Generation Interconnection

Feasibility Study Report

for

Queue Project AG1-234

HINTON-RONCEVERTE 138 KV

30 MW Capacity / 50 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 AEP.

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 Greenbrier County, West Virginia. The installed facilities will have a total capability of 50 MW with 30 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is December 31, 2024. This study does not imply a TO commitment to this in-service date.

Queue Number	**AG1-234**
Project Name	HINTON-RONCEVERTE 138 KV
State	West Virginia
County	Greenbrier
Transmission Owner	AEP
MFO	50
MWE	50
MWC	30
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.

4 Point of Interconnection – Primary POI

AG1-234 will interconnect with the AEP transmission system via a new switching station cut into the Hinton - Ronceverte 138 kV section of the Hinton - Fudge Hollow (V.P.Co) 138 kV circuit.

To accommodate the interconnection on the Hinton - Ronceverte 138 kV section of the Hinton - Fudge Hollow (V.P.Co) 138 kV circuit, a new three (3) circuit breaker 138 kV switching station physically configured and operated as a ring-bus will be constructed (see Attachment 1). Installation of associated protection and control equipment, 138 kV line risers, SCADA, and 138 kV revenue metering will also be required. AEP reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.

Installation of the generator lead first span exiting the POI station, including the first structure outside the AEP fence, will also be included in AEP's scope. In the case where the generator lead is a single span, the structure in the customer station will be the customer's responsibility.

5 Point of Interconnection – Secondary POI

AG1-234 will interconnect with the AEP transmission system via a new switching station cut into the Ronceverte - Greenbrier Metering 138 kV section of the Hinton - Fudge Hollow (V.P.Co) 138 kV circuit.

To accommodate the interconnection on the Ronceverte - Greenbrier Metering 138 kV section of the Hinton - Fudge Hollow (V.P.Co) 138 kV circuit, a new three (3) circuit breaker 138 kV switching station physically configured and operated as a ring-bus will be constructed (see Attachment 2). Installation of associated protection and control equipment, 138 kV line risers, SCADA, and 138 kV revenue metering will also be required. AEP reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.

Installation of the generator lead first span exiting the POI station, including the first structure outside the AEP fence, will also be included in AEP's scope. In the case where the generator lead is a single span, the structure in the customer station will be the customer's responsibility.

6 Cost Summary

The AG1-234 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$9,741,000
Total System Network Upgrade Costs	$2,000
Total Costs	$9,743,000

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.

The estimates provided in this report are preliminary in nature, as they were determined without the benefit of detailed engineering studies. Final estimates will require an on-site review and coordination to determine final construction requirements. In addition, Stability analysis will be completed during the Facilities Study stage. It is possible that a need for additional upgrades could be identified by these studies.

7 Transmission Owner Scope of Work

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

7.1 Attachment Facilities

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

Description	Total Cost
138 kV Revenue Metering	$376,000
Generator lead first span exiting the POI station, including the first structure outside the fence	$400,000
Total Attachment Facility Costs	**$776,000**

7.2 Direct Connection Cost Estimate

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

Description	Total Cost
A new three (3) circuit breaker 138 kV switching station physically configured and operated as a ring-bus will be constructed. Installation of associated protection and control equipment, 138 kV line risers, and SCADA will also be required.	$8,150,000
Total Direct Connection Facility Costs	**$8,150,000**

7.3 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
Hinton - Ronceverte 138 kV section of the Hinton - Fudge Hollow Circuit T-Line Cut In	$770,000
Review Protection and Control Settings at the Hinton 138 kV substation	$45,000
Review Protection and Control Settings at the Fudge Hollow138 kV (V.P.Co) substation	$To be provided by Virginia Power
Total Non-Direct Connection Facility Costs	**$815,000**

8 Schedule

It is anticipated that the time between receipt of executed Agreements and Commercial Operation may range from 12 to 18 months if no line work is required. If line work is required, construction time would generally be between 24 to 36 months after Agreement execution.

9 Interconnection Customer Requirements

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

The Generation Interconnection Agreement does not in or by itself establish a requirement for the 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.

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.

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 AG1-234 was evaluated as a 50.0 MW (Capacity 30.0 MW) injection tapping the Ronceverte to Hinton 138 kV line in the AEP area. Project AG1-234 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-234 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

11.1 Generation Deliverability

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

None

11.2 Multiple Facility Contingency

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
161611161	937350	AD2-179 TAP	138.0	AEP	242721	05MORGAN	138.0	AEP	1	AEP_P7-1_#15399	tower	167.0	99.12	102.46	DC	5.58

11.3 Contribution to Previously Identified Overloads

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
167108573	937350	AD2-179 TAP	138.0	AEP	242721	05MORGAN	138.0	AEP	1	AEP_P4_#2914_05J.FERR	breaker	167.0	103.13	104.26	DC	4.19
167108574	937350	AD2-179 TAP	138.0	AEP	242721	05MORGAN	138.0	AEP	1	AEP_P4_#311_05CLOVRD	breaker	167.0	103.13	104.26	DC	4.19

11.4 Potential Congestion due to Local Energy Deliverability

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

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
167893183	235376	01NETTIE	138.0	AP	235318	01CRUPRN	138.0	AP	1	FE-P1-2-MP-138-076	operation	192.0	124.39	125.01	DC	2.64
168153581	242608	05CLYTR1	138.0	AEP	242791	05SCHRIS	138.0	AEP	1	AEP_P1-2_#8518_92-B	operation	167.0	140.49	141.34	DC	3.13

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
168153673	242791	05SCHRIS	138.0	AEP	243874	05TECHDR	138.0	AEP	1	AEP_P1-2_#311_5	operation	167.0	120.86	121.55	DC	2.57
168153714	243874	05TECHDR	138.0	AEP	242708	05M FUNK	138.0	AEP	1	AEP_P1-2_#311_5	operation	167.0	117.27	117.96	DC	2.57
169639105	937350	AD2-179 TAP	138.0	AEP	242721	05MORGAN	138.0	AEP	1	Base Case	operation	134.0	113.83	115.23	DC	4.18

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
167108574,161611161,167108573	1	AD2-179 TAP 138.0 kV - 05MORGAN 138.0 kV Ckt 1	**AEP** **AEPA0026a (57) : A Sag Study will be required for the 0.5 miles of overhead conductor (ACSR ~ 397.5 ~ 30/7 ~ LARK ~ Fe Clamps 9 d) to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between $2,000 (no remediation required, just sag study) and $0.75 million (complete line reconductor/rebuild). Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement.** **Project Type : FAC** **Cost : $2,000** **Time Estimate : 6 - 12 months**	$2,000
			TOTAL COST	**$2,000**

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
167108574	937350	AD2-179 TAP	AEP	242721	05MORGAN	AEP	1	AEP_P4_#311_05CLOVRD	breaker	167.0	103.13	104.26	DC	4.19

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
937351	AD2-179 C O1	42.6972	50/50	42.6972
937352	AD2-179 E O1	28.4648	50/50	28.4648
939804	AE1-212 C O1	2.6123	Adder	3.07
939805	AE1-212 E O1	1.7976	Adder	2.11
958111	AF2-105 C	39.8844	50/50	39.8844
958112	AF2-105 E	26.5896	50/50	26.5896
962401	AG1-089 C	0.2816	Adder	0.63
962402	AG1-089 E	0.4224	Adder	0.94
962433	AG1-092 BAT	6.7602	50/50	6.7602
963811	AG1-234 C O1	1.1312	Adder	2.51
963812	AG1-234 E O1	0.7541	Adder	1.67
WEC	WEC	0.0885	Confirmed LTF	0.0885
LGEE	LGEE	0.2004	Confirmed LTF	0.2004
CBM-W2	CBM-W2	2.2310	Confirmed LTF	2.2310
NY	NY	0.0564	Confirmed LTF	0.0564
TVA	TVA	0.3346	Confirmed LTF	0.3346
O-066	O-066	0.9018	Confirmed LTF	0.9018
SIGE	SIGE	0.0456	Confirmed LTF	0.0456
CBM-S1	CBM-S1	0.0965	Confirmed LTF	0.0965
G-007	G-007	0.1418	Confirmed LTF	0.1418
HAMLET	HAMLET	0.1011	Confirmed LTF	0.1011
MEC	MEC	0.4306	Confirmed LTF	0.4306
LAGN	LAGN	0.3832	Confirmed LTF	0.3832
CATAWBA	CATAWBA	0.0228	Confirmed LTF	0.0228
CBM-W1	CBM-W1	3.7854	Confirmed LTF	3.7854

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
AD2-179	Morgans Cut-Glen Lyn 138kV	Active
AE1-212	Grandview-Clifftop 138 kV	Active
AF2-105	Morgans Cut 138 kV	Active
AG1-089	Grandview-Clifftop 138 kV	Active
AG1-092	Hickman-River Bend 69 kV	Active
AG1-234	Hinton-Ronceverte 115 kV	Active

11.8 Contingency Descriptions - Primary POI

Contingency Name	Contingency Definition
AEP_P1-2_#311_5	CONTINGENCY 'AEP_P1-2_#311_5' OPEN BRANCH FROM BUS 242512 TO BUS 242514 CKT 1 / 242512 05CLOVRD 765 242514 05J.FERR 765 1 END
AEP_P4_#311_05CLOVRD	CONTINGENCY '"AEP_P4_#311_05CLOVRD' 765_CC2" / 1395 OPEN BRANCH FROM BUS 242512 TO BUS 242514 CKT 1 / 242512 05CLOVRD 765 242514 05J.FERR 765 1 END
FE-P1-2-MP-138-076	CONTINGENCY 'FE-P1-2-MP-138-076' /* GRASSY FALLS-SUMMERSVILLE 138KV DISCONNECT BRANCH FROM BUS 235340 TO BUS 235410 CKT 1 /* 01GRASSY 138 01SUMMRV 138 END
AEP_P7-1_#15399	CONTINGENCY 'AEP_P7-1_#15399' OPEN BRANCH FROM BUS 242650 TO BUS 242694 CKT 1 / 242650 05GLENL1 138 242694 05KIMBAL 138 1 OPEN BRANCH FROM BUS 242587 TO BUS 242749 CKT 1 / 242587 05CELAN 138 242749 05PETERM 138 1 OPEN BRANCH FROM BUS 242651 TO BUS 242749 CKT 1 / 242651 05GLENL2 138 242749 05PETERM 138 1 END
AEP_P1-2_#8518_92-B	CONTINGENCY 'AEP_P1-2_#8518_92-B' OPEN BRANCH FROM BUS 942640 TO BUS 242634 CKT 1 / 942640 AE2-280 TAP 138 242634 05EDGEMO 138 1 END
Base Case	
AEP_P4_#2914_05J.FERR	CONTINGENCY '"AEP_P4_#2914_05J.FERR' 765_B2" / 1487 OPEN BRANCH FROM BUS 242512 TO BUS 242514 CKT 1 / 242512 05CLOVRD 765 242514 05J.FERR 765 1 OPEN BRANCH FROM BUS 242514 TO BUS 245993 CKT 4 / 242514 05J.FERR 765 245993 05J.FERR SVS 20.6 4 REMOVE SWSHUNT FROM BUS 242514 /* 242514 05J.FERR 765 END

12 Short Circuit Analysis - Primary POI

The following Breakers are overdutied

None

13 Summer Peak - Load Flow Analysis - Secondary POI

The Queue Project AG1-234 was evaluated as a 50.0 MW (Capacity 30.0 MW) injection tapping the Ronceverte to Greenbier 138 kV line in the AEP area. Project AG1-234 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-234 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)

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161611161	937350	AD2-179 TAP	138.0	AEP	242721	05MORGAN	138.0	AEP	1	AEP_P7-1_#15399	tower	167.0	99.12	102.46	DC	5.58

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	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
161610722	942640	AE2-280 TAP	138.0	AEP	242634	05EDGEMO	138.0	AEP	1	AEP_P2-2_#8520_05TECHDR 138_1	bus	240.0	108.41	108.89	DC	2.57

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.

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167893183	235376	01NETTIE	138.0	AP	235318	01CRUPRN	138.0	AP	1	FE-P1-2-MP-138-076	operation	192.0	124.39	125.01	DC	2.64
168153581	242608	05CLYTR 1	138.0	AEP	242791	05SCHRIS	138.0	AEP	1	AEP_P1-2_#8518_92-B	operation	167.0	140.49	141.34	DC	3.13
168153673	242791	05SCHRIS	138.0	AEP	243874	05TECHDR	138.0	AEP	1	AEP_P1-2_#311_5	operation	167.0	119.12	119.81	DC	2.57
168153714	243874	05TECHDR	138.0	AEP	242708	05M FUNK	138.0	AEP	1	AEP_P1-2_#311_5	operation	167.0	115.53	116.22	DC	2.57

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
169639105	937350	AD2-179 TAP	138.0	AEP	242721	05MORGAN	138.0	AEP	1	Base Case	operation	134.0	113.83	115.23	DC	4.18

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
161611161	937350	AD2-179 TAP	AEP	242721	05MORGAN	AEP	1	AEP_P7-1_#15399	tower	167.0	99.12	102.46	DC	5.58

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
937351	AD2-179 C O1	43.5564	50/50	43.5564
937352	AD2-179 E O1	29.0376	50/50	29.0376
939804	AE1-212 C O1	3.4553	Adder	4.07
939805	AE1-212 E O1	2.3777	Adder	2.8
958111	AF2-105 C	40.8636	50/50	40.8636
958112	AF2-105 E	27.2424	50/50	27.2424
962401	AG1-089 C	0.3725	Adder	0.83
962402	AG1-089 E	0.5587	Adder	1.24
962433	AG1-092 BAT	6.4119	50/50	6.4119
963811	AG1-234 C O2	3.3465	50/50	3.3465
963812	AG1-234 E O2	2.2310	50/50	2.2310
WEC	WEC	0.0684	Confirmed LTF	0.0684
LGEE	LGEE	0.1590	Confirmed LTF	0.1590
CBM-W2	CBM-W2	1.4605	Confirmed LTF	1.4605
NY	NY	0.0420	Confirmed LTF	0.0420
TVA	TVA	0.1932	Confirmed LTF	0.1932
O-066	O-066	0.6999	Confirmed LTF	0.6999
SIGE	SIGE	0.0352	Confirmed LTF	0.0352
CBM-S1	CBM-S1	0.0604	Confirmed LTF	0.0604
G-007	G-007	0.1113	Confirmed LTF	0.1113
HAMLET	HAMLET	0.1715	Confirmed LTF	0.1715
MEC	MEC	0.3178	Confirmed LTF	0.3178
LAGN	LAGN	0.2118	Confirmed LTF	0.2118
CATAWBA	CATAWBA	0.0763	Confirmed LTF	0.0763
CBM-W1	CBM-W1	2.9442	Confirmed LTF	2.9442

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
161610722	942640	AE2-280 TAP	AEP	242634	05EDGEMO	AEP	1	AEP_P2-2_#8520_05TECHDR 138_1	bus	240.0	108.41	108.89	DC	2.57

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
242906	05CLAY-1	1.5534	50/50	1.5534
242907	05CLAY-2	1.5559	50/50	1.5559
247619	Y1-049	0.1125	50/50	0.1125
934756	AD1-102 C	5.1850	50/50	5.1850
934757	AD1-102 E	34.7016	50/50	34.7016
937341	AD2-178 C O1	12.5244	50/50	12.5244
937342	AD2-178 E O1	8.3496	50/50	8.3496
937351	AD2-179 C O1	13.5132	50/50	13.5132
937352	AD2-179 E O1	9.0088	50/50	9.0088
942641	AE2-280 C O1	27.0182	50/50	27.0182
942642	AE2-280 E O1	18.0122	50/50	18.0122
958111	AF2-105 C	12.7944	50/50	12.7944
958112	AF2-105 E	8.5296	50/50	8.5296
958121	AF2-106 C	20.3949	50/50	20.3949
958122	AF2-106 E	13.5966	50/50	13.5966
962421	AG1-091 C	7.8191	50/50	7.8191
962422	AG1-091 E	4.2474	50/50	4.2474
963811	AG1-234 C O2	0.6947	Adder	1.54
963812	AG1-234 E O2	0.4631	Adder	1.03
WEC	WEC	0.0781	Confirmed LTF	0.0781
LGEE	LGEE	0.1759	Confirmed LTF	0.1759
CPLE	CPLE	0.1536	Confirmed LTF	0.1536
CBM-W2	CBM-W2	2.7866	Confirmed LTF	2.7866
NY	NY	0.0658	Confirmed LTF	0.0658
TVA	TVA	0.5124	Confirmed LTF	0.5124
O-066	O-066	0.9489	Confirmed LTF	0.9489
SIGE	SIGE	0.0440	Confirmed LTF	0.0440
CBM-S2	CBM-S2	3.3199	Confirmed LTF	3.3199
CBM-S1	CBM-S1	0.1330	Confirmed LTF	0.1330
G-007	G-007	0.1501	Confirmed LTF	0.1501
MEC	MEC	0.4306	Confirmed LTF	0.4306
LAGN	LAGN	0.5915	Confirmed LTF	0.5915
CBM-W1	CBM-W1	3.2667	Confirmed LTF	3.2667

13.6 Contingency Descriptions - Secondary POI

Contingency Name	Contingency Definition
FE-P1-2-MP-138-076	CONTINGENCY 'FE-P1-2-MP-138-076' / 371 OPEN BRANCH FROM BUS 235340 TO BUS 235410 CKT 1 / 235340 01GRASSY 138 235410 01SUMMRV 138 1 END
AEP_P1-2_#311_5	CONTINGENCY 'AEP_P1-2_#311_5' / 157 OPEN BRANCH FROM BUS 242512 TO BUS 242514 CKT 1 / 242512 05CLOVRD 765 242514 05J.FERR 765 1 END
AEP_P2-2_#8520_05TECHDR 138_1	CONTINGENCY 'AEP_P2-2_#8520_05TECHDR 138_1' OPEN BRANCH FROM BUS 242608 TO BUS 242791 CKT 1 / 242608 05CLYTR1 138 242791 05SCHRIS 138 1 OPEN BRANCH FROM BUS 242708 TO BUS 243874 CKT 1 / 242708 05M FUNK 138 243874 05TECHDR 138 1 OPEN BRANCH FROM BUS 242791 TO BUS 243874 CKT 1 / 242791 05SCHRIS 138 243874 05TECHDR 138 1 OPEN BRANCH FROM BUS 242791 TO BUS 244118 CKT 1 / 242791 05SCHRIS 138 244118 05SCHRISTB 69.0 1 END
AEP_P7-1_#15399	CONTINGENCY 'AEP_P7-1_#15399' OPEN BRANCH FROM BUS 242650 TO BUS 242694 CKT 1 / 242650 05GLENL1 138 242694 05KIMBAL 138 1 OPEN BRANCH FROM BUS 242587 TO BUS 242749 CKT 1 / 242587 05CELAN 138 242749 05PETERM 138 1 OPEN BRANCH FROM BUS 242651 TO BUS 242749 CKT 1 / 242651 05GLENL2 138 242749 05PETERM 138 1 END
AEP_P1-2_#8518_92-B	CONTINGENCY 'AEP_P1-2_#8518_92-B' / 576 OPEN BRANCH FROM BUS 242634 TO BUS 942640 CKT 1 / 242634 05EDGEMO 138 942640 AE2-280 TAP 138 1 END
Base Case	

14 Affected Systems

14.1 TVA

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

14.2 Duke Energy Progress

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

14.3 MISO

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

14.4 LG&E

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