Generation Interconnection

System Impact Study Report

for

Queue Project AE1-064

ROCKCASTLE 138 KV

67.3 MW Capacity / 102.1 MW Energy

December 2020

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1 Introduction

This System Impact Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 205, as well as the System Impact Study Agreement between the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is AEP.

2 Preface

The intent of the System Impact Study is to determine a plan, with approximate cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications (on PJM web site) for the appropriate transmission owner.

In some instances an Interconnection Customer may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection or merchant transmission upgrade, may also contribute to the need for the same network reinforcement. 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 System Impact Study is performed.

The System Impact 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.

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.

An Interconnection Customer with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

3 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Bedford County, Virginia. The installed facilities will have a total capability of 102.1 MW with 67.3 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is May 03, 2021. This study does not imply a TO commitment to this in-service date.

Queue Number	AE1-064
Project Name	ROCKCASTLE 138 KV
State	Virginia
County	Bedford
Transmission Owner	AEP
MFO	102.1
MWE	102.1
MWC	67.3
Fuel	Solar
Basecase Study Year	2022

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

AE1-064 will interconnect with the Southside Electric Cooperative's (SEC) transmission system via a new station cut into the Whitehouse to Lone Gum 138 kV line. SEC is an ODEC member. The Whitehouse 138 kV Breaker Station is an SEC Delivery Point, served from the AEP Cloverdale-Smith Mountain 138 kV circuit at the Rockcastle 138 kV station.

5 Cost Summary

The AE1-064 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$250,000 + TBD costs by SEC/ODEC*
Allocation towards System Network Upgrade Costs*	$0
Total Costs	$250,000 + TBD costs by SEC/ODEC*

*For the upgrades associated with Southside Electric Cooperative's (SEC) facilities, the Attachment facilities, Direct Connection, and Non Direct Connection upgrades along with terms and conditions to interconnect AE1-064 will be specified in a separate two party Interconnection Agreement (IA) between SEC and the Interconnection Customer as this project is considered FERC non-jurisdictional per the PJM Open Access Transmission Tariff (OATT). From the transmission system perspective, network impacts were identified as detailed below.

*As your project progresses through the study process and other projects modify their request or withdraw, then your cost allocation could change.

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.

Note 1: PJM Open Access Transmission Tariff (OATT) section 217.3A outline cost allocation rules. The rules are further clarified in PJM Manual 14A Attachment B. The allocation of costs for a network upgrade will start with the first Queue project to cause the need for the upgrade. Later queue projects will receive cost allocation contingent on their contribution to the violation and are allocated to the queues that have not closed less than 5 years following the execution of the first Interconnection Service Agreement which identifies the need for this upgrade.

Note 2: For customers with System Reinforcements listed: If your present cost allocation to a System Reinforcement indicates $0, then please be aware that as changes to the interconnection process occur, such as prior queued projects withdrawing from the queue, reducing in size, etc, the cost responsibilities can change and a cost allocation may be assigned to your project. In addition, although your present cost

allocation to a System Reinforcement is presently $0, your project may need this system reinforcement completed to be deliverable to the PJM system. If your project comes into service prior to completion of the system reinforcement, an interim deliverability study for your project will be required.

6 Transmission Owner Scope of Work

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

Description	Total Cost
Attachment Facilities	To be Provided by Southside Electric Cooperative*
Direct Connection Network Upgrade	To be Provided by Southside Electric Cooperative*
Non Direct Connection Network Upgrades	$ 250,000 (AEP) + TBD by SEC and/or ODEC*
Total Costs	$ 250,000 + TBD costs by SEC/ODEC*

*For the upgrades associated with Southside Electric Cooperative's (SEC) facilities, the Attachment facilities, Direct Connection, and Non Direct Connection upgrades along with terms and conditions to interconnect AE1-064 will be specified in a separate two party Interconnection Agreement (IA) between SEC and the Interconnection Customer as this project is considered FERC non-jurisdictional per the PJM Open Access Transmission Tariff (OATT). From the transmission system perspective, network impacts were identified as detailed below.

7 Incremental Capacity Transfer Rights (ICTRs)

None

8 Schedule

TBD

9 Transmission Owner Analysis

None

10 Interconnection Customer Requirements

It is understood that the Interconnection Customer is responsible for all costs associated with this interconnection. The costs above are reimbursable to the Interconnected Transmission Owner. The cost of the Interconnection Customer's generating plant and the costs for the line connecting the generating plant to the Interconnected Transmission Owner's Transmission circuit are not included in this report; these are assumed to be the Interconnection Customer's responsibility.

The Generation Interconnection Agreement does not in or by itself establish a requirement for the Interconnected Transmission Owner to provide power for consumption at the developer's facilities. A separate agreement may be reached with the local utility that provides service in the area to ensure that infrastructure is in place to meet this demand and proper metering equipment is installed. It is the responsibility of the developer to contact the local service provider to determine if a local service agreement is required.

Requirement from the PJM Open Access Transmission Tariff:

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.
2. The Interconnection Customer may be required to install and/or pay for metering as necessary to properly track real time output of the facility as well as installing metering which shall be used for billing purposes. See Section 8 of Appendix 2 to the Interconnection Service Agreement as well as Section 4 of PJM Manual 14D for additional information.

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.

11.2 Meteorological Data Reporting Requirements

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

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

11.3 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/

12 Summer Peak Analysis

The Queue Project AE1-064 was evaluated as a 102.1 MW (Capacity 67.3 MW) injection into the Rockcastle 138 kV substation in the AEP area. Project AE1-064 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE1-064 was studied with a commercial probability of 100.0 %. Potential network impacts were as follows:

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)

None

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
4117000	243892	05MEADS 8	138.0	AEP	242607	05CLOVR D	138.0	AEP	1	AEP_P7-1_#10817-A	tower	277.0	107.54	125.43	AC	51.48
4117001	243892	05MEADS 8	138.0	AEP	242607	05CLOVR D	138.0	AEP	1	AEP_P7-1_#10808-A	tower	277.0	100.44	118.3	AC	51.49

12.4 Steady-State Voltage Requirements

None

12.5 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
4116677	242687	05JOHNMT	138.0	AEP	242734	05NEWLDN	138.0	AEP	1	Base Case	operation	167.0	98.23	102.23	AC	7.86
3358829	242701	05LEESVI	138.0	AEP	314667	4ALTVSTA	138.0	DVP	1	Base Case	operation	205.0	100.55	108.71	AC	16.92
4116642	242741	05OTTER	138.0	AEP	242687	05JOHNMT	138.0	AEP	1	Base Case	operation	167.0	101.96	105.96	AC	7.86
4116577	243892	05MEADS8	138.0	AEP	242607	05CLOVRD	138.0	AEP	1	AEP_P1-2_#5366-B	operation	277.0	90.47	106.26	AC	45.98
3358556	314667	4ALTVSTA	138.0	DVP	242741	05OTTER	138.0	AEP	1	Base Case	operation	167.0	104.34	108.33	AC	7.86

12.6 System Reinforcements

ID	Idx	Facility	Upgrade Description	Cost	Cost Allocated to AE1-064	Upgrade Number
4117000,4117001,4116583,170575614	2	**05MEADS8 138.0 kV - 05CLOVRD 138.0 kV Ckt 1**	The SE rating is 407 MVA and is sufficient. No upgrade required.	$0	$0	N/A

Note : For customers with System Reinforcements listed: If your present cost allocation to a System Reinforcement indicates $0, then please be aware that as changes to the interconnection process occur, such as prior queued projects withdrawing from the queue, reducing in size, etc, the cost responsibilities can change and a cost allocation may be assigned to your project. In addition, although your present cost allocation to a System Reinforcement is presently $0, your project may need this system reinforcement completed to be deliverable to the PJM system. If your project comes into service prior to completion of the system reinforcement, an interim deliverability study for your project will be required.

12.7 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".

12.7.1 Index 1

None

12.7.2 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
4117000	243892	05MEADS8	AEP	242607	05CLOVRD	AEP	1	AEP_P7-1_#10817-A	tower	277.0	107.54	125.43	AC	51.48

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
244012	05PINNACLE	0.6739	Adder	0.79
246843	05SMG1	4.6203	50/50	4.6203
246844	05SMG2	12.1459	50/50	12.1459
246845	05SMG3	7.1247	50/50	7.1247
246846	05SMG4	12.5531	50/50	12.5531
246847	05SMG5	4.7562	50/50	4.7562
247284	05LEESVG	3.3973	50/50	3.3973
919841	AA2-070	2.3071	50/50	2.3071
926051	AC1-083 C O1	11.2746	50/50	11.2746
926052	AC1-083 E O1	18.3954	50/50	18.3954
933941	AD1-017 C	2.2549	50/50	2.2549
933942	AD1-017 E	3.6791	50/50	3.6791
938451	AE1-064 C	33.9320	50/50	33.9320
938452	AE1-064 E	17.5458	50/50	17.5458
939011	AE1-130 C O1	39.0164	50/50	39.0164
939012	AE1-130 E O1	19.5435	50/50	19.5435
940081	AE1-250 C	19.7208	50/50	19.7208
940082	AE1-250 E	13.1472	50/50	13.1472
DUCKCREEK	DUCKCREEK	0.1900	Confirmed LTF	0.1900
NEWTON	NEWTON	0.1991	Confirmed LTF	0.1991
CPLE	CPLE	1.3124	Confirmed LTF	1.3124
CBM-W2	CBM-W2	0.8253	Confirmed LTF	0.8253
PRAIRIE	PRAIRIE	0.1601	Confirmed LTF	0.1601
O-066	O-066	1.0499	Confirmed LTF	1.0499
CBM-S2	CBM-S2	2.1599	Confirmed LTF	2.1599
COFFEEN	COFFEEN	0.0719	Confirmed LTF	0.0719
CARR	CARR	0.0643	Confirmed LTF	0.0643
EDWARDS	EDWARDS	0.0929	Confirmed LTF	0.0929
CBM-S1	CBM-S1	0.3156	Confirmed LTF	0.3156
TILTON	TILTON	0.1241	Confirmed LTF	0.1241
G-007	G-007	0.1628	Confirmed LTF	0.1628
BLUEG	BLUEG	1.1222	Confirmed LTF	1.1222
CANNELTON	CANNELTON	0.0445	Confirmed LTF	0.0445
GIBSON	GIBSON	0.0381	Confirmed LTF	0.0381
FARMERCITY	FARMERCITY	0.0245	Confirmed LTF	0.0245
TRIMBLE	TRIMBLE	0.1286	Confirmed LTF	0.1286
RENSSELAER	RENSSELAER	0.0508	Confirmed LTF	0.0508
TATANKA	TATANKA	0.0699	Confirmed LTF	0.0699

12.7.3 Index 3

None

12.8 Queue Dependencies

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

Queue Number	Project Name	Status
AA2-070	Smith Mountain 138kV	In Service
AB2-109	Reusens 34.5kV	In Service
AC1-042	Altavista-Mt. Airy 69kV	Engineering and Procurement
AC1-075	Perth-Hickory Grove 115kV	Engineering and Procurement
AC1-080	Perth-Hickory Grove 115kV	Engineering and Procurement
AC1-083	Smith Mountain-Bearskin 138kV	Active
AC1-105	Halifax-Mt. Laurel 115kV	Engineering and Procurement
AC1-123	Smith Mountain-Candler's Mountain 138kV	Under Construction
AC1-145	Gretna DP 69 kV	Engineering and Procurement
AC1-222	Crystal Hill-Halifax 115kV	Engineering and Procurement
AD1-017	Smith Mountain-Bearskin 138 kV	Active
AD1-055	Crystal Hill-Halifax 115 kV	Engineering and Procurement
AE1-064	Rockcastle 138 kV	Active
AE1-130	Meads Store 138 kV	Active
AE1-230	Shockoe 69 kV	Active
AE1-250	Smith Mountain-E. Danville 138 kV	Active

12.9 Contingency Descriptions

Contingency Name	Contingency Definition
AEP_P1-2_#5366-B	CONTINGENCY 'AEP_P1-2_#5366-B' OPEN BRANCH FROM BUS 242549 TO BUS 940080 CKT 1 / 242549 05BANSTR 138 940080 AE1-250 TAP 138 1 OPEN BRANCH FROM BUS 242549 TO BUS 242632 CKT 1 / 242549 05BANSTR 138 242632 05EDAN 2 138 1 OPEN BRANCH FROM BUS 242549 TO BUS 314668 CKT Z1 / 242549 05BANSTR 138 314668 4BANISTR 138 Z1 END
AEP_P1-3_#10688_05EDANV2 230_4-A	CONTINGENCY 'AEP_P1-3_#10688_05EDANV2 230_4-A' OPEN BRANCH FROM BUS 242531 TO BUS 936170 CKT 1 / 242531 05EDANV2 230 936170 AD2-023 TAP 230 1 OPEN BRANCH FROM BUS 242531 TO BUS 242632 CKT 4 / 242531 05EDANV2 230 242632 05EDAN 2 138 4 OPEN BRANCH FROM BUS 242549 TO BUS 242632 CKT 1 / 242549 05BANSTR 138 242632 05EDAN 2 138 1 OPEN BRANCH FROM BUS 242629 TO BUS 242632 CKT 1 / 242629 05E.MONU 138 242632 05EDAN 2 138 1 OPEN BRANCH FROM BUS 242631 TO BUS 242632 CKT Z1 / 242631 05EDAN 1 138 242632 05EDAN 2 138 Z1 END
AEP_P1-2_#8677	CONTINGENCY 'AEP_P1-2_#8677' OPEN BRANCH FROM BUS 242629 TO BUS 242632 CKT 1 / 242629 05E.MONU 138 242632 05EDAN 2 138 1 OPEN BRANCH FROM BUS 242629 TO BUS 242770 CKT 1 / 242629 05E.MONU 138 242770 05RIGIS 138 1 OPEN BRANCH FROM BUS 242629 TO BUS 243948 CKT 1 / 242629 05E.MONU 138 243948 05BRANTLY 69.0 1 REMOVE SWSHUNT FROM BUS 242629 / 242629 05E.MONU 138 END
AEP_P1-2_#5419-A	CONTINGENCY 'AEP_P1-2_#5419-A' OPEN BRANCH FROM BUS 242607 TO BUS 243892 CKT 1 / 242607 05CLOVRD 138 243892 05MEADS8 138 1 OPEN BRANCH FROM BUS 243892 TO BUS 939010 CKT 1 / 243892 05MEADS8 138 939010 AE1-130 TAP 138 1 OPEN BRANCH FROM BUS 243892 TO BUS 243893 CKT Z1 / 243892 05MEADS8 138 243893 05MEADS 8 24.9 Z1 END

Contingency Name	Contingency Definition
AEP_P4_#10213_05CLOV4 EQ 999_A	CONTINGENCY 'AEP_P4_#10213_05CLOV4 EQ 999_A' OPEN BRANCH FROM BUS 242560 TO BUS 242607 CKT 1 / 242560 05BONSCK 138 242607 05CLOVRD 138 1 OPEN BRANCH FROM BUS 242560 TO BUS 242840 CKT 1 / 242560 05BONSCK 138 242840 05VINTON 138 1 OPEN BRANCH FROM BUS 242607 TO BUS 243892 CKT 1 / 242607 05CLOVRD 138 243892 05MEADS8 138 1 OPEN BRANCH FROM BUS 243892 TO BUS 939010 CKT 1 / 243892 05MEADS8 138 939010 AE1-130 TAP 138 1 OPEN BRANCH FROM BUS 242773 TO BUS 242840 CKT 1 / 242773 05ROANO1 138 242840 05VINTON 138 1 OPEN BRANCH FROM BUS 243892 TO BUS 243893 CKT Z1 / 243892 05MEADS8 138 243893 05MEADS 8 24.9 Z1 END
AEP_P1-2_#5471-A	CONTINGENCY 'AEP_P1-2_#5471-A' OPEN BRANCH FROM BUS 242575 TO BUS 242737 CKT 1 / 242575 05CAMDLM 138 242737 05OPOSSUMCK 138 1 OPEN BRANCH FROM BUS 242575 TO BUS 242781 CKT 1 / 242575 05CAMDLM 138 242781 05RUSTBR 138 1 OPEN BRANCH FROM BUS 242575 TO BUS 926520 CKT 1 / 242575 05CAMDLM 138 926520 AC1-123 TAP 138 1 END
AEP_P7-1_#10808-A	CONTINGENCY 'AEP_P7-1_#10808-A' OPEN BRANCH FROM BUS 926520 TO BUS 247499 CKT 1 / 926520 AC1-123 TAP 138 247499 05SMITHMTN2 138 1 OPEN BRANCH FROM BUS 242701 TO BUS 247499 CKT 1 / 242701 05LEESVI 138 247499 05SMITHMTN2 138 1 OPEN BRANCH FROM BUS 242701 TO BUS 314667 CKT 1 / 242701 05LEESVI 138 314667 4ALTVSTA 138 1 OPEN BRANCH FROM BUS 242701 TO BUS 247284 CKT 1 / 242701 05LEESVI 138 247284 05LEESVG 13.8 1 END
AEP_P7-1_#10817-A	CONTINGENCY 'AEP_P7-1_#10817-A' OPEN BRANCH FROM BUS 926520 TO BUS 247499 CKT 1 / 926520 AC1-123 TAP 138 247499 05SMITHMTN2 138 1 OPEN BRANCH FROM BUS 242701 TO BUS 314667 CKT 1 / 242701 05LEESVI 138 314667 4ALTVSTA 138 1 END
Base Case	

Contingency Name	Contingency Definition
AEP_P4_#10210_05CLOVRD 138_A2	CONTINGENCY 'AEP_P4_#10210_05CLOVRD 138_A2' OPEN BRANCH FROM BUS 244044 TO BUS 242607 CKT 1 / 244044 05CLOV4 EQ 999 242607 05CLOVRD 138 1 OPEN BRANCH FROM BUS 244044 TO BUS 244041 CKT 1 / 244044 05CLOV4 EQ 999 244041 05CLOV 4 69.0 1 OPEN BRANCH FROM BUS 244044 TO BUS 244043 CKT 1 / 244044 05CLOV4 EQ 999 244043 05CLOV4 34.5 1 OPEN BRANCH FROM BUS 242607 TO BUS 243883 CKT 1 / 242607 05CLOVRD 138 243883 05LAKEFR 138 1 OPEN BRANCH FROM BUS 242607 TO BUS 243892 CKT 1 / 242607 05CLOVRD 138 243892 05MEADS8 138 1 OPEN BRANCH FROM BUS 243892 TO BUS 939010 CKT 1 / 243892 05MEADS8 138 939010 AE1-130 TAP 138 1 OPEN BRANCH FROM BUS 243892 TO BUS 243893 CKT Z1 / 243892 05MEADS8 138 243893 05MEADS 8 24.9 Z1 END

13 Light Load Analysis

Light Load Studies (As applicable).

Not applicable

14 Short Circuit Analysis

The following Breakers are overdutied

None

15 Stability and Reactive Power Assessment

(Summary of the VAR requirements based upon the results of the dynamic studies)

EXECUTIVE SUMMARY

Generator Interconnection Request AE1-064 is for a 102.1 MW photovoltaic (PV) solar generation plant consisting of 31 x 3.42 MW Sungrow SG3600UD PV inverters. AE1-064 has a Point of Interconnection (POI) directly connecting to the Rockcastle 138 kV in Bedford County, Virginia, in the American Electric Power (AEP) transmission system.

The power flow scenario for the analysis was based on the RTEP 2022 summer peak case, modified to include applicable queue projects. AE1-064 has been dispatched online at maximum facility output, with approximately unity power factor at the high side of the station transformer.

AE1-064 was tested for compliance with NERC, PJM, Transmission Owner and other applicable criteria. For this study, 123 contingencies were simulated, each with a 20 second simulation time period. Studied faults included:

- Steady-state operation (20 second simulation)
- Three-phase faults with normal clearing time
- Single-phase bus faults with normal clearing time
- Single-phase faults with stuck breaker
- Single-phase faults placed at 80% of the line with delayed (Zone 2) clearing at remote line end because of primary communications/relaying failure
- Three-phase faults with loss of multiple circuits caused by a common tower contingency

The 122 fault contingencies tested on the 2022 summer peak case met the recovery criteria:

- The AE1-064 generator was able to ride through the faults except for faults where protective actions trip one or more generator(s).

- All generators maintained synchronism and any post-contingency oscillations are positively damped with a damping margin of at least 3%.
- All bus voltages recover to 0.7 p.u. within 2.5 seconds and the final voltage is within the range of 0.92 p.u. to 1.05 p.u.
- No transmission element trips, other than those either directly connected or designated to trip as a consequence of the fault.

The AE1-064 queue project met both the 0.95 lagging power factor requirement and the 0.95 leading power factor requirement.

16 Affected Systems

16.1 TVA

None

16.2 Duke Energy Progress

CPLE impacts to be determined during the Facilities Study phase. No DUKE area impacts.

16.3 MISO

None

16.4 LG&E

None