Generation Interconnection

Feasibility Study Report

for

Queue Project AF2-296

MADERA 34.5 KV

12 MW Capacity / 20 MW Energy

July 2020

Table of Contents

1 Introduction 4
2 Preface 4
3 General 5
4 Point of Interconnection 6
5 Cost Summary 6
6 Transmission Owner Scope of Work 7
7 Schedule 8
8 Transmission Owner Analysis 8
9 Interconnection Customer Requirements 8
9.1 System Protection 8
9.2 General Concerns 8
9.3 Requirements for Owner's/Developer's generation IPP Facility 9
9.4 Compliance Issues 9
10 Revenue Metering and SCADA Requirements 10
10.1 PJM Requirements 10
10.2 Meteorological Data Reporting Requirements 10
10.3 PENELEC Requirements 10
11 Summer Peak - Load Flow Analysis 11
11.1 Generation Deliverability 12
11.2 Multiple Facility Contingency 12
11.3 Contribution to Previously Identified Overloads 12
11.4 Potential Congestion due to Local Energy Deliverability 13
11.5 System Reinforcements - Summer Peak Load Flow - Primary POI 15
11.6 Flow Gate Details 17
11.6.1 Index 1 18
11.6.2 Index 2 20
11.6.3 Index 3 22
11.6.4 Index 4 24
11.7 Queue Dependencies 26
11.8 Contingency Descriptions 27
12 Short Circuit Analysis 29

13 Affected Systems 29
13.1 NYISO 29

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 Interconnection Customer seeking to interconnect a wind or solar generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

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

3 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Clearfield County, Pennsylvania. The installed facilities will have a total capability of 20 MW with 12 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is October 01, 2021. This study does not imply a TO commitment to this in-service date.

Queue Number	AF2-296
Project Name	MADERA 34.5 KV
State	Pennsylvania
County	Clearfield
Transmission Owner	MAIT-PENELEC Zone
MFO	20
MWE	20
MWC	12
Fuel	Solar
Basecase Study Year	2023

Any new service customers who can feasibly be commercially operable prior to June 1st of the basecase study year are required to request interim deliverability analysis.

4 Point of Interconnection

AF2-296 will interconnect with the PENELEC distribution system at POI pole MC-9621, which is located on the 34.5kV Curwensville ckt#00147-22 @ Madera substation.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AF2-296 generation project to connect to the Penelec distribution system. IC will be responsible for constructing all of the facilities on its side of the POI, including the attachment facilities which connect the generator to the Penelec distribution system's direct connection facilities.

Customer did not request a secondary point of interconnection.

5 Cost Summary

The AF2-296 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$191,200
Total System Network Upgrade Costs	$56,756,262
Total Costs	**$56,947,462**

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.

Cost allocations for any System Upgrades will be provided in the System Impact Study Report.

6 Transmission Owner Scope of Work

AF2-296 will interconnect with the PENELEC distribution system at POI pole MC-9621, which is located on the 34.5kV Curwensville ckt#00147-22 @ Madera substation.

IC will be responsible for constructing all of the facilities on its side of the POI, including the attachment facilities which connect the generator to the Penelec distribution system's direct connection facilities.

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

Description	Total Cost
Tap the existing 34.5kV Curwensville ckt#00147-22 @ Madera at POI pole MC-9621 and install a SCADA controlled 34.5kV recloser to interconnect queue project AF2-296. Install 34.5kV metering in customer's facilities. The customer is responsible to build their own line from their site to Penelec's existing facilities.	$100,000
Madera 34.5kV SS. Adjust Remote Relay and Metering Settings.	$33,000
Curwensville 34.5kV SS. Adjust Remote Relay and Metering Settings.	$33,000
NPs & Cust Dwg Review @ AF2-296	$25,200
Total Physical Interconnection Costs	**$191,200**

7 Schedule

Based on the scope of work for the Attachment Facilities and the Direct and/or Non-Direct Connection facilities, it is expected to take a minimum of **9 months** after the signing of an Interconnection Construction Service Agreement to complete the installation. This includes the requirement for the IC to make a preliminary payment that compensates FE for the engineering design work that is related to the construction. This assumes that there will be no environmental issues with any of the new properties associated with this project, that there will be no delays in acquiring the necessary permits for implementing the defined direct connection and network upgrades, and that all transmission system outages will be allowed when requested.

The schedule for the required Network Impact Reinforcements will be more clearly identified in future study phases.

8 Transmission Owner Analysis

Penelec performed an analysis of its distribution system. The AF2-296 project did not contribute to any overloads on the distribution system.

9 Interconnection Customer Requirements

9.1 System Protection

An analysis was conducted to assess the impact of the Madera 34.5kV (AF2-296) 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 the Interconnection Customer (Developer) constructing a generation facility they call “Madera 34.5kV” that will connect to Penelec’s 34.5kV Madera substation ckt#00147-22 via a customer owned tap to pole MC-9621.

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".

Protection requirements are included in the "Technical Requirements" document.

9.2 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.

9.3 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.

9.4 Compliance Issues

The Interconnection Customer will be responsible for meeting a power factor between 0.95 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/storage 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. The Interconnection Customer is responsible for the installation of equipment on its side of the POI in order to adhere to the criteria stated above by FirstEnergy.

10 Revenue Metering and SCADA Requirements

10.1 PJM Requirements

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Section 8 of Attachment O.

10.2 Meteorological Data Reporting Requirements

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

- Back Panel temperature (Fahrenheit)
- Irradiance (Watts/meter^2)
- Ambient air temperature (Fahrenheit) – (Accepted, not required)
- Wind speed (meters/second) – (Accepted, not required)
- Wind direction (decimal degrees from true north) – (Accepted, not required)

10.3 PENELEC Requirements

The Interconnection Customer 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.

11 Summer Peak - Load Flow Analysis

The Queue Project AF2-296 was evaluated as a 20.0 MW (Capacity 12.0 MW) injection at the Madera 34.5 kV substation in the PENELEC area. Project AF2-296 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-296 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

11.1 Generation Deliverability

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

None.

11.2 Multiple Facility Contingency

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

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
10128454 7	20071 4	26SHAWV L 1	115. 0	PENELE C	20071 3	26ROCKTO N	115. 0	PENELE C	1	AP-P2-3-WP-230-445	breake r	190.0	98.92	100.06	DC	2.17

11.3 Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
1012843 37	20071 2	26DUBOIS	115. 0	PENELE C	20072 0	26HARVY.R U	115. 0	PENELE C	1	AP-P2-2-WP-230-001T	bus	179.0	115.42	116.71	DC	2.31
1012846 38	20071 2	26DUBOIS	115. 0	PENELE C	20072 0	26HARVY.R U	115. 0	PENELE C	1	AP-P2-3-WP-230-446T	breake r	179.0	115.53	116.83	DC	2.31
1012846 39	20071 2	26DUBOIS	115. 0	PENELE C	20072 0	26HARVY.R U	115. 0	PENELE C	1	AP-P2-2-WP-230-001T	breake r	179.0	115.42	116.71	DC	2.31
1012846 40	20071 2	26DUBOIS	115. 0	PENELE C	20072 0	26HARVY.R U	115. 0	PENELE C	1	AP-P2-3-WP-230-443T *	breake r	179.0	115.37	116.66	DC	2.31
1012842 87	20071 3	26ROCKTO N	115. 0	PENELE C	20071 2	26DUBOIS	115. 0	PENELE C	1	AP-P2-2-WP-230-001T	bus	190.0	131.82	133.04	DC	2.31
1012845 48	20071 3	26ROCKTO N	115. 0	PENELE C	20071 2	26DUBOIS	115. 0	PENELE C	1	AP-P2-3-WP-230-446T	breake r	190.0	131.92	133.14	DC	2.31
1012845 49	20071 3	26ROCKTO N	115. 0	PENELE C	20071 2	26DUBOIS	115. 0	PENELE C	1	AP-P2-2-WP-230-001T	breake r	190.0	131.82	133.04	DC	2.31

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
101284550	200713	26ROCKTON	115.0	PENELEC	200712	26DUBOIS	115.0	PENELEC	1	AP-P2-3-WP-230-443T *	breaker	190.0	131.77	132.99	DC	2.31
101284286	200714	26SHAWVL1	115.0	PENELEC	200713	26ROCKTON	115.0	PENELEC	1	AP-P2-2-WP-230-001T	bus	190.0	133.45	134.67	DC	2.31
101284543	200714	26SHAWVL1	115.0	PENELEC	200713	26ROCKTON	115.0	PENELEC	1	AP-P2-3-WP-230-446T	breaker	190.0	133.56	134.77	DC	2.31
101284544	200714	26SHAWVL1	115.0	PENELEC	200713	26ROCKTON	115.0	PENELEC	1	AP-P2-2-WP-230-001T	breaker	190.0	133.45	134.67	DC	2.31
101284545	200714	26SHAWVL1	115.0	PENELEC	200713	26ROCKTON	115.0	PENELEC	1	AP-P2-3-WP-230-443T *	breaker	190.0	133.4	134.62	DC	2.31
101284546	200714	26SHAWVL1	115.0	PENELEC	200713	26ROCKTON	115.0	PENELEC	1	AP-P2-3-WP-230-447	breaker	190.0	100.19	101.33	DC	2.16
101284347	200720	26HARVY.RU	115.0	PENELEC	200711	26WHETSTON	115.0	PENELEC	1	AP-P2-2-WP-230-001T	bus	172.0	112.11	113.44	DC	2.28
101284672	200720	26HARVY.RU	115.0	PENELEC	200711	26WHETSTON	115.0	PENELEC	1	AP-P2-3-WP-230-446T	breaker	172.0	112.23	113.55	DC	2.28
101284673	200720	26HARVY.RU	115.0	PENELEC	200711	26WHETSTON	115.0	PENELEC	1	AP-P2-2-WP-230-001T	breaker	172.0	112.11	113.44	DC	2.28
101284674	200720	26HARVY.RU	115.0	PENELEC	200711	26WHETSTON	115.0	PENELEC	1	AP-P2-3-WP-230-443T *	breaker	172.0	111.99	113.32	DC	2.28

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
101284882	200716	26PHILIPSB	115.0	PENELEC	200904	26EAGLVAL	115.0	PENELEC	1	AP-P1-2-WP-230-323T	operation	174.0	142.45	142.96	DC	1.97
101285068	200717	26MADERA	115.0	PENELEC	944180	AF1-086 TAP	115.0	PENELEC	1	AP-P1-2-WP-230-323T	operation	237.0	101.82	105.78	DC	9.4
101284905	200727	26SHAW. 2	115.0	PENELEC	200716	26PHILIPSB	115.0	PENELEC	1	AP-P1-2-WP-230-323T	operation	185.0	136.51	136.99	DC	1.97
101285040	200740	26BLRSVL E	115.0	PENELEC	200763	26BLAIRSVL	138.0	PENELEC	1	PN-P1_2-PN-230-0103	operation	364.0	99.79	100.01	DC	1.73
101284912	200755	26WESTOVER	115.0	PENELEC	200801	26GARMAN	115.0	PENELEC	1	AP-P1-2-WP-230-323T	operation	246.0	128.09	131.91	DC	9.4
101284914	200755	26WESTOVER	115.0	PENELEC	200801	26GARMAN	115.0	PENELEC	1	Base Case	operation	193.0	106.48	111.16	DC	9.03
101285016	200801	26GARMAN	115.0	PENELEC	200507	26GLORY	115.0	PENELEC	1	AP-P1-2-WP-230-323T	operation	233.0	107.67	111.25	DC	8.34
101284822	200904	26EAGLVAL	115.0	PENELEC	200527	26TYRONEN	115.0	PENELEC	1	AP-P1-2-WP-230-323T	operation	191.0	172.23	172.69	DC	1.97
101284827	200904	26EAGLVAL	115.0	PENELEC	200527	26TYRONEN	115.0	PENELEC	1	Base Case	operation	147.0	132.23	132.72	DC	1.59
101284895	944180	AF1-086 TAP	115.0	PENELEC	200755	26WESTOVER	115.0	PENELEC	1	AP-P1-2-WP-230-323T	operation	237.0	133.71	137.68	DC	9.4
101284897	944180	AF1-086 TAP	115.0	PENELEC	200755	26WESTOVER	115.0	PENELEC	1	Base Case	operation	175.0	118.46	123.62	DC	9.03

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
101284550,101284548,101284549,101284287	3	26ROCKTON 115.0 kV - 26DUBOIS 115.0 kV Ckt 1	PENELEC PN-AF2-F-0054A (1833) : Replace line trap at Dubois. Project Type : FAC Cost : $122,280 Time Estimate : 12.0 Months PN-AF2-F-0054B (1834) : Reconductor 11.67 miles of transmission line Project Type : FAC Cost : $28,540,152 Time Estimate : 48.0 Months PN-AF2-F-0054C (1835) : Adjust CT ratios at Dubois. Project Type : FAC Cost : $733,680 Time Estimate : 12.0 Months	$29,396,112
101284286,101284543,101284546,101284547,101284544,101284545	1	26SHAWVL 1 115.0 kV - 26ROCKTON 115.0 kV Ckt 1	PENELEC PN-AF2-F-0050A (1826) : Replace line trap at Shawville. Project Type : FAC Cost : $122,280 Time Estimate : 12.0 Months PN-AF2-F-0050B (1827) : Reconductor 8.63 miles of transmission line. Replace line drops at Shawville. Project Type : FAC Cost : $26,381,910 Time Estimate : 48.0 Months	$26,504,190
101284674,101284672,101284347,101284673	4	26HARVY.RU 115.0 kV - 26WHETSTON 115.0 kV Ckt 1	PENELEC PN-AF2-F-0060A (1849) : Replace disconnect switches at Whetstone. Project Type : FAC Cost : $183,420 Time Estimate : 12.0 Months PN-AF2-F-0060B (1850) : Replace bus conductor at Whetstone. Project Type : FAC Cost : $122,280 Time Estimate : 12.0 Months	$305,700
101284640,101284638,101284639,101284337	2	26DUBOIS 115.0 kV - 26HARVY.RU 115.0 kV Ckt 1	PENELEC PN-AF2-F-0058A (1841) : Replace relays at Dubois Project Type : FAC Cost : $427,980 Time Estimate : 12.0 Months PN-AF2-F-0058B (1842) : Replace line trap at Dubois. Project Type : FAC Cost : $122,280 Time Estimate : 12.0 Months	$550,260

ID	Idx	Facility	Upgrade Description	Cost
N/A	N/A	**26GARMAN 115.0 kV - 26GLORY 115.0 kV Ckt 1**	**Note: It should be noted that some of the contingencies taken in the analysis may not be valid due to system condition changes that were not captured in the model. This will be re-evaluated for validity in the System Impact phase.**	$0
			TOTAL COST	**$56,756,262**

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".

11.6.1 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
101284545	200714	26SHAWVL 1	PENELEC	200713	26ROCKTON	PENELEC	1	AP-P2-3-WP-230-443T *	breaker	190.0	133.4	134.62	DC	2.31

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
200665	26SHAWVL 3	3.3814	50/50	3.3814
200666	26SHAWVL 4	3.3661	50/50	3.3661
200715	26SHAWVL 1	3.0636	50/50	3.0636
200722	26SHAWVL 2	3.1420	50/50	3.1420
200905	26Q36	0.1849	50/50	0.1849
200913	26SHAW-D	0.1864	50/50	0.1864
235003	AC1-025 E	0.0987	Adder	0.12
236828	01GRAYMONT	0.2707	Adder	0.32
290086	Q-036 E	4.2876	50/50	4.2876
919491	AA2-000	28.6741	Adder	33.73
930511	AB1-092	1.0528	Adder	1.24
936421	AD2-055	2.1676	Adder	2.55
936991	AD2-133 C	1.9294	50/50	1.9294
936992	AD2-133 E	8.8250	50/50	8.8250
939171	AE1-147 C	0.8156	Adder	0.96
939172	AE1-147 E	0.5437	Adder	0.64
940201	AE2-001 C	0.8137	Adder	0.96
940202	AE2-001 E	0.5424	Adder	0.64
940681	**AE2-055 C (Suspended)**	**0.7834**	**Adder**	**0.92**
940682	**AE2-055 E (Suspended)**	**0.5222**	**Adder**	**0.61**
941261	AE2-120 C	0.8125	Adder	0.96
941262	AE2-120 E	0.5417	Adder	0.64
941271	AE2-121 C	0.4355	Adder	0.51
941272	AE2-121 E	0.2908	Adder	0.34
941331	AE2-129 C	1.6744	50/50	1.6744
941332	AE2-129 E	1.1162	50/50	1.1162
941351	AE2-131 C	1.6744	50/50	1.6744
941352	AE2-131 E	1.1162	50/50	1.1162
942351	AE2-248 C	0.6368	Adder	0.75
942352	AE2-248 E	0.4245	Adder	0.5
942491	AE2-262 C	3.8169	Adder	4.49
942492	AE2-262 E	2.5650	Adder	3.02
942501	AE2-263 C	3.5879	Adder	4.22
942502	AE2-263 E	2.3955	Adder	2.82
943751	AF1-043	6.5028	Adder	7.65
944001	AF1-068 C O1	0.8449	Adder	0.99
944002	AF1-068 E O1	0.4753	Adder	0.56
944181	AF1-086 C O1	1.1729	Adder	1.38
944182	AF1-086 E O1	5.1027	Adder	6.0
944311	AF1-099 C	5.7941	Adder	6.82
944312	AF1-099 E	3.8627	Adder	4.54

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
944321	AF1-100 C	16.4745	50/50	16.4745
944322	AF1-100 E	10.9830	50/50	10.9830
944382	AF1-103 BAT	1.3786	Merchant Transmission	1.3786
944471	AF1-112 C	0.8526	Adder	1.0
944472	AF1-112 E	0.4796	Adder	0.56
944671	AF1-132 C O1	0.7900	Adder	0.93
944672	AF1-132 E O1	0.5267	Adder	0.62
944691	AF1-134 C O1	1.3878	50/50	1.3878
944692	AF1-134 E O1	0.9252	50/50	0.9252
944771	AF1-142 C	9.2705	Adder	10.91
944772	AF1-142 E	6.1804	Adder	7.27
944841	AF1-149 C	0.8124	Adder	0.96
944842	AF1-149 E	0.5416	Adder	0.64
945161	AF1-181	0.0912	50/50	0.0912
945171	AF1-182	0.4565	50/50	0.4565
945181	AF1-183	0.1456	50/50	0.1456
945491	AF1-214 C	0.8126	Adder	0.96
945492	AF1-214 E	0.5418	Adder	0.64
946423	AF1-306 BAT	32.4419	50/50	32.4419
957451	AF2-039 C	1.4574	50/50	1.4574
957452	AF2-039 E	0.9716	50/50	0.9716
957941	AF2-088 C	0.7017	50/50	0.7017
957942	AF2-088 E	0.4678	50/50	0.4678
958271	AF2-121 C	1.6744	50/50	1.6744
958272	AF2-121 E	1.1162	50/50	1.1162
959802	AF2-271 E	0.1218	Adder	0.27
960022	AF2-293 E	0.0420	Adder	0.09
960051	AF2-296 C	1.3878	50/50	1.3878
960052	AF2-296 E	0.9252	50/50	0.9252
NEWTON	NEWTON	0.3138	Confirmed LTF	0.3138
FARMERCITY	FARMERCITY	0.0161	Confirmed LTF	0.0161
G-007A	G-007A	1.2563	Confirmed LTF	1.2563
VFT	VFT	3.4185	Confirmed LTF	3.4185
CALDERWOOD	CALDERWOOD	0.1118	Confirmed LTF	0.1118
NY	NY	0.0216	Confirmed LTF	0.0216
PRAIRIE	PRAIRIE	0.7284	Confirmed LTF	0.7284
CHEOAH	CHEOAH	0.1116	Confirmed LTF	0.1116
EDWARDS	EDWARDS	0.1064	Confirmed LTF	0.1064
TILTON	TILTON	0.1903	Confirmed LTF	0.1903
MADISON	MADISON	0.0202	Confirmed LTF	0.0202
GIBSON	GIBSON	0.1600	Confirmed LTF	0.1600
BLUEG	BLUEG	0.5052	Confirmed LTF	0.5052
TRIMBLE	TRIMBLE	0.1619	Confirmed LTF	0.1619
CATAWBA	CATAWBA	0.0606	Confirmed LTF	0.0606

11.6.2 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
101284640	200712	26DUBOIS	PENELEC	200720	26HARVY.RU	PENELEC	1	AP-P2-3-WP-230-443T *	breaker	179.0	115.37	116.66	DC	2.31

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
200665	26SHAWVL 3	3.3814	50/50	3.3814
200666	26SHAWVL 4	3.3661	50/50	3.3661
200715	26SHAWVL 1	3.0636	50/50	3.0636
200722	26SHAWVL 2	3.1420	50/50	3.1420
200905	26Q36	0.1849	50/50	0.1849
200913	26SHAW-D	0.1864	50/50	0.1864
235003	AC1-025 E	0.0987	Adder	0.12
236828	01GRAYMONT	0.2707	Adder	0.32
290086	Q-036 E	4.2876	50/50	4.2876
919491	AA2-000	28.6741	Adder	33.73
930511	AB1-092	1.0528	Adder	1.24
936421	AD2-055	2.1676	Adder	2.55
936991	AD2-133 C	1.9294	50/50	1.9294
936992	AD2-133 E	8.8250	50/50	8.8250
939171	AE1-147 C	0.8156	Adder	0.96
939172	AE1-147 E	0.5437	Adder	0.64
940201	AE2-001 C	0.8137	Adder	0.96
940202	AE2-001 E	0.5424	Adder	0.64
940681	**AE2-055 C (Suspended)**	**0.7834**	**Adder**	**0.92**
940682	**AE2-055 E (Suspended)**	**0.5222**	**Adder**	**0.61**
941261	AE2-120 C	0.8125	Adder	0.96
941262	AE2-120 E	0.5417	Adder	0.64
941271	AE2-121 C	0.4355	Adder	0.51
941272	AE2-121 E	0.2908	Adder	0.34
941321	AE2-126 C	5.8504	50/50	5.8504
941322	AE2-126 E	3.9002	50/50	3.9002
941331	AE2-129 C	1.6744	50/50	1.6744
941332	AE2-129 E	1.1162	50/50	1.1162
941351	AE2-131 C	1.6744	50/50	1.6744
941352	AE2-131 E	1.1162	50/50	1.1162
942351	AE2-248 C	0.6368	Adder	0.75
942352	AE2-248 E	0.4245	Adder	0.5
942491	AE2-262 C	3.8169	Adder	4.49
942492	AE2-262 E	2.5650	Adder	3.02
942501	AE2-263 C	3.5879	Adder	4.22
942502	AE2-263 E	2.3955	Adder	2.82
943751	AF1-043	6.5028	Adder	7.65
944001	AF1-068 C O1	0.8449	Adder	0.99
944002	AF1-068 E O1	0.4753	Adder	0.56
944181	AF1-086 C O1	1.1729	Adder	1.38
944182	AF1-086 E O1	5.1027	Adder	6.0

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
944311	AF1-099 C	5.7941	Adder	6.82
944312	AF1-099 E	3.8627	Adder	4.54
944321	AF1-100 C	16.4745	50/50	16.4745
944322	AF1-100 E	10.9830	50/50	10.9830
944382	AF1-103 BAT	1.3786	Merchant Transmission	1.3786
944471	AF1-112 C	0.8526	Adder	1.0
944472	AF1-112 E	0.4796	Adder	0.56
944671	AF1-132 C O1	0.7900	Adder	0.93
944672	AF1-132 E O1	0.5267	Adder	0.62
944691	AF1-134 C O1	1.3878	50/50	1.3878
944692	AF1-134 E O1	0.9252	50/50	0.9252
944771	AF1-142 C	9.2705	Adder	10.91
944772	AF1-142 E	6.1804	Adder	7.27
944841	AF1-149 C	0.8124	Adder	0.96
944842	AF1-149 E	0.5416	Adder	0.64
945161	AF1-181	0.0912	50/50	0.0912
945171	AF1-182	0.4565	50/50	0.4565
945181	AF1-183	0.1456	50/50	0.1456
945491	AF1-214 C	0.8126	Adder	0.96
945492	AF1-214 E	0.5418	Adder	0.64
946423	AF1-306 BAT	32.4419	50/50	32.4419
957451	AF2-039 C	1.4574	50/50	1.4574
957452	AF2-039 E	0.9716	50/50	0.9716
957941	AF2-088 C	0.7017	50/50	0.7017
957942	AF2-088 E	0.4678	50/50	0.4678
958271	AF2-121 C	1.6744	50/50	1.6744
958272	AF2-121 E	1.1162	50/50	1.1162
959802	AF2-271 E	0.1218	Adder	0.27
960022	AF2-293 E	0.0420	Adder	0.09
960051	AF2-296 C	1.3878	50/50	1.3878
960052	AF2-296 E	0.9252	50/50	0.9252
NEWTON	NEWTON	0.3138	Confirmed LTF	0.3138
FARMERCITY	FARMERCITY	0.0161	Confirmed LTF	0.0161
G-007A	G-007A	1.2563	Confirmed LTF	1.2563
VFT	VFT	3.4185	Confirmed LTF	3.4185
CALDERWOOD	CALDERWOOD	0.1118	Confirmed LTF	0.1118
NY	NY	0.0216	Confirmed LTF	0.0216
PRAIRIE	PRAIRIE	0.7284	Confirmed LTF	0.7284
CHEOAH	CHEOAH	0.1116	Confirmed LTF	0.1116
EDWARDS	EDWARDS	0.1064	Confirmed LTF	0.1064
TILTON	TILTON	0.1903	Confirmed LTF	0.1903
MADISON	MADISON	0.0202	Confirmed LTF	0.0202
GIBSON	GIBSON	0.1600	Confirmed LTF	0.1600
BLUEG	BLUEG	0.5052	Confirmed LTF	0.5052
TRIMBLE	TRIMBLE	0.1619	Confirmed LTF	0.1619
CATAWBA	CATAWBA	0.0606	Confirmed LTF	0.0606

11.6.3 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
101284549	200713	26ROCKTON	PENELEC	200712	26DUBOIS	PENELEC	1	AP-P2-2-WP-230-001T	breaker	190.0	131.82	133.04	DC	2.31

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
200665	26SHAWVL 3	3.3814	50/50	3.3814
200666	26SHAWVL 4	3.3664	50/50	3.3664
200715	26SHAWVL 1	3.0636	50/50	3.0636
200722	26SHAWVL 2	3.1420	50/50	3.1420
200905	26Q36	0.1849	50/50	0.1849
200913	26SHAW-D	0.1864	50/50	0.1864
235003	AC1-025 E	0.0987	Adder	0.12
236828	01GRAYMONT	0.2707	Adder	0.32
290086	Q-036 E	4.2876	50/50	4.2876
919491	AA2-000	28.6741	Adder	33.73
930511	AB1-092	1.0528	Adder	1.24
936421	AD2-055	2.1676	Adder	2.55
936991	AD2-133 C	1.9294	50/50	1.9294
936992	AD2-133 E	8.8250	50/50	8.8250
939171	AE1-147 C	0.8156	Adder	0.96
939172	AE1-147 E	0.5437	Adder	0.64
940201	AE2-001 C	0.8137	Adder	0.96
940202	AE2-001 E	0.5424	Adder	0.64
940681	**AE2-055 C (Suspended)**	**0.7834**	**Adder**	**0.92**
940682	**AE2-055 E (Suspended)**	**0.5222**	**Adder**	**0.61**
941261	AE2-120 C	0.8125	Adder	0.96
941262	AE2-120 E	0.5417	Adder	0.64
941271	AE2-121 C	0.4355	Adder	0.51
941272	AE2-121 E	0.2908	Adder	0.34
941331	AE2-129 C	1.6744	50/50	1.6744
941332	AE2-129 E	1.1162	50/50	1.1162
941351	AE2-131 C	1.6744	50/50	1.6744
941352	AE2-131 E	1.1162	50/50	1.1162
942351	AE2-248 C	0.6368	Adder	0.75
942352	AE2-248 E	0.4245	Adder	0.5
942491	AE2-262 C	3.8169	Adder	4.49
942492	AE2-262 E	2.5650	Adder	3.02
942501	AE2-263 C	3.5879	Adder	4.22
942502	AE2-263 E	2.3955	Adder	2.82
943751	AF1-043	6.5028	Adder	7.65
944001	AF1-068 C O1	0.8450	Adder	0.99
944002	AF1-068 E O1	0.4753	Adder	0.56
944181	AF1-086 C O1	1.1729	Adder	1.38
944182	AF1-086 E O1	5.1027	Adder	6.0
944311	AF1-099 C	5.7941	Adder	6.82
944312	AF1-099 E	3.8627	Adder	4.54

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
944321	AF1-100 C	16.4745	50/50	16.4745
944322	AF1-100 E	10.9830	50/50	10.9830
944382	AF1-103 BAT	1.3784	Merchant Transmission	1.3784
944471	AF1-112 C	0.8526	Adder	1.0
944472	AF1-112 E	0.4796	Adder	0.56
944671	AF1-132 C O1	0.7901	Adder	0.93
944672	AF1-132 E O1	0.5267	Adder	0.62
944691	AF1-134 C O1	1.3879	50/50	1.3879
944692	AF1-134 E O1	0.9253	50/50	0.9253
944771	AF1-142 C	9.2705	Adder	10.91
944772	AF1-142 E	6.1804	Adder	7.27
944841	AF1-149 C	0.8124	Adder	0.96
944842	AF1-149 E	0.5416	Adder	0.64
945161	AF1-181	0.0912	50/50	0.0912
945171	AF1-182	0.4565	50/50	0.4565
945181	AF1-183	0.1456	50/50	0.1456
945491	AF1-214 C	0.8126	Adder	0.96
945492	AF1-214 E	0.5418	Adder	0.64
946423	AF1-306 BAT	32.4369	50/50	32.4369
957451	AF2-039 C	1.4574	50/50	1.4574
957452	AF2-039 E	0.9716	50/50	0.9716
957941	AF2-088 C	0.7017	50/50	0.7017
957942	AF2-088 E	0.4678	50/50	0.4678
958271	AF2-121 C	1.6744	50/50	1.6744
958272	AF2-121 E	1.1162	50/50	1.1162
959802	AF2-271 E	0.1218	Adder	0.27
960022	AF2-293 E	0.0421	Adder	0.09
960051	AF2-296 C	1.3879	50/50	1.3879
960052	AF2-296 E	0.9253	50/50	0.9253
NEWTON	NEWTON	0.3138	Confirmed LTF	0.3138
FARMERCITY	FARMERCITY	0.0161	Confirmed LTF	0.0161
G-007A	G-007A	1.2563	Confirmed LTF	1.2563
VFT	VFT	3.4185	Confirmed LTF	3.4185
CALDERWOOD	CALDERWOOD	0.1118	Confirmed LTF	0.1118
NY	NY	0.0210	Confirmed LTF	0.0210
PRAIRIE	PRAIRIE	0.7284	Confirmed LTF	0.7284
CHEOAH	CHEOAH	0.1116	Confirmed LTF	0.1116
EDWARDS	EDWARDS	0.1064	Confirmed LTF	0.1064
TILTON	TILTON	0.1903	Confirmed LTF	0.1903
MADISON	MADISON	0.0202	Confirmed LTF	0.0202
GIBSON	GIBSON	0.1600	Confirmed LTF	0.1600
BLUEG	BLUEG	0.5052	Confirmed LTF	0.5052
TRIMBLE	TRIMBLE	0.1619	Confirmed LTF	0.1619
CATAWBA	CATAWBA	0.0606	Confirmed LTF	0.0606

11.6.4 Index 4

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
101284674	200720	26HARVY.RU	PENELEC	200711	26WHETSTON	PENELEC	1	AP-P2-3-WP-230-443T *	breaker	172.0	111.99	113.32	DC	2.28

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
200665	26SHAWVL 3	3.3398	50/50	3.3398
200666	26SHAWVL 4	3.3248	50/50	3.3248
200715	26SHAWVL 1	3.0259	50/50	3.0259
200722	26SHAWVL 2	3.1032	50/50	3.1032
200905	26Q36	0.1826	50/50	0.1826
200913	26SHAW-D	0.1841	50/50	0.1841
235003	AC1-025 E	0.0975	Adder	0.11
236828	01GRAYMONT	0.2674	Adder	0.31
290086	Q-036 E	4.2348	50/50	4.2348
919491	AA2-000	28.3199	Adder	33.32
930511	AB1-092	1.0398	Adder	1.22
936421	AD2-055	2.1408	Adder	2.52
936991	AD2-133 C	1.9057	50/50	1.9057
936992	AD2-133 E	8.7163	50/50	8.7163
939171	AE1-147 C	0.8056	Adder	0.95
939172	AE1-147 E	0.5371	Adder	0.63
940201	AE2-001 C	0.8037	Adder	0.95
940202	AE2-001 E	0.5358	Adder	0.63
940681	**AE2-055 C (Suspended)**	**0.7738**	**Adder**	**0.91**
940682	**AE2-055 E (Suspended)**	**0.5158**	**Adder**	**0.61**
941261	AE2-120 C	0.8025	Adder	0.94
941262	AE2-120 E	0.5350	Adder	0.63
941271	AE2-121 C	0.4301	Adder	0.51
941272	AE2-121 E	0.2872	Adder	0.34
941321	AE2-126 C	5.7784	50/50	5.7784
941322	AE2-126 E	3.8522	50/50	3.8522
941331	AE2-129 C	1.6537	50/50	1.6537
941332	AE2-129 E	1.1025	50/50	1.1025
941351	AE2-131 C	1.6537	50/50	1.6537
941352	AE2-131 E	1.1025	50/50	1.1025
942351	AE2-248 C	0.6290	Adder	0.74
942352	AE2-248 E	0.4193	Adder	0.49
942491	AE2-262 C	3.7702	Adder	4.44
942492	AE2-262 E	2.5336	Adder	2.98
942501	AE2-263 C	3.5440	Adder	4.17
942502	AE2-263 E	2.3662	Adder	2.78
943751	AF1-043	6.4224	Adder	7.56
944001	AF1-068 C O1	0.8346	Adder	0.98
944002	AF1-068 E O1	0.4695	Adder	0.55
944181	AF1-086 C O1	1.1584	Adder	1.36
944182	AF1-086 E O1	5.0397	Adder	5.93

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
944311	AF1-099 C	5.7231	Adder	6.73
944312	AF1-099 E	3.8154	Adder	4.49
944321	AF1-100 C	16.2720	50/50	16.2720
944322	AF1-100 E	10.8480	50/50	10.8480
944382	AF1-103 BAT	1.3616	Merchant Transmission	1.3616
944471	AF1-112 C	0.8421	Adder	0.99
944472	AF1-112 E	0.4737	Adder	0.56
944671	AF1-132 C O1	0.7803	Adder	0.92
944672	AF1-132 E O1	0.5202	Adder	0.61
944691	AF1-134 C O1	1.3708	50/50	1.3708
944692	AF1-134 E O1	0.9138	50/50	0.9138
944771	AF1-142 C	9.1570	Adder	10.77
944772	AF1-142 E	6.1047	Adder	7.18
944841	AF1-149 C	0.8024	Adder	0.94
944842	AF1-149 E	0.5350	Adder	0.63
945161	AF1-181	0.0901	50/50	0.0901
945171	AF1-182	0.4509	50/50	0.4509
945181	AF1-183	0.1438	50/50	0.1438
945491	AF1-214 C	0.8026	Adder	0.94
945492	AF1-214 E	0.5351	Adder	0.63
946423	AF1-306 BAT	32.0425	50/50	32.0425
957451	AF2-039 C	1.4395	50/50	1.4395
957452	AF2-039 E	0.9596	50/50	0.9596
957941	AF2-088 C	0.6931	50/50	0.6931
957942	AF2-088 E	0.4620	50/50	0.4620
958271	AF2-121 C	1.6537	50/50	1.6537
958272	AF2-121 E	1.1025	50/50	1.1025
959802	AF2-271 E	0.1203	Adder	0.27
960022	AF2-293 E	0.0415	Adder	0.09
960051	AF2-296 C	1.3708	50/50	1.3708
960052	AF2-296 E	0.9138	50/50	0.9138
NEWTON	NEWTON	0.3095	Confirmed LTF	0.3095
FARMERCITY	FARMERCITY	0.0158	Confirmed LTF	0.0158
G-007A	G-007A	1.2419	Confirmed LTF	1.2419
VFT	VFT	3.3798	Confirmed LTF	3.3798
CALDERWOOD	CALDERWOOD	0.1103	Confirmed LTF	0.1103
NY	NY	0.0210	Confirmed LTF	0.0210
PRAIRIE	PRAIRIE	0.7181	Confirmed LTF	0.7181
CHEOAH	CHEOAH	0.1101	Confirmed LTF	0.1101
EDWARDS	EDWARDS	0.1054	Confirmed LTF	0.1054
TILTON	TILTON	0.1877	Confirmed LTF	0.1877
MADISON	MADISON	0.0202	Confirmed LTF	0.0202
GIBSON	GIBSON	0.1583	Confirmed LTF	0.1583
BLUEG	BLUEG	0.4982	Confirmed LTF	0.4982
TRIMBLE	TRIMBLE	0.1603	Confirmed LTF	0.1603
CATAWBA	CATAWBA	0.0598	Confirmed LTF	0.0598

11.7 Queue Dependencies

The Queue Projects below are listed in one or more indices for the overloads identified in your report. These projects contribute to the loading of the overloaded facilities identified in your report. The percent overload of a facility and cost allocation you may have towards a particular reinforcement could vary depending on the action of these earlier projects. The status of each project at the time of the analysis is presented in the table. This list may change as earlier projects withdraw or modify their requests.

Queue Number	Project Name	Status
AA2-000	N/A	N/A
AB1-092	Moshannon-East Towanda 230kV	Active
AC1-025	Dale Summit	In Service
AD2-055	Moshannon-East Towanda 230 kV	Active
AD2-133	Eagle Valley 115kV	Active
AE1-147	Bellefonte 46 kV	Engineering and Procurement
AE2-001	Nittany-Zion 46 kV	Active
AE2-055	Shingletown-Boalsburg 46 kV	Suspended
AE2-120	Graymont-Zion 46 kV	Active
AE2-121	Milesburg-Tanney Junction 46 kV	Active
AE2-126	Dubois-Curwensville 34.5 kV	Active
AE2-129	Philipsburg-Clarence 34.5 kV	Active
AE2-131	Philipsburg-Karthaus 34.5	Active
AE2-248	Fillmore-Thompson Farm 46 kV	Active
AE2-262	Moshannon-Milesburg 230 kV	Active
AE2-263	Moshannon-Milesburg 230 kV	Active
AF1-043	Moshannon-East Towanda 230 kV	Active
AF1-068	Boalsburg-Centre Hall 46 kV	Active
AF1-086	Madera-Westover South 115 kV	Active
AF1-099	Moshannon-Milesburg 230 kV	Active
AF1-100	Shawville-Moshannon 230 kV	Active
AF1-103	Warren 34.5 kV	Active
AF1-112	Centre Hall-Boalsburg 46 kV	Active
AF1-132	Shingletown-Boalsburg 46 kV	Active
AF1-134	Philipsburg-Madera 34.5 kV	Active
AF1-142	Moshannon-Milesburg 230 kV	Active
AF1-149	Graymont-Zion 46 kV	Active
AF1-181	Shawville 3 230 kV	Partially in Service - Under Construction
AF1-182	Shawville 4 230 kV	Partially in Service - Under Construction
AF1-183	Shawville 1 230 kV	Partially in Service - Under Construction
AF1-214	Nittany-Zion 46 kV	Active
AF1-306	Squab Hollow 230 kV	Active
AF2-039	Shawville-Clearfield 34.5 kV	Active
AF2-088	Shawville-Clearfield 34.5 kV II	Active
AF2-121	Philipsburg-Shawville 34.5 kV	Active
AF2-271	Pemberton-Sinking Valley 12.47 kV	Active
AF2-293	Beech Creek 46 kV	Active
AF2-296	Madera 34.5 kV	Active

11.8 Contingency Descriptions

Contingency Name	Contingency Definition
AP-P2-3-WP-230-443T *	CONTINGENCY 'AP-P2-3-WP-230-443T *' / UPDATED CON AJK 3-31-16 DISCONNECT BRANCH FROM BUS 200726 TO BUS 235175 CKT 1 DISCONNECT BRANCH FROM BUS 235175 TO BUS 235236 CKT 1 DISCONNECT BUS 235158 END
AP-P2-2-WP-230-001T	CONTINGENCY 'AP-P2-2-WP-230-001T' /* ELKO #2 230KV BUS DISCONNECT BRANCH FROM BUS 235175 TO BUS 235158 CKT 1 /* 01ELKO 230 01CARB 230 DISCONNECT BRANCH FROM BUS 235175 TO BUS 235236 CKT 1 /* 01ELKO 230 01QUEHAN 230 DISCONNECT BRANCH FROM BUS 235175 TO BUS 200726 CKT 1 /* 01ELKO 230 26SHAWVL 2 230 REDUCE BUS 237007 SHUNT BY 100 PERCENT /* 01ELKO CAP 138 DISCONNECT BUS 237007 /* 01ELKO CAP 138 END
AP-P1-2-WP-230-323T	CONTINGENCY 'AP-P1-2-WP-230-323T' /* SHINGLETOWN-LEWISTOWN 230KV APS-PN TIE DISCONNECT BRANCH FROM BUS 235248 TO BUS 200513 CKT 1 /* 01SHINGL 230 26LEWISTWN 230 END
Base Case	
PN-P1_2-PN-230-0103	CONTINGENCY 'PN-P1_2-PN-230-0103' /* SHELOCTA - KEYSTONE 230 KV LINE OPEN BRANCH FROM BUS 200795 TO BUS 200810 CKT 1 /* 26SHELOCTA 230.00 26KEYSTONE 230.00 END
AP-P2-3-WP-230-447	CONTINGENCY 'AP-P2-3-WP-230-447' /* 456 DISCONNECT BRANCH FROM BUS 235971 TO BUS 235175 CKT 1 /* 01SQUABHLLW 230 01ELKO 230 DISCONNECT BRANCH FROM BUS 235174 TO BUS 235175 CKT 1 /* 01ELKO 138 01ELKO 230 DISCONNECT BRANCH FROM BUS 235157 TO BUS 235159 CKT 1 /* 01CARB 138 01CARB J 138 DISCONNECT BRANCH FROM BUS 235159 TO BUS 235174 CKT 1 /* 01CARB J 138 01ELKO 138 DISCONNECT BRANCH FROM BUS 235159 TO BUS 235286 CKT 1 /* 01CARB J 138 01WILLAM 138 END

Contingency Name	Contingency Definition
AP-P2-3-WP-230-446T	CONTINGENCY 'AP-P2-3-WP-230-446T' /* ELKO-MOSHANNON STK BKR AT ELKO DISCONNECT BRANCH FROM BUS 200726 TO BUS 235175 CKT 1 /* 26SHAWVL 2 230 01ELKO 230 DISCONNECT BRANCH FROM BUS 235158 TO BUS 235175 CKT 1 /* 01CARB 230 01ELKO 230 DISCONNECT BRANCH FROM BUS 235175 TO BUS 235236 CKT 1 /* 01ELKO 230 01QUEHAN 230 DISCONNECT BRANCH FROM BUS 235220 TO BUS 235236 CKT 1 /* 01MOSHAN 230 01QUEHAN 230 DISCONNECT BRANCH FROM BUS 235236 TO BUS 236732 CKT 81 /* 01QUEHAN 230 01QUEHANNA 46 END
AP-P2-3-WP-230-445	CONTINGENCY 'AP-P2-3-WP-230-445' /* 454 DISCONNECT BRANCH FROM BUS 235174 TO BUS 235175 CKT 1 /* 01ELKO 138 01ELKO 230 DISCONNECT BRANCH FROM BUS 235971 TO BUS 235175 CKT 1 /* 01SQUABHLLW 230 01ELKO 230 DISCONNECT BRANCH FROM BUS 235174 TO BUS 235237 CKT 1 /* 01ELKO 138 01RIDGWY 138 DISCONNECT BRANCH FROM BUS 235159 TO BUS 235174 CKT 1 /* 01CARB J 138 01ELKO 138 END

12 Short Circuit Analysis

To be performed in System Impact phase.

13 Affected Systems

13.1 NYISO

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