Generation Interconnection

Feasibility Study Report

for

Queue Project AF2-092

SNAKE SPRING-BEDFORD AREA 23 KV

7.2 MW Capacity / 12 MW Energy

July 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 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 Bedford County, Pennsylvania. The installed facilities will have a total capability of 12 MW with 7.2 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is September 15, 2022. This study does not imply a TO commitment to this in-service date.

Queue Number	**AF2-092**
Project Name	SNAKE SPRING-BEDFORD AREA 23 KV
State	Pennsylvania
County	Bedford
Transmission Owner	PENELEC (MAIT)
MFO	12
MWE	12
MWC	7.2
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

AF2-092 will interconnect with the PENELEC distribution system at POI pole KB-60073, which is located on the 22.86kV Bedford Area ckt#00602-73 @ Snake Spring.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AF2-092 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.

5 Cost Summary

The AF2-092 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$134,400
Total System Network Upgrade Costs	$50,032,410[1]
Total Costs	$50,166,810

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.

[1] This project currently contributes to overloads of the Transmission System (see Summer Peak Load Flow Analysis section below) and therefore has potential to have cost allocation for the system reinforcements listed in the report. This will be re-evaluated in the System Impact phase. The results may vary with queue customers withdrawing from the queue and other generators deactivating over time. If a customer is the first to cause the need for a project (causes loading to exceed 100% of rating), then the customer is responsible. If a customer's MW contribution to a facility that is already overloaded by a prior queue is less than 5 MW, then they will not receive cost allocation.

6 Transmission Owner Scope of Work

AF2-092 will interconnect with the PENELEC distribution system at POI pole KB-60073, which is located on the 22.86kV Bedford Area ckt#00602-73 @ Snake Spring.

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

Description	Total Cost
Tap an existing pole or interspersed pole on Penelec's existing distribution circuit (00602-73) near pole KB-60073, new SCADA recloser, new primary metering.	$134,400
Total Physical Interconnection Costs	$134,400

7 Schedule

Based on the scope of work for the interconnection facilities, it is expected to take a minimum of 9 months after the signing of an Interconnection Construction Service Agreement and construction kickoff call 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 work and that any system outages will be allowed when requested.

8 Transmission Owner Analysis

Penelec performed an analysis of its distribution system. The AF2-092 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 Snake Spring-Bedford Area 23kV (AF2-092) 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 IC constructing a generation facility they call “Bedford North - Snake River 23.5kV” that will connect to Penelec’s 22.86kV Snake Spring substation ckt#00602-82 via a customer owned tap to pole KB-60073.

The 22.86kV 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 IC 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 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.

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 PENELEC Requirements

The 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.

10.3 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)

10.4 Interconnected Transmission Owner Requirements

The IC will be required to comply with all Interconnected Transmission Owner's revenue metering requirements for generation interconnection customers located at the following link:

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

11 Summer Peak - Load Flow Analysis

The Queue Project AF2-092 was evaluated as a 12.0 MW (Capacity 7.2 MW) injection at the Snake Spring 23 kV substation in the PENELEC area. Project AF2-092 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-092 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

11.1 Generation Deliverability

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

None

11.2 Multiple Facility Contingency

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

None

11.3 Contribution to Previously Identified Overloads

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

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
10099823 6	20074 3	26HOOVERS V	115. 0	PENELE C	20073 4	26SCALP L.	115. 0	PENELE C	1	PN-P7-1-PN-230-001	tower	190.0	101.14	102.52	DC	2.62
10099821 0	20074 6	26ROCKWOO D	115. 0	PENELE C	20265 0	26HIGHPOI NT	115. 0	PENELE C	1	PN-P7-1-PN-230-001	tower	179.0	127.53	128.61	DC	1.94
98676989	20076 2	26GARRETT	115. 0	PENELE C	23547 0	01GARRET	115. 0	AP	1	PN-P2-3-PN-115-35E	breake r	160.0	193.39	194.4	DC	1.62
10099820 5	20265 0	26HIGHPOIN T	115. 0	PENELE C	20074 7	26PENN-MAR	115. 0	PENELE C	1	PN-P7-1-PN-230-001	tower	174.0	142.36	143.47	DC	1.94

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	CONTNAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
10099752 7	20074 2	26TOWER 51	115. 0	PENELEC	20074 1	26SEWARD	115. 0	PENELEC	1	AP-P1-3-PN-115-010	operation	185.0	110.59	111.98	DC	2.57
10099748 0	20074 3	26HOOVERSV	115. 0	PENELEC	20074 2	26TOWER 51	115. 0	PENELEC	1	AP-P1-3-PN-115-010	operation	172.0	132.45	133.95	DC	2.59
10099748 5	20074 3	26HOOVERSV	115. 0	PENELEC	20074 2	26TOWER 51	115. 0	PENELEC	1	Base Case	operation	137.0	111.45	113.06	DC	2.2
10099751 3	20263 7	26PRIDE	115. 0	PENELEC	20074 4	26SOMERST	115. 0	PENELEC	1	Base Case	operation	133.0	147.56	149.11	DC	2.06
10099751 0	20264 7	26KIMRUN TAP	115. 0	PENELEC	20263 7	26PRIDE	115. 0	PENELEC	1	Base Case	operation	133.0	149.97	151.52	DC	2.06
10099750 7	94567 0	AF1-232 TAP	115. 0	PENELEC	20264 7	26KIMRUN TAP	115. 0	PENELEC	1	Base Case	operation	133.0	149.97	151.52	DC	2.06

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
100998210	2	26ROCKWOOD 115.0 kV - 26HIGHPOINT 115.0 kV Ckt 1	PENELEC PN-AF2-F-0037 (1775) : Rebuild 10.1 miles of transmission line Project Type : FAC Cost : $30,875,700 Time Estimate : 36.0 Months	$30,875,700
100998236	1	26HOOVERSV 115.0 kV - 26SCALP L. 115.0 kV Ckt 1	PENELEC s2046_s2046.1_s2046.2 (1893) : Hooversville115 kV Substation Replace line relaying and line trap (s2046.1) Scalp Level 115 kV Substation Replace substation conductor (s2046.2) Rachel Hill 115 kV Substation Replace line relaying, line trap, and substation conductor (s2046.3) Project Type : FAC Cost : $0	$0
98676989	3	26GARRETT 115.0 kV - 01GARRET 115.0 kV Ckt 1	APS WP-AF1-F-0003 (636) : Reconductor Garrett Tap - Garrett (~2.0 miles) Project Type : FAC Cost : $3,780,000 Time Estimate : 6.0 Months PENELEC PN-AF2-F-0042A (1787) : Replace line trap at Garrett. Project Type : FAC Cost : $122,280 Time Estimate : 12.0 Months PN-AF2-F-0042B (1788) : Replace bus conductor at Garrett. Project Type : FAC Cost : $122,280 Time Estimate : 12.0 Months	$4,024,560
100998205	4	26HIGHPOINT 115.0 kV - 26PENN-MAR 115.0 kV Ckt 1	PENELEC PN-AF2-F-0039A (1779) : Replace circuit breaker at Penn Mar Project Type : FAC Cost : $733,680 Time Estimate : 12.0 Months PN-AF2-F-0039B (1780) : Rebuild 4.67 miles of transmission line Project Type : FAC Cost : $14,276,190 Time Estimate : 36.0 Months PN-AF2-F-0039C (1781) : Replace bus conductor at Penn Mar. Project Type : FAC Cost : $122,280 Time Estimate : 12.0 Months	$15,132,150
			TOTAL COST	$50,032,410[1]

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
100998236	200743	26HOOVERSV	PENELEC	200734	26SCALP L.	PENELEC	1	PN-P7-1-PN-230-001	tower	190.0	101.14	102.52	DC	2.62

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
200813	26YOUGH	0.2537	50/50	0.2537
200834	26SW_E13_K22	0.1303	50/50	0.1303
200835	26DSGENWIN	0.6414	50/50	0.6414
200840	26DEEPCRK1	0.2343	50/50	0.2343
200841	26DEEPCRK2	0.2343	50/50	0.2343
200846	26FORWARD	0.4573	50/50	0.4573
200864	K-013 E	10.6047	50/50	10.6047
200889	26STNY CRK	0.6356	50/50	0.6356
200890	26BF_G21_K23	0.3146	50/50	0.3146
200891	26CSLMN_L13	0.4934	50/50	0.4934
200892	26LOOKOUT	0.4687	50/50	0.4687
202225	26SCI_S29B	0.2027	50/50	0.2027
202652	26RGH_Y1-033	0.2408	50/50	0.2408
292350	K-023	11.7637	50/50	11.7637
292542	L-013 1	11.4419	50/50	11.4419
293432	R-040 E	0.6436	50/50	0.6436
293902	O-048 E	10.2977	50/50	10.2977
294903	P-060 E	14.7386	50/50	14.7386
913142	Y1-033 E OP1	9.5361	50/50	9.5361
917672	Z2-108 E	6.4361	50/50	6.4361
930262	**AB1-065 E (Suspended)**	**0.4692**	**Adder**	**0.55**
938351	AE1-053	3.5756	50/50	3.5756
938881	AE1-116	1.8885	50/50	1.8885
938991	AE1-128 C	19.0411	50/50	19.0411
938992	AE1-128 E	12.6941	50/50	12.6941
943301	AF1-001 C	0.4485	Adder	0.53
943302	AF1-001 E	0.5002	Adder	0.59
943711	AF1-039 C O1	2.5228	50/50	2.5228
943712	AF1-039 E O1	1.6819	50/50	1.6819
944781	AF1-143 C	21.4536	50/50	21.4536
944782	AF1-143 E	11.4419	50/50	11.4419
945671	AF1-232 C O2	39.0010	50/50	39.0010
945672	AF1-232 E O2	21.0006	50/50	21.0006
946081	AF1-273 C O1	18.7389	50/50	18.7389
946082	AF1-273 E O1	12.4926	50/50	12.4926
946571	AF1-321 C O1	6.0611	50/50	6.0611
946572	AF1-321 E O1	4.0407	50/50	4.0407
957001	AF2-001 C O1	6.0611	50/50	6.0611
957002	AF2-001 E O1	4.0407	50/50	4.0407
957011	AF2-002 C O1	3.0305	50/50	3.0305
957012	AF2-002 E O1	2.0204	50/50	2.0204

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
957981	AF2-092 C	1.5727	50/50	1.5727
957982	AF2-092 E	1.0485	50/50	1.0485
958101	AF2-104 C	1.0072	50/50	1.0072
958102	AF2-104 E	0.6715	50/50	0.6715
958411	AF2-135 C	1.0727	50/50	1.0727
958412	AF2-135 E	0.7151	50/50	0.7151
958471	AF2-141	2.8605	50/50	2.8605
959792	AF2-270 E	0.9841	50/50	0.9841
960451	AF2-336 C O1	2.6212	50/50	2.6212
960452	AF2-336 E O1	1.7474	50/50	1.7474
960461	AF2-337 C O1	2.6212	50/50	2.6212
960462	AF2-337 E O1	1.7474	50/50	1.7474
960471	AF2-338 C O1	2.6212	50/50	2.6212
960472	AF2-338 E O1	1.7474	50/50	1.7474
960481	AF2-339 C O1	2.6212	50/50	2.6212
960482	AF2-339 E O1	1.7474	50/50	1.7474
960901	AF2-381 C	32.3898	50/50	32.3898
960902	AF2-381 E	17.0452	50/50	17.0452
WEC	WEC	0.0410	Confirmed LTF	0.0410
LGEE	LGEE	0.0787	Confirmed LTF	0.0787
CPLE	CPLE	0.1131	Confirmed LTF	0.1131
CBM-W2	CBM-W2	1.1630	Confirmed LTF	1.1630
NY	NY	0.2300	Confirmed LTF	0.2300
CBM-W1	CBM-W1	1.4887	Confirmed LTF	1.4887
TVA	TVA	0.2086	Confirmed LTF	0.2086
O-066	O-066	1.5994	Confirmed LTF	1.5994
CBM-S2	CBM-S2	0.9595	Confirmed LTF	0.9595
CBM-S1	CBM-S1	1.2524	Confirmed LTF	1.2524
G-007	G-007	0.2392	Confirmed LTF	0.2392
MEC	MEC	0.2129	Confirmed LTF	0.2129

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
100998210	200746	26ROCKWOOD	PENELEC	202650	26HIGHPOINT	PENELEC	1	PN-P7-1-PN-230-001	tower	179.0	127.53	128.61	DC	1.94

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
200834	26SW_E13_K22	0.0866	50/50	0.0866
200835	26DSGENWIN	0.6918	50/50	0.6918
200846	26FORWARD	0.2029	50/50	0.2029
200864	K-013 E	4.7045	50/50	4.7045
200883	Q-053 E	3.2917	Adder	3.87
200888	26HIGHLAND	0.2565	50/50	0.2565
200889	26STNY CRK	0.4216	50/50	0.4216
200890	26BF_G21_K23	0.3393	50/50	0.3393
200891	26CSLMN_L13	0.5322	50/50	0.5322
200892	26LOOKOUT	0.5056	50/50	0.5056
200925	26R32	0.2960	50/50	0.2960
202225	26SCI_S29B	0.1348	50/50	0.1348
292350	K-023	12.6879	50/50	12.6879
292542	L-013 1	12.3408	50/50	12.3408
293432	R-040 E	0.6942	50/50	0.6942
293603	O-018 E	5.9483	50/50	5.9483
293902	O-048 E	11.1067	50/50	11.1067
294903	P-060 E	9.7768	50/50	9.7768
296332	R-032 E	6.8634	50/50	6.8634
917672	Z2-108 E	6.9417	50/50	6.9417
938351	AE1-053	3.8565	50/50	3.8565
938881	AE1-116	1.2556	50/50	1.2556
938991	AE1-128 C	12.5719	50/50	12.5719
938992	AE1-128 E	8.3813	50/50	8.3813
944751	AF1-140 C	1.1220	50/50	1.1220
944752	AF1-140 E	0.7480	50/50	0.7480
944781	AF1-143 C	23.1390	50/50	23.1390
944782	AF1-143 E	12.3408	50/50	12.3408
945671	AF1-232 C O2	25.8939	50/50	25.8939
945672	AF1-232 E O2	13.9429	50/50	13.9429
946081	AF1-273 C O1	12.4379	50/50	12.4379
946082	AF1-273 E O1	8.2919	50/50	8.2919
946571	AF1-321 C O1	2.5176	50/50	2.5176
946572	AF1-321 E O1	1.6784	50/50	1.6784
957001	AF2-001 C O1	2.5176	50/50	2.5176
957002	AF2-001 E O1	1.6784	50/50	1.6784
957011	AF2-002 C O1	1.2588	50/50	1.2588
957012	AF2-002 E O1	0.8392	50/50	0.8392
957512	AF2-045 E	0.5650	Adder	1.25
957981	AF2-092 C	1.1613	50/50	1.1613
957982	AF2-092 E	0.7742	50/50	0.7742

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
958101	AF2-104 C	0.6697	50/50	0.6697
958102	AF2-104 E	0.4464	50/50	0.4464
958411	AF2-135 C	1.1570	50/50	1.1570
958412	AF2-135 E	0.7713	50/50	0.7713
958471	AF2-141	3.0852	50/50	3.0852
959301	AF2-221 C	0.9989	50/50	0.9989
959302	AF2-221 E	1.3795	50/50	1.3795
959792	AF2-270 E	0.6497	50/50	0.6497
960391	AF2-330 C	1.9956	Adder	4.43
960392	AF2-330 E	0.8728	Adder	1.94
960451	AF2-336 C O1	1.9355	50/50	1.9355
960452	AF2-336 E O1	1.2903	50/50	1.2903
960461	AF2-337 C O1	1.9355	50/50	1.9355
960462	AF2-337 E O1	1.2903	50/50	1.2903
960471	AF2-338 C O1	1.9355	50/50	1.9355
960472	AF2-338 E O1	1.2903	50/50	1.2903
960481	AF2-339 C O1	1.9355	50/50	1.9355
960482	AF2-339 E O1	1.2903	50/50	1.2903
960901	AF2-381 C	15.8698	50/50	15.8698
960902	AF2-381 E	8.3515	50/50	8.3515
NEWTON	NEWTON	0.3084	Confirmed LTF	0.3084
FARMERCITY	FARMERCITY	0.0161	Confirmed LTF	0.0161
G-007A	G-007A	1.0141	Confirmed LTF	1.0141
VFT	VFT	2.7993	Confirmed LTF	2.7993
CALDERWOOD	CALDERWOOD	0.1580	Confirmed LTF	0.1580
PRAIRIE	PRAIRIE	0.7517	Confirmed LTF	0.7517
CHEOAH	CHEOAH	0.1597	Confirmed LTF	0.1597
EDWARDS	EDWARDS	0.0973	Confirmed LTF	0.0973
TILTON	TILTON	0.1770	Confirmed LTF	0.1770
GIBSON	GIBSON	0.1567	Confirmed LTF	0.1567
BLUEG	BLUEG	0.5034	Confirmed LTF	0.5034
TRIMBLE	TRIMBLE	0.1614	Confirmed LTF	0.1614
CATAWBA	CATAWBA	0.1169	Confirmed LTF	0.1169

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
98676989	200762	26GARRETT	PENELEC	235470	01GARRET	AP	1	PN-P2-3-PN-115-35E	breaker	160.0	193.39	194.4	DC	1.62

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
200813	26YOUGH	0.7147	50/50	0.7147
200834	26SW_E13_K22	0.1461	50/50	0.1461
200835	26DSGENWIN	0.9847	50/50	0.9847
200840	26DEEPCRK1	1.4114	50/50	1.4114
200841	26DEEPCRK2	1.4114	50/50	1.4114
200889	26STNY CRK	0.5954	50/50	0.5954
200890	26BF_G21_K23	0.4829	50/50	0.4829
200891	26CSLMN_L13	0.7575	50/50	0.7575
200892	26LOOKOUT	0.7196	50/50	0.7196
202225	26SCI_S29B	0.2273	50/50	0.2273
202652	26RGH_Y1-033	0.5551	50/50	0.5551
292350	K-023	18.0595	50/50	18.0595
292542	L-013 1	17.5654	50/50	17.5654
293432	R-040 E	0.9881	50/50	0.9881
293902	O-048 E	15.8089	50/50	15.8089
294903	P-060 E	13.8062	50/50	13.8062
913142	Y1-033 E OP1	21.9847	50/50	21.9847
917672	Z2-108 E	9.8806	50/50	9.8806
938351	AE1-053	5.4892	50/50	5.4892
938881	AE1-116	2.1181	50/50	2.1181
938991	AE1-128 C	10.8130	50/50	10.8130
938992	AE1-128 E	7.2086	50/50	7.2086
943711	AF1-039 C O1	5.8161	50/50	5.8161
943712	AF1-039 E O1	3.8774	50/50	3.8774
944781	AF1-143 C	32.9352	50/50	32.9352
944782	AF1-143 E	17.5654	50/50	17.5654
945671	AF1-232 C O2	39.3588	50/50	39.3588
945672	AF1-232 E O2	21.1932	50/50	21.1932
946081	AF1-273 C O1	18.5033	50/50	18.5033
946082	AF1-273 E O1	12.3355	50/50	12.3355
957981	AF2-092 C	0.9696	50/50	0.9696
957982	AF2-092 E	0.6464	50/50	0.6464
958101	AF2-104 C	1.1296	50/50	1.1296
958102	AF2-104 E	0.7531	50/50	0.7531
958411	AF2-135 C	1.6468	50/50	1.6468
958412	AF2-135 E	1.0978	50/50	1.0978
958471	AF2-141	4.3914	50/50	4.3914
959792	AF2-270 E	0.5588	50/50	0.5588
960451	AF2-336 C O1	1.6159	50/50	1.6159
960452	AF2-336 E O1	1.0773	50/50	1.0773
960461	AF2-337 C O1	1.6159	50/50	1.6159

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
960462	AF2-337 E O1	1.0773	50/50	1.0773
960471	AF2-338 C O1	1.6159	50/50	1.6159
960472	AF2-338 E O1	1.0773	50/50	1.0773
960481	AF2-339 C O1	1.6159	50/50	1.6159
960482	AF2-339 E O1	1.0773	50/50	1.0773
960901	AF2-381 C	8.9959	50/50	8.9959
960902	AF2-381 E	4.7341	50/50	4.7341
NEWTON	NEWTON	0.2450	Confirmed LTF	0.2450
FARMERCITY	FARMERCITY	0.0128	Confirmed LTF	0.0128
G-007A	G-007A	0.6737	Confirmed LTF	0.6737
VFT	VFT	1.8640	Confirmed LTF	1.8640
CALDERWOOD	CALDERWOOD	0.1252	Confirmed LTF	0.1252
PRAIRIE	PRAIRIE	0.5967	Confirmed LTF	0.5967
CHEOAH	CHEOAH	0.1266	Confirmed LTF	0.1266
EDWARDS	EDWARDS	0.0777	Confirmed LTF	0.0777
TILTON	TILTON	0.1411	Confirmed LTF	0.1411
GIBSON	GIBSON	0.1245	Confirmed LTF	0.1245
BLUEG	BLUEG	0.4010	Confirmed LTF	0.4010
TRIMBLE	TRIMBLE	0.1280	Confirmed LTF	0.1280
CATAWBA	CATAWBA	0.0927	Confirmed LTF	0.0927

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
100998205	202650	26HIGHPOINT	PENELEC	200747	26PENN-MAR	PENELEC	1	PN-P7-1-PN-230-001	tower	174.0	142.36	143.47	DC	1.94

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
200834	26SW_E13_K22	0.0866	50/50	0.0866
200835	26DSGENWIN	0.6918	50/50	0.6918
200846	26FORWARD	0.2029	50/50	0.2029
200864	K-013 E	4.7040	50/50	4.7040
200883	Q-053 E	3.2909	Adder	3.87
200888	26HIGHLAND	0.2564	50/50	0.2564
200889	26STNY CRK	0.4216	50/50	0.4216
200890	26BF_G21_K23	0.3392	50/50	0.3392
200891	26CSLMN_L13	0.5321	50/50	0.5321
200892	26LOOKOUT	0.5055	50/50	0.5055
200925	26R32	0.2959	50/50	0.2959
202225	26SCI_S29B	0.1348	50/50	0.1348
202652	26RGH_Y1-033	0.4452	50/50	0.4452
292350	K-023	12.6872	50/50	12.6872
292542	L-013 1	12.3402	50/50	12.3402
293432	R-040 E	0.6941	50/50	0.6941
293603	O-018 E	5.9467	50/50	5.9467
293902	O-048 E	11.1061	50/50	11.1061
294903	P-060 E	9.7755	50/50	9.7755
296332	R-032 E	6.8616	50/50	6.8616
913142	Y1-033 E OP1	17.6302	50/50	17.6302
917672	Z2-108 E	6.9413	50/50	6.9413
938351	AE1-053	3.8563	50/50	3.8563
938881	AE1-116	1.2555	50/50	1.2555
938991	AE1-128 C	12.5698	50/50	12.5698
938992	AE1-128 E	8.3798	50/50	8.3798
943711	AF1-039 C O1	4.6641	50/50	4.6641
943712	AF1-039 E O1	3.1094	50/50	3.1094
944751	AF1-140 C	1.1217	50/50	1.1217
944752	AF1-140 E	0.7478	50/50	0.7478
944781	AF1-143 C	23.1378	50/50	23.1378
944782	AF1-143 E	12.3402	50/50	12.3402
945671	AF1-232 C O2	25.8908	50/50	25.8908
945672	AF1-232 E O2	13.9412	50/50	13.9412
946081	AF1-273 C O1	12.4369	50/50	12.4369
946082	AF1-273 E O1	8.2912	50/50	8.2912
946571	AF1-321 C O1	2.5172	50/50	2.5172
946572	AF1-321 E O1	1.6782	50/50	1.6782
957001	AF2-001 C O1	2.5172	50/50	2.5172
957002	AF2-001 E O1	1.6782	50/50	1.6782
957011	AF2-002 C O1	1.2586	50/50	1.2586

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
957012	AF2-002 E O1	0.8391	50/50	0.8391
957512	AF2-045 E	0.5648	Adder	1.25
957981	AF2-092 C	1.1611	50/50	1.1611
957982	AF2-092 E	0.7740	50/50	0.7740
958101	AF2-104 C	0.6696	50/50	0.6696
958102	AF2-104 E	0.4464	50/50	0.4464
958411	AF2-135 C	1.1569	50/50	1.1569
958412	AF2-135 E	0.7713	50/50	0.7713
958471	AF2-141	3.0850	50/50	3.0850
959301	AF2-221 C	0.9988	50/50	0.9988
959302	AF2-221 E	1.3793	50/50	1.3793
959792	AF2-270 E	0.6496	50/50	0.6496
960391	AF2-330 C	1.9949	Adder	4.43
960392	AF2-330 E	0.8725	Adder	1.94
960451	AF2-336 C O1	1.9351	50/50	1.9351
960452	AF2-336 E O1	1.2901	50/50	1.2901
960461	AF2-337 C O1	1.9351	50/50	1.9351
960462	AF2-337 E O1	1.2901	50/50	1.2901
960471	AF2-338 C O1	1.9351	50/50	1.9351
960472	AF2-338 E O1	1.2901	50/50	1.2901
960481	AF2-339 C O1	1.9351	50/50	1.9351
960482	AF2-339 E O1	1.2901	50/50	1.2901
960901	AF2-381 C	15.8673	50/50	15.8673
960902	AF2-381 E	8.3502	50/50	8.3502
NEWTON	NEWTON	0.3105	Confirmed LTF	0.3105
FARMERCITY	FARMERCITY	0.0162	Confirmed LTF	0.0162
G-007A	G-007A	1.0093	Confirmed LTF	1.0093
VFT	VFT	2.7864	Confirmed LTF	2.7864
CALDERWOOD	CALDERWOOD	0.1590	Confirmed LTF	0.1590
PRAIRIE	PRAIRIE	0.7568	Confirmed LTF	0.7568
CHEOAH	CHEOAH	0.1607	Confirmed LTF	0.1607
EDWARDS	EDWARDS	0.0980	Confirmed LTF	0.0980
TILTON	TILTON	0.1783	Confirmed LTF	0.1783
GIBSON	GIBSON	0.1578	Confirmed LTF	0.1578
BLUEG	BLUEG	0.5069	Confirmed LTF	0.5069
TRIMBLE	TRIMBLE	0.1625	Confirmed LTF	0.1625
CATAWBA	CATAWBA	0.1176	Confirmed LTF	0.1176

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
AB1-065	Jennings-Hoyes 34.5kV	Suspended
AE1-053	Meyersdale North	Active
AE1-116	Somerset Windpower 23 kV	Active
AE1-128	Bedford North-Wills Mounain 115 kV	Active
AF1-001	Thayerville 34.5 kV	Engineering and Procurement
AF1-039	Listonburg-Highpoint 24.9 kV	Active
AF1-140	Claysburg 23 kV	Engineering and Procurement
AF1-143	Lick Run 115 kV	Active
AF1-232	Allegheny-Somerset 115 kV	Active
AF1-273	Allegheny 115 kV	Active
AF1-321	Hooversville 115 kV I	Active
AF2-001	Hooversville 115 kV II	Active
AF2-002	Hooversville 115 kV III	Active
AF2-045	Cambria Nug 115 kV	Active
AF2-092	Snake Spring-Bedford Area 23 kV	Active
AF2-104	Somerset 23 kV	Active
AF2-135	Rockwood-Confluence 23 kV	Active
AF2-141	Lick Run 115 kV	Active
AF2-221	Scalp Level 22.9 kV	Active
AF2-270	Bedford South RCB-Bedford Area 23 kV	Active
AF2-330	Claysburg-Summit 115 kV	Active
AF2-336	Snake Spring 115 kV I	Active
AF2-337	Snake Spring 115 kV II	Active
AF2-338	Snake Spring 115 kV III	Active
AF2-339	Snake Spring 115 kV IV	Active
AF2-381	Bedford North-Central City West 115 kV	Active
Y1-033	Penn Mar-Rock Wood 115kV	In Service
Z2-108	Meyersdale North 115kV	In Service

11.8 Contingency Descriptions

Contingency Name	Contingency Definition
Base Case	
PN-P7-1-PN-230-001	CONTINGENCY 'PN-P7-1-PN-230-001' /* HOMER CITY - HOOVERSVILLE 230KV & SEWARD - TOWER 51 115KV DISCONNECT BRANCH FROM BUS 200767 TO BUS 200768 CKT 1 /* 26HOMER CT 230 26QUEMAHON 230 DISCONNECT BRANCH FROM BUS 200768 TO BUS 200796 CKT 1 /* 26QUEMAHON 230 26HOOVRSVL 230 DISCONNECT BRANCH FROM BUS 200796 TO BUS 200743 CKT 3 /* 26HOOVRSVL 230 26HOOVERSV 115 DISCONNECT BRANCH FROM BUS 200741 TO BUS 200742 CKT 1 /* 26SEWARD 115 26TOWER 51 115 END
PN-P2-3-PN-115-35E	CONTINGENCY 'PN-P2-3-PN-115-35E' /* #14 STUCK TIE BREAKER BETWEEN BUSES 1 AND 2 DISCONNECT BRANCH FROM BUS 200734 TO BUS 200743 CKT 1 /* 26SCALP L. 115 26HOOVERSV 115 DISCONNECT BRANCH FROM BUS 200743 TO BUS 200802 CKT 1 /* 26HOOVERSV 115 26RALPHTON 115 DISCONNECT BRANCH FROM BUS 200743 TO BUS 200776 CKT 1 /* 26HOOVERSV 115 26HOOVER#1 23 DISCONNECT BRANCH FROM BUS 200743 TO BUS 200744 CKT 1 /* 26HOOVERSV 115 26SOMERST 115 DISCONNECT BRANCH FROM BUS 200742 TO BUS 200743 CKT 1 /* 26TOWER 51 115 26HOOVERSV 115 DISCONNECT BRANCH FROM BUS 200743 TO BUS 200789 CKT 2 /* 26HOOVERSV 115 26HOOVER#2 23 END
AP-P1-3-PN-115-010	CONTINGENCY 'AP-P1-3-PN-115-010' /* GARRETT 138/115KV XFMR FAULT OPEN BRANCH FROM BUS 235469 TO BUS 235470 CKT 1 /* 01GARRET 138.00 01GARRET 115.00 END

12 Short Circuit Analysis

The Short Circuit Analysis will be completed during the System Impact Study phase.

13 Affected Systems

13.1 NYISO

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

14 Attachment 1: One Line Diagram