARREN 230 END
PN-P2-3-PN-230-6G	CONTINGENCY 'PN-P2-3-PN-230-6G' /* ERIE SOUTH 230KV SB 35 OPEN BUS 200819 /*ERIE SOUTH 1 230KV BUS OPEN BUS 200918 /*ERIE SOUTH 230 KV BUS TIE END
PN-P1-2-PN-345-003	CONTINGENCY 'PN-P1-2-PN-345-003' /* HANDSOME LAKE - WAYNE 345KV DISCONNECT BRANCH FROM BUS 200826 TO BUS 200595 CKT 1 /* 26HANDSMLK 345 26WAYNE 345 END

Short Circuit

9.9 Short Circuit

The following Breakers are overduty:

None.

10 Network Impacts – Secondary POI

The Queue Project AF1-103 was evaluated as a 20.1 MW (Capacity 20.0 MW) injection at the Warren 115 kV substation in the PENELEC area. Project AF1-103 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-103 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

10.1 Generation Deliverability

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

None

10.2 Multiple Facility Contingency

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

None

10.3 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
42139941	200593	26GLADE	230.0	PENELEC	200811	26WARREN	230.0	PENELEC	1	PN-P2-3-PN-345-003A	breaker	621.0	152.59	154.31	DC	10.74
41524296	200927	26FOURMILE	115.0	PENELEC	200820	26ERIE SE	115.0	PENELEC	1	PN-P2-3-PN-230-6G	breaker	245.0	154.05	155.3	DC	3.06
41791377	944300	AF1-098 TAP	115.0	PENELEC	200927	26FOURMILE	115.0	PENELEC	1	PN-P2-2-PN-230-009	bus	245.0	105.28	107.15	DC	4.57

10.4 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
42424464	200593	26GLADE	230.0	PENELEC	200811	26WARREN	230.0	PENELEC	1	Base Case	operation	520.0	149.87	151.87	DC	10.5

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
42424465	200593	26GLADE	230.0	PENELEC	200811	26WARREN	230.0	PENELEC	1	PN-P1-2-PN-345-003	operation	621.0	150.73	152.45	DC	10.73
42424824	200811	26WARREN	230.0	PENELEC	200918	26ERIE S TIE	230.0	PENELEC	1	Base Case	operation	520.0	110.08	111.33	DC	6.52
42424825	200811	26WARREN	230.0	PENELEC	200918	26ERIE S TIE	230.0	PENELEC	1	PN-P1-2-PN-115-100-A	operation	621.0	113.2	114.5	DC	8.16
41188068	944300	AF1-098 TAP	115.0	PENELEC	200927	26FOURMILE	115.0	PENELEC	1	PN-P1-2-PN-230-003	operation	245.0	104.72	106.59	DC	4.58

10.5 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.

10.5.1 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
42139941	200593	26GLADE	PENELEC	200811	26WARREN	PENELEC	1	PN-P2-3-PN-345-003A	breaker	621.0	152.59	154.31	DC	10.74

Bus #	Bus	MW Impact
200642	26SENECA#1	11.2398
200643	26SENECA#2	10.6153
200644	26SENECA#3	1.0612
200649	26PENNTECH	1.0703
200665	26SHAWVL 3	2.9713
200666	26SHAWVL 4	2.9187
200894	26K02	3.9122
200898	26AA1-106	1.2431
235003	AC1-025 E	0.1202
236828	01GRAYMONT	0.3311
290086	Q-036 E	2.7363
915952	Y3-092 NFTWR	143.9500
916202	Z1-069 E	5.4537
919491	AA2-000	41.4133
922932	AB1-082 OP	2.9396
923443	AB1-160 E	1.5582
923821	AB2-019 FTWR	4.0306
930511	AB1-092	1.5206
936421	AD2-055	3.1306
936991	AD2-133 C	1.2313
936992	AD2-133 E	5.6320
939171	AE1-147 C	0.9983
939172	AE1-147 E	0.6655
940201	AE2-001 C	0.9954
940202	AE2-001 E	0.6636
940681	AE2-055 C	0.9525
940682	AE2-055 E	0.6350
940861	AE2-074 C	2.2320
940862	AE2-074 E	2.9382
941191	AE2-113 C	11.0858
941192	AE2-113 E	11.9359
941251	**AE2-119 C (Withdrawn : 12/16/2019)**	**1.1559**
941252	**AE2-119 E (Withdrawn : 12/16/2019)**	**0.7706**
941261	AE2-120 C	0.9939
941262	AE2-120 E	0.6626
941271	AE2-121 C	0.5334
941272	AE2-121 E	0.3561
941321	AE2-126 C	1.7676
941322	AE2-126 E	1.1784
941331	AE2-129 C	0.9711
941332	AE2-129 E	0.6474

Bus #	Bus	MW Impact
941351	AE2-131 C	0.9711
941352	AE2-131 E	0.6474
942351	AE2-248 C	0.7763
942352	AE2-248 E	0.5176
942491	AE2-262 C	4.7536
942492	AE2-262 E	3.1944
942501	AE2-263 C	4.4684
942502	AE2-263 E	2.9834
942813	AE2-299 BAT	29.7024
942961	AE2-316 C	3.6176
942962	AE2-316 E	5.1587
943751	AF1-043	4.9776
944001	AF1-068 C O2	0.5448
944002	AF1-068 E O2	0.3064
944311	AF1-099 C	3.8245
944312	AF1-099 E	2.5497
944321	AF1-100 C O2	18.3450
944322	AF1-100 E O2	12.2300
944382	AF1-103 BAT	10.7388
944392	AF1-104 BAT	3.0956
944471	AF1-112 C	0.5169
944472	AF1-112 E	0.3446
944671	AF1-132 C O2	0.5107
944672	AF1-132 E O2	0.3405
944691	AF1-134 C O1	0.3673
944692	AF1-134 E O1	0.3673
944701	AF1-135 C	0.4408
944702	AF1-135 E	0.2939
944771	AF1-142 C	6.1192
944772	AF1-142 E	4.0794
944841	AF1-149 C	0.9938
944842	AF1-149 E	0.6625
944881	AF1-153 C O2	1.6386
944882	AF1-153 E O2	1.0924
944901	AF1-155 C	1.6288
944902	AF1-155 E	1.0858
945071	AF1-172 C	7.6042
945072	AF1-172 E	5.0695
945161	AF1-181	0.0978
945171	AF1-182	0.4891
945181	AF1-183	0.0531
945331	AF1-198	0.0858
945481	AF1-213 C	3.9764
945482	AF1-213 E	2.6509
945491	AF1-214 C	0.5268
945492	AF1-214 E	0.3512
945551	AF1-220 C	15.5337
945552	AF1-220 E	10.3615
945771	AF1-242 C	1.6288
945772	AF1-242 E	1.0858
946091	AF1-274 C	7.8581
946092	AF1-274 E	5.2387

Bus #	Bus	MW Impact
946131	AF1-278	42.0788
946381	AF1-302 C	0.8373
946382	AF1-302 E	1.1163
946421	AF1-306 C	9.4557
946422	AF1-306 E	37.8230
DUCKCREEK	DUCKCREEK	1.5845
NEWTON	NEWTON	1.4216
FARMERCITY	FARMERCITY	0.0731
G-007A	G-007A	3.6418
VFT	VFT	9.9330
PRAIRIE	PRAIRIE	3.3088
COFFEEN	COFFEEN	0.7034
EDWARDS	EDWARDS	0.4854
CHEOAH	CHEOAH	0.5090
TILTON	TILTON	0.8625
MADISON	MADISON	0.0444
GIBSON	GIBSON	0.7240
CALDERWOOD	CALDERWOOD	0.5089
BLUEG	BLUEG	2.2672
TRIMBLE	TRIMBLE	0.7285
CATAWBA	CATAWBA	0.2835

10.5.2 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
41524296	200927	26FOURMILE	PENELEC	200820	26ERIE SE	PENELEC	1	PN-P2-3-PN-230-6G	breaker	245.0	154.05	155.3	DC	3.06

Bus #	Bus	MW Impact
200642	26SENECA#1	3.4420
200643	26SENECA#2	3.2507
200644	26SENECA#3	0.3250
201144	W3-099 C OP1	5.7161
201201	26WRREN CT	1.2187
201477	26Y2-055	4.4216
203910	26Z1-091	0.8507
203999	P-047 E	3.5759
903644	W3-099 E OP1	38.2539
915952	Y3-092 NFTWR	52.7800
916202	Z1-069 E	2.9992
920341	AA2-132	0.9444
922932	AB1-082 OP	1.1683
923443	AB1-160 E	0.8569
923821	AB2-019 FTWR	1.4778
940861	AE2-074 C	0.8871
940862	AE2-074 E	1.1677
941191	AE2-113 C	3.6151
941192	AE2-113 E	3.8923
942811	AE2-299 C	13.8966
942812	AE2-299 E	55.5866
944301	AF1-098 C	21.8875
944302	AF1-098 E	14.5917
944381	AF1-103 O2	3.0636
944392	AF1-104 BAT	1.0838
944411	AF1-106 O2	0.5235
944741	AF1-139 C O1	0.3018
944742	AF1-139 E O1	0.2012
945121	AF1-177	0.7659
945331	AF1-198	0.0587
945551	AF1-220 C	2.3482
945552	AF1-220 E	1.5663
946091	AF1-274 C	1.1848
946092	AF1-274 E	0.7899
946131	AF1-278	7.2284
946211	AF1-286 C O2	0.2120
946212	AF1-286 E O2	0.1440
946403	AF1-304 BAT	6.4440
946421	AF1-306 C	1.3686
946422	AF1-306 E	5.4745
DUCKCREEK	DUCKCREEK	0.6840

Bus #	Bus	MW Impact
NEWTON	NEWTON	0.6168
FARMERCITY	FARMERCITY	0.0318
G-007A	G-007A	1.7813
VFT	VFT	4.9020
AA3-300	AA3-300	5.2330
PRAIRIE	PRAIRIE	1.4387
COFFEEN	COFFEEN	0.3049
EDWARDS	EDWARDS	0.2096
CHEOAH	CHEOAH	0.2272
TILTON	TILTON	0.3730
MADISON	MADISON	0.0222
GIBSON	GIBSON	0.3145
CALDERWOOD	CALDERWOOD	0.2271
BLUEG	BLUEG	0.9878
TRIMBLE	TRIMBLE	0.3166
CATAWBA	CATAWBA	0.1295

10.5.3 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
41791377	944300	AF1-098 TAP	PENELEC	200927	26FOURMILE	PENELEC	1	PN-P2-2-PN-230-009	bus	245.0	105.28	107.15	DC	4.57

Bus #	Bus	MW Impact
200642	26SENECA#1	4.5819
200643	26SENECA#2	4.3273
200644	26SENECA#3	0.4326
201201	26WRREN CT	1.8176
201477	26Y2-055	6.5879
922932	AB1-082 OP	0.9630
940861	AE2-074 C	0.7312
940862	AE2-074 E	0.9625
941191	AE2-113 C	3.6864
941192	AE2-113 E	3.9691
941321	AE2-126 C	0.5814
941322	AE2-126 E	0.3876
942813	AE2-299 BAT	10.8432
944301	AF1-098 C	37.3008
944302	AF1-098 E	24.8672
944381	AF1-103 O2	4.5690
944392	AF1-104 BAT	1.0240
944881	AF1-153 C O2	0.2805
944882	AF1-153 E O2	0.1870
944901	AF1-155 C	0.2785
944902	AF1-155 E	0.1856
945121	AF1-177	1.1423
945551	AF1-220 C	2.7377
945552	AF1-220 E	1.8261
945771	AF1-242 C	0.2785
945772	AF1-242 E	0.1856
946091	AF1-274 C	1.3749
946092	AF1-274 E	0.9166
946131	AF1-278	7.5365
946421	AF1-306 C	1.6574
946422	AF1-306 E	6.6294
DUCKCREEK	DUCKCREEK	0.5136
NEWTON	NEWTON	0.4631
FARMERCITY	FARMERCITY	0.0238
G-007A	G-007A	1.1436
VFT	VFT	3.1283
PRAIRIE	PRAIRIE	1.0797
COFFEEN	COFFEEN	0.2288
EDWARDS	EDWARDS	0.1575
CHEOAH	CHEOAH	0.1697
TILTON	TILTON	0.2797

Bus #	Bus	MW Impact
MADISON	MADISON	0.0161
GIBSON	GIBSON	0.2359
CALDERWOOD	CALDERWOOD	0.1695
BLUEG	BLUEG	0.7395
TRIMBLE	TRIMBLE	0.2376
CATAWBA	CATAWBA	0.0966

Affected Systems

10.6 Affected Systems

10.6.1 LG&E

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

10.6.2 MISO

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

10.6.3 TVA

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

10.6.4 Duke Energy Progress

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

10.6.5 NYISO

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

10.7 Contingency Definitions

Contingency Name	Contingency Definition
PN-P1-2-PN-230-003	CONTINGENCY 'PN-P1-2-PN-230-003' /* ERIE SOUTH - WARREN 230KV DISCONNECT BRANCH FROM BUS 200918 TO BUS 200811 CKT 1 /* 26ERIE S TIE230 26WARREN 230 END
PN-P2-3-PN-345-003A	CONTINGENCY 'PN-P2-3-PN-345-003A' /* WAYNE 345KV STUCK BREAKER DISCONNECT BUS 200595 /* 26WAYNE 345 END
PN-P1-2-PN-345-003	CONTINGENCY 'PN-P1-2-PN-345-003' /* HANDSOME LAKE - WAYNE 345KV DISCONNECT BRANCH FROM BUS 200826 TO BUS 200595 CKT 1 /* 26HANDSMLK 345 26WAYNE 345 END
PN-P1-2-PN-115-100-A	CONTINGENCY 'PN-P1-2-PN-115-100-A' /* CORRY EAST - FOUR MILE JCT. 115KV LINE DISCONNECT BRANCH FROM BUS 200927 TO BUS 944300 CKT 1 /* 26FOURMILE 115 AF1-098 TAP 115 END
PN-P2-3-PN-230-6G	CONTINGENCY 'PN-P2-3-PN-230-6G' /* ERIE SOUTH 230KV SB 35 OPEN BUS 200819 /*ERIE SOUTH 1 230KV BUS OPEN BUS 200918 /*ERIE SOUTH 230 KV BUS TIE END
Base Case	
PN-P2-2-PN-230-009	CONTINGENCY 'PN-P2-2-PN-230-009' /* ERIE SOUTH 230KV TIE BUS DISCONNECT BRANCH FROM BUS 200918 TO BUS 200819 CKT ZB /* 26ERIE S TIE230 26ERIE SE 230 DISCONNECT BRANCH FROM BUS 200918 TO BUS 200568 CKT ZB /* 26ERIE S TIE230 26ERIE SO. 230 DISCONNECT BRANCH FROM BUS 200918 TO BUS 200811 CKT 1 /* 26ERIE S TIE230 26WARREN 230 DISCONNECT BUS 200918 /* 26ERIE S TIE230 END

Short Circuit

10.8 Short Circuit

The following Breakers are overduty:

None.

11 Attachment 1 – One Line