



**Generation Interconnection  
Feasibility Study Report  
for  
Queue Project AG1-124  
GLADSTONE 138 KV  
58.9 MW Capacity / 100 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.

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.

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 Nelson County, Virginia. The installed facilities will have a total capability of 100 MW with 58.9 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is December 01, 2024. This study does not imply a TO commitment to this in-service date.

|                            |                         |
|----------------------------|-------------------------|
| <b>Queue Number</b>        | <b>AG1-124</b>          |
| <b>Project Name</b>        | <b>GLADSTONE 138 KV</b> |
| <b>State</b>               | Virginia                |
| <b>County</b>              | Nelson                  |
| <b>Transmission Owner</b>  | AEP                     |
| <b>MFO</b>                 | 100                     |
| <b>MWE</b>                 | 100                     |
| <b>MWC</b>                 | 58.9                    |
| <b>Fuel</b>                | Solar                   |
| <b>Basecase Study Year</b> | 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

AG1-124 will interconnect with the AEP transmission system at the Gladstone 138 kV substation. The baseline project b3208 replaces the existing Gladstone 46 kV switch station to 138 kV substation.

To accommodate the interconnection to the Gladstone 138 kV substation, three (3) new 138 kV circuit breakers will be installed (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

AG1-124 will interconnect with the AEP transmission system via a new station cut into the Amherst – Riverville section of the Boxwood – Riverville 138 kV circuit.

To accommodate the interconnection on the Amherst – Riverville section of the Boxwood – Riverville 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 AG1-124 project will be responsible for the following costs:

| Description                                 | Total Cost          |
|---------------------------------------------|---------------------|
| <b>Total Physical Interconnection Costs</b> | <b>\$8,971,000</b>  |
| <b>Total System Network Upgrade Costs</b>   | <b>\$12,144,000</b> |
| <b>Total Costs</b>                          | <b>\$21,115,000</b> |

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        |
| <b>Total Attachment Facility Costs</b>                                                             | <b>\$776,000</b> |

### 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         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Three (3) new 138 kV circuit breakers will be installed at the Gladstone 138 kV substation. Installation of associated protection and control equipment, 138 kV line risers, and SCADA will also be required. | \$8,150,000        |
| <b>Total Direct Connection Facility Costs</b>                                                                                                                                                                 | <b>\$8,150,000</b> |

### 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      |
|--------------------------------------------------------------------------------|-----------------|
| Review line protection and control settings at the Gladstone 138 kV substation | \$45,000        |
| <b>Total Non-Direct Connection Facility Costs</b>                              | <b>\$45,000</b> |



## 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/meter<sup>2</sup>) - (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 AG1-124 was evaluated as a 100.0 MW (Capacity 58.9 MW) injection at the Gladstone 138 kV substation in the AEP area. Project AG1-124 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-124 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)

| 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 |
|-----------|-----------|----------|-------|---------------|---------|---------|-------|-------------|--------|---------------------------------------------------|--------|------------|-----------------------|------------------------|-------|-----------|
| 167837942 | 242549    | 05BANSTR | 138.0 | AEP           | 242632  | 05EDAN2 | 138.0 | AEP         | 1      | AEP_P2-1_24272005MONETA138 24277505ROCKCASS 138 1 | single | 296.0      | 99.36                 | 100.76                 | DC    | 4.14      |

## 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 |
|-----------|-----------|----------|-------|---------------|---------|--------|-------|-------------|--------|-------------------------|-------|------------|-----------------------|------------------------|-------|-----------|
| 166901007 | 314746    | 4BREMO   | 138.0 | DVP           | 314744  | 3BREMO | 115.0 | DVP         | 1      | DVP_P7-1: LN 555-2168-A | tower | 228.0      | 95.53                 | 100.45                 | DC    | 11.23     |

## 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 |
|-----------|-----------|-------------|-------|---------------|---------|--------|-------|-------------|--------|-------------------------|---------|------------|-----------------------|------------------------|-------|-----------|
| 163996387 | 314746    | 4BREMO      | 138.0 | DVP           | 314744  | 3BREMO | 115.0 | DVP         | 1      | DVP_P2-2: BREMO B1      | bus     | 228.0      | 102.62                | 104.59                 | DC    | 9.94      |
| 166901006 | 314746    | 4BREMO      | 138.0 | DVP           | 314744  | 3BREMO | 115.0 | DVP         | 1      | DVP_P7-1: LN 2106-2111  | tower   | 228.0      | 101.98                | 106.83                 | DC    | 11.07     |
| 163996297 | 938820    | AE1-108 TAP | 138.0 | DVP           | 314746  | 4BREMO | 138.0 | DVP         | 1      | DVP_P2-2: BREMO B1      | bus     | 173.0      | 135.25                | 137.84                 | DC    | 9.94      |
| 163996298 | 938820    | AE1-108 TAP | 138.0 | DVP           | 314746  | 4BREMO | 138.0 | DVP         | 1      | DVP_P2-2: DOOMS B2      | bus     | 173.0      | 122.5                 | 128.83                 | DC    | 10.95     |
| 166900933 | 938820    | AE1-108 TAP | 138.0 | DVP           | 314746  | 4BREMO | 138.0 | DVP         | 1      | DVP_P7-1: LN 2106-2111  | tower   | 173.0      | 134.4                 | 140.8                  | DC    | 11.07     |
| 166900934 | 938820    | AE1-108 TAP | 138.0 | DVP           | 314746  | 4BREMO | 138.0 | DVP         | 1      | DVP_P7-1: LN 555-2168-A | tower   | 173.0      | 125.9                 | 132.39                 | DC    | 11.23     |
| 167063741 | 938820    | AE1-108 TAP | 138.0 | DVP           | 314746  | 4BREMO | 138.0 | DVP         | 1      | AP-P2-3-PE-500-014      | breaker | 173.0      | 121.79                | 128.2                  | DC    | 11.09     |
| 167063742 | 938820    | AE1-108 TAP | 138.0 | DVP           | 314746  | 4BREMO | 138.0 | DVP         | 1      | AP-P2-3-PE-500-015      | breaker | 173.0      | 121.79                | 128.2                  | DC    | 11.09     |

## 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 PROJE CT LOADIN G % | POST PROJE CT LOADIN G % | AC/D C | MW IMPAC T |
|------------|-----------|--------------|--------|---------------|---------|-------------|--------|-------------|---------|---------------------------------------------------------|------------|----------------|-------------------------|--------------------------|--------|------------|
| 1678379 39 | 24254 9   | 05BANSTR     | 138. 0 | AEP           | 24263 2 | 05EDAN 2    | 138. 0 | AEP         | 1       | AEP_P2-1_242720 05MONET A 138 242775 05ROCKCA S S 138 1 | operati on | 296.0          | 140.35                  | 141.43                   | DC     | 7.03       |
| 1678379 41 | 24254 9   | 05BANSTR     | 138. 0 | AEP           | 24263 2 | 05EDAN 2    | 138. 0 | AEP         | 1       | Base Case                                               | operati on | 296.0          | 112.8                   | 113.71                   | DC     | 5.94       |
| 1678381 77 | 24255 0   | 05BEARSK     | 138. 0 | AEP           | 94008 0 | AE1-250 TAP | 138. 0 | AEP         | 1       | AEP_P2-1_242607 05CLOVRD 138 243892 05MEADS8 138 1      | operati on | 392.0          | 102.6                   | 103.41                   | DC     | 7.03       |
| 1681074 38 | 24277 5   | 05ROCKCA S S | 138. 0 | AEP           | 24272 0 | 05MONE TA   | 138. 0 | AEP         | 1       | AEP_P2-1_242549 05BANSTR 138 940080 AE1-250 TAP 138 1-A | operati on | 409.0          | 101.54                  | 102.16                   | DC     | 5.6        |
| 1681074 39 | 24277 5   | 05ROCKCA S S | 138. 0 | AEP           | 24272 0 | 05MONE TA   | 138. 0 | AEP         | 1       | AEP_P1-2_#5366_4 2-A                                    | operati on | 409.0          | 101.54                  | 102.16                   | DC     | 5.6        |
| 1681073 31 | 24280 2   | 05SMITHM TN  | 138. 0 | AEP           | 92605 0 | AC1-083 TAP | 138. 0 | AEP         | 1       | AEP_P2-1_242607 05CLOVRD 138 243892 05MEADS8 138 1      | operati on | 296.0          | 115.57                  | 116.64                   | DC     | 7.03       |
| 1681073 73 | 24389 2   | 05MEADS8     | 138. 0 | AEP           | 24260 7 | 05CLOVR D   | 138. 0 | AEP         | 1       | AEP_P1-2_#5366_4 2-A                                    | operati on | 407.0          | 110.8                   | 111.43                   | DC     | 5.6        |
| 1693431 21 | 31474 6   | 4BREMO       | 138. 0 | DVP           | 31474 4 | 3BREMO      | 115. 0 | DVP         | 1       | Base Case                                               | operati on | 186.1199951 17 | 109.68                  | 115.64                   | DC     | 11.09      |
| 1678379 66 | 92605 0   | AC1-083 TAP  | 138. 0 | AEP           | 24255 0 | 05BEARSK    | 138. 0 | AEP         | 1       | AEP_P2-1_242607 05CLOVRD 138 243892 05MEADS8 138 1      | operati on | 296.0          | 135.91                  | 136.98                   | DC     | 7.03       |
| 1678379 68 | 92605 0   | AC1-083 TAP  | 138. 0 | AEP           | 24255 0 | 05BEARSK    | 138. 0 | AEP         | 1       | Base Case                                               | operati on | 296.0          | 105.7                   | 106.61                   | DC     | 5.94       |

| 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 |
|-----------|-----------|-------------|-------|---------------|---------|-----------|-------|-------------|---------|----------------------------------------------|------------|---------------|------------------------|-------------------------|--------|------------|
| 169343010 | 938820    | AE1-108 TAP | 138.0 | DVP           | 314746  | 4BREMO    | 138.0 | DVP         | 1       | Base Case                                    | operati on | 156.979995728 | 130.04                 | 137.11                  | DC     | 11.09      |
| 169577649 | 940080    | AE1-250 TAP | 138.0 | AEP           | 242549  | 05BANST R | 138.0 | AEP         | 1       | AEP_P2-1_24260705CLOVRD13824389205MEADS81381 | operati on | 392.0         | 113.21                 | 114.03                  | DC     | 7.03       |
| 169577651 | 940080    | AE1-250 TAP | 138.0 | AEP           | 242549  | 05BANST R | 138.0 | AEP         | 1       | Base Case                                    | operati on | 335.0         | 102.12                 | 102.92                  | DC     | 5.94       |

## 11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

| ID                                                                          | Idx | Facility                                              | Upgrade Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Cost         |
|-----------------------------------------------------------------------------|-----|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| 163996387,166<br>901006,166901<br>007                                       | 2   | 4BREMO 138.0<br>kV - 3BREMO<br>115.0 kV Ckt 1         | <u>DVP</u><br>dom-362 (1893) : Add an additional 138/115 kV transformer at Bremo<br>Project Type : CON<br>Cost : \$7,000,000<br>Time Estimate : 16-18 Months                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | \$7,000,000  |
| 167837942                                                                   | 1   | 05BANSTR<br>138.0 kV -<br>05EDAN 2 138.0<br>kV Ckt 1  | <u>AEP</u><br>AEPA0010e (65) : A Sag Study will be required for the 10.7 miles of overhead conductor (2 bundle ACSR ~ 556.5 ~ 26/7 ~ DOVE) to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between \$42,800 (no remediation required, just sag study) and \$21.4 million (complete line reconductor/rebuild). New Rating after sag study is SN 298MVA, SE: 396MVA. 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.<br>Project Type : FAC<br>Cost : \$42,800<br>Time Estimate : 6-12 Months | \$42,800     |
| 163996298,167<br>063741,167063<br>742,163996297,<br>166900933,166<br>900934 | 3   | AE1-108 TAP<br>138.0 kV -<br>4BREMO 138.0<br>kV Ckt 1 | <u>DVP</u><br>dom-397 (1928) : Reconductor 8.502 miles of 138 kV line 8 from AE1-108 Tap to Bremo with 636 ACSR 150 C<br>Project Type : FAC<br>Cost : \$5,101,200<br>Time Estimate : 30-36 Months                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | \$5,101,200  |
|                                                                             |     |                                                       | TOTAL COST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | \$12,144,000 |

## 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 |
|-----------|-----------|----------|---------------|---------|-------------|-------------|--------|------------------------------------------------------------------------|--------|------------|-----------------------|------------------------|-------|-----------|
| 167837942 | 242549    | 05BANSTR | AEP           | 242632  | 05EDAN<br>2 | AEP         | 1      | AEP_P2-<br>1_242720<br>05MONETA<br>138 242775<br>05ROCKCAS<br>SS 138 1 | single | 296.0      | 99.36                 | 100.76                 | DC    | 4.14      |

| Bus #      | Bus          | Gendeliv MW Impact | Type          | Full MW Impact |
|------------|--------------|--------------------|---------------|----------------|
| 242889     | 05REUSENS    | 0.0515             | 80/20         | 0.0515         |
| 246843     | 05SMG1       | 3.5712             | 80/20         | 3.5712         |
| 246844     | 05SMG2       | 9.7076             | 80/20         | 9.7076         |
| 246845     | 05SMG3       | 6.0861             | 80/20         | 6.0861         |
| 246846     | 05SMG4       | 9.5567             | 80/20         | 9.5567         |
| 246847     | 05SMG5       | 3.7221             | 80/20         | 3.7221         |
| 247284     | 05LEESVG     | 1.9442             | 80/20         | 1.9442         |
| 315156     | 1HALLBR1     | 1.2904             | 80/20         | 1.2904         |
| 316123     | AC1-075 C    | 0.4585             | 80/20         | 0.4585         |
| 925661     | AC1-042 C    | 2.7205             | 80/20         | 2.7205         |
| 926023     | AC1-080 C    | 0.1532             | 80/20         | 0.1532         |
| 926051     | AC1-083 C O1 | 19.0954            | 80/20         | 19.0954        |
| 926521     | AC1-123 C O1 | 2.0209             | 80/20         | 2.0209         |
| 926645     | AC1-145 C    | 0.5110             | 80/20         | 0.5110         |
| 933941     | AD1-017 C    | 3.8191             | 80/20         | 3.8191         |
| 935241     | AD1-161 C    | 2.5993             | 80/20         | 2.5993         |
| 938451     | AE1-064 C    | 21.4559            | 80/20         | 21.4559        |
| 939941     | AE1-230 C    | 1.2273             | 80/20         | 1.2273         |
| 940081     | AE1-250 C    | 57.5154            | 80/20         | 57.5154        |
| 941801     | AE2-185 C    | 6.1366             | 80/20         | 6.1366         |
| 941821     | AE2-187 C    | 6.1366             | 80/20         | 6.1366         |
| 942671     | AE2-283 C    | 6.7502             | 80/20         | 6.7502         |
| 942751     | AE2-291 C    | 6.1176             | 80/20         | 6.1176         |
| 942761     | AE2-292 C O1 | 7.6170             | 80/20         | 7.6170         |
| 945081     | AF1-173      | 2.3779             | 80/20         | 2.3779         |
| 958131     | AF2-107 C    | 1.8934             | 80/20         | 1.8934         |
| 961121     | AF2-403      | 1.3637             | 80/20         | 1.3637         |
| 962741     | AG1-123 C O1 | 3.0900             | 80/20         | 3.0900         |
| 962751     | AG1-124 C O1 | 4.1436             | 80/20         | 4.1436         |
| 963601     | AG1-209 C    | 0.4773             | 80/20         | 0.4773         |
| 964141     | AG1-275 C    | 2.0455             | 80/20         | 2.0455         |
| 964151     | AG1-276 C    | 2.0455             | 80/20         | 2.0455         |
| 964251     | AG1-286 C    | 0.8361             | 80/20         | 0.8361         |
| 964531     | AG1-316 C O1 | 7.6979             | 80/20         | 7.6979         |
| 966251     | AG1-494 C    | 1.3718             | 80/20         | 1.3718         |
| 966691     | AG1-539 C    | 3.1987             | 80/20         | 3.1987         |
| 966761     | AG1-547 C    | 5.5468             | 80/20         | 5.5468         |
| CALDERWOOD | CALDERWOOD   | 0.3628             | Confirmed LTF | 0.3628         |
| NY         | NY           | 0.0553             | Confirmed LTF | 0.0553         |

| Bus #      | Bus        | Gendeliv MW Impact | Type          | Full MW Impact |
|------------|------------|--------------------|---------------|----------------|
| PRAIRIE    | PRAIRIE    | 0.7801             | Confirmed LTF | 0.7801         |
| CHEOAH     | CHEOAH     | 0.3804             | Confirmed LTF | 0.3804         |
| COTTONWOOD | COTTONWOOD | 1.2369             | Confirmed LTF | 1.2369         |
| HAMLET     | HAMLET     | 1.1966             | Confirmed LTF | 1.1966         |
| GIBSON     | GIBSON     | 0.0814             | Confirmed LTF | 0.0814         |
| BLUEG      | BLUEG      | 0.1962             | Confirmed LTF | 0.1962         |
| TRIMBLE    | TRIMBLE    | 0.0590             | Confirmed LTF | 0.0590         |
| CATAWBA    | CATAWBA    | 0.5712             | Confirmed LTF | 0.5712         |

## 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 |
|-----------|-----------|----------|---------------|---------|--------|-------------|--------|------------------------|-------|------------|-----------------------|------------------------|-------|-----------|
| 166901006 | 314746    | 4BREMO   | DVP           | 314744  | 3BREMO | DVP         | 1      | DVP_P7-1: LN 2106-2111 | tower | 228.0      | 101.98                | 106.83                 | DC    | 11.07     |

| Bus #  | Bus          | Gendeliv MW Impact | Type                  | Full MW Impact |
|--------|--------------|--------------------|-----------------------|----------------|
| 935241 | AD1-161 C    | 1.6457             | Adder                 | 1.94           |
| 935242 | AD1-161 E    | 1.3514             | Adder                 | 1.59           |
| 938821 | AE1-108 C O1 | 63.1217            | 50/50                 | 63.1217        |
| 938822 | AE1-108 E O1 | 28.3291            | 50/50                 | 28.3291        |
| 946293 | AF1-293 BAT  | 7.9115             | Merchant Transmission | 7.9115         |
| 946591 | AF1-323 C    | 20.1656            | 50/50                 | 20.1656        |
| 946592 | AF1-323 E    | 13.4438            | 50/50                 | 13.4438        |
| 958131 | AF2-107 C    | 8.9351             | 50/50                 | 8.9351         |
| 958132 | AF2-107 E    | 4.8964             | 50/50                 | 4.8964         |
| 960111 | AF2-302 C    | 7.3330             | 50/50                 | 7.3330         |
| 960112 | AF2-302 E    | 4.8886             | 50/50                 | 4.8886         |
| 961801 | AG1-022 C    | 7.3330             | 50/50                 | 7.3330         |
| 961802 | AG1-022 E    | 4.8886             | 50/50                 | 4.8886         |
| 962741 | AG1-123 C O1 | 5.9944             | 50/50                 | 5.9944         |
| 962742 | AG1-123 E O1 | 4.1771             | 50/50                 | 4.1771         |
| 962751 | AG1-124 C O1 | 6.5196             | 50/50                 | 6.5196         |
| 962752 | AG1-124 E O1 | 4.5494             | 50/50                 | 4.5494         |
| 964531 | AG1-316 C O1 | 1.6607             | Adder                 | 3.69           |
| 964532 | AG1-316 E O1 | 0.4152             | Adder                 | 0.92           |
| 965581 | AG1-426      | 13.7520            | 50/50                 | 13.7520        |
| 966251 | AG1-494 C    | 3.1736             | 50/50                 | 3.1736         |
| 966252 | AG1-494 E    | 4.7604             | 50/50                 | 4.7604         |
| WEC    | WEC          | 0.1559             | Confirmed LTF         | 0.1559         |
| LGEE   | LGEE         | 0.3387             | Confirmed LTF         | 0.3387         |
| CPL    | CPL          | 0.0607             | Confirmed LTF         | 0.0607         |
| CBM-W2 | CBM-W2       | 4.5965             | Confirmed LTF         | 4.5965         |
| NY     | NY           | 0.1288             | Confirmed LTF         | 0.1288         |
| TVA    | TVA          | 0.7490             | Confirmed LTF         | 0.7490         |
| O-066  | O-066        | 1.9652             | Confirmed LTF         | 1.9652         |
| SIGE   | SIGE         | 0.0860             | Confirmed LTF         | 0.0860         |
| CBM-S2 | CBM-S2       | 3.2677             | Confirmed LTF         | 3.2677         |
| CBM-S1 | CBM-S1       | 0.2037             | Confirmed LTF         | 0.2037         |
| G-007  | G-007        | 0.3098             | Confirmed LTF         | 0.3098         |
| MEC    | MEC          | 0.7993             | Confirmed LTF         | 0.7993         |
| LAGN   | LAGN         | 0.8908             | Confirmed LTF         | 0.8908         |
| CBM-W1 | CBM-W1       | 6.6455             | Confirmed LTF         | 6.6455         |

### 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 |
|-----------|-----------|-------------|---------------|---------|--------|-------------|--------|------------------------|-------|------------|-----------------------|------------------------|-------|-----------|
| 166900933 | 938820    | AE1-108 TAP | DVP           | 314746  | 4BREMO | DVP         | 1      | DVP_P7-1: LN 2106-2111 | tower | 173.0      | 134.4                 | 140.8                  | DC    | 11.07     |

| Bus #  | Bus          | Gendeliv MW Impact | Type                  | Full MW Impact |
|--------|--------------|--------------------|-----------------------|----------------|
| 935241 | AD1-161 C    | 1.6457             | Adder                 | 1.94           |
| 935242 | AD1-161 E    | 1.3514             | Adder                 | 1.59           |
| 938821 | AE1-108 C O1 | 63.1217            | 50/50                 | 63.1217        |
| 938822 | AE1-108 E O1 | 28.3291            | 50/50                 | 28.3291        |
| 946293 | AF1-293 BAT  | 7.9115             | Merchant Transmission | 7.9115         |
| 946591 | AF1-323 C    | 20.1656            | 50/50                 | 20.1656        |
| 946592 | AF1-323 E    | 13.4438            | 50/50                 | 13.4438        |
| 958131 | AF2-107 C    | 8.9351             | 50/50                 | 8.9351         |
| 958132 | AF2-107 E    | 4.8964             | 50/50                 | 4.8964         |
| 960111 | AF2-302 C    | 7.3330             | 50/50                 | 7.3330         |
| 960112 | AF2-302 E    | 4.8886             | 50/50                 | 4.8886         |
| 961801 | AG1-022 C    | 7.3330             | 50/50                 | 7.3330         |
| 961802 | AG1-022 E    | 4.8886             | 50/50                 | 4.8886         |
| 962741 | AG1-123 C O1 | 5.9944             | 50/50                 | 5.9944         |
| 962742 | AG1-123 E O1 | 4.1771             | 50/50                 | 4.1771         |
| 962751 | AG1-124 C O1 | 6.5196             | 50/50                 | 6.5196         |
| 962752 | AG1-124 E O1 | 4.5494             | 50/50                 | 4.5494         |
| 964531 | AG1-316 C O1 | 1.6607             | Adder                 | 3.69           |
| 964532 | AG1-316 E O1 | 0.4152             | Adder                 | 0.92           |
| 965581 | AG1-426      | 13.7520            | 50/50                 | 13.7520        |
| 966251 | AG1-494 C    | 3.1736             | 50/50                 | 3.1736         |
| 966252 | AG1-494 E    | 4.7604             | 50/50                 | 4.7604         |
| WEC    | WEC          | 0.1559             | Confirmed LTF         | 0.1559         |
| LGEE   | LGEE         | 0.3387             | Confirmed LTF         | 0.3387         |
| CPL    | CPL          | 0.0607             | Confirmed LTF         | 0.0607         |
| CBM-W2 | CBM-W2       | 4.5965             | Confirmed LTF         | 4.5965         |
| NY     | NY           | 0.1288             | Confirmed LTF         | 0.1288         |
| TVA    | TVA          | 0.7490             | Confirmed LTF         | 0.7490         |
| O-066  | O-066        | 1.9652             | Confirmed LTF         | 1.9652         |
| SIGE   | SIGE         | 0.0860             | Confirmed LTF         | 0.0860         |
| CBM-S2 | CBM-S2       | 3.2677             | Confirmed LTF         | 3.2677         |
| CBM-S1 | CBM-S1       | 0.2037             | Confirmed LTF         | 0.2037         |
| G-007  | G-007        | 0.3098             | Confirmed LTF         | 0.3098         |
| MEC    | MEC          | 0.7993             | Confirmed LTF         | 0.7993         |
| LAGN   | LAGN         | 0.8908             | Confirmed LTF         | 0.8908         |
| CBM-W1 | CBM-W1       | 6.6455             | Confirmed LTF         | 6.6455         |

## 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                      |
|--------------|---------------------------------------------|-----------------------------|
| 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                      |
| AC1-123      | Smith Mountain-Candler's Mountain 138kV     | Under Construction          |
| AC1-145      | Gretna DP 69 kV                             | Engineering and Procurement |
| AD1-017      | Smith Mountain-Bearskin 138 kV              | Active                      |
| AD1-161      | Stonewall-Long Mountain 69 kV               | Active                      |
| AE1-064      | Rockcastle 138 kV                           | Active                      |
| AE1-108      | Bremo-Scottsville 138 kV                    | Active                      |
| AE1-230      | Shockoe 69 kV                               | Active                      |
| AE1-250      | Smith Mountain-E. Danville 138 kV           | Active                      |
| AE2-185      | Gladys DP-Stonemill Switching Station 69 kV | Active                      |
| AE2-187      | Shockoe DP-Chatham 69 kV                    | Active                      |
| AE2-283      | Gladys-Stone Mill 69 kV                     | Active                      |
| AE2-291      | Grit DP-Perth 115 kV                        | Active                      |
| AE2-292      | Grit DP-Perth 115 kV                        | Active                      |
| AF1-173      | Gretna DP-Shockoe DP 69 kV                  | Active                      |
| AF1-293      | Kidds Store-Fort Union 115 kV               | Active                      |
| AF1-323      | Scottsville-Colleen 138 kV                  | Active                      |
| AF2-107      | Clifford 138 kV                             | Active                      |
| AF2-302      | Scottsville-Colleen 138 kV                  | Active                      |
| AF2-403      | Shockoe DP-Chatham 69 kV                    | Active                      |
| AG1-022      | Scottsville-Colleen 138 kV                  | Active                      |
| AG1-123      | Amherst-Riverville138 kV                    | Active                      |
| AG1-124      | Gladstone 138 kV                            | Active                      |
| AG1-209      | Gretna 12.5 kV                              | Active                      |
| AG1-275      | Gladys DP-Stone Mill 69 kV                  | Active                      |
| AG1-276      | Gladys DP-Stone Mill 69 kV                  | Active                      |
| AG1-286      | Johnson Mountain 138 kV                     | Active                      |
| AG1-316      | Rustburg 138 kV                             | Active                      |
| AG1-426      | Bremo-Scottsville 138 kV                    | Active                      |
| AG1-494      | Boxwood-Riverville 138 kV                   | Active                      |
| AG1-539      | Grit DP-Perth 115 kV                        | Active                      |
| AG1-547      | Mount Airy-Chatham 69 kV                    | Active                      |

## 11.8 Contingency Descriptions - Primary POI

| Contingency Name                                               | Contingency Definition                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AEP_P2-1_242549 05BANSTR 138 940080 AE1-250 TAP 138 1-A</b> | CONTINGENCY 'AEP_P2-1_242549 05BANSTR 138 940080 AE1-250 TAP 138 1-A'<br>OPEN BRANCH FROM BUS 242549 TO BUS 940080 CKT 1<br>END                                                                                                                                                                                                                                                                                                 |
| <b>AP-P2-3-PE-500-014</b>                                      | CONTINGENCY "'AP-P2-3-PE-500-014'" / 181<br>OPEN BRANCH FROM BUS 235103 TO BUS 964990 CKT 1 / 235103 01BLACKO 500<br>964990 AG1-363 TAP 500 1<br>OPEN BRANCH FROM BUS 235446 TO BUS 235103 CKT 3 / 235446 01BLACKO 138<br>235103 01BLACKO 500 3<br>OPEN BRANCH FROM BUS 235103 TO BUS 235130 CKT 1 / 235103 01BLACKO 500<br>235130 01BO_SVC 23.0 1<br>DECREASE BUS 235103 SHUNT BY 100.00 PERCENT /* 235103 01BLACKO 500<br>END |
| <b>AP-P2-3-PE-500-015</b>                                      | CONTINGENCY "'AP-P2-3-PE-500-015'" / 182<br>OPEN BRANCH FROM BUS 235103 TO BUS 964990 CKT 1 / 235103 01BLACKO 500<br>964990 AG1-363 TAP 500 1<br>OPEN BRANCH FROM BUS 235101 TO BUS 235103 CKT 1 / 235101 01BEDNGT 500<br>235103 01BLACKO 500 1<br>END                                                                                                                                                                          |
| <b>DVP_P2-2: DOOMS B2</b>                                      | CONTINGENCY 'DVP_P2-2: DOOMS B2' /* DOOMS 115 KV<br>OPEN BRANCH FROM BUS 314767 TO BUS 314793 CKT 1 /* 3MIDWAY 115.00 -<br>3DOOMS 115.00<br>OPEN BRANCH FROM BUS 314791 TO BUS 314793 CKT 1 /* 3BRND DP 115.00 -<br>3DOOMS 115.00<br>OPEN BRANCH FROM BUS 314793 TO BUS 314819 CKT 1 /* 3DOOMS 115.00 -<br>3WAYNSBO 115.00<br>END                                                                                               |
| <b>AEP_P2-1_242720 05MONETA 138 242775 05ROCKCAS SS 138 1</b>  | CONTINGENCY 'AEP_P2-1_242720 05MONETA 138 242775 05ROCKCAS SS 138 1'<br>OPEN BRANCH FROM BUS 242720 TO BUS 242775 CKT 1<br>END                                                                                                                                                                                                                                                                                                  |
| <b>AEP_P1-2_#5366_42-A</b>                                     | CONTINGENCY 'AEP_P1-2_#5366_42-A'<br>OPEN BRANCH FROM BUS 242549 TO BUS 940080 CKT 1 / 242549 05BANSTR 138<br>940080 AE1-250 TAP 138 1<br>OPEN BRANCH FROM BUS 242549 TO BUS 242632 CKT 1 / 242549 05BANSTR 138<br>242632 05EDAN 2 138 1<br>OPEN BRANCH FROM BUS 242549 TO BUS 314668 CKT Z1 / 242549 05BANSTR 138<br>314668 4BANISTR 138 Z1<br>END                                                                             |

| Contingency Name               | Contingency Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DVP_P2-2: BREMO B1</b>      | CONTINGENCY 'DVP_P2-2: BREMO B1' /* BREMO 230 KV<br>OPEN BRANCH FROM BUS 314326 TO BUS 314747 CKT 1 /* 6BEARGRDN 230.00 - 6BREMO 230.00<br>OPEN BRANCH FROM BUS 314326 TO BUS 315191 CKT 1 /* 6BEARGRDN 230.00 - 1BEARGRDN G118.000<br>OPEN BUS 315191 /* ISLAND: 1BEARGRDN G118.000<br>OPEN BRANCH FROM BUS 314326 TO BUS 314747 CKT 2 /* 6BEARGRDN 230.00 - 6BREMO 230.00<br>OPEN BRANCH FROM BUS 314326 TO BUS 315192 CKT 1 /* 6BEARGRDN 230.00 - 1BEARGRDN G218.000<br>OPEN BRANCH FROM BUS 314326 TO BUS 315193 CKT 1 /* 6BEARGRDN 230.00 - 1BEARGRDN S122.000<br>OPEN BUS 315192 /* ISLAND: 1BEARGRDN G218.000<br>OPEN BUS 315193 /* ISLAND: 1BEARGRDN S122.000<br>OPEN BRANCH FROM BUS 314677 TO BUS 314747 CKT 1 /* 6BUCKING 230.00 - 6BREMO 230.00<br>OPEN BRANCH FROM BUS 313868 TO BUS 314747 CKT 1 /* 6CARTERV 230.00 - 6BREMO 230.00<br>OPEN BRANCH FROM BUS 313867 TO BUS 314747 CKT 1 /* 6BREMODIST 230.00 - 6BREMO 230.00<br>OPEN BRANCH FROM BUS 314744 TO BUS 314747 CKT 1 /* 3BREMO 115.00 - 6BREMO 230.00<br>OPEN BUS 314747 /* 6BREMO 230.00 KV<br>OPEN BUS 314326 /* ISLAND: 6BEARGRDN 230.00<br>END |
| <b>DVP_P7-1: LN 555-2168-A</b> | CONTINGENCY 'DVP_P7-1: LN 555-2168-A' /* .<br>OPEN BRANCH FROM BUS 314907 TO BUS 314912 CKT 1 /* 8DOOMS 500.00 - 8LEXNGTN 500.00<br>OPEN BRANCH FROM BUS 314794 TO BUS 965530 CKT 1 /* 6DOOMS 230.00 - AG1-421 TAP 230.00<br>END                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Base Case</b>               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>DVP_P7-1: LN 2106-2111</b>  | CONTINGENCY 'DVP_P7-1: LN 2106-2111' /* .<br>OPEN BRANCH FROM BUS 314326 TO BUS 314747 CKT 1 /* 6BEARGRDN 230.00 - 6BREMO 230.00<br>OPEN BRANCH FROM BUS 314326 TO BUS 315191 CKT 1 /* 6BEARGRDN 230.00 - 1BEARGRDN G118.000<br>OPEN BUS 315191 /* ISLAND: 1BEARGRDN G118.000<br>OPEN BRANCH FROM BUS 314326 TO BUS 314747 CKT 2 /* 6BEARGRDN 230.00 - 6BREMO 230.00<br>OPEN BRANCH FROM BUS 314326 TO BUS 315192 CKT 1 /* 6BEARGRDN 230.00 - 1BEARGRDN G218.000<br>OPEN BRANCH FROM BUS 314326 TO BUS 315193 CKT 1 /* 6BEARGRDN 230.00 - 1BEARGRDN S122.000<br>OPEN BUS 315192 /* ISLAND: 1BEARGRDN G218.000<br>OPEN BUS 315193 /* ISLAND: 1BEARGRDN S122.000<br>END                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Contingency Name                                              | Contingency Definition                                                                                                     |
|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>AEP_P2-1_242607 05CLOVRD 138<br/>243892 05MEADS8 138 1</b> | CONTINGENCY 'AEP_P2-1_242607 05CLOVRD 138 243892 05MEADS8 138 1'<br>OPEN BRANCH FROM BUS 242607 TO BUS 243892 CKT 1<br>END |



## 12 Short Circuit Analysis - Primary POI

The following Breakers are overdutied

None

### **13 Summer Peak - Load Flow Analysis - Secondary POI**

The Queue Project AG1-124 was evaluated as a 100.0 MW (Capacity 58.9 MW) injection tapping the Amherst to Riverville 138 kV line in the AEP area. Project AG1-124 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-124 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 | CKT ID | CONT NAME       | Type    | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC/DC | MW IMPACT |
|-----------|-----------|-------------|-------|---------------|---------|----------|-------|-------------|--------|-----------------|---------|------------|-----------------------|------------------------|-------|-----------|
| 173803571 | 946590    | AF1-323 TAP | 138.0 | AEP           | 242792  | 05SCOTSV | 138.0 | AEP         | 1      | DVP_P4-2: 29822 | breaker | 167.0      | 96.08                 | 102.93                 | DC    | 11.43     |

### 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 |
|-----------|-----------|-------------|-------|---------------|---------|-----------|-------|-------------|--------|-------------------------------|---------|------------|-----------------------|------------------------|-------|-----------|
| 161488616 | 242549    | 05BANSTR    | 138.0 | AEP           | 242632  | 05EDAN2   | 138.0 | AEP         | 1      | AEP_P2-2_#6213_05WLAKE138_1   | bus     | 296.0      | 134.36                | 135.36                 | DC    | 6.54      |
| 161488981 | 242549    | 05BANSTR    | 138.0 | AEP           | 242632  | 05EDAN2   | 138.0 | AEP         | 1      | AEP_P7-1_#10830               | tower   | 296.0      | 134.36                | 135.36                 | DC    | 6.54      |
| 173803457 | 242549    | 05BANSTR    | 138.0 | AEP           | 242632  | 05EDAN2   | 138.0 | AEP         | 1      | AEP_P4_#10213_05CL OVRD 138_A | breaker | 296.0      | 133.5                 | 134.57                 | DC    | 7.02      |
| 173987697 | 242775    | 05ROCKCASS  | 138.0 | AEP           | 242720  | 05MONE TA | 138.0 | AEP         | 1      | AEP_P4_#10164_05EDAN 2 138_M  | breaker | 409.0      | 101.61                | 102.23                 | DC    | 5.61      |
| 173987656 | 243892    | 05MEADS8    | 138.0 | AEP           | 242607  | 05CLOVRD  | 138.0 | AEP         | 1      | AEP_P4_#10164_05EDAN 2 138_M  | breaker | 407.0      | 110.85                | 111.47                 | DC    | 5.61      |
| 163996387 | 314746    | 4BREMO      | 138.0 | DVP           | 314744  | 3BREMO    | 115.0 | DVP         | 1      | DVP_P2-2: BREMO B1            | bus     | 228.0      | 102.13                | 107.14                 | DC    | 11.43     |
| 174386764 | 314746    | 4BREMO      | 138.0 | DVP           | 314744  | 3BREMO    | 115.0 | DVP         | 1      | DVP_P4-2: 210622              | breaker | 228.0      | 102.13                | 107.14                 | DC    | 11.43     |
| 174386765 | 314746    | 4BREMO      | 138.0 | DVP           | 314744  | 3BREMO    | 115.0 | DVP         | 1      | DVP_P4-2: 29822               | breaker | 228.0      | 102.09                | 107.1                  | DC    | 11.43     |
| 163996297 | 938820    | AE1-108 TAP | 138.0 | DVP           | 314746  | 4BREMO    | 138.0 | DVP         | 1      | DVP_P2-2: BREMO B1            | bus     | 173.0      | 134.6                 | 141.21                 | DC    | 11.43     |
| 163996298 | 938820    | AE1-108 TAP | 138.0 | DVP           | 314746  | 4BREMO    | 138.0 | DVP         | 1      | DVP_P2-2: DOOMS B2            | bus     | 173.0      | 121.79                | 129.05                 | DC    | 12.57     |
| 166900933 | 938820    | AE1-108 TAP | 138.0 | DVP           | 314746  | 4BREMO    | 138.0 | DVP         | 1      | DVP_P7-1: LN 2106-2111        | tower   | 173.0      | 133.68                | 141.03                 | DC    | 12.72     |
| 166900934 | 938820    | AE1-108 TAP | 138.0 | DVP           | 314746  | 4BREMO    | 138.0 | DVP         | 1      | DVP_P7-1: LN 555-2168-A       | tower   | 173.0      | 125.18                | 132.62                 | DC    | 12.87     |
| 172849972 | 938820    | AE1-108 TAP | 138.0 | DVP           | 314746  | 4BREMO    | 138.0 | DVP         | 1      | DVP_P7-1: LN 555-2168-B       | tower   | 173.0      | 125.18                | 132.62                 | DC    | 12.87     |
| 174183624 | 938820    | AE1-108 TAP | 138.0 | DVP           | 314746  | 4BREMO    | 138.0 | DVP         | 1      | DVP_P4-2: 2106T2111           | breaker | 173.0      | 133.68                | 141.03                 | DC    | 12.72     |

### 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/D C | MW IMPA CT |
|------------|-----------|--------------|-------|---------------|---------|-------------|-------|-------------|---------|----------------------------------------------|------------|---------------|------------------------|-------------------------|--------|------------|
| 1678379 40 | 24254 9   | 05BANSTR     | 138.0 | AEP           | 24263 2 | 05EDAN 2    | 138.0 | AEP         | 1       | AEP_P1-2_#5419_105                           | operati on | 296.0         | 132.08                 | 133.15                  | DC     | 7.01       |
| 1678379 41 | 24254 9   | 05BANSTR     | 138.0 | AEP           | 24263 2 | 05EDAN 2    | 138.0 | AEP         | 1       | Base Case                                    | operati on | 296.0         | 112.84                 | 113.74                  | DC     | 5.91       |
| 1678381 77 | 24255 0   | 05BEARSK     | 138.0 | AEP           | 94008 0 | AE1-250 TAP | 138.0 | AEP         | 1       | AEP_P2-1_24260705CLOVRD13824389205MEADS81381 | operati on | 392.0         | 102.64                 | 103.45                  | DC     | 7.01       |
| 1681074 39 | 24277 5   | 05ROCKCA SSS | 138.0 | AEP           | 24272 0 | 05MONE TA   | 138.0 | AEP         | 1       | AEP_P1-2_#5366_42-A                          | operati on | 409.0         | 101.58                 | 102.2                   | DC     | 5.61       |
| 1681073 31 | 24280 2   | 05SMITHM TN  | 138.0 | AEP           | 92605 0 | AC1-083 TAP | 138.0 | AEP         | 1       | AEP_P2-1_24260705CLOVRD13824389205MEADS81381 | operati on | 296.0         | 115.62                 | 116.69                  | DC     | 7.01       |
| 1681073 73 | 24389 2   | 05MEADS8     | 138.0 | AEP           | 24260 7 | 05CLOVR D   | 138.0 | AEP         | 1       | AEP_P1-2_#5366_42-A                          | operati on | 407.0         | 110.84                 | 111.47                  | DC     | 5.61       |
| 1693431 21 | 31474 6   | 4BREMO       | 138.0 | DVP           | 31474 4 | 3BREMO      | 115.0 | DVP         | 1       | Base Case                                    | operati on | 186.119995117 | 109.01                 | 115.86                  | DC     | 12.74      |
| 1746090 25 | 31474 6   | 4BREMO       | 138.0 | DVP           | 31474 4 | 3BREMO      | 115.0 | DVP         | 1       | PJM_PLAN T BEAR GARDEN                       | operati on | 205.86000061  | 112.65                 | 118.84                  | DC     | 12.74      |
| 1678379 66 | 92605 0   | AC1-083 TAP  | 138.0 | AEP           | 24255 0 | 05BEARSK    | 138.0 | AEP         | 1       | AEP_P2-1_24260705CLOVRD13824389205MEADS81381 | operati on | 296.0         | 135.96                 | 137.03                  | DC     | 7.01       |
| 1678379 68 | 92605 0   | AC1-083 TAP  | 138.0 | AEP           | 24255 0 | 05BEARSK    | 138.0 | AEP         | 1       | Base Case                                    | operati on | 296.0         | 105.74                 | 106.65                  | DC     | 5.91       |
| 1693430 10 | 93882 0   | AE1-108 TAP  | 138.0 | DVP           | 31474 6 | 4BREMO      | 138.0 | DVP         | 1       | Base Case                                    | operati on | 156.979995728 | 129.25                 | 137.36                  | DC     | 12.74      |
| 1695776 49 | 94008 0   | AE1-250 TAP  | 138.0 | AEP           | 24254 9 | 05BANSTR    | 138.0 | AEP         | 1       | AEP_P2-1_24260705CLOVRD13824389205MEADS81381 | operati on | 392.0         | 113.25                 | 114.06                  | DC     | 7.01       |
| 1695776 51 | 94008 0   | AE1-250 TAP  | 138.0 | AEP           | 24254 9 | 05BANSTR    | 138.0 | AEP         | 1       | Base Case                                    | operati on | 335.0         | 102.15                 | 102.95                  | DC     | 5.91       |

### 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".

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### 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 |
|-----------|-----------|-------------|---------------|---------|----------|-------------|--------|-----------------|---------|------------|-----------------------|------------------------|-------|-----------|
| 173803571 | 946590    | AF1-323 TAP | AEP           | 242792  | 05SCOTSV | AEP         | 1      | DVP_P4-2: 29822 | breaker | 167.0      | 96.08                 | 102.93                 | DC    | 11.43     |

| Bus #  | Bus          | Gendeliv MW Impact | Type                  | Full MW Impact |
|--------|--------------|--------------------|-----------------------|----------------|
| 935241 | AD1-161 C    | 1.4796             | Adder                 | 1.74           |
| 935242 | AD1-161 E    | 1.2151             | Adder                 | 1.43           |
| 946293 | AF1-293 BAT  | 13.6367            | 50/50                 | 13.6367        |
| 946591 | AF1-323 C    | 18.1464            | 50/50                 | 18.1464        |
| 946592 | AF1-323 E    | 12.0976            | 50/50                 | 12.0976        |
| 958131 | AF2-107 C    | 8.0379             | 50/50                 | 8.0379         |
| 958132 | AF2-107 E    | 4.4046             | 50/50                 | 4.4046         |
| 960111 | AF2-302 C    | 6.5987             | 50/50                 | 6.5987         |
| 960112 | AF2-302 E    | 4.3991             | 50/50                 | 4.3991         |
| 961063 | AF2-397 BAT  | 4.2883             | Merchant Transmission | 4.2883         |
| 961801 | AG1-022 C    | 6.5987             | 50/50                 | 6.5987         |
| 961802 | AG1-022 E    | 4.3991             | 50/50                 | 4.3991         |
| 962741 | AG1-123 C O2 | 4.7294             | 50/50                 | 4.7294         |
| 962742 | AG1-123 E O2 | 3.2956             | 50/50                 | 3.2956         |
| 962751 | AG1-124 C O2 | 6.7323             | 50/50                 | 6.7323         |
| 962752 | AG1-124 E O2 | 4.6977             | 50/50                 | 4.6977         |
| 964531 | AG1-316 C O2 | 1.6619             | Adder                 | 3.69           |
| 964532 | AG1-316 E O2 | 0.4155             | Adder                 | 0.92           |
| 965582 | AG1-426 BAT  | 7.6246             | 50/50                 | 7.6246         |
| 966251 | AG1-494 C    | 2.8536             | 50/50                 | 2.8536         |
| 966252 | AG1-494 E    | 4.2804             | 50/50                 | 4.2804         |
| 966792 | AG1-550 BAT  | 7.3171             | 50/50                 | 7.3171         |
| WEC    | WEC          | 0.1405             | Confirmed LTF         | 0.1405         |
| LGEE   | LGEE         | 0.3041             | Confirmed LTF         | 0.3041         |
| CPL    | CPL          | 0.3269             | Confirmed LTF         | 0.3269         |
| CBM-W2 | CBM-W2       | 4.5786             | Confirmed LTF         | 4.5786         |
| NY     | NY           | 0.1377             | Confirmed LTF         | 0.1377         |
| TVA    | TVA          | 0.7826             | Confirmed LTF         | 0.7826         |
| O-066  | O-066        | 2.0123             | Confirmed LTF         | 2.0123         |
| SIGE   | SIGE         | 0.0819             | Confirmed LTF         | 0.0819         |
| CBM-S2 | CBM-S2       | 5.8151             | Confirmed LTF         | 5.8151         |
| CBM-S1 | CBM-S1       | 0.2071             | Confirmed LTF         | 0.2071         |
| G-007  | G-007        | 0.3171             | Confirmed LTF         | 0.3171         |
| MEC    | MEC          | 0.7468             | Confirmed LTF         | 0.7468         |
| LAGN   | LAGN         | 0.9397             | Confirmed LTF         | 0.9397         |
| CBM-W1 | CBM-W1       | 5.9445             | Confirmed LTF         | 5.9445         |

### 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 |
|-----------|-----------|----------|---------------|---------|----------|-------------|--------|-----------------|-------|------------|-----------------------|------------------------|-------|-----------|
| 161488981 | 242549    | 05BANSTR | AEP           | 242632  | 05EDAN 2 | AEP         | 1      | AEP_P7-1_#10830 | tower | 296.0      | 134.36                | 135.36                 | DC    | 6.54      |

| Bus #  | Bus          | Gendeliv MW Impact | Type  | Full MW Impact |
|--------|--------------|--------------------|-------|----------------|
| 244012 | 05PINNACLE   | -1.0308            | Adder | -1.21          |
| 246843 | 05SMG1       | 3.1825             | 50/50 | 3.1825         |
| 246844 | 05SMG2       | 8.6510             | 50/50 | 8.6510         |
| 246845 | 05SMG3       | 5.4237             | 50/50 | 5.4237         |
| 246846 | 05SMG4       | 8.5165             | 50/50 | 8.5165         |
| 246847 | 05SMG5       | 3.3170             | 50/50 | 3.3170         |
| 247284 | 05LEESVG     | 1.7344             | 50/50 | 1.7344         |
| 315156 | 1HALLBR1     | 1.1514             | 50/50 | 1.1514         |
| 925661 | AC1-042 C    | 2.4318             | 50/50 | 2.4318         |
| 925662 | AC1-042 E    | 3.9677             | 50/50 | 3.9677         |
| 925997 | AC1-075 E    | 1.2021             | Adder | 1.41           |
| 926024 | AC1-080 E    | 0.3988             | Adder | 0.47           |
| 926051 | AC1-083 C O1 | 18.0800            | 50/50 | 18.0800        |
| 926052 | AC1-083 E O1 | 29.4990            | 50/50 | 29.4990        |
| 926521 | AC1-123 C O1 | 1.8103             | 50/50 | 1.8103         |
| 926522 | AC1-123 E O1 | 5.3990             | 50/50 | 5.3990         |
| 926645 | AC1-145 C    | 0.4567             | 50/50 | 0.4567         |
| 926646 | AC1-145 E    | 2.5979             | 50/50 | 2.5979         |
| 933941 | AD1-017 C    | 3.6160             | 50/50 | 3.6160         |
| 933942 | AD1-017 E    | 5.8998             | 50/50 | 5.8998         |
| 935241 | AD1-161 C    | 2.0472             | Adder | 2.41           |
| 935242 | AD1-161 E    | 1.6811             | Adder | 1.98           |
| 938451 | AE1-064 C    | 16.0187            | 50/50 | 16.0187        |
| 938452 | AE1-064 E    | 8.2831             | 50/50 | 8.2831         |
| 939011 | AE1-130 C    | 8.0506             | 50/50 | 8.0506         |
| 939012 | AE1-130 E    | 4.0326             | 50/50 | 4.0326         |
| 939941 | AE1-230 C    | 1.0971             | 50/50 | 1.0971         |
| 939942 | AE1-230 E    | 1.9503             | 50/50 | 1.9503         |
| 940081 | AE1-250 C    | 55.6443            | 50/50 | 55.6443        |
| 940082 | AE1-250 E    | 37.0962            | 50/50 | 37.0962        |
| 941801 | AE2-185 C    | 5.4853             | 50/50 | 5.4853         |
| 941802 | AE2-185 E    | 3.6569             | 50/50 | 3.6569         |
| 941821 | AE2-187 C    | 5.4853             | 50/50 | 5.4853         |
| 941822 | AE2-187 E    | 2.4379             | 50/50 | 2.4379         |
| 942671 | AE2-283 C    | 6.0339             | 50/50 | 6.0339         |
| 942672 | AE2-283 E    | 3.1693             | 50/50 | 3.1693         |
| 942751 | AE2-291 C    | 4.5476             | Adder | 5.35           |
| 942752 | AE2-291 E    | 3.0317             | Adder | 3.57           |
| 942761 | AE2-292 C O1 | 5.6622             | Adder | 6.66           |
| 942762 | AE2-292 E O1 | 3.7748             | Adder | 4.44           |
| 945081 | AF1-173      | 2.1256             | 50/50 | 2.1256         |
| 958131 | AF2-107 C    | 1.4990             | Adder | 1.76           |

| Bus #      | Bus          | Gendeliv MW Impact | Type                  | Full MW Impact |
|------------|--------------|--------------------|-----------------------|----------------|
| 958132     | AF2-107 E    | 0.8215             | Adder                 | 0.97           |
| 961121     | AF2-403      | 1.2190             | 50/50                 | 1.2190         |
| 962741     | AG1-123 C O2 | 1.3783             | Adder                 | 3.06           |
| 962742     | AG1-123 E O2 | 0.9605             | Adder                 | 2.13           |
| 962751     | AG1-124 C O2 | 1.7364             | Adder                 | 3.85           |
| 962752     | AG1-124 E O2 | 1.2117             | Adder                 | 2.69           |
| 963601     | AG1-209 C    | 0.4266             | 50/50                 | 0.4266         |
| 963602     | AG1-209 E    | 0.6400             | 50/50                 | 0.6400         |
| 964141     | AG1-275 C    | 1.8284             | 50/50                 | 1.8284         |
| 964142     | AG1-275 E    | 1.2190             | 50/50                 | 1.2190         |
| 964151     | AG1-276 C    | 1.8284             | 50/50                 | 1.8284         |
| 964152     | AG1-276 E    | 1.2190             | 50/50                 | 1.2190         |
| 964251     | AG1-286 C    | 0.7535             | 50/50                 | 0.7535         |
| 964252     | AG1-286 E    | 0.5024             | 50/50                 | 0.5024         |
| 964531     | AG1-316 C O2 | 2.2994             | Adder                 | 5.1            |
| 964532     | AG1-316 E O2 | 0.5748             | Adder                 | 1.28           |
| 966251     | AG1-494 C    | 0.5765             | Adder                 | 1.28           |
| 966252     | AG1-494 E    | 0.8647             | Adder                 | 1.92           |
| 966691     | AG1-539 C    | 1.2602             | Adder                 | 2.8            |
| 966692     | AG1-539 E    | 1.6935             | Adder                 | 3.76           |
| 966703     | AG1-540 BAT  | 2.1728             | Merchant Transmission | 2.1728         |
| 966761     | AG1-547 C    | 4.9581             | 50/50                 | 4.9581         |
| 966762     | AG1-547 E    | 2.6604             | 50/50                 | 2.6604         |
| CALDERWOOD | CALDERWOOD   | 0.4001             | Confirmed LTF         | 0.4001         |
| NY         | NY           | 0.0415             | Confirmed LTF         | 0.0415         |
| PRAIRIE    | PRAIRIE      | 0.8111             | Confirmed LTF         | 0.8111         |
| O-066      | O-066        | 0.6259             | Confirmed LTF         | 0.6259         |
| CHEOAH     | CHEOAH       | 0.4199             | Confirmed LTF         | 0.4199         |
| COTTONWOOD | COTTONWOOD   | 1.3482             | Confirmed LTF         | 1.3482         |
| G-007      | G-007        | 0.0987             | Confirmed LTF         | 0.0987         |
| HAMLET     | HAMLET       | 1.3427             | Confirmed LTF         | 1.3427         |
| GIBSON     | GIBSON       | 0.0759             | Confirmed LTF         | 0.0759         |
| BLUEG      | BLUEG        | 0.1701             | Confirmed LTF         | 0.1701         |
| TRIMBLE    | TRIMBLE      | 0.0501             | Confirmed LTF         | 0.0501         |
| CATAWBA    | CATAWBA      | 0.6416             | Confirmed LTF         | 0.6416         |



### 13.5.3 Index 3

| ID        | FROM BUS# | FROM BUS   | FROM BUS AREA | TO BUS# | TO BUS   | TO BUS AREA | CK T ID | CONT NAME                    | Type    | Rating MVA | PRE PROJECT LOADIN G % | POST PROJECT LOADIN G % | AC/D C | MW IMPACT |
|-----------|-----------|------------|---------------|---------|----------|-------------|---------|------------------------------|---------|------------|------------------------|-------------------------|--------|-----------|
| 173987697 | 242775    | 05ROCKCASS | AEP           | 242720  | 05MONETA | AEP         | 1       | AEP_P4_#10164_05EDAN 2 138_M | breaker | 409.0      | 101.61                 | 102.23                  | DC     | 5.61      |

| Bus #  | Bus          | Gendeliv MW Impact | Type  | Full MW Impact |
|--------|--------------|--------------------|-------|----------------|
| 246843 | 05SMG1       | 3.7207             | 50/50 | 3.7207         |
| 246844 | 05SMG2       | 10.1141            | 50/50 | 10.1141        |
| 246845 | 05SMG3       | 6.3410             | 50/50 | 6.3410         |
| 246846 | 05SMG4       | 9.9569             | 50/50 | 9.9569         |
| 246847 | 05SMG5       | 3.8779             | 50/50 | 3.8779         |
| 247284 | 05LEESVG     | 2.0136             | 50/50 | 2.0136         |
| 315156 | 1HALLBR1     | 1.3319             | 50/50 | 1.3319         |
| 925661 | AC1-042 C    | 2.7845             | 50/50 | 2.7845         |
| 925662 | AC1-042 E    | 4.5432             | 50/50 | 4.5432         |
| 925997 | AC1-075 E    | 1.7025             | Adder | 2.0            |
| 926024 | AC1-080 E    | 0.5649             | Adder | 0.66           |
| 926051 | AC1-083 C O1 | 12.6221            | 50/50 | 12.6221        |
| 926052 | AC1-083 E O1 | 20.5939            | 50/50 | 20.5939        |
| 926521 | AC1-123 C O1 | 2.0526             | 50/50 | 2.0526         |
| 926522 | AC1-123 E O1 | 6.1217             | 50/50 | 6.1217         |
| 926645 | AC1-145 C    | 0.5230             | 50/50 | 0.5230         |
| 926646 | AC1-145 E    | 2.9747             | 50/50 | 2.9747         |
| 933941 | AD1-017 C    | 2.5244             | 50/50 | 2.5244         |
| 933942 | AD1-017 E    | 4.1188             | 50/50 | 4.1188         |
| 935241 | AD1-161 C    | 1.8626             | Adder | 2.19           |
| 935242 | AD1-161 E    | 1.5296             | Adder | 1.8            |
| 938451 | AE1-064 C    | 30.1491            | 50/50 | 30.1491        |
| 938452 | AE1-064 E    | 15.5897            | 50/50 | 15.5897        |
| 939941 | AE1-230 C    | 1.2562             | 50/50 | 1.2562         |
| 939942 | AE1-230 E    | 2.2332             | 50/50 | 2.2332         |
| 940081 | AE1-250 C    | 29.8944            | 50/50 | 29.8944        |
| 940082 | AE1-250 E    | 19.9296            | 50/50 | 19.9296        |
| 941801 | AE2-185 C    | 6.2809             | 50/50 | 6.2809         |
| 941802 | AE2-185 E    | 4.1873             | 50/50 | 4.1873         |
| 941821 | AE2-187 C    | 6.2809             | 50/50 | 6.2809         |
| 941822 | AE2-187 E    | 2.7915             | 50/50 | 2.7915         |
| 942671 | AE2-283 C    | 6.9090             | 50/50 | 6.9090         |
| 942672 | AE2-283 E    | 3.6290             | 50/50 | 3.6290         |
| 942751 | AE2-291 C    | 6.9132             | 50/50 | 6.9132         |
| 942752 | AE2-291 E    | 4.6088             | 50/50 | 4.6088         |
| 942761 | AE2-292 C O1 | 8.6076             | 50/50 | 8.6076         |
| 942762 | AE2-292 E O1 | 5.7384             | 50/50 | 5.7384         |
| 945081 | AF1-173      | 2.4339             | 50/50 | 2.4339         |
| 961121 | AF2-403      | 1.3958             | 50/50 | 1.3958         |
| 962741 | AG1-123 C O2 | 1.2067             | Adder | 2.68           |
| 962742 | AG1-123 E O2 | 0.8408             | Adder | 1.87           |
| 962751 | AG1-124 C O2 | 1.4878             | Adder | 3.3            |

| Bus #      | Bus          | Gendeliv MW Impact | Type          | Full MW Impact |
|------------|--------------|--------------------|---------------|----------------|
| 962752     | AG1-124 E O2 | 1.0382             | Adder         | 2.3            |
| 963601     | AG1-209 C    | 0.4885             | 50/50         | 0.4885         |
| 963602     | AG1-209 E    | 0.7328             | 50/50         | 0.7328         |
| 964141     | AG1-275 C    | 2.0936             | 50/50         | 2.0936         |
| 964142     | AG1-275 E    | 1.3958             | 50/50         | 1.3958         |
| 964151     | AG1-276 C    | 2.0936             | 50/50         | 2.0936         |
| 964152     | AG1-276 E    | 1.3958             | 50/50         | 1.3958         |
| 964251     | AG1-286 C    | 0.8191             | 50/50         | 0.8191         |
| 964252     | AG1-286 E    | 0.5461             | 50/50         | 0.5461         |
| 964471     | AG1-310 C    | 0.3026             | Adder         | 0.67           |
| 964472     | AG1-310 E    | 0.1491             | Adder         | 0.33           |
| 964531     | AG1-316 C O2 | 2.0920             | Adder         | 4.64           |
| 964532     | AG1-316 E O2 | 0.5230             | Adder         | 1.16           |
| 966251     | AG1-494 C    | 0.4966             | Adder         | 1.1            |
| 966252     | AG1-494 E    | 0.7449             | Adder         | 1.65           |
| 966691     | AG1-539 C    | 3.6147             | 50/50         | 3.6147         |
| 966692     | AG1-539 E    | 4.8573             | 50/50         | 4.8573         |
| 966761     | AG1-547 C    | 5.6773             | 50/50         | 5.6773         |
| 966762     | AG1-547 E    | 3.0462             | 50/50         | 3.0462         |
| CPLE       | CPLE         | 0.3344             | Confirmed LTF | 0.3344         |
| CALDERWOOD | CALDERWOOD   | 0.0318             | Confirmed LTF | 0.0318         |
| NY         | NY           | 0.0691             | Confirmed LTF | 0.0691         |
| PRAIRIE    | PRAIRIE      | 0.4779             | Confirmed LTF | 0.4779         |
| O-066      | O-066        | 0.7403             | Confirmed LTF | 0.7403         |
| CBM-S2     | CBM-S2       | 2.7353             | Confirmed LTF | 2.7353         |
| CHEOAH     | CHEOAH       | 0.0275             | Confirmed LTF | 0.0275         |
| COTTONWOOD | COTTONWOOD   | 0.2163             | Confirmed LTF | 0.2163         |
| G-007      | G-007        | 0.1145             | Confirmed LTF | 0.1145         |
| GIBSON     | GIBSON       | 0.1256             | Confirmed LTF | 0.1256         |
| BLUEG      | BLUEG        | 0.4218             | Confirmed LTF | 0.4218         |
| TRIMBLE    | TRIMBLE      | 0.1363             | Confirmed LTF | 0.1363         |

### 13.5.4 Index 4

| ID        | FROM BUS# | FROM BUS | FROM BUS AREA | TO BUS# | TO BUS   | TO BUS AREA | CK T ID | CONT NAME                    | Type    | Rating MVA | PRE PROJECT LOADIN G % | POST PROJECT LOADIN G % | AC/D C | MW IMPACT |
|-----------|-----------|----------|---------------|---------|----------|-------------|---------|------------------------------|---------|------------|------------------------|-------------------------|--------|-----------|
| 173987656 | 243892    | 05MEADS8 | AEP           | 242607  | 05CLOVRD | AEP         | 1       | AEP_P4_#10164_05EDAN 2 138_M | breaker | 407.0      | 110.85                 | 111.47                  | DC     | 5.61      |

| Bus #  | Bus          | Gendeliv MW Impact | Type  | Full MW Impact |
|--------|--------------|--------------------|-------|----------------|
| 246843 | 05SMG1       | 3.7207             | 50/50 | 3.7207         |
| 246844 | 05SMG2       | 10.1141            | 50/50 | 10.1141        |
| 246845 | 05SMG3       | 6.3410             | 50/50 | 6.3410         |
| 246846 | 05SMG4       | 9.9569             | 50/50 | 9.9569         |
| 246847 | 05SMG5       | 3.8779             | 50/50 | 3.8779         |
| 247284 | 05LEESVG     | 2.0136             | 50/50 | 2.0136         |
| 315156 | 1HALLBR1     | 1.3319             | 50/50 | 1.3319         |
| 925661 | AC1-042 C    | 2.7845             | 50/50 | 2.7845         |
| 925662 | AC1-042 E    | 4.5432             | 50/50 | 4.5432         |
| 925997 | AC1-075 E    | 1.7025             | Adder | 2.0            |
| 926024 | AC1-080 E    | 0.5649             | Adder | 0.66           |
| 926051 | AC1-083 C O1 | 12.6221            | 50/50 | 12.6221        |
| 926052 | AC1-083 E O1 | 20.5939            | 50/50 | 20.5939        |
| 926521 | AC1-123 C O1 | 2.0526             | 50/50 | 2.0526         |
| 926522 | AC1-123 E O1 | 6.1217             | 50/50 | 6.1217         |
| 926645 | AC1-145 C    | 0.5230             | 50/50 | 0.5230         |
| 926646 | AC1-145 E    | 2.9747             | 50/50 | 2.9747         |
| 933941 | AD1-017 C    | 2.5244             | 50/50 | 2.5244         |
| 933942 | AD1-017 E    | 4.1188             | 50/50 | 4.1188         |
| 935241 | AD1-161 C    | 1.8626             | Adder | 2.19           |
| 935242 | AD1-161 E    | 1.5296             | Adder | 1.8            |
| 938451 | AE1-064 C    | 30.1491            | 50/50 | 30.1491        |
| 938452 | AE1-064 E    | 15.5897            | 50/50 | 15.5897        |
| 939011 | AE1-130 C    | 37.6178            | 50/50 | 37.6178        |
| 939012 | AE1-130 E    | 18.8429            | 50/50 | 18.8429        |
| 939941 | AE1-230 C    | 1.2562             | 50/50 | 1.2562         |
| 939942 | AE1-230 E    | 2.2332             | 50/50 | 2.2332         |
| 940081 | AE1-250 C    | 29.8944            | 50/50 | 29.8944        |
| 940082 | AE1-250 E    | 19.9296            | 50/50 | 19.9296        |
| 941801 | AE2-185 C    | 6.2809             | 50/50 | 6.2809         |
| 941802 | AE2-185 E    | 4.1873             | 50/50 | 4.1873         |
| 941821 | AE2-187 C    | 6.2809             | 50/50 | 6.2809         |
| 941822 | AE2-187 E    | 2.7915             | 50/50 | 2.7915         |
| 942671 | AE2-283 C    | 6.9090             | 50/50 | 6.9090         |
| 942672 | AE2-283 E    | 3.6290             | 50/50 | 3.6290         |
| 942751 | AE2-291 C    | 6.9132             | 50/50 | 6.9132         |
| 942752 | AE2-291 E    | 4.6088             | 50/50 | 4.6088         |
| 942761 | AE2-292 C O1 | 8.6076             | 50/50 | 8.6076         |
| 942762 | AE2-292 E O1 | 5.7384             | 50/50 | 5.7384         |
| 945081 | AF1-173      | 2.4339             | 50/50 | 2.4339         |
| 961121 | AF2-403      | 1.3958             | 50/50 | 1.3958         |
| 962741 | AG1-123 C O2 | 1.2067             | Adder | 2.68           |

| Bus #      | Bus          | Gendeliv MW Impact | Type          | Full MW Impact |
|------------|--------------|--------------------|---------------|----------------|
| 962742     | AG1-123 E O2 | 0.8408             | Adder         | 1.87           |
| 962751     | AG1-124 C O2 | 1.4878             | Adder         | 3.3            |
| 962752     | AG1-124 E O2 | 1.0382             | Adder         | 2.3            |
| 963601     | AG1-209 C    | 0.4885             | 50/50         | 0.4885         |
| 963602     | AG1-209 E    | 0.7328             | 50/50         | 0.7328         |
| 964141     | AG1-275 C    | 2.0936             | 50/50         | 2.0936         |
| 964142     | AG1-275 E    | 1.3958             | 50/50         | 1.3958         |
| 964151     | AG1-276 C    | 2.0936             | 50/50         | 2.0936         |
| 964152     | AG1-276 E    | 1.3958             | 50/50         | 1.3958         |
| 964251     | AG1-286 C    | 0.8191             | 50/50         | 0.8191         |
| 964252     | AG1-286 E    | 0.5461             | 50/50         | 0.5461         |
| 964531     | AG1-316 C O2 | 2.0920             | Adder         | 4.64           |
| 964532     | AG1-316 E O2 | 0.5230             | Adder         | 1.16           |
| 966251     | AG1-494 C    | 0.4966             | Adder         | 1.1            |
| 966252     | AG1-494 E    | 0.7449             | Adder         | 1.65           |
| 966691     | AG1-539 C    | 3.6147             | 50/50         | 3.6147         |
| 966692     | AG1-539 E    | 4.8573             | 50/50         | 4.8573         |
| 966761     | AG1-547 C    | 5.6773             | 50/50         | 5.6773         |
| 966762     | AG1-547 E    | 3.0462             | 50/50         | 3.0462         |
| CPLE       | CPLE         | 0.3344             | Confirmed LTF | 0.3344         |
| CALDERWOOD | CALDERWOOD   | 0.0318             | Confirmed LTF | 0.0318         |
| NY         | NY           | 0.0691             | Confirmed LTF | 0.0691         |
| PRAIRIE    | PRAIRIE      | 0.4779             | Confirmed LTF | 0.4779         |
| O-066      | O-066        | 0.7403             | Confirmed LTF | 0.7403         |
| CBM-S2     | CBM-S2       | 2.7353             | Confirmed LTF | 2.7353         |
| CHEOAH     | CHEOAH       | 0.0275             | Confirmed LTF | 0.0275         |
| COTTONWOOD | COTTONWOOD   | 0.2163             | Confirmed LTF | 0.2163         |
| G-007      | G-007        | 0.1145             | Confirmed LTF | 0.1145         |
| GIBSON     | GIBSON       | 0.1256             | Confirmed LTF | 0.1256         |
| BLUEG      | BLUEG        | 0.4218             | Confirmed LTF | 0.4218         |
| TRIMBLE    | TRIMBLE      | 0.1363             | Confirmed LTF | 0.1363         |

### 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 |
|-----------|-----------|----------|---------------|---------|--------|-------------|--------|-----------------|---------|------------|-----------------------|------------------------|-------|-----------|
| 174386765 | 314746    | 4BREMO   | DVP           | 314744  | 3BREMO | DVP         | 1      | DVP_P4-2: 29822 | breaker | 228.0      | 102.09                | 107.1                  | DC    | 11.43     |

| Bus #  | Bus          | Gendeliv MW Impact | Type                  | Full MW Impact |
|--------|--------------|--------------------|-----------------------|----------------|
| 935241 | AD1-161 C    | 1.4796             | Adder                 | 1.74           |
| 935242 | AD1-161 E    | 1.2151             | Adder                 | 1.43           |
| 938821 | AE1-108 C O1 | 56.8031            | 50/50                 | 56.8031        |
| 938822 | AE1-108 E O1 | 25.4933            | 50/50                 | 25.4933        |
| 946293 | AF1-293 BAT  | 13.6367            | 50/50                 | 13.6367        |
| 946591 | AF1-323 C    | 18.1464            | 50/50                 | 18.1464        |
| 946592 | AF1-323 E    | 12.0976            | 50/50                 | 12.0976        |
| 958131 | AF2-107 C    | 8.0379             | 50/50                 | 8.0379         |
| 958132 | AF2-107 E    | 4.4046             | 50/50                 | 4.4046         |
| 960111 | AF2-302 C    | 6.5987             | 50/50                 | 6.5987         |
| 960112 | AF2-302 E    | 4.3991             | 50/50                 | 4.3991         |
| 961063 | AF2-397 BAT  | 4.2883             | Merchant Transmission | 4.2883         |
| 961801 | AG1-022 C    | 6.5987             | 50/50                 | 6.5987         |
| 961802 | AG1-022 E    | 4.3991             | 50/50                 | 4.3991         |
| 962741 | AG1-123 C O2 | 4.7294             | 50/50                 | 4.7294         |
| 962742 | AG1-123 E O2 | 3.2956             | 50/50                 | 3.2956         |
| 962751 | AG1-124 C O2 | 6.7323             | 50/50                 | 6.7323         |
| 962752 | AG1-124 E O2 | 4.6977             | 50/50                 | 4.6977         |
| 964531 | AG1-316 C O2 | 1.6619             | Adder                 | 3.69           |
| 964532 | AG1-316 E O2 | 0.4155             | Adder                 | 0.92           |
| 965581 | AG1-426      | 12.3754            | 50/50                 | 12.3754        |
| 966251 | AG1-494 C    | 2.8536             | 50/50                 | 2.8536         |
| 966252 | AG1-494 E    | 4.2804             | 50/50                 | 4.2804         |
| 966792 | AG1-550 BAT  | 7.3171             | 50/50                 | 7.3171         |
| WEC    | WEC          | 0.1405             | Confirmed LTF         | 0.1405         |
| LGEE   | LGEE         | 0.3041             | Confirmed LTF         | 0.3041         |
| CPL    | CPL          | 0.3269             | Confirmed LTF         | 0.3269         |
| CBM-W2 | CBM-W2       | 4.5786             | Confirmed LTF         | 4.5786         |
| NY     | NY           | 0.1377             | Confirmed LTF         | 0.1377         |
| TVA    | TVA          | 0.7826             | Confirmed LTF         | 0.7826         |
| O-066  | O-066        | 2.0123             | Confirmed LTF         | 2.0123         |
| SIGE   | SIGE         | 0.0819             | Confirmed LTF         | 0.0819         |
| CBM-S2 | CBM-S2       | 5.8151             | Confirmed LTF         | 5.8151         |
| CBM-S1 | CBM-S1       | 0.2071             | Confirmed LTF         | 0.2071         |
| G-007  | G-007        | 0.3171             | Confirmed LTF         | 0.3171         |
| MEC    | MEC          | 0.7468             | Confirmed LTF         | 0.7468         |
| LAGN   | LAGN         | 0.9397             | Confirmed LTF         | 0.9397         |
| CBM-W1 | CBM-W1       | 5.9445             | Confirmed LTF         | 5.9445         |

### 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 |
|-----------|-----------|-------------|---------------|---------|--------|-------------|--------|---------------------|---------|------------|-----------------------|------------------------|-------|-----------|
| 174183624 | 938820    | AE1-108 TAP | DVP           | 314746  | 4BREMO | DVP         | 1      | DVP_P4-2: 2106T2111 | breaker | 173.0      | 133.68                | 141.03                 | DC    | 12.72     |

| Bus #  | Bus          | Gendeliv MW Impact | Type                  | Full MW Impact |
|--------|--------------|--------------------|-----------------------|----------------|
| 935241 | AD1-161 C    | 1.6457             | Adder                 | 1.94           |
| 935242 | AD1-161 E    | 1.3514             | Adder                 | 1.59           |
| 938821 | AE1-108 C O1 | 63.1217            | 50/50                 | 63.1217        |
| 938822 | AE1-108 E O1 | 28.3291            | 50/50                 | 28.3291        |
| 946293 | AF1-293 BAT  | 7.9115             | Merchant Transmission | 7.9115         |
| 946591 | AF1-323 C    | 20.1656            | 50/50                 | 20.1656        |
| 946592 | AF1-323 E    | 13.4438            | 50/50                 | 13.4438        |
| 958131 | AF2-107 C    | 8.9351             | 50/50                 | 8.9351         |
| 958132 | AF2-107 E    | 4.8964             | 50/50                 | 4.8964         |
| 960111 | AF2-302 C    | 7.3330             | 50/50                 | 7.3330         |
| 960112 | AF2-302 E    | 4.8886             | 50/50                 | 4.8886         |
| 961801 | AG1-022 C    | 7.3330             | 50/50                 | 7.3330         |
| 961802 | AG1-022 E    | 4.8886             | 50/50                 | 4.8886         |
| 962741 | AG1-123 C O2 | 5.2594             | 50/50                 | 5.2594         |
| 962742 | AG1-123 E O2 | 3.6649             | 50/50                 | 3.6649         |
| 962751 | AG1-124 C O2 | 7.4909             | 50/50                 | 7.4909         |
| 962752 | AG1-124 E O2 | 5.2271             | 50/50                 | 5.2271         |
| 964531 | AG1-316 C O2 | 1.8484             | Adder                 | 4.1            |
| 964532 | AG1-316 E O2 | 0.4621             | Adder                 | 1.03           |
| 965581 | AG1-426      | 13.7520            | 50/50                 | 13.7520        |
| 966251 | AG1-494 C    | 3.1736             | 50/50                 | 3.1736         |
| 966252 | AG1-494 E    | 4.7604             | 50/50                 | 4.7604         |
| 966792 | AG1-550 BAT  | 4.2395             | 50/50                 | 4.2395         |
| WEC    | WEC          | 0.1559             | Confirmed LTF         | 0.1559         |
| LGEE   | LGEE         | 0.3387             | Confirmed LTF         | 0.3387         |
| CPL    | CPL          | 0.0607             | Confirmed LTF         | 0.0607         |
| CBM-W2 | CBM-W2       | 4.5965             | Confirmed LTF         | 4.5965         |
| NY     | NY           | 0.1288             | Confirmed LTF         | 0.1288         |
| TVA    | TVA          | 0.7490             | Confirmed LTF         | 0.7490         |
| O-066  | O-066        | 1.9652             | Confirmed LTF         | 1.9652         |
| SIGE   | SIGE         | 0.0860             | Confirmed LTF         | 0.0860         |
| CBM-S2 | CBM-S2       | 3.2677             | Confirmed LTF         | 3.2677         |
| CBM-S1 | CBM-S1       | 0.2037             | Confirmed LTF         | 0.2037         |
| G-007  | G-007        | 0.3098             | Confirmed LTF         | 0.3098         |
| MEC    | MEC          | 0.7993             | Confirmed LTF         | 0.7993         |
| LAGN   | LAGN         | 0.8925             | Confirmed LTF         | 0.8925         |
| CBM-W1 | CBM-W1       | 6.6455             | Confirmed LTF         | 6.6455         |

## 13.6 Contingency Descriptions - Secondary POI

| Contingency Name                    | Contingency Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AEP_P4_#10213_05CLOVRD 138_A</b> | CONTINGENCY 'AEP_P4_#10213_05CLOVRD 138_A' / 363<br>OPEN BRANCH FROM BUS 242560 TO BUS 242607 CKT 1 / 242560 05BONSCK 138<br>242607 05CLOVRD 138 1<br>OPEN BRANCH FROM BUS 242560 TO BUS 242840 CKT 1 / 242560 05BONSCK 138<br>242840 05VINTON 138 1<br>OPEN BRANCH FROM BUS 242607 TO BUS 243892 CKT 1 / 242607 05CLOVRD 138<br>243892 05MEADS8 138 1<br>OPEN BRANCH FROM BUS 242720 TO BUS 243892 CKT 1 / 242720 05MONETA 138<br>243892 05MEADS8 138 1<br>OPEN BRANCH FROM BUS 242720 TO BUS 242775 CKT 1 / 242720 05MONETA 138<br>242775 05ROCKCAS SS 138 1<br>OPEN BRANCH FROM BUS 242773 TO BUS 242840 CKT 1 / 242773 05ROANO1 138<br>242840 05VINTON 138 1<br>OPEN BRANCH FROM BUS 242775 TO BUS 242802 CKT 1 / 242775 05ROCKCAS SS<br>138 242802 05SMITHMTN 138 1<br>OPEN BRANCH FROM BUS 242775 TO BUS 245675 CKT Z1 / 242775 05ROCKCAS SS<br>138 245675 05WHITEHOU8 138 Z1<br>OPEN BRANCH FROM BUS 243892 TO BUS 243893 CKT Z1 / 243892 05MEADS8 138<br>243893 05MEADS 8 24.9 Z1<br>REMOVE LOAD C1 FROM BUS 242775 /* 242775 05ROCKCAS SS 138<br>DEFAULT DISPATCH<br>END                                                                   |
| <b>DVP_P4-2: 210622</b>             | CONTINGENCY 'DVP_P4-2: 210622' /* BREMO 230 KV<br>OPEN BRANCH FROM BUS 314326 TO BUS 314747 CKT 1 /* 6BEARGRDN 230.00 -<br>6BREMO 230.00<br>OPEN BRANCH FROM BUS 314326 TO BUS 315191 CKT 1 /* 6BEARGRDN 230.00 -<br>1BEARGRDN G118.000<br>OPEN BUS 315191 /* ISLAND: 1BEARGRDN G118.000<br>OPEN BRANCH FROM BUS 314326 TO BUS 314747 CKT 2 /* 6BEARGRDN 230.00 -<br>6BREMO 230.00<br>OPEN BRANCH FROM BUS 314326 TO BUS 315192 CKT 1 /* 6BEARGRDN 230.00 -<br>1BEARGRDN G218.000<br>OPEN BRANCH FROM BUS 314326 TO BUS 315193 CKT 1 /* 6BEARGRDN 230.00 -<br>1BEARGRDN S122.000<br>OPEN BUS 315192 /* ISLAND: 1BEARGRDN G218.000<br>OPEN BUS 315193 /* ISLAND: 1BEARGRDN S122.000<br>OPEN BRANCH FROM BUS 314677 TO BUS 314747 CKT 1 /* 6BUCKING 230.00 -<br>6BREMO 230.00<br>OPEN BRANCH FROM BUS 313868 TO BUS 314747 CKT 1 /* 6CARTERV 230.00 -<br>6BREMO 230.00<br>OPEN BRANCH FROM BUS 313867 TO BUS 314747 CKT 1 /* 6BREMODIST 230.00 -<br>6BREMO 230.00<br>OPEN BRANCH FROM BUS 314744 TO BUS 314747 CKT 1 /* 3BREMO 115.00 -<br>6BREMO 230.00<br>OPEN BUS 314747 /* 6BREMO 230.00 KV<br>OPEN BUS 314326 /* ISLAND: 6BEARGRDN 230.00<br>END |

| Contingency Name              | Contingency Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DVP_P2-2: DOOMS B2</b>     | CONTINGENCY 'DVP_P2-2: DOOMS B2' /* DOOMS 115 KV<br>OPEN BRANCH FROM BUS 314767 TO BUS 314793 CKT 1 /* 3MIDWAY 115.00 -<br>3DOOMS 115.00<br>OPEN BRANCH FROM BUS 314791 TO BUS 314793 CKT 1 /* 3BRND DP 115.00 -<br>3DOOMS 115.00<br>OPEN BRANCH FROM BUS 314793 TO BUS 314819 CKT 1 /* 3DOOMS 115.00 -<br>3WAYNSBO 115.00<br>END                                                                                                                                                                                                                                                                                                                                                    |
| <b>DVP_P4-2: 2106T2111</b>    | CONTINGENCY 'DVP_P4-2: 2106T2111' / 634<br>OPEN BRANCH FROM BUS 314326 TO BUS 314747 CKT 1 / 314326 6BEARGRDN 230<br>314747 6BREMO 230 1<br>OPEN BRANCH FROM BUS 314326 TO BUS 315191 CKT 1 / 314326 6BEARGRDN 230<br>315191 1BEARGRDN G1 18.0 1<br>OPEN BRANCH FROM BUS 314326 TO BUS 314747 CKT 2 / 314326 6BEARGRDN 230<br>314747 6BREMO 230 2<br>OPEN BRANCH FROM BUS 314326 TO BUS 315192 CKT 1 / 314326 6BEARGRDN 230<br>315192 1BEARGRDN G2 18.0 1<br>OPEN BRANCH FROM BUS 314326 TO BUS 315193 CKT 1 / 314326 6BEARGRDN 230<br>315193 1BEARGRDN S1 22.0 1<br>END                                                                                                             |
| <b>PJM_PLANT BEAR GARDEN</b>  | CONTINGENCY 'PJM_PLANT BEAR GARDEN' / 575<br>REMOVE MACHINE G1 FROM BUS 315191 /* 315191 1BEARGRDN G1 18.0<br>DEFAULT DISPATCH<br>REMOVE MACHINE G2 FROM BUS 315192 /* 315192 1BEARGRDN G2 18.0<br>DEFAULT DISPATCH<br>REMOVE MACHINE S1 FROM BUS 315193 /* 315193 1BEARGRDN S1 22.0<br>DEFAULT DISPATCH<br>END                                                                                                                                                                                                                                                                                                                                                                      |
| <b>DVP_P7-1: LN 2106-2111</b> | CONTINGENCY 'DVP_P7-1: LN 2106-2111' /* .<br>OPEN BRANCH FROM BUS 314326 TO BUS 314747 CKT 1 /* 6BEARGRDN 230.00 -<br>6BREMO 230.00<br>OPEN BRANCH FROM BUS 314326 TO BUS 315191 CKT 1 /* 6BEARGRDN 230.00 -<br>1BEARGRDN G118.000<br>OPEN BUS 315191 /* ISLAND: 1BEARGRDN G118.000<br>OPEN BRANCH FROM BUS 314326 TO BUS 314747 CKT 2 /* 6BEARGRDN 230.00 -<br>6BREMO 230.00<br>OPEN BRANCH FROM BUS 314326 TO BUS 315192 CKT 1 /* 6BEARGRDN 230.00 -<br>1BEARGRDN G218.000<br>OPEN BRANCH FROM BUS 314326 TO BUS 315193 CKT 1 /* 6BEARGRDN 230.00 -<br>1BEARGRDN S122.000<br>OPEN BUS 315192 /* ISLAND: 1BEARGRDN G218.000<br>OPEN BUS 315193 /* ISLAND: 1BEARGRDN S122.000<br>END |



| Contingency Name                    | Contingency Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AEP_P1-2_#5366_42-A</b>          | CONTINGENCY 'AEP_P1-2_#5366_42-A' / 325<br>OPEN BRANCH FROM BUS 242549 TO BUS 940080 CKT 1 / 242549 05BANSTR 138<br>940080 AE1-250 TAP 138 1<br>OPEN BRANCH FROM BUS 242549 TO BUS 242632 CKT 1 / 242549 05BANSTR 138<br>242632 05EDAN 2 138 1<br>OPEN BRANCH FROM BUS 242549 TO BUS 314668 CKT Z1 / 242549 05BANSTR 138<br>314668 4BANISTR 138 Z1<br>END                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>DVP_P2-2: BREMO B1</b>           | CONTINGENCY 'DVP_P2-2: BREMO B1' /* BREMO 230 KV<br>OPEN BRANCH FROM BUS 314326 TO BUS 314747 CKT 1 /* 6BEARGRDN 230.00 -<br>6BREMO 230.00<br>OPEN BRANCH FROM BUS 314326 TO BUS 315191 CKT 1 /* 6BEARGRDN 230.00 -<br>1BEARGRDN G118.000<br>OPEN BUS 315191 /* ISLAND: 1BEARGRDN G118.000<br>OPEN BRANCH FROM BUS 314326 TO BUS 314747 CKT 2 /* 6BEARGRDN 230.00 -<br>6BREMO 230.00<br>OPEN BRANCH FROM BUS 314326 TO BUS 315192 CKT 1 /* 6BEARGRDN 230.00 -<br>1BEARGRDN G218.000<br>OPEN BRANCH FROM BUS 314326 TO BUS 315193 CKT 1 /* 6BEARGRDN 230.00 -<br>1BEARGRDN S122.000<br>OPEN BUS 315192 /* ISLAND: 1BEARGRDN G218.000<br>OPEN BUS 315193 /* ISLAND: 1BEARGRDN S122.000<br>OPEN BRANCH FROM BUS 314677 TO BUS 314747 CKT 1 /* 6BUCKING 230.00 -<br>6BREMO 230.00<br>OPEN BRANCH FROM BUS 313868 TO BUS 314747 CKT 1 /* 6CARTERV 230.00 -<br>6BREMO 230.00<br>OPEN BRANCH FROM BUS 313867 TO BUS 314747 CKT 1 /* 6BREMODIST 230.00 -<br>6BREMO 230.00<br>OPEN BRANCH FROM BUS 314744 TO BUS 314747 CKT 1 /* 3BREMO 115.00 -<br>6BREMO 230.00<br>OPEN BUS 314747 /* 6BREMO 230.00 KV<br>OPEN BUS 314326 /* ISLAND: 6BEARGRDN 230.00<br>END |
| <b>AEP_P4_#10164_05EDAN 2 138_M</b> | CONTINGENCY 'AEP_P4_#10164_05EDAN 2 138_M'<br>OPEN BRANCH FROM BUS 242531 TO BUS 304094 CKT 1 / 242531 05EDANV2 230<br>304094 6YANCY TAP 230 1<br>OPEN BRANCH FROM BUS 242531 TO BUS 242632 CKT 4 / 242531 05EDANV2 230<br>242632 05EDAN 2 138 4<br>OPEN BRANCH FROM BUS 242549 TO BUS 940080 CKT 1 / 242549 05BANSTR 138<br>940080 AE1-250 TAP 138 1<br>OPEN BRANCH FROM BUS 242549 TO BUS 242632 CKT 1 / 242549 05BANSTR 138<br>242632 05EDAN 2 138 1<br>OPEN BRANCH FROM BUS 242549 TO BUS 314668 CKT Z1 / 242549 05BANSTR 138<br>314668 4BANISTR 138 Z1<br>OPEN BRANCH FROM BUS 242629 TO BUS 242632 CKT 1 / 242629 05E.MONU 138<br>242632 05EDAN 2 138 1<br>OPEN BRANCH FROM BUS 242631 TO BUS 242632 CKT Z1 / 242631 05EDAN 1 138<br>242632 05EDAN 2 138 Z1<br>END                                                                                                                                                                                                                                                                                                                                                                              |

| Contingency Name   | Contingency Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DVP_P4-2: 29822    | CONTINGENCY 'DVP_P4-2: 29822' /* BREMO 230 KV<br>OPEN BRANCH FROM BUS 314677 TO BUS 966860 CKT 1 /* 6BUCKING 230.00 - AG1-557 TAP 230.00<br>OPEN BRANCH FROM BUS 314677 TO BUS 314747 CKT 1 /* 6BUCKING 230.00 - 6BREMO 230.00<br>OPEN BUS 314677 /* ISLAND: 6BUCKING 230.00<br>OPEN BUS 924032 /* ISLAND: AB2-045 E 230.00<br>OPEN BUS 932511 /* ISLAND: AC2-071 C 230.00<br>OPEN BUS 932512 /* ISLAND: AC2-071 E 230.00<br>OPEN BRANCH FROM BUS 314326 TO BUS 314747 CKT 1 /* 6BEARGRDN 230.00 - 6BREMO 230.00<br>OPEN BRANCH FROM BUS 314326 TO BUS 315191 CKT 1 /* 6BEARGRDN 230.00 - 1BEARGRDN G118.000<br>OPEN BUS 315191 /* ISLAND: 1BEARGRDN G118.000<br>OPEN BRANCH FROM BUS 314326 TO BUS 314747 CKT 2 /* 6BEARGRDN 230.00 - 6BREMO 230.00<br>OPEN BRANCH FROM BUS 314326 TO BUS 315192 CKT 1 /* 6BEARGRDN 230.00 - 1BEARGRDN G218.000<br>OPEN BRANCH FROM BUS 314326 TO BUS 315193 CKT 1 /* 6BEARGRDN 230.00 - 1BEARGRDN S122.000<br>OPEN BUS 315192 /* ISLAND: 1BEARGRDN G218.000<br>OPEN BUS 315193 /* ISLAND: 1BEARGRDN S122.000<br>OPEN BRANCH FROM BUS 313868 TO BUS 314747 CKT 1 /* 6CARTERV 230.00 - 6BREMO 230.00<br>OPEN BRANCH FROM BUS 313867 TO BUS 314747 CKT 1 /* 6BREMODIST 230.00 - 6BREMO 230.00<br>OPEN BRANCH FROM BUS 314744 TO BUS 314747 CKT 1 /* 3BREMO 115.00 - 6BREMO 230.00<br>OPEN BUS 314747 /* 6BREMO 230.00 KV<br>OPEN BUS 314326 /* ISLAND: 6BEARGRDN 230.00<br>END |
| AEP_P1-2_#5419_105 | CONTINGENCY 'AEP_P1-2_#5419_105' / 337<br>OPEN BRANCH FROM BUS 242607 TO BUS 243892 CKT 1 / 242607 05CLOVRD 138 243892 05MEADS8 138 1<br>OPEN BRANCH FROM BUS 242720 TO BUS 243892 CKT 1 / 242720 05MONETA 138 243892 05MEADS8 138 1<br>OPEN BRANCH FROM BUS 242720 TO BUS 242775 CKT 1 / 242720 05MONETA 138 242775 05ROCKCAS SS 138 1<br>OPEN BRANCH FROM BUS 242775 TO BUS 242802 CKT 1 / 242775 05ROCKCAS SS 138 242802 05SMITHMTN 138 1<br>OPEN BRANCH FROM BUS 242775 TO BUS 245675 CKT Z1 / 242775 05ROCKCAS SS 138 245675 05WHITEHOU8 138 Z1<br>OPEN BRANCH FROM BUS 243892 TO BUS 243893 CKT Z1 / 243892 05MEADS8 138 243893 05MEADS 8 24.9 Z1<br>REMOVE LOAD C1 FROM BUS 242775 /* 242775 05ROCKCAS SS 138<br>DEFAULT DISPATCH<br>END                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| Contingency Name                                          | Contingency Definition                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DVP_P7-1: LN 555-2168-B</b>                            | CONTINGENCY 'DVP_P7-1: LN 555-2168-B' /* .<br>OPEN BRANCH FROM BUS 314907 TO BUS 314912 CKT 1 /* 8DOOMS 500.00 -<br>8LEXNGTN 500.00<br>OPEN BRANCH FROM BUS 965530 TO BUS 314854 CKT 1 /* AG1-421 TAP 230.00 -<br>6LEXNGT1 230.00<br>END                                                                                                                                                                                                       |
| <b>Base Case</b>                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>DVP_P7-1: LN 555-2168-A</b>                            | CONTINGENCY 'DVP_P7-1: LN 555-2168-A' /* .<br>OPEN BRANCH FROM BUS 314907 TO BUS 314912 CKT 1 /* 8DOOMS 500.00 -<br>8LEXNGTN 500.00<br>OPEN BRANCH FROM BUS 314794 TO BUS 965530 CKT 1 /* 6DOOMS 230.00 - AG1-<br>421 TAP 230.00<br>END                                                                                                                                                                                                        |
| <b>AEP_P2-2_#6213_05WLAKE 138_1</b>                       | CONTINGENCY 'AEP_P2-2_#6213_05WLAKE 138_1'<br>OPEN BRANCH FROM BUS 242748 TO BUS 243951 CKT 1 / 242748 05PENHOK 138<br>243951 05REDWOOD 138 1<br>OPEN BRANCH FROM BUS 242748 TO BUS 242802 CKT 1 / 242748 05PENHOK 138<br>242802 05SMITHMTN 138 1<br>OPEN BRANCH FROM BUS 242843 TO BUS 243951 CKT 1 / 242843 05WLAKE 138<br>243951 05REDWOOD 138 1<br>END                                                                                     |
| <b>AEP_P7-1_#10830</b>                                    | CONTINGENCY 'AEP_P7-1_#10830'<br>OPEN BRANCH FROM BUS 242555 TO BUS 242843 CKT 1 / 242555 05BLAINE 138<br>242843 05WLAKE 138 1<br>OPEN BRANCH FROM BUS 242748 TO BUS 243951 CKT 1 / 242748 05PENHOK 138<br>243951 05REDWOOD 138 1<br>OPEN BRANCH FROM BUS 242748 TO BUS 242802 CKT 1 / 242748 05PENHOK 138<br>242802 05SMITHMTN 138 1<br>OPEN BRANCH FROM BUS 242843 TO BUS 243951 CKT 1 / 242843 05WLAKE 138<br>243951 05REDWOOD 138 1<br>END |
| <b>AEP_P2-1_242607 05CLOVRD 138 243892 05MEADS8 138 1</b> | CONTINGENCY 'AEP_P2-1_242607 05CLOVRD 138 243892 05MEADS8 138 1'<br>OPEN BRANCH FROM BUS 242607 TO BUS 243892 CKT 1<br>END                                                                                                                                                                                                                                                                                                                     |

## **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).