Generation Interconnection

Feasibility Study Report

for

Queue Project AF1-321

HOOVERSVILLE 115 KV I

12 MW Capacity / 20 MW Energy

January, 2020

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1 Introduction

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

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

Section 4.3 for starting dates) for the Interconnection Request which shall specify the use of the new model. The Interconnection Customer will be required to submit a completed dynamic model study request form (Attachment B-1 of Manual 14G) in order to document the request for the study.

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

3 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Somerset 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 03/01/2022. This study does not imply a TO commitment to this in-service date.

Queue Number	**AF1-321**
Project Name	HOOVERSVILLE 115 KV I
State	Pennsylvania
County	Somerset
Transmission Owner	PENELEC
MFO	20
MWE	20
MWC	12
Fuel	Solar
Basecase Study Year	2023

3.1 Primary Point of Interconnection

The interconnection of the project at the primary Point of Interconnection (POI) will be accomplished by constructing a new 115 kV breaker position in the existing Hooversville 115 kV substation. The IC will be responsible for acquiring all easements, properties, and permits that may be required to construct both the new interconnection and the associated facilities. The IC will also be responsible for the rough grade of the property and any access needed to the proposed breaker terminal. The project is not planned to require non-direct connection upgrades at any remote substations.

3.2 Secondary Point of Interconnection

The interconnection of the project at a secondary POI can be accomplished by constructing a new 230 kV breaker position in the existing substation at Quemahonning 230 kV station. A full scope of work or estimated cost is not provided for the proposed Secondary POI.

2.2 Cost Summary

The AF1-321 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$ 0
Direct Connection Network Upgrade	$ 0
Non Direct Connection Network Upgrades	$ 1,615,000
Total Costs	**$ 1,615,000**

In addition, the AF1-321 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	**$ 0**

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

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

The required Attachment Facilities and Direct and Non-Direct Connection work for the interconnection of the AF1-321 generation project to the FE Transmission System is detailed in the following sections. The associated one-line with the generation project Attachment Facilities and the Primary Direct and Non-Direct Connection facilities are shown in Attachment 1.

4 Transmission Owner Scope of Work

The interconnection of the project at the Primary POI will be accomplished by constructing a new 115 kV breaker position in the existing Hooversville 115 kV substation. The IC will be responsible for acquiring all easements, properties, and permits that may be required to construct both the new interconnection and the associated facilities. The IC will also be responsible for the rough grade of the property and any access needed to the proposed breaker terminal. The project is not planned to require non-direct connection upgrades at any remote substations.

5 Attachment Facilities

There was no Attachment Facilities scope of work identified in this study.

6 Direct Connection Cost Estimate

There is no Direct Connection scope of work required.

7 Non-Direct Connection Cost Estimate

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

Description	Total Cost
Install a breaker at Hooversville	$ 1,550,400
Nameplates and Drawing Review	$ 64,600
Total Non-Direct Connection Facility Costs	**$ 1,615,000**

8 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 18 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 first three months of the engineering design work that is related to the construction of the interconnection substation. 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. The estimate elapsed time to complete each of the required reinforcements is identified in the "System Reinforcements" section of the report.

9 Transmission Owner Analysis

9.1 Power Flow Analysis

FE performed an analysis of its underlying transmission < 100 kV system. The AF1-321 project did not contribute to any overloads on the FE transmission < 100 kV system.

10 Interconnection Customer Requirements

10.1 System Protection

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

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

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

10.2 Compliance Issues and Interconnection Customer Requirements

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

1. The purchase and installation of a fully rated 115 kV circuit breaker to protect the AF1-321 generator lead line. A single circuit breaker must be used to protect this line; if the project has several GSU transformers, the individual GSU transformer breakers cannot be used to protect this line.

2. The purchase and installation of the minimum required FE generation interconnection relaying and control facilities. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.

3. The purchase and installation of supervisory control and data acquisition ("SCADA") equipment to provide information in a compatible format to the FE Transmission System Control Center.

4. Compliance with the FE and PJM generator power factor and voltage control requirements.

5. The execution of a back-up service agreement to serve the customer load supplied from the AF1-321 generation project metering point when the units are out-of-service. This assumes the intent of the IC is to net the generation with the load.

The IC will also be required to meet all PJM, ReliabilityFirst, and NERC reliability criteria and operating procedures for standards compliance. For example, the IC will need to properly locate and report the over and under voltage and over and under frequency system protection elements for its units as well as the submission of the generator model and protection data required to satisfy the PJM and ReliabilityFirst audits.

Failure to comply with these requirements may result in a disconnection of service if the violation is found to compromise the reliability of the FE system.

10.3 Power Factor Requirements

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

11 Revenue Metering and SCADA Requirements

11.1 PJM Requirements

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

11.1.1 Meteorological Data Reporting Requirement

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

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

11.2 FE Requirements

The IC will be required to comply with all FE revenue metering requirements for generation interconnection customers which can be found in FE's "Requirements for Transmission Connected Facilities" document located at: http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx

12 Network Impacts – Primary Point of Interconnection

The Queue Project AF1-321 was evaluated as a 20.0 MW (Capacity 12.0 MW) injection at the Hooversville 115 kV substation in the PENELEC area. Project AF1-321 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-321 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

12.1 Generation Deliverability

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

None

12.2 Multiple Facility Contingency

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

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
41080612	200743	26HOOVERSV	115.0	PENELEC	200734	26SCALP L.	115.0	PENELEC	1	PN-P7-1-PN-230-001	tower	190.0	95.27	100.59	DC	10.1

12.3 Contribution to Previously Identified Overloads

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
41080443	200746	26ROCKWOOD	115.0	PENELEC	202650	26HIGHPOINT	115.0	PENELEC	1	PN-P7-1-PN-230-001	tower	179.0	134.56	136.9	DC	4.19

12.4 Potential Congestion due to Local Energy Deliverability

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

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
41422173	200742	26TOWER51	115.0	PENELEC	200741	26SEWARD	115.0	PENELEC	1	AP-P1-3-PN-115-010	operation	185.0	117.57	121.46	DC	7.19

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
41421883	200743	26HOOVERSV	115.0	PENELEC	200742	26TOWER51	115.0	PENELEC	1	AP-P1-3-PN-115-010	operation	172.0	139.78	144.02	DC	7.29
41421888	200743	26HOOVERSV	115.0	PENELEC	200742	26TOWER51	115.0	PENELEC	1	Base Case	operation	137.0	112.19	117.01	DC	6.61
41422004	200746	26ROCKWOOD	115.0	PENELEC	202650	26HIGHPOINT	115.0	PENELEC	1	Base Case	operation	148.0	138.13	138.73	DC	1.98
41421716	200747	26PENN-MAR	115.0	PENELEC	946190	AF1-284 TAP	115.0	PENELEC	1	Base Case	operation	137.0	164.87	165.52	DC	1.98
41421599	200762	26GARRETT	115.0	PENELEC	235470	01GARRET	115.0	AP	1	Base Case	operation	133.0	187.4	188.07	DC	1.98
41421767	202650	26HIGHPOINT	115.0	PENELEC	200747	26PENN-MAR	115.0	PENELEC	1	Base Case	operation	137.0	160.84	161.5	DC	1.98
41421667	946190	AF1-284 TAP	115.0	PENELEC	200762	26GARRETT	115.0	PENELEC	1	Base Case	operation	137.0	173.43	174.08	DC	1.98

12.5 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
41080443	2	**26ROCKWOOD 115.0 kV - 26HIGHPOINT 115.0 kV Ckt 1**	**PENELEC** **s1770.1:** **Supplemental upgrade s1770.1: Penn Mar – High Point – Rockwood 115 kV Line, Rebuild/reconductor approximately 14.8 miles of wood pole construction. The supplemental project has a projected in-service date of 06/01/2020.** **Project Type: CON** **Cost : $0** **s1770.2:** **Supplemental upgrade s1770.2: Rockwood 115 kV Substation - Adjust CT ratios and replace substation conductor and breaker disconnect (on Penn Mar – High Point – Rockwood 115 kV Line). The supplemental project has a projected in-service date of 06/01/2020.** **Project Type: CON** **Cost : $0** **s1770.3:** **Supplemental upgrade s1770.3: Penn Mar 115 kV Substation - Adjust relaying and replace CTs, substation conductor, line drops, circuit breaker and disconnect switches (on Penn Mar – High Point – Rockwood 115 kV Line). The supplemental project has a projected in-service date of 06/01/2020.** **Project Type: CON** **Cost : $0**	$0

ID	Index	Facility	Upgrade Description	Cost
41080612	1	26HOOVERSV 115.0 kV - 26SCALP L. 115.0 kV Ckt 1	**PENELEC** **s2046: Supplemental upgrade s2046: Replace terminal equipment on the Hooversville – Scalp Level – Rachel Hill 115 kV Line.** • **Hooversville 115 kV Substation – Replace line relaying and line trap on the Hooversville – Scalp Level l 115 kV Line. (s2046.1)** • **Scalp Level 115 kV Substation – Replace substation conductor on the Hooversville – Scalp Level – Rachel Hill 115 kV Line. (s2046.2)** • **Rachel Hill 115 kV Substation – Replace line relaying, line trap, and substation conductor on the Scalp Level – Rachel Hill 115 kV Line. (s2046.3)** **The supplemental project has a projected in-service date of 12/01/2020.** **Project Type: FAC** **Cost : $0**	$0
			TOTAL COST	**$0**

12.6 Flow Gate Details

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

12.6.1 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
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

12.6.2 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
41080612	200743	26HOOVERSV	PENELEC	200734	26SCALP L.	PENELEC	1	PN-P7-1-PN-230-001	tower	190.0	95.27	100.59	DC	10.1

Bus #	Bus	MW Impact
200813	26YOUGH	0.2053
200834	26SW_E13_K22	0.1055
200835	26DSGENWIN	0.5191
200840	26DEEPCRK1	0.1896
200841	26DEEPCRK2	0.1896
200846	26FORWARD	0.3701
200864	K-013 E	10.6056
200889	26STNY CRK	0.5144
200890	26BF_G21_K23	0.2546
200891	26CSLMN_L13	0.3993
200892	26LOOKOUT	0.3793
202225	26SCI_S29B	0.1640
202652	26RGH_Y1-033	0.1949
292350	K-023	11.7647
292542	L-013 1	11.4429
293432	R-040 E	0.6437
293902	O-048 E	10.2986
294903	P-060 E	14.7403
913142	Y1-033 E OP1	9.5368
917672	Z2-108 E	6.4366
930262	AB1-065 E	0.4692
938351	AE1-053	3.5759
938881	AE1-116	1.8887
938991	AE1-128 C	19.0440
938992	AE1-128 E	12.6960
942361	AE2-249 C	2.1425
942362	AE2-249 E	1.4283
943301	AF1-001 C	0.2377
943302	AF1-001 E	0.2651
943711	AF1-039 C O1	2.5230
943712	AF1-039 E O1	1.6820
944781	AF1-143 C	21.4554
944782	AF1-143 E	14.3036
945671	AF1-232 C O1	38.2169
945672	AF1-232 E O1	20.5783
945901	AF1-255 C	1.0487
945902	AF1-255 E	1.4482
946081	AF1-273 C O1	22.0482
946082	AF1-273 E O1	14.6988
946191	AF1-284 C O1	2.6866
946192	AF1-284 E O1	1.6120

Bus #	Bus	MW Impact
946241	AF1-289 C O1	0.8594
946242	AF1-289 E O1	0.5730
946571	AF1-321 C O1	6.0616
946572	AF1-321 E O1	4.0410
LGEE	LGEE	0.0764
CPLE	CPLE	0.1125
WEC	WEC	0.0394
CBM-W2	CBM-W2	1.1302
NY	NY	0.2229
CBM-W1	CBM-W1	1.4387
TVA	TVA	0.2044
O-066	O-066	1.4851
CBM-S2	CBM-S2	0.9537
CBM-S1	CBM-S1	1.2269
G-007	G-007	0.2236
MADISON	MADISON	0.0020
MEC	MEC	0.2066

12.6.3 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
41080443	200746	26ROCKWOOD	PENELEC	202650	26HIGHPOINT	PENELEC	1	PN-P7-1-PN-230-001	tower	179.0	134.56	136.9	DC	4.19

Bus #	Bus	MW Impact
200834	26SW_E13_K22	0.0701
200835	26DSGENWIN	0.5597
200846	26FORWARD	0.1641
200864	K-013 E	4.7029
200883	Q-053 E	3.2881
200888	26HIGHLAND	0.2074
200889	26STNY CRK	0.3411
200890	26BF_G21_K23	0.2745
200891	26CSLMN_L13	0.4306
200892	26LOOKOUT	0.4090
200925	26R32	0.2393
202225	26SCI_S29B	0.1090
292350	K-023	12.6859
292542	L-013 1	12.3389
293432	R-040 E	0.6941
293603	O-018 E	5.9441
293902	O-048 E	11.1050
294903	P-060 E	9.7738
296332	R-032 E	6.8586
917672	Z2-108 E	6.9406
938351	AE1-053	3.8559
938881	AE1-116	1.2553
938991	AE1-128 C	12.5662
938992	AE1-128 E	8.3774
942361	AE2-249 C	1.4137
942362	AE2-249 E	0.9425
944751	AF1-140 C	1.1212
944752	AF1-140 E	0.7475
944781	AF1-143 C	23.1354
944782	AF1-143 E	15.4236
945671	AF1-232 C O1	25.3562
945672	AF1-232 E O1	13.6534
945901	AF1-255 C	0.8591
945902	AF1-255 E	1.1863
946081	AF1-273 C O1	14.6286
946082	AF1-273 E O1	9.7524
946241	AF1-289 C O1	2.9038
946242	AF1-289 E O1	1.9358
946571	AF1-321 C O1	2.5168
946572	AF1-321 E O1	1.6778
DUCKCREEK	DUCKCREEK	0.3155

Bus #	Bus	MW Impact
NEWTON	NEWTON	0.3019
FARMERCITY	FARMERCITY	0.0158
G-007A	G-007A	0.9350
VFT	VFT	2.5671
PRAIRIE	PRAIRIE	0.7362
COFFEEN	COFFEEN	0.1480
EDWARDS	EDWARDS	0.0952
CHEOAH	CHEOAH	0.1577
TILTON	TILTON	0.1732
GIBSON	GIBSON	0.1534
CALDERWOOD	CALDERWOOD	0.1566
BLUEG	BLUEG	0.4930
TRIMBLE	TRIMBLE	0.1580
CATAWBA	CATAWBA	0.1162

Short Circuit

12.7 Short Circuit

The following Breakers are overdutied:

None

13 Network Impacts – Secondary Point of Interconnection

The Queue Project AF1-321 was evaluated as a 20.0 MW (Capacity 12.0 MW) injection at the Quemahoning 230 kV substation in the PENELEC area. Project AF1-321 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-321 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

13.1 Generation Deliverability

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

None

13.2 Multiple Facility Contingency

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

None

13.3 Contribution to Previously Identified Overloads

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

None

13.4 Potential Congestion due to Local Energy Deliverability

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

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
4142217 3	20074 2	26TOWER 51	115. 0	PENELE C	20074 1	26SEWAR D	115. 0	PENELE C	1	AP-P1-3-PN-115-010	operatio n	185.0	118.54	120.66	DC	3.93
4142188 3	20074 3	26HOOVER SV	115. 0	PENELE C	20074 2	26TOWER 51	115. 0	PENELE C	1	AP-P1-3-PN-115-010	operatio n	172.0	140.84	143.15	DC	3.98
4142188 8	20074 3	26HOOVER SV	115. 0	PENELE C	20074 2	26TOWER 51	115. 0	PENELE C	1	Base Case	operatio n	137.0	113.16	115.73	DC	3.53

13.5 Flow Gate Details

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

13.5.1 Contingency Descriptions

Contingency Name	Contingency Definition
Base Case	
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

Short Circuit

13.6 Short Circuit

The following Breakers are overdutied:

None

Affected Systems

14 Affected Systems

14.1 LG&E

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

14.2 MISO

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

14.3 TVA

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

14.4 Duke Energy Progress

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

14.5 NYISO

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

Attachment 1

System Configuration