



**Generation Interconnection
Feasibility Study Report
for
Queue Project AG1-391
GOLD 115 KV III
24 MW Capacity / 40 MW Energy**

January 2021

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1 Introduction

This Feasibility Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 36.2, as well as the Feasibility Study Agreement between the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is Mid-Atlantic Interstate Transmission, LLC (MAIT) (PENELEC zone).

2 Preface

The intent of the feasibility study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. Cost allocation rules for network upgrades can be found in PJM Manual 14A, Attachment B. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

The 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 Potter County, Pennsylvania. The installed facilities will have a total capability of 40¹ MW with 24 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is June 01, 2022. This study does not imply a TO commitment to this in-service date.

Queue Number	AG1-391
Project Name	GOLD 115 KV III
State	Pennsylvania
County	Potter
Transmission Owner	MAIT (PENELEC zone)
MFO	40 ¹
MWE	40
MWC	24
Fuel	Solar
Basecase Study Year	2024

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

¹ Note that this project was mistakenly studied at 20 MWE and 12 MWC in the Feasibility analysis. The analysis will be updated to show 40 MWE and 24 MWC in the System Impact phase. The network impacts section of this report will show results for a 20 MWE/12 MWC project. The customer may see modified impacts at the SIS phase.

4 Point of Interconnection

4.1 Primary POI

The AG1-391 project is sharing the Point of Interconnection and attachment facilities with the proposed AG1-389 and AG1-390 projects. The IC will not incur any connection facility upgrade costs for this project as long as AG1-389 is constructed before or concurrently with AG1-391.

Attachment 1 shows a one-line diagram of the proposed primary Direct Connection facilities for the AG1-391 generation project to connect to the FirstEnergy (“FE”) Transmission System. The IC will be responsible for constructing the facilities on its side of the POI, including the Attachment Facilities which connect the generator to the FE Transmission System’s Direct Connection facilities.

4.2 Secondary POI

The AG1-391 project would also be sharing the same POI and attachment facilities with the proposed AG1-389 and AG1-390 projects for the secondary POI. The interconnection of the project at a Secondary POI can be accomplished by constructing a new 115 kV three (3) breaker ring bus substation and looping the Hector - Potter 115 kV line into the new station. The new substation would be located approximately 0.3 miles from Gold Substation. A full scope of work or estimated cost is not provided for the proposed Secondary POI.

5 Cost Summary

The AG1-391 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	\$0
Total System Network Upgrade Costs	\$93,060,000 ²
Total Costs	\$93,060,000

This cost excludes a Federal Income Tax Gross Up charges. This tax may or may not be charged based on whether this project meets the eligibility requirements of IRS Notice 2016-36, 2016-25 I.R.B. (6/20/2016). If at a future date it is determined that the Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

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

² This project currently causes and 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 contributes to a facility that is already overloaded by a prior queue, then they may receive cost allocation.

6 Transmission Owner Scope of Work

This project is sharing the same generator lead line and main potential transformer with the AG1-389 and AG1-390 projects. There is no additional interconnection facility scope of work required if AG1-389 builds the interconnection facilities. If AG1-389 withdraws from the interconnection queue, then AG1-390 will assume the scope and cost of the interconnection described in the AG1-389 Feasibility Study report. If AG1-390 withdraws from the interconnection queue, then AG1-391 will assume the scope and cost of the interconnection.

7 Schedule

This project is sharing the same attachment facilities with the AG1-389 and AG1-390 projects and will share the same schedule with those projects if constructed as the same time.

If the customer is ultimately responsible for network upgrades, then the schedule for those upgrades will be refined in future study phases. The customer would need to wait for those upgrades to be completed prior to commercial operation unless determined deliverable by an interim deliverability study. The elapsed time to complete any network upgrades is provided in the System Reinforcements table of this report.²

8 Transmission Owner Analysis

8.1 Power Flow Analysis

FE performed an analysis of its underlying transmission <100 kV system. The AG1-391 project did not contribute to any overloads on the FE Transmission <100 kV System.

9 Interconnection Customer Requirements

9.1 System Protection

The IC must design its Customer Facilities in accordance with all applicable standards, including the standards in FE's "Requirements for Transmission Connected Facilities" document located at: <http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx>.

Preliminary Protection requirements will be provided as part of the Facilities Study. Detailed Protection Requirements will be provided once the project enters the construction phase.

9.2 Compliance Issues and Interconnection Customer Requirements

The proposed Customer Facilities must be designed in accordance with FE's "Requirements for Transmission Connected Facilities" document located at: <http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx>. In particular, the IC is responsible for the following:

1. The purchase and installation of a fully rated 115 kV circuit breaker to protect the AG1-391 generator lead line. A single circuit breaker must be used to protect this line; if the project has several GSU transformers, the individual GSU transformer breakers cannot be used to protect this line.
2. The purchase and installation of the minimum required FE generation interconnection relaying and control facilities. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.
3. The purchase and installation of supervisory control and data acquisition (“SCADA”) equipment to provide information in a compatible format to the FE Transmission System Control Center.
4. Compliance with the FE and PJM generator power factor and voltage control requirements.
5. The execution of a back-up service agreement to serve the customer load supplied from the AG1-391 generation project metering point when the units are out-of-service. This assumes the intent of the IC is to net the generation with the load.

The IC will also be required to meet all PJM, ReliabilityFirst, and NERC reliability criteria and operating procedures for standards compliance. For example, the IC will need to properly locate and report the over and under voltage and over and under frequency system protection elements for its units as well as the submission of the generator model and protection data required to satisfy the PJM and ReliabilityFirst audits. Failure to comply with these requirements may result in a disconnection of service if the violation is found to compromise the reliability of the FE Transmission System.

9.3 Power Factor Requirements

The IC shall design its non-synchronous Customer Facility with the ability to maintain a power factor of at least 0.95 leading (absorbing VARs) to 0.95 lagging (supplying VARs) measured at the high-side of the facility substation transformer(s) connected to the FE Transmission System.

10 Revenue Metering and SCADA Requirements

10.1 PJM Requirements

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

10.2 Meteorological Data Reporting Requirements

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

- Back Panel temperature (Fahrenheit) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Irradiance (Watts/meter²) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- 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 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 - Primary POI

The Queue Project AG1-391 was evaluated as a 20.0 MW (Capacity 12.0 MW) injection at the Gold 138 kV substation in the PENELEC area. Project AG1-391 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-391 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	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC/DC	MW IMPACT
166019875	200671	26NILE SVA	115.0	PENELEC	200672	26MANSFIELD	115.0	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	185.0	94.13	100.75	DC	12.25

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	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC/DC	MW IMPACT
166019835	200582	26RIDGWAY	115.0	PENELEC	200647	26FOREST	115.0	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	277.0	111.47	113.7	DC	6.16
166019697	200668	26FARM VLY	115.0	PENELEC	941190	AE2-113 TAP	115.0	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	160.0	151.39	156.24	DC	7.75
166019798	200670	26SABINSVI	115.0	PENELEC	200671	26NILES VA	115.0	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	191.0	108.82	115.23	DC	12.25
166019887	200944	26PIERCEBRK	115.0	PENELEC	200668	26FARM VLY	115.0	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	245.0	103.07	106.24	DC	7.75
166019622	941190	AE2-113 TAP	115.0	PENELEC	200582	26RIDGWAY	115.0	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	160.0	212.87	217.72	DC	7.75

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	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC DC	MW IMPACT
166249380	941190	AE2-113 TAP	115.0	PENELEC	200582	26RIDGWAY	115.0	PENELEC	1	PN-P1-2-PN-230-006	operation	160.0	119.41	120.91	DC	2.41
166249384	941190	AE2-113 TAP	115.0	PENELEC	200582	26RIDGWAY	115.0	PENELEC	1	Base Case	operation	133.0	102.85	104.54	DC	2.24

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
166019875	1	26NILES VA 115.0 kV - 26MANSFIEL 115.0 kV Ckt 1	<u>PENELEC</u> PN-AG1-F-0028A (2271) : Replace line traps at Mansfield and Niles Valley Project Type : FAC Cost : \$300,000 Time Estimate : 12.0 Months	\$300,000
166019697	3	26FARM VLY 115.0 kV - AE2- 113 TAP 115.0 kV Ckt 1	<u>PENELEC</u> PN-AG1-F-0012A (2197) : Reconductor 5.6 miles of line. Project Type : FAC Cost : \$13,700,000 Time Estimate : 36.0 Months PN-AG1-F-0012B (2198) : Replace substation conductor at Farmers Valley Project Type : FAC Cost : \$200,000 Time Estimate : 12.0 Months PN-AG1-F-0012C (2199) : Adjust line relaying at Farmers Valley Project Type : FAC Cost : \$800,000 Time Estimate : 12.0 Months PN-AG1-F-0012D (2200) : Reconductor 10 miles of line. Project Type : FAC Cost : \$24,500,000 Time Estimate : 48.0 Months	\$39,200,000
166019887	5	26PIERCEBRK 115.0 kV - 26FARM VLY 115.0 kV Ckt 1	<u>PENELEC</u> PN-AG1-F-0011 (2196) : Reconductor 2.23 miles of line. Project Type : FAC Cost : \$5,460,000 Time Estimate : 30.0 Months	\$5,460,000
166019622	6	AE2-113 TAP 115.0 kV - 26RIDGWAY 115.0 kV Ckt 1	<u>PENELEC</u> PN-AG1-F-0013 (2201) : Reconductor 18.7 miles of line. Project Type : FAC Cost : \$45,800,000 Time Estimate : 62.0 Months	\$45,800,000
166019798	4	26SABINSVI 115.0 kV - 26NILES VA 115.0 kV Ckt 1	<u>PENELEC</u> PN-AG1-F-0022 (2254) : Replace substation conductor at Niles Valley Project Type : FAC Cost : \$200,000 Time Estimate : 12.0 Months	\$200,000

ID	Idx	Facility	Upgrade Description	Cost
166019835	2	26RIDGWAY 115.0 kV - 26FOREST 115.0 kV Ckt 1	<u>PENELEC</u> PN-AF2-F-0063A (2266) : Replace line traps at Forest and Ridgway substations. Project Type : FAC Cost : \$200,000 Time Estimate : 12.0 Months PN-AF2-F-0063B (2267) : Adjust relay settings at Forest. Project Type : FAC Cost : \$450,000 Time Estimate : 12.0 Months PN-AF2-F-0063C (2268) : Replace line relays. Project Type : FAC Cost : \$450,000 Time Estimate : 12.0 Months PN-AF2-F-0063D (2269) : Replace bus conductor at Ridgway. Project Type : FAC Cost : \$200,000 Time Estimate : 12.0 Months PN-AF2-F-0063E (2270) : Replace circuit breakers at Forest and Ridgway. Project Type : FAC Cost : \$800,000 Time Estimate : 12.0 Months	\$2,100,000
			TOTAL COST	\$93,060,000

11.6 Flow Gate Details - Primary POI

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
166019875	200671	26NILES VA	PENELEC	200672	26MANSFIEL	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	185.0	94.13	100.75	DC	12.25

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
203349	26Z1-069 C	1.3590	50/50	1.3590
916202	Z1-069 E	36.7235	50/50	36.7235
931091	AB1-160 C	0.3883	50/50	0.3883
931092	AB1-160 E	10.4924	50/50	10.4924
940861	AE2-074 C	7.5311	50/50	7.5311
940862	AE2-074 E	9.9136	50/50	9.9136
941191	AE2-113 C	14.2446	50/50	14.2446
941192	AE2-113 E	15.3369	50/50	15.3369
946111	AF1-276 C	23.3234	50/50	23.3234
946112	AF1-276 E	11.4876	50/50	11.4876
946121	AF1-277 C	23.3234	50/50	23.3234
946122	AF1-277 E	11.4876	50/50	11.4876
946131	AF1-278 C	18.6030	50/50	18.6030
946132	AF1-278 E	9.2458	50/50	9.2458
961212	AF2-412 BAT	12.0887	Merchant Transmission	12.0887
963571	AG1-206 C	0.1926	Adder	0.43
963572	AG1-206 E	0.1037	Adder	0.23
965241	AG1-389 C O1	7.3478	50/50	7.3478
965242	AG1-389 E O1	4.8986	50/50	4.8986
965251	AG1-390 C O1	7.3478	50/50	7.3478
965252	AG1-390 E O1	4.8986	50/50	4.8986
965261	AG1-391 C O1	7.3478	50/50	7.3478
965262	AG1-391 E O1	4.8986	50/50	4.8986
965271	AG1-392 C O1	14.6957	50/50	14.6957
965272	AG1-392 E O1	9.7971	50/50	9.7971
WEC	WEC	0.0227	Confirmed LTF	0.0227
LGEE	LGEE	0.0434	Confirmed LTF	0.0434
CPL	CPL	0.0293	Confirmed LTF	0.0293
CBM-W2	CBM-W2	0.5914	Confirmed LTF	0.5914
NY	NY	0.5746	Confirmed LTF	0.5746
TVA	TVA	0.0868	Confirmed LTF	0.0868
O-066	O-066	1.3393	Confirmed LTF	1.3393
SIGE	SIGE	0.0281	Confirmed LTF	0.0281
CBM-S2	CBM-S2	0.5011	Confirmed LTF	0.5011
CBM-S1	CBM-S1	0.0239	Confirmed LTF	0.0239
G-007	G-007	0.1911	Confirmed LTF	0.1911
MEC	MEC	0.1112	Confirmed LTF	0.1112
LAGN	LAGN	0.1103	Confirmed LTF	0.1103
CBM-W1	CBM-W1	1.0655	Confirmed LTF	1.0655

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
166019835	200582	26RIDGWAY	PENELEC	200647	26FOREST	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	277.0	111.47	113.7	DC	6.16

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
200649	26PENNTech	4.8519	50/50	4.8519
203349	26Z1-069 C	0.5876	50/50	0.5876
916202	Z1-069 E	15.8783	50/50	15.8783
931091	AB1-160 C	0.1679	50/50	0.1679
931092	AB1-160 E	4.5366	50/50	4.5366
940861	AE2-074 C	6.0265	50/50	6.0265
940862	AE2-074 E	7.9329	50/50	7.9329
941191	AE2-113 C	38.4652	50/50	38.4652
941192	AE2-113 E	41.4146	50/50	41.4146
941321	AE2-126 C	5.0311	50/50	5.0311
941322	AE2-126 E	3.3541	50/50	3.3541
941331	AE2-129 C	0.6977	Adder	0.82
941332	AE2-129 E	0.4651	Adder	0.55
941351	AE2-131 C (Suspended)	0.6977	Adder	0.82
941352	AE2-131 E (Suspended)	0.4651	Adder	0.55
946111	AF1-276 C	34.7402	50/50	34.7402
946112	AF1-276 E	17.1108	50/50	17.1108
946121	AF1-277 C	34.7402	50/50	34.7402
946122	AF1-277 E	17.1108	50/50	17.1108
946131	AF1-278 C	27.7092	50/50	27.7092
946132	AF1-278 E	13.7716	50/50	13.7716
946423	AF1-306 BAT	18.4505	Merchant Transmission	18.4505
957451	AF2-039 C	0.6261	Adder	0.74
957452	AF2-039 E	0.4174	Adder	0.49
957941	AF2-088 C	0.3015	Adder	0.35
957942	AF2-088 E	0.2010	Adder	0.24
958271	AF2-121 C	0.6977	Adder	0.82
958272	AF2-121 E	0.4651	Adder	0.55
961211	AF2-412	8.1350	Adder	9.57
962411	AG1-090 C O1	1.8489	Adder	4.1
962412	AG1-090 E O1	1.2326	Adder	2.74
962951	AG1-144 C	0.3698	Adder	0.82
962952	AG1-144 E	0.2465	Adder	0.55
963571	AG1-206 C	3.2639	50/50	3.2639
963572	AG1-206 E	1.7575	50/50	1.7575
964451	AG1-308 C O1	0.2805	Adder	0.62
964452	AG1-308 E O1	0.3920	Adder	0.87
965121	AG1-377 C O1	0.3698	Adder	0.82
965122	AG1-377 E O1	0.2465	Adder	0.55

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
965131	AG1-378 C O1	0.3698	Adder	0.82
965132	AG1-378 E O1	0.2465	Adder	0.55
965241	AG1-389 C O1	3.6982	50/50	3.6982
965242	AG1-389 E O1	2.4654	50/50	2.4654
965251	AG1-390 C O1	3.6982	50/50	3.6982
965252	AG1-390 E O1	2.4654	50/50	2.4654
965261	AG1-391 C O1	3.6982	50/50	3.6982
965262	AG1-391 E O1	2.4654	50/50	2.4654
965271	AG1-392 C O1	7.3963	50/50	7.3963
965272	AG1-392 E O1	4.9309	50/50	4.9309
965301	AG1-395 C	0.4752	Adder	1.05
965302	AG1-395 E	0.1411	Adder	0.31
G-007A	G-007A	0.5778	Confirmed LTF	0.5778
VFT	VFT	1.6125	Confirmed LTF	1.6125
CALDERWOOD	CALDERWOOD	0.0631	Confirmed LTF	0.0631
PRAIRIE	PRAIRIE	0.3978	Confirmed LTF	0.3978
CHEOAH	CHEOAH	0.0636	Confirmed LTF	0.0636
CBM-N	CBM-N	0.3300	Confirmed LTF	0.3300
COTTONWOOD	COTTONWOOD	0.2919	Confirmed LTF	0.2919
HAMLET	HAMLET	0.0537	Confirmed LTF	0.0537
GIBSON	GIBSON	0.0874	Confirmed LTF	0.0874
BLUEG	BLUEG	0.2743	Confirmed LTF	0.2743
TRIMBLE	TRIMBLE	0.0879	Confirmed LTF	0.0879
CATAWBA	CATAWBA	0.0364	Confirmed LTF	0.0364

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
166019697	200668	26FARM VLY	PENELEC	941190	AE2-113 TAP	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	160.0	151.39	156.24	DC	7.75

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
203349	26Z1-069 C	0.7391	50/50	0.7391
203999	P-047 E	5.0737	Adder	5.97
916202	Z1-069 E	19.9714	50/50	19.9714
931091	AB1-160 C	0.2112	50/50	0.2112
931092	AB1-160 E	5.7061	50/50	5.7061
940861	AE2-074 C	7.5775	50/50	7.5775
940862	AE2-074 E	9.9746	50/50	9.9746
946111	AF1-276 C	43.6706	50/50	43.6706
946112	AF1-276 E	21.5094	50/50	21.5094
946121	AF1-277 C	43.6706	50/50	43.6706
946122	AF1-277 E	21.5094	50/50	21.5094
946131	AF1-278 C	34.8322	50/50	34.8322
946132	AF1-278 E	17.3118	50/50	17.3118
959471	AF2-238 C	0.6301	Adder	0.74
959472	AF2-238 E	0.4200	Adder	0.49
959741	AF2-265 C	0.4515	Adder	0.53
959742	AF2-265 E	0.3360	Adder	0.4
961211	AF2-412	10.2655	Adder	12.08
965241	AG1-389 C O1	4.6511	50/50	4.6511
965242	AG1-389 E O1	3.1007	50/50	3.1007
965251	AG1-390 C O1	4.6511	50/50	4.6511
965252	AG1-390 E O1	3.1007	50/50	3.1007
965261	AG1-391 C O1	4.6511	50/50	4.6511
965262	AG1-391 E O1	3.1007	50/50	3.1007
965271	AG1-392 C O1	9.3022	50/50	9.3022
965272	AG1-392 E O1	6.2014	50/50	6.2014
G-007A	G-007A	0.4148	Confirmed LTF	0.4148
VFT	VFT	1.1868	Confirmed LTF	1.1868
CALDERWOOD	CALDERWOOD	0.0333	Confirmed LTF	0.0333
PRAIRIE	PRAIRIE	0.1989	Confirmed LTF	0.1989
CHEOAH	CHEOAH	0.0335	Confirmed LTF	0.0335
CBM-N	CBM-N	0.2592	Confirmed LTF	0.2592
COTTONWOOD	COTTONWOOD	0.1512	Confirmed LTF	0.1512
HAMLET	HAMLET	0.0312	Confirmed LTF	0.0312
GIBSON	GIBSON	0.0431	Confirmed LTF	0.0431
BLUEG	BLUEG	0.1371	Confirmed LTF	0.1371
TRIMBLE	TRIMBLE	0.0440	Confirmed LTF	0.0440
CATAWBA	CATAWBA	0.0203	Confirmed LTF	0.0203

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
166019798	200670	26SABINSVI	PENELEC	200671	26NILES VA	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	191.0	108.82	115.23	DC	12.25

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
203349	26Z1-069 C	1.3590	50/50	1.3590
916202	Z1-069 E	36.7235	50/50	36.7235
931091	AB1-160 C	0.3883	50/50	0.3883
931092	AB1-160 E	10.4924	50/50	10.4924
940861	AE2-074 C	7.5311	50/50	7.5311
940862	AE2-074 E	9.9136	50/50	9.9136
941191	AE2-113 C	14.2446	50/50	14.2446
941192	AE2-113 E	15.3369	50/50	15.3369
946111	AF1-276 C	23.3234	50/50	23.3234
946112	AF1-276 E	11.4876	50/50	11.4876
946121	AF1-277 C	23.3234	50/50	23.3234
946122	AF1-277 E	11.4876	50/50	11.4876
946131	AF1-278 C	18.6030	50/50	18.6030
946132	AF1-278 E	9.2458	50/50	9.2458
961212	AF2-412 BAT	12.0887	Merchant Transmission	12.0887
963571	AG1-206 C	0.1926	Adder	0.43
963572	AG1-206 E	0.1037	Adder	0.23
965241	AG1-389 C O1	7.3478	50/50	7.3478
965242	AG1-389 E O1	4.8986	50/50	4.8986
965251	AG1-390 C O1	7.3478	50/50	7.3478
965252	AG1-390 E O1	4.8986	50/50	4.8986
965261	AG1-391 C O1	7.3478	50/50	7.3478
965262	AG1-391 E O1	4.8986	50/50	4.8986
965271	AG1-392 C O1	14.6957	50/50	14.6957
965272	AG1-392 E O1	9.7971	50/50	9.7971
WEC	WEC	0.0227	Confirmed LTF	0.0227
LGEE	LGEE	0.0434	Confirmed LTF	0.0434
CPL	CPL	0.0293	Confirmed LTF	0.0293
CBM-W2	CBM-W2	0.5914	Confirmed LTF	0.5914
NY	NY	0.5746	Confirmed LTF	0.5746
TVA	TVA	0.0868	Confirmed LTF	0.0868
O-066	O-066	1.3393	Confirmed LTF	1.3393
SIGE	SIGE	0.0281	Confirmed LTF	0.0281
CBM-S2	CBM-S2	0.5011	Confirmed LTF	0.5011
CBM-S1	CBM-S1	0.0239	Confirmed LTF	0.0239
G-007	G-007	0.1911	Confirmed LTF	0.1911
MEC	MEC	0.1112	Confirmed LTF	0.1112
LAGN	LAGN	0.1103	Confirmed LTF	0.1103
CBM-W1	CBM-W1	1.0655	Confirmed LTF	1.0655

11.6.5 Index 5

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
166019887	200944	26PIERCEBRK	PENELEC	200668	26FARM VLY	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	245.0	103.07	106.24	DC	7.75

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
203349	26Z1-069 C	0.7391	50/50	0.7391
203999	P-047 E	5.0737	Adder	5.97
916202	Z1-069 E	19.9714	50/50	19.9714
931091	AB1-160 C	0.2112	50/50	0.2112
931092	AB1-160 E	5.7061	50/50	5.7061
940861	AE2-074 C	7.5775	50/50	7.5775
940862	AE2-074 E	9.9746	50/50	9.9746
946111	AF1-276 C	43.6706	50/50	43.6706
946112	AF1-276 E	21.5094	50/50	21.5094
946121	AF1-277 C	43.6706	50/50	43.6706
946122	AF1-277 E	21.5094	50/50	21.5094
946131	AF1-278 C	34.8322	50/50	34.8322
946132	AF1-278 E	17.3118	50/50	17.3118
959471	AF2-238 C	0.6301	Adder	0.74
959472	AF2-238 E	0.4200	Adder	0.49
959741	AF2-265 C	0.4515	Adder	0.53
959742	AF2-265 E	0.3360	Adder	0.4
961211	AF2-412	10.2655	Adder	12.08
965241	AG1-389 C O1	4.6511	50/50	4.6511
965242	AG1-389 E O1	3.1007	50/50	3.1007
965251	AG1-390 C O1	4.6511	50/50	4.6511
965252	AG1-390 E O1	3.1007	50/50	3.1007
965261	AG1-391 C O1	4.6511	50/50	4.6511
965262	AG1-391 E O1	3.1007	50/50	3.1007
965271	AG1-392 C O1	9.3022	50/50	9.3022
965272	AG1-392 E O1	6.2014	50/50	6.2014
G-007A	G-007A	0.4148	Confirmed LTF	0.4148
VFT	VFT	1.1868	Confirmed LTF	1.1868
CALDERWOOD	CALDERWOOD	0.0333	Confirmed LTF	0.0333
PRAIRIE	PRAIRIE	0.1989	Confirmed LTF	0.1989
CHEOAH	CHEOAH	0.0335	Confirmed LTF	0.0335
CBM-N	CBM-N	0.2592	Confirmed LTF	0.2592
COTTONWOOD	COTTONWOOD	0.1512	Confirmed LTF	0.1512
HAMLET	HAMLET	0.0312	Confirmed LTF	0.0312
GIBSON	GIBSON	0.0431	Confirmed LTF	0.0431
BLUEG	BLUEG	0.1371	Confirmed LTF	0.1371
TRIMBLE	TRIMBLE	0.0440	Confirmed LTF	0.0440
CATAWBA	CATAWBA	0.0203	Confirmed LTF	0.0203

11.6.6 Index 6

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
166019622	941190	AE2-113 TAP	PENELEC	200582	26RIDGWAY	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	160.0	212.87	217.72	DC	7.75

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
203349	26Z1-069 C	0.7391	50/50	0.7391
203999	P-047 E	5.0737	Adder	5.97
916202	Z1-069 E	19.9714	50/50	19.9714
931091	AB1-160 C	0.2112	50/50	0.2112
931092	AB1-160 E	5.7061	50/50	5.7061
940861	AE2-074 C	7.5775	50/50	7.5775
940862	AE2-074 E	9.9746	50/50	9.9746
941191	AE2-113 C	48.3497	50/50	48.3497
941192	AE2-113 E	52.0571	50/50	52.0571
946111	AF1-276 C	43.6706	50/50	43.6706
946112	AF1-276 E	21.5094	50/50	21.5094
946121	AF1-277 C	43.6706	50/50	43.6706
946122	AF1-277 E	21.5094	50/50	21.5094
946131	AF1-278 C	34.8322	50/50	34.8322
946132	AF1-278 E	17.3118	50/50	17.3118
961211	AF2-412	10.2655	Adder	12.08
965241	AG1-389 C O1	4.6511	50/50	4.6511
965242	AG1-389 E O1	3.1007	50/50	3.1007
965251	AG1-390 C O1	4.6511	50/50	4.6511
965252	AG1-390 E O1	3.1007	50/50	3.1007
965261	AG1-391 C O1	4.6511	50/50	4.6511
965262	AG1-391 E O1	3.1007	50/50	3.1007
965271	AG1-392 C O1	9.3022	50/50	9.3022
965272	AG1-392 E O1	6.2014	50/50	6.2014
G-007A	G-007A	0.4148	Confirmed LTF	0.4148
VFT	VFT	1.1868	Confirmed LTF	1.1868
CALDERWOOD	CALDERWOOD	0.0333	Confirmed LTF	0.0333
PRAIRIE	PRAIRIE	0.1989	Confirmed LTF	0.1989
CHEOAH	CHEOAH	0.0335	Confirmed LTF	0.0335
CBM-N	CBM-N	0.2592	Confirmed LTF	0.2592
COTTONWOOD	COTTONWOOD	0.1512	Confirmed LTF	0.1512
HAMLET	HAMLET	0.0312	Confirmed LTF	0.0312
GIBSON	GIBSON	0.0431	Confirmed LTF	0.0431
BLUEG	BLUEG	0.1371	Confirmed LTF	0.1371
TRIMBLE	TRIMBLE	0.0440	Confirmed LTF	0.0440
CATAWBA	CATAWBA	0.0203	Confirmed LTF	0.0203

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
AB1-160	Gold-Sabinsville 115kV	In Service
AE2-074	Potter 46 kV	Active
AE2-113	Farmers Valley-Ridgeway 115 kV	Active
AE2-126	Dubois-Curwensville 34.5 kV	Engineering and Procurement
AE2-129	Philipsburg-Clarence 34.5 kV	Engineering and Procurement
AE2-131	Philipsburg-Karthaus 34.5	Suspended
AF1-276	Lewis Run-Pierce Brook 230 kV	Active
AF1-277	Lewis Run-Pierce Brook 2 230 kV	Active
AF1-278	Lewis Run-Pierce Brook 3 230 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
AF2-238	Mansfield-South Troy 34.5 kV	Active
AF2-265	South Troy-Athens 34.5 kV	Active
AF2-412	Mainesburg 115 kV	Active
AG1-090	Philipsburg 115 kV	Active
AG1-144	Phillipsburg 34.5 kV	Active
AG1-206	Snyder Twp 34.5 kV	Active
AG1-308	Shawville-Philipsburg 115 kV	Active
AG1-377	Philipsburg 115 kV	Active
AG1-378	Philipsburg 115 kV	Active
AG1-389	Gold 115 kV I	Active
AG1-390	Gold 115 kV II	Active
AG1-391	Gold 115 kV III	Active
AG1-392	Gold 115 kV IV	Active
AG1-395	Philipsburg-Karthaus 34.5 kV 2	Active
Z1-069	Gold-Sabinsville 115kV	In Service

11.8 Contingency Descriptions - Primary POI

Contingency Name	Contingency Definition
Base Case	
PN-P2_1-PN-345-997-DRT-051	CONTINGENCY 'PN-P2_1-PN-345-997-DRT-051' /* B8 INTERNAL FAULT DISCONNECT BRANCH FROM BUS 946110 TO BUS 200704 CKT 1 /* AF1-276 TAP - PIERCEBRK 345 DISCONNECT BRANCH FROM BUS 200942 TO BUS 200943 CKT 1 /* 26PIERCEBRK XFMR BK_1 END
PN-P1-2-PN-230-006	CONTINGENCY 'PN-P1-2-PN-230-006' /* GLADE - FOREST 230KV DISCONNECT BRANCH FROM BUS 200593 TO BUS 200581 CKT 1 /* 26GLADE 230 26FOREST 230 END

12 Short Circuit Analysis - Primary POI

The following Breakers are overdutied:

None

12.1 System Reinforcements - Short Circuit

None

13 Summer Peak - Load Flow Analysis - Secondary POI

The Queue Project AG1-391 was evaluated as a 20.0 MW (Capacity 12.0 MW) injection tapping the Gold to Tennessee Gas 138 kV line in the PENELEC area. Project AG1-391 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-391 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

13.1 Generation Deliverability

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

None

13.2 Multiple Facility Contingency

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPAC T
166019875	200671	26NILE S VA	115.0	PENELE C	200672	26MANSFIEL	115.0	PENELE C	1	PN-P2_1-PN-345-997-DRT-051	breaker	185.0	94.11	100.73	DC	12.25

13.3 Contribution to Previously Identified Overloads

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPAC T
166019835	200582	26RIDGWAY	115.0	PENELE C	200647	26FOREST	115.0	PENELE C	1	PN-P2_1-PN-345-997-DRT-051	breaker	277.0	110.35	112.57	DC	6.16
166019697	200668	26FARM VLY	115.0	PENELE C	941190	AE2-113 TAP	115.0	PENELE C	1	PN-P2_1-PN-345-997-DRT-051	breaker	160.0	151.48	156.32	DC	7.75
166019798	200670	26SABINSVI	115.0	PENELE C	200671	26NILES VA	115.0	PENELE C	1	PN-P2_1-PN-345-997-DRT-051	breaker	191.0	108.8	115.21	DC	12.25
166019887	200944	26PIERCEBR K	115.0	PENELE C	200668	26FARM VLY	115.0	PENELE C	1	PN-P2_1-PN-345-997-DRT-051	breaker	245.0	103.09	106.25	DC	7.75
166019622	941190	AE2-113 TAP	115.0	PENELE C	200582	26RIDGWAY	115.0	PENELE C	1	PN-P2_1-PN-345-997-DRT-051	breaker	160.0	212.9	217.74	DC	7.75

13.4 Potential Congestion due to Local Energy Deliverability

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC DC	MW IMPACT
166249380	941190	AE2-113 TAP	115.0	PENELEC	200582	26RIDGWAY	115.0	PENELEC	1	PN-P1-2-PN-230-006	operation	160.0	119.42	120.92	DC	2.41
166249384	941190	AE2-113 TAP	115.0	PENELEC	200582	26RIDGWAY	115.0	PENELEC	1	Base Case	operation	133.0	102.86	104.54	DC	2.24

13.5 Flow Gate Details - Secondary POI

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".

13.5.1 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC/DC	MW IMPACT
166019875	200671	26NILES VA	PENELEC	200672	26MANSFIEL	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	185.0	94.11	100.73	DC	12.25

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
203349	26Z1-069 C	1.3590	50/50	1.3590
916202	Z1-069 E	36.7235	50/50	36.7235
931091	AB1-160 C	0.3883	50/50	0.3883
931092	AB1-160 E	10.4924	50/50	10.4924
940861	AE2-074 C	7.5311	50/50	7.5311
940862	AE2-074 E	9.9136	50/50	9.9136
941191	AE2-113 C	14.2446	50/50	14.2446
941192	AE2-113 E	15.3369	50/50	15.3369
946111	AF1-276 C	23.3234	50/50	23.3234
946112	AF1-276 E	11.4876	50/50	11.4876
946121	AF1-277 C	23.3234	50/50	23.3234
946122	AF1-277 E	11.4876	50/50	11.4876
946131	AF1-278 C	18.6030	50/50	18.6030
946132	AF1-278 E	9.2458	50/50	9.2458
961212	AF2-412 BAT	12.0887	Merchant Transmission	12.0887
963571	AG1-206 C	0.1926	Adder	0.43
963572	AG1-206 E	0.1037	Adder	0.23
965241	AG1-389 C O1	7.3478	50/50	7.3478
965242	AG1-389 E O1	4.8986	50/50	4.8986
965251	AG1-390 C O2	7.3220	50/50	7.3220
965252	AG1-390 E O2	4.8814	50/50	4.8814
965261	AG1-391 C O1	7.3478	50/50	7.3478
965262	AG1-391 E O1	4.8986	50/50	4.8986
965271	AG1-392 C O1	14.6957	50/50	14.6957
965272	AG1-392 E O1	9.7971	50/50	9.7971
WEC	WEC	0.0227	Confirmed LTF	0.0227
LGEE	LGEE	0.0434	Confirmed LTF	0.0434
CPL	CPL	0.0293	Confirmed LTF	0.0293
CBM-W2	CBM-W2	0.5914	Confirmed LTF	0.5914
NY	NY	0.5746	Confirmed LTF	0.5746
TVA	TVA	0.0868	Confirmed LTF	0.0868
O-066	O-066	1.3393	Confirmed LTF	1.3393
SIGE	SIGE	0.0281	Confirmed LTF	0.0281
CBM-S2	CBM-S2	0.5011	Confirmed LTF	0.5011
CBM-S1	CBM-S1	0.0239	Confirmed LTF	0.0239
G-007	G-007	0.1911	Confirmed LTF	0.1911
MEC	MEC	0.1112	Confirmed LTF	0.1112
LAGN	LAGN	0.1103	Confirmed LTF	0.1103
CBM-W1	CBM-W1	1.0655	Confirmed LTF	1.0655

13.5.2 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
166019835	200582	26RIDGWAY	PENELEC	200647	26FOREST	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	277.0	110.35	112.57	DC	6.16

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
200649	26PENNTech	4.8519	50/50	4.8519
203349	26Z1-069 C	0.5876	50/50	0.5876
916202	Z1-069 E	15.8783	50/50	15.8783
931091	AB1-160 C	0.1679	50/50	0.1679
931092	AB1-160 E	4.5366	50/50	4.5366
940861	AE2-074 C	6.0265	50/50	6.0265
940862	AE2-074 E	7.9329	50/50	7.9329
941191	AE2-113 C	38.4652	50/50	38.4652
941192	AE2-113 E	41.4146	50/50	41.4146
941321	AE2-126 C	5.0311	50/50	5.0311
941322	AE2-126 E	3.3541	50/50	3.3541
941331	AE2-129 C	0.6977	Adder	0.82
941332	AE2-129 E	0.4651	Adder	0.55
941351	AE2-131 C (Suspended)	0.6977	Adder	0.82
941352	AE2-131 E (Suspended)	0.4651	Adder	0.55
946111	AF1-276 C	34.7402	50/50	34.7402
946112	AF1-276 E	17.1108	50/50	17.1108
946121	AF1-277 C	34.7402	50/50	34.7402
946122	AF1-277 E	17.1108	50/50	17.1108
946131	AF1-278 C	27.7092	50/50	27.7092
946132	AF1-278 E	13.7716	50/50	13.7716
946423	AF1-306 BAT	18.4505	Merchant Transmission	18.4505
957451	AF2-039 C	0.6261	Adder	0.74
957452	AF2-039 E	0.4174	Adder	0.49
957941	AF2-088 C	0.3015	Adder	0.35
957942	AF2-088 E	0.2010	Adder	0.24
958271	AF2-121 C	0.6977	Adder	0.82
958272	AF2-121 E	0.4651	Adder	0.55
961211	AF2-412	8.1350	Adder	9.57
962951	AG1-144 C	0.3698	Adder	0.82
962952	AG1-144 E	0.2465	Adder	0.55
963571	AG1-206 C	3.2639	50/50	3.2639
963572	AG1-206 E	1.7575	50/50	1.7575
964451	AG1-308 C O2	0.2558	Adder	0.57
964452	AG1-308 E O2	0.3574	Adder	0.79
965121	AG1-377 C O1	0.3698	Adder	0.82
965122	AG1-377 E O1	0.2465	Adder	0.55
965131	AG1-378 C O1	0.3698	Adder	0.82
965132	AG1-378 E O1	0.2465	Adder	0.55

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
965241	AG1-389 C O1	3.6982	50/50	3.6982
965242	AG1-389 E O1	2.4654	50/50	2.4654
965251	AG1-390 C O2	3.7188	50/50	3.7188
965252	AG1-390 E O2	2.4792	50/50	2.4792
965261	AG1-391 C O1	3.6982	50/50	3.6982
965262	AG1-391 E O1	2.4654	50/50	2.4654
965271	AG1-392 C O1	7.3963	50/50	7.3963
965272	AG1-392 E O1	4.9309	50/50	4.9309
965301	AG1-395 C	0.4752	Adder	1.05
965302	AG1-395 E	0.1411	Adder	0.31
G-007A	G-007A	0.5778	Confirmed LTF	0.5778
VFT	VFT	1.6125	Confirmed LTF	1.6125
CALDERWOOD	CALDERWOOD	0.0631	Confirmed LTF	0.0631
PRAIRIE	PRAIRIE	0.3978	Confirmed LTF	0.3978
CHEOAH	CHEOAH	0.0636	Confirmed LTF	0.0636
CBM-N	CBM-N	0.3300	Confirmed LTF	0.3300
COTTONWOOD	COTTONWOOD	0.2919	Confirmed LTF	0.2919
HAMLET	HAMLET	0.0537	Confirmed LTF	0.0537
GIBSON	GIBSON	0.0874	Confirmed LTF	0.0874
BLUEG	BLUEG	0.2743	Confirmed LTF	0.2743
TRIMBLE	TRIMBLE	0.0879	Confirmed LTF	0.0879
CATAWBA	CATAWBA	0.0364	Confirmed LTF	0.0364

13.5.3 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
166019697	200668	26FARM VLY	PENELEC	941190	AE2-113 TAP	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	160.0	151.48	156.32	DC	7.75

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
203349	26Z1-069 C	0.7391	50/50	0.7391
203999	P-047 E	5.0737	Adder	5.97
916202	Z1-069 E	19.9714	50/50	19.9714
931091	AB1-160 C	0.2112	50/50	0.2112
931092	AB1-160 E	5.7061	50/50	5.7061
940861	AE2-074 C	7.5775	50/50	7.5775
940862	AE2-074 E	9.9746	50/50	9.9746
946111	AF1-276 C	43.6706	50/50	43.6706
946112	AF1-276 E	21.5094	50/50	21.5094
946121	AF1-277 C	43.6706	50/50	43.6706
946122	AF1-277 E	21.5094	50/50	21.5094
946131	AF1-278 C	34.8322	50/50	34.8322
946132	AF1-278 E	17.3118	50/50	17.3118
959471	AF2-238 C	0.6301	Adder	0.74
959472	AF2-238 E	0.4200	Adder	0.49
959741	AF2-265 C	0.4515	Adder	0.53
959742	AF2-265 E	0.3360	Adder	0.4
961211	AF2-412	10.2655	Adder	12.08
965241	AG1-389 C O1	4.6511	50/50	4.6511
965242	AG1-389 E O1	3.1007	50/50	3.1007
965251	AG1-390 C O2	4.6769	50/50	4.6769
965252	AG1-390 E O2	3.1179	50/50	3.1179
965261	AG1-391 C O1	4.6511	50/50	4.6511
965262	AG1-391 E O1	3.1007	50/50	3.1007
965271	AG1-392 C O1	9.3022	50/50	9.3022
965272	AG1-392 E O1	6.2014	50/50	6.2014
G-007A	G-007A	0.4148	Confirmed LTF	0.4148
VFT	VFT	1.1868	Confirmed LTF	1.1868
CALDERWOOD	CALDERWOOD	0.0333	Confirmed LTF	0.0333
PRAIRIE	PRAIRIE	0.1989	Confirmed LTF	0.1989
CHEOAH	CHEOAH	0.0335	Confirmed LTF	0.0335
CBM-N	CBM-N	0.2592	Confirmed LTF	0.2592
COTTONWOOD	COTTONWOOD	0.1512	Confirmed LTF	0.1512
HAMLET	HAMLET	0.0312	Confirmed LTF	0.0312
GIBSON	GIBSON	0.0431	Confirmed LTF	0.0431
BLUEG	BLUEG	0.1371	Confirmed LTF	0.1371
TRIMBLE	TRIMBLE	0.0440	Confirmed LTF	0.0440
CATAWBA	CATAWBA	0.0203	Confirmed LTF	0.0203

13.5.4 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
166019798	200670	26SABINSVI	PENELEC	200671	26NILES VA	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	191.0	108.8	115.21	DC	12.25

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
203349	26Z1-069 C	1.3590	50/50	1.3590
916202	Z1-069 E	36.7235	50/50	36.7235
931091	AB1-160 C	0.3883	50/50	0.3883
931092	AB1-160 E	10.4924	50/50	10.4924
940861	AE2-074 C	7.5311	50/50	7.5311
940862	AE2-074 E	9.9136	50/50	9.9136
941191	AE2-113 C	14.2446	50/50	14.2446
941192	AE2-113 E	15.3369	50/50	15.3369
946111	AF1-276 C	23.3234	50/50	23.3234
946112	AF1-276 E	11.4876	50/50	11.4876
946121	AF1-277 C	23.3234	50/50	23.3234
946122	AF1-277 E	11.4876	50/50	11.4876
946131	AF1-278 C	18.6030	50/50	18.6030
946132	AF1-278 E	9.2458	50/50	9.2458
961212	AF2-412 BAT	12.0887	Merchant Transmission	12.0887
963571	AG1-206 C	0.1926	Adder	0.43
963572	AG1-206 E	0.1037	Adder	0.23
965241	AG1-389 C O1	7.3478	50/50	7.3478
965242	AG1-389 E O1	4.8986	50/50	4.8986
965251	AG1-390 C O2	7.3220	50/50	7.3220
965252	AG1-390 E O2	4.8814	50/50	4.8814
965261	AG1-391 C O1	7.3478	50/50	7.3478
965262	AG1-391 E O1	4.8986	50/50	4.8986
965271	AG1-392 C O1	14.6957	50/50	14.6957
965272	AG1-392 E O1	9.7971	50/50	9.7971
WEC	WEC	0.0227	Confirmed LTF	0.0227
LGEE	LGEE	0.0434	Confirmed LTF	0.0434
CPL	CPL	0.0293	Confirmed LTF	0.0293
CBM-W2	CBM-W2	0.5914	Confirmed LTF	0.5914
NY	NY	0.5746	Confirmed LTF	0.5746
TVA	TVA	0.0868	Confirmed LTF	0.0868
O-066	O-066	1.3393	Confirmed LTF	1.3393
SIGE	SIGE	0.0281	Confirmed LTF	0.0281
CBM-S2	CBM-S2	0.5011	Confirmed LTF	0.5011
CBM-S1	CBM-S1	0.0239	Confirmed LTF	0.0239
G-007	G-007	0.1911	Confirmed LTF	0.1911
MEC	MEC	0.1112	Confirmed LTF	0.1112
LAGN	LAGN	0.1103	Confirmed LTF	0.1103
CBM-W1	CBM-W1	1.0655	Confirmed LTF	1.0655

13.5.5 Index 5

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
166019887	200944	26PIERCEBRK	PENELEC	200668	26FARM VLY	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	245.0	103.09	106.25	DC	7.75

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
203349	26Z1-069 C	0.7391	50/50	0.7391
203999	P-047 E	5.0737	Adder	5.97
916202	Z1-069 E	19.9714	50/50	19.9714
931091	AB1-160 C	0.2112	50/50	0.2112
931092	AB1-160 E	5.7061	50/50	5.7061
940861	AE2-074 C	7.5775	50/50	7.5775
940862	AE2-074 E	9.9746	50/50	9.9746
946111	AF1-276 C	43.6706	50/50	43.6706
946112	AF1-276 E	21.5094	50/50	21.5094
946121	AF1-277 C	43.6706	50/50	43.6706
946122	AF1-277 E	21.5094	50/50	21.5094
946131	AF1-278 C	34.8322	50/50	34.8322
946132	AF1-278 E	17.3118	50/50	17.3118
959471	AF2-238 C	0.6301	Adder	0.74
959472	AF2-238 E	0.4200	Adder	0.49
959741	AF2-265 C	0.4515	Adder	0.53
959742	AF2-265 E	0.3360	Adder	0.4
961211	AF2-412	10.2655	Adder	12.08
965241	AG1-389 C O1	4.6511	50/50	4.6511
965242	AG1-389 E O1	3.1007	50/50	3.1007
965251	AG1-390 C O2	4.6769	50/50	4.6769
965252	AG1-390 E O2	3.1179	50/50	3.1179
965261	AG1-391 C O1	4.6511	50/50	4.6511
965262	AG1-391 E O1	3.1007	50/50	3.1007
965271	AG1-392 C O1	9.3022	50/50	9.3022
965272	AG1-392 E O1	6.2014	50/50	6.2014
G-007A	G-007A	0.4148	Confirmed LTF	0.4148
VFT	VFT	1.1868	Confirmed LTF	1.1868
CALDERWOOD	CALDERWOOD	0.0333	Confirmed LTF	0.0333
PRAIRIE	PRAIRIE	0.1989	Confirmed LTF	0.1989
CHEOAH	CHEOAH	0.0335	Confirmed LTF	0.0335
CBM-N	CBM-N	0.2592	Confirmed LTF	0.2592
COTTONWOOD	COTTONWOOD	0.1512	Confirmed LTF	0.1512
HAMLET	HAMLET	0.0312	Confirmed LTF	0.0312
GIBSON	GIBSON	0.0431	Confirmed LTF	0.0431
BLUEG	BLUEG	0.1371	Confirmed LTF	0.1371
TRIMBLE	TRIMBLE	0.0440	Confirmed LTF	0.0440
CATAWBA	CATAWBA	0.0203	Confirmed LTF	0.0203

13.5.6 Index 6

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
166019622	941190	AE2-113 TAP	PENELEC	200582	26RIDGWAY	PENELEC	1	PN-P2_1-PN-345-997-DRT-051	breaker	160.0	212.9	217.74	DC	7.75

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
203349	26Z1-069 C	0.7391	50/50	0.7391
203999	P-047 E	5.0737	Adder	5.97
916202	Z1-069 E	19.9714	50/50	19.9714
931091	AB1-160 C	0.2112	50/50	0.2112
931092	AB1-160 E	5.7061	50/50	5.7061
940861	AE2-074 C	7.5775	50/50	7.5775
940862	AE2-074 E	9.9746	50/50	9.9746
941191	AE2-113 C	48.3497	50/50	48.3497
941192	AE2-113 E	52.0571	50/50	52.0571
946111	AF1-276 C	43.6706	50/50	43.6706
946112	AF1-276 E	21.5094	50/50	21.5094
946121	AF1-277 C	43.6706	50/50	43.6706
946122	AF1-277 E	21.5094	50/50	21.5094
946131	AF1-278 C	34.8322	50/50	34.8322
946132	AF1-278 E	17.3118	50/50	17.3118
961211	AF2-412	10.2655	Adder	12.08
965241	AG1-389 C O1	4.6511	50/50	4.6511
965242	AG1-389 E O1	3.1007	50/50	3.1007
965251	AG1-390 C O2	4.6769	50/50	4.6769
965252	AG1-390 E O2	3.1179	50/50	3.1179
965261	AG1-391 C O1	4.6511	50/50	4.6511
965262	AG1-391 E O1	3.1007	50/50	3.1007
965271	AG1-392 C O1	9.3022	50/50	9.3022
965272	AG1-392 E O1	6.2014	50/50	6.2014
G-007A	G-007A	0.4148	Confirmed LTF	0.4148
VFT	VFT	1.1868	Confirmed LTF	1.1868
CALDERWOOD	CALDERWOOD	0.0333	Confirmed LTF	0.0333
PRAIRIE	PRAIRIE	0.1989	Confirmed LTF	0.1989
CHEOAH	CHEOAH	0.0335	Confirmed LTF	0.0335
CBM-N	CBM-N	0.2592	Confirmed LTF	0.2592
COTTONWOOD	COTTONWOOD	0.1512	Confirmed LTF	0.1512
HAMLET	HAMLET	0.0312	Confirmed LTF	0.0312
GIBSON	GIBSON	0.0431	Confirmed LTF	0.0431
BLUEG	BLUEG	0.1371	Confirmed LTF	0.1371
TRIMBLE	TRIMBLE	0.0440	Confirmed LTF	0.0440
CATAWBA	CATAWBA	0.0203	Confirmed LTF	0.0203

13.6 Contingency Descriptions - Secondary POI

Contingency Name	Contingency Definition
Base Case	
PN-P2_1-PN-345-997-DRT-051	CONTINGENCY 'PN-P2_1-PN-345-997-DRT-051' /* B8 INTERNAL FAULT DISCONNECT BRANCH FROM BUS 946110 TO BUS 200704 CKT 1 /* AF1-276 TAP - PIERCEBRK 345 DISCONNECT BRANCH FROM BUS 200942 TO BUS 200943 CKT 1 /* 26PIERCEBRK XFMR BK_1 END
PN-P1-2-PN-230-006	CONTINGENCY 'PN-P1-2-PN-230-006' /* GLADE - FOREST 230KV DISCONNECT BRANCH FROM BUS 200593 TO BUS 200581 CKT 1 /* 26GLADE 230 26FOREST 230 END

14 Affected Systems

14.1 NYISO

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

15 Attachment One: One Line Diagram