



**Generation Interconnection  
System Impact Study Report  
for**

**Queue Project AG1-047**

**JAY 138 KV**

**60 MW Capacity / 100 MW Energy**

August 2021

## Table of Contents

|        |                                                              |    |
|--------|--------------------------------------------------------------|----|
| 1      | Introduction.....                                            | 4  |
| 2      | Preface.....                                                 | 4  |
| 3      | General .....                                                | 5  |
| 4      | Point of Interconnection.....                                | 6  |
| 5      | Cost Summary .....                                           | 6  |
| 6      | Transmission Owner Scope of Work .....                       | 8  |
| 6.1    | Attachment Facilities.....                                   | 8  |
| 6.2    | Direct Connection Cost Estimate.....                         | 8  |
| 6.3    | Non-Direct Connection Cost Estimate.....                     | 8  |
| 7      | Schedule.....                                                | 9  |
| 8      | Transmission Owner Analysis.....                             | 9  |
| 9      | Interconnection Customer Requirements.....                   | 9  |
| 10     | Revenue Metering and SCADA Requirements .....                | 10 |
| 10.1   | PJM Requirements .....                                       | 10 |
| 10.2   | Meteorological Data Reporting Requirements .....             | 10 |
| 10.3   | Interconnected Transmission Owner Requirements.....          | 10 |
| 11     | Summer Peak Analysis .....                                   | 11 |
| 11.1   | Generation Deliverability .....                              | 11 |
| 11.2   | Multiple Facility Contingency .....                          | 11 |
| 11.3   | Contribution to Previously Identified Overloads.....         | 11 |
| 11.4   | Steady-State Voltage Requirements.....                       | 11 |
| 11.5   | Potential Congestion due to Local Energy Deliverability..... | 11 |
| 11.6   | System Reinforcements.....                                   | 13 |
| 11.7   | Flow Gate Details.....                                       | 16 |
| 11.7.1 | Index 1 .....                                                | 16 |
| 11.7.2 | Index 2 .....                                                | 16 |
| 11.7.3 | Index 3 .....                                                | 17 |
| 11.7.4 | Index 4 .....                                                | 21 |
| 11.7.5 | Index 5 .....                                                | 26 |
| 11.7.6 | Index 6 .....                                                | 28 |
| 11.8   | Queue Dependencies .....                                     | 32 |

|      |                                                               |    |
|------|---------------------------------------------------------------|----|
| 11.9 | Contingency Descriptions.....                                 | 34 |
| 12   | Light Load Analysis.....                                      | 39 |
| 13   | Short Circuit Analysis.....                                   | 39 |
| 14   | Stability and Reactive Power .....                            | 39 |
| 15   | Affected Systems .....                                        | 40 |
| 15.1 | TVA.....                                                      | 40 |
| 15.2 | Duke Energy Progress.....                                     | 40 |
| 15.3 | MISO .....                                                    | 40 |
| 15.4 | LG&E.....                                                     | 40 |
| 16   | Attachment 1: One Line Diagram and Project Site Location..... | 41 |

## 1 Introduction

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

## 2 Preface

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

In some instances an Interconnection Customer may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection or merchant transmission upgrade, may also contribute to the need for the same network reinforcement. The possibility of sharing the reinforcement costs with other projects may be identified in the Feasibility Study, but the actual allocation will be deferred until the System Impact Study is performed.

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

The Interconnection Customer seeking to interconnect a wind or solar generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

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

### 3 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Jay County, Indiana. The installed facilities will have a total capability of 100 MW with 60 MW of this output being recognized by PJM as Capacity.

The proposed in-service date for this project is October 01, 2023. This study does not imply a TO commitment to this in-service date.

|                            |                |
|----------------------------|----------------|
| <b>Queue Number</b>        | <b>AG1-047</b> |
| <b>Project Name</b>        | JAY 138 KV     |
| <b>State</b>               | Indiana        |
| <b>County</b>              | Jay            |
| <b>Transmission Owner</b>  | AEP            |
| <b>MFO</b>                 | 100            |
| <b>MWE</b>                 | 100            |
| <b>MWC</b>                 | 60             |
| <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

AG1-047 will interconnect with the AEP transmission system via a direct connection to the Jay 138 kV station as an uprate to PJM project AC2-176/AG1-017.

Note: It is assumed that the existing 138 kV revenue metering system, generation lead and protection & control equipment that will be installed for AC2-176/AG1-017 will be adequate for the increased generation of AG1-047. Depending on the timing of the completion of the AC2-176/AG1-017 interconnection construction relative to the AG1-047 completion, there may (or may not) be a need to review and revise the relay settings for the increased generation of AG1-047.

## 5 Cost Summary

The AG1-047 project will be responsible for the following costs:

| Description                                                                            | Total Cost         |
|----------------------------------------------------------------------------------------|--------------------|
| <b>Total Physical Interconnection Costs</b>                                            | \$45,000           |
| <b>Allocation towards System Network Upgrade Costs (PJM Identified - Summer Peak)*</b> | \$1,739,000        |
| <b>Allocation towards System Network Upgrade Costs (PJM Identified - Light Load)*</b>  | \$0                |
| <b>Allocation towards System Network Upgrade Costs (TO Identified)*</b>                | \$0                |
| <b>Total Costs</b>                                                                     | <b>\$1,784,000</b> |

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

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.

This cost excludes a Federal Income Tax Gross Up charges. This tax may or may not be charged based on whether this project meets the eligibility requirements of IRS Notice 88-129. If at a future date it is determined that the Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

Note 1: PJM Open Access Transmission Tariff (OATT) section 217.3A outline cost allocation rules. The rules are further clarified in PJM Manual 14A Attachment B. The allocation of costs for a network upgrade will start with the first Queue project to cause the need for the upgrade. Later queue projects will receive cost

allocation contingent on their contribution to the violation and are allocated to the queues that have not closed less than 5 years following the execution of the first Interconnection Service Agreement which identifies the need for this upgrade.

Note 2: For customers with System Reinforcements listed: If your present cost allocation to a System Reinforcement indicates \$0, then please be aware that as changes to the interconnection process occur, such as prior queued projects withdrawing from the queue, reducing in size, etc, the cost responsibilities can change and a cost allocation may be assigned to your project. In addition, although your present cost allocation to a System Reinforcement is presently \$0, your project may need this system reinforcement completed to be deliverable to the PJM system. If your project comes into service prior to completion of the system reinforcement, an interim deliverability study for your project will be required.

## 6 Transmission Owner Scope of Work

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

### 6.1 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 |
|----------------------------------------|------------|
| None                                   | \$0        |
| <b>Total Attachment Facility Costs</b> | <b>\$0</b> |

### 6.2 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 |
|-----------------------------------------------|------------|
| None                                          | \$0        |
| <b>Total Direct Connection Facility Costs</b> | <b>\$0</b> |

### 6.3 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 protection and control settings at the Jay 138 kV station | \$45,000        |
| <b>Total Non-Direct Connection Facility Costs</b>                | <b>\$45,000</b> |



## 7 Schedule

Based on the scope of work for the interconnection facilities, it is expected to take a minimum of 12 to 18 months after the signing of an Interconnection Construction Service Agreement (or "Interconnection Agreement" if non-FERC) and construction kickoff call to complete the installation of the physical connection work. This assumes that there will be no environmental issues with any of the new properties associated with this project, that there will be no delays in acquiring the necessary permits for implementing the defined interconnection work, and that all system outages will be allowed when requested.

The schedule for any required Network Impact Reinforcements will be more clearly identified in future study phases. The estimated time to complete each of the required reinforcements is identified in the "System Reinforcements" section of the report.

## 8 Transmission Owner Analysis

AEP did not find any sub-transmission overloads with the interconnection of AG1-047.

## 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 Analysis

The Queue Project AG1-047 was evaluated as a 100.0 MW (Capacity 60.00 MW) injection at the Jay 138 kV substation in the AEP area. Project AG1-047 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-047 was studied with a commercial probability of 100.0 %. Potential network impacts were as follows:

### 11.1 Generation Deliverability

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

None

### 11.2 Multiple Facility Contingency

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

None

### 11.3 Contribution to Previously Identified Overloads

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

| ID        | FROM BUS # | FROM BUS     | kV    | FROM BUS AREA | TO BUS # | TO BUS    | kV    | TO BUS AREA | CK T ID | CONT NAME                          | Type    | Rating MVA | PRE PROJE CT LOADI NG % | POST PROJE CT LOADI NG % | AC DC | MW IMPA CT |
|-----------|------------|--------------|-------|---------------|----------|-----------|-------|-------------|---------|------------------------------------|---------|------------|-------------------------|--------------------------|-------|------------|
| 161406966 | 243233     | 05TANNER     | 345.0 | AEP           | 248001   | 06DEARB1  | 345.0 | OVERC       | Z1      | DEOK_P7_4504MFTANNERS4512EBTANNERS | tower   | 1204.0     | 131.92                  | 132.96                   | AC    | 14.44      |
| 164200101 | 243233     | 05TANNER     | 345.0 | AEP           | 248001   | 06DEARB1  | 345.0 | OVERC       | Z1      | AEP_P4_#14920_05TANNER345_T        | breaker | 1204.0     | 131.93                  | 132.96                   | AC    | 14.44      |
| 180309987 | 243262     | 05COLLEGEC   | 138.0 | AEP           | 250001   | 08COLI NV | 138.0 | DEO&K       | 1       | DEOK_P2-2_TRENTON2                 | bus     | 167.0      | 120.8                   | 123.41                   | AC    | 5.19       |
| 180310428 | 243262     | 05COLLEGEC   | 138.0 | AEP           | 250001   | 08COLI NV | 138.0 | DEO&K       | 1       | 914_TRENTON                        | breaker | 167.0      | 120.8                   | 123.41                   | AC    | 5.19       |
| 161407010 | 243792     | 05LOSANTVILL | 345.0 | AEP           | 243233   | 05TANNER  | 345.0 | AEP         | 2       | AEP_P7-1_#11019-D                  | tower   | 648.0      | 114.66                  | 115.81                   | AC    | 8.7        |
| 161407042 | 923880     | AB2-028TAP   | 345.0 | AEP           | 243222   | 05FALLC   | 345.0 | AEP         | 1       | AEP_P7-1_#11019-D                  | tower   | 1318.0     | 101.84                  | 103.05                   | AC    | 16.09      |

### 11.4 Steady-State Voltage Requirements

To be determined during the Facility Study phase.

### 11.5 Potential Congestion due to Local Energy Deliverability

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

Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection

Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

| ID        | FROM BUS# | FROM BUS    | KV    | FROM BUS AREA | TO BUS# | TO BUS      | KV    | TO BUS AREA | CK T ID | CONT NAME                 | Type      | Rating MVA | PRE PROJECTIONS T LOADING % | POST PROJECTIONS T LOADING % | ACID C | MW IMPACT |
|-----------|-----------|-------------|-------|---------------|---------|-------------|-------|-------------|---------|---------------------------|-----------|------------|-----------------------------|------------------------------|--------|-----------|
| 168076499 | 243218    | 05DESOTO    | 345.0 | AEP           | 958860  | AF2-177 TAP | 345.0 | AEP         | 2       | AEP_P1-2_#4817_6341       | operation | 971.0      | 108.8                       | 109.78                       | AC     | 11.2      |
| 164200430 | 243262    | 05COLLEGE C | 138.0 | AEP           | 250001  | 08COLIN V   | 138.0 | DEO&K       | 1       | DEOK_P1_TODHUNTER JCT 138 | operation | 167.0      | 119.24                      | 121.85                       | AC     | 5.19      |
| 168076347 | 944530    | AF1-118 TAP | 345.0 | AEP           | 243232  | 05SORENS    | 345.0 | AEP         | 2       | AEP_P1-2_#4817_6341       | operation | 971.0      | 148.28                      | 149.26                       | AC     | 11.2      |
| 169536590 | 944540    | AF1-119 TAP | 345.0 | AEP           | 960970  | AF2-388 TAP | 345.0 | AEP         | 1       | AEP_P1-2_#8702_2543-C     | operation | 897.0      | 125.68                      | 126.93                       | AC     | 11.16     |
| 169536582 | 944830    | AF1-148 TAP | 345.0 | AEP           | 944530  | AF1-118 TAP | 345.0 | AEP         | 2       | AEP_P1-2_#4817_6341       | operation | 971.0      | 127.25                      | 128.22                       | AC     | 11.2      |
| 169536672 | 945370    | AF1-202 TAP | 345.0 | AEP           | 944540  | AF1-119 TAP | 345.0 | AEP         | 1       | AEP_P1-2_#8702_2543-C     | operation | 897.0      | 113.73                      | 114.97                       | AC     | 11.16     |
| 169536655 | 958860    | AF2-177 TAP | 345.0 | AEP           | 944830  | AF1-148 TAP | 345.0 | AEP         | 2       | AEP_P1-2_#4817_6341       | operation | 971.0      | 117.9                       | 118.88                       | AC     | 11.2      |
| 168076367 | 960970    | AF2-388 TAP | 345.0 | AEP           | 243225  | 05KEYSTON   | 345.0 | AEP         | 1       | AEP_P1-2_#8702_2543-C     | operation | 897.0      | 136.11                      | 137.34                       | AC     | 11.16     |
|           |           |             |       |               |         |             |       |             |         |                           |           |            |                             |                              |        |           |
|           |           |             |       |               |         |             |       |             |         |                           |           |            |                             |                              |        |           |
|           |           |             |       |               |         |             |       |             |         |                           |           |            |                             |                              |        |           |
|           |           |             |       |               |         |             |       |             |         |                           |           |            |                             |                              |        |           |
|           |           |             |       |               |         |             |       |             |         |                           |           |            |                             |                              |        |           |
|           |           |             |       |               |         |             |       |             |         |                           |           |            |                             |                              |        |           |

## 11.6 System Reinforcements

| ID                      | Idx | Facility                                         | Upgrade Description                                                                                                                                                                                                                                                                                                                                                                                                  | Cost    | Cost Allocated to AG1-047 | Upgrade Number |
|-------------------------|-----|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------------------------|----------------|
| 161407010               | 6   | 05LOSANTV ILL 345.0 kV - 05TANNER 345.0 kV Ckt 2 | <p>An engineering study will need to be conducted to determine if the Tanner Relay Thermal limit 1118 Amps settings can be adjusted to mitigate the overload.</p> <p>Time estimate: 12-18 months<br/>New expected SE rating to be 954 MVA.</p> <p>This upgrade is driven by a prior queue cycle.</p>                                                                                                                 | \$25 K  | \$0                       | TBD            |
| 161407042,<br>161407043 | 3   | AB2-028 TAP 345.0 kV - 05FALL C 345.0 kV Ckt 1   | <p>IPL SE rating is 1195 MVA.</p> <p>The limiting element is station equipment (2000A CTs) owned by IPL at Fall Creek. Cost estimate is \$200K. Other IPL equipment is rated above 1318 MVA SE and will need to be confirmed during the Facilities Study that no additional IPL upgrades are required.</p> <p>This upgrade is driven by a prior queue cycle.</p> <p>AEP SE rating is 1409 MVA and is sufficient.</p> | \$200 K | \$0                       | N/A            |

| 180309987,<br>180310428 | 5               | 05COLLCO<br>138.0 kV -<br>08COLINV<br>138.0 kV<br>Ckt 1 | <ul style="list-style-type: none"><li>○ AEP end SE rating is 167 MVA<ul style="list-style-type: none"><li>▪ Limiting element is ACSR ~ 397.5 ~ 30/7 ~ LARK - Conductor section 1. A Sag Study will be required on the 0.15 mile section of line to mitigate the overload. Depending on the sag study results, cost for this upgrade is expected to be between \$20,000 (no remediation required just sag study) and \$0.3 million (complete line reconductor/rebuild required). New AEP SE rating to be 245 MVA. PJM Network Upgrade N6123.</li></ul></li></ul> <p>(A) Sag Study: 6 to 12 months.<br/>(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.</p> <p>This AEP upgrade is driven by a prior queue cycle.</p> <ul style="list-style-type: none"><li>○ DEOK-end SE rating is 178 MVA<ul style="list-style-type: none"><li>▪ Rebuild 11.87 miles of the DEOK portion of line. \$24.164 M. 36 months from ISA. New DEOK SE rating to be 239 MVA. PJM Network Upgrade N6284.</li></ul></li></ul> <p>The cost allocation is:</p> <table><tr><th>Queue</th><th>MW contribution</th><th>Percentage of Cost</th><th>\$ cost ( \$24.164 M)</th></tr><tr><td>AE2-219</td><td>9.4</td><td>12.94%</td><td>3.127</td></tr><tr><td>AF1-071</td><td>5.3</td><td>7.34%</td><td>1.773</td></tr><tr><td>AF1-221</td><td>44.6</td><td>61.73%</td><td>14.916</td></tr><tr><td>AF2-068</td><td>7.8</td><td>10.80%</td><td>2.609</td></tr><tr><td>AG1-047</td><td>5.2</td><td>7.20%</td><td>1.739</td></tr></table> | Queue   | MW contribution | Percentage of Cost | \$ cost ( \$24.164 M) | AE2-219 | 9.4 | 12.94% | 3.127 | AF1-071 | 5.3 | 7.34% | 1.773 | AF1-221 | 44.6 | 61.73% | 14.916 | AF2-068 | 7.8 | 10.80% | 2.609 | AG1-047 | 5.2 | 7.20% | 1.739 | \$20 K<br>\$24.164 M | \$0<br>\$1.739 M | N6123<br>N6284 |
|-------------------------|-----------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----------------|--------------------|-----------------------|---------|-----|--------|-------|---------|-----|-------|-------|---------|------|--------|--------|---------|-----|--------|-------|---------|-----|-------|-------|----------------------|------------------|----------------|
| Queue                   | MW contribution | Percentage of Cost                                      | \$ cost ( \$24.164 M)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |                 |                    |                       |         |     |        |       |         |     |       |       |         |      |        |        |         |     |        |       |         |     |       |       |                      |                  |                |
| AE2-219                 | 9.4             | 12.94%                                                  | 3.127                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |                 |                    |                       |         |     |        |       |         |     |       |       |         |      |        |        |         |     |        |       |         |     |       |       |                      |                  |                |
| AF1-071                 | 5.3             | 7.34%                                                   | 1.773                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |                 |                    |                       |         |     |        |       |         |     |       |       |         |      |        |        |         |     |        |       |         |     |       |       |                      |                  |                |
| AF1-221                 | 44.6            | 61.73%                                                  | 14.916                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |                 |                    |                       |         |     |        |       |         |     |       |       |         |      |        |        |         |     |        |       |         |     |       |       |                      |                  |                |
| AF2-068                 | 7.8             | 10.80%                                                  | 2.609                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |                 |                    |                       |         |     |        |       |         |     |       |       |         |      |        |        |         |     |        |       |         |     |       |       |                      |                  |                |
| AG1-047                 | 5.2             | 7.20%                                                   | 1.739                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |                 |                    |                       |         |     |        |       |         |     |       |       |         |      |        |        |         |     |        |       |         |     |       |       |                      |                  |                |
| 161406966,<br>164200101 | 4               | 05TANNER<br>345.0 kV -<br>06DEARB1                      | Replace Tanner's Creek 345 kV Riser (Sub Cond 2870 MCM ACSR). Cost estimate is \$100K. Time estimate is 12-18 months. New expected SE rating is 2034 MVA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | \$100 K | \$0             | N6999              |                       |         |     |        |       |         |     |       |       |         |      |        |        |         |     |        |       |         |     |       |       |                      |                  |                |

| ID | Idx | Facility               | Upgrade Description                            | Cost                | Cost Allocated to AG1-047 | Upgrade Number |
|----|-----|------------------------|------------------------------------------------|---------------------|---------------------------|----------------|
|    |     | <b>345.0 kV Ckt Z1</b> | This upgrade is driven by a prior queue cycle. |                     |                           |                |
|    |     |                        | <b>Total Cost</b>                              | <b>\$24,509,000</b> | <b>\$1,739,000</b>        |                |

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

## 11.7 Flow Gate Details

The following indices contain additional information about each facility presented in the body of the report. For each index, a description of the flowgate and its contingency was included for convenience. The intent of the indices is to provide more details on which projects/generators have contributions to the flowgate in question. All New Service Queue Requests, through the end of the Queue under study, that are contributors to a flowgate will be listed in the indices. Please note that there may be contributors that are subsequently queued after the queue under study that are not listed in the indices. Although this information is not used "as is" for cost allocation purposes, it can be used to gage the impact of other projects/generators. It should be noted the project/generator MW contributions presented in the body of the report are Full MW Impact contributions which are also noted in the indices column named "Full MW Impact", whereas the loading percentages reported in the body of the report, take into consideration the PJM Generator Deliverability Test rules such as commercial probability of each project as well as the ramping impact of "Adder" contributions. The MW Impact found and used in the analysis is shown in the indices column named "Gendeliv MW Impact".

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### 11.7.1 Index 1

None

### 11.7.2 Index 2

None



### 11.7.3 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 |
|-----------|-----------|-------------|---------------|---------|----------|-------------|--------|-------------------|-------|------------|-----------------------|------------------------|-------|-----------|
| 161407042 | 923880    | AB2-028 TAP | AEP           | 243222  | 05FALL C | AEP         | 1      | AEP_P7-1_#11019-D | tower | 1318.0     | 101.84                | 103.05                 | AC    | 16.09     |

| Bus #  | Bus                                | Gendeliv MW Impact | Type  | Full MW Impact |
|--------|------------------------------------|--------------------|-------|----------------|
| 243795 | 05HDWTR1G C                        | 1.37               | 80 50 | 1.37           |
| 247292 | 05KEY G1                           | 3.52               | 80 50 | 3.52           |
| 247293 | 05KEY G2                           | 3.54               | 80 50 | 3.54           |
| 247294 | 05KEY G3                           | 3.64               | 80 50 | 3.64           |
| 247295 | 05KEY G4                           | 3.65               | 80 50 | 3.65           |
| 247536 | 05BLUFF P WF                       | 0.59               | 80 50 | 0.59           |
| 247543 | V3-007 C                           | 1.37               | 80 50 | 1.37           |
| 247621 | Y3-024                             | 0.05               | 80 50 | 0.05           |
| 247929 | S-071 E                            | 14.43              | 80 50 | 14.43          |
| 247935 | V3-007 E                           | 55.74              | 80 50 | 55.74          |
| 247963 | 05HDWTR1G E                        | 55.74              | 80 50 | 55.74          |
| 923881 | AB2-028 C (Withdrawn : 06/17/2021) | 15.67              | 80 50 | 15.67          |
| 923882 | AB2-028 E (Withdrawn : 06/17/2021) | 104.86             | 80 50 | 104.86         |
| 926881 | AC1-175 C                          | 24.35              | 80 50 | 24.35          |
| 926882 | AC1-175 E                          | 39.73              | 80 50 | 39.73          |
| 932681 | AC2-090 C                          | 12.17              | 80 50 | 12.17          |
| 932682 | AC2-090 E                          | 19.86              | 80 50 | 19.86          |
| 932841 | AC2-111 C O1                       | 2.48               | Adder | 2.92           |
| 932842 | AC2-111 E O1                       | 4.05               | Adder | 4.76           |
| 933594 | AC2-176 C                          | 0.45               | 80 50 | 0.45           |
| 933596 | AC2-176 E                          | 18.2               | 80 50 | 18.2           |
| 934961 | AD1-128 C                          | 12.08              | 80 50 | 12.08          |
| 934962 | AD1-128 E                          | 19.72              | 80 50 | 19.72          |
| 939761 | AE1-207 C                          | 8.58               | 80 50 | 8.58           |
| 939762 | AE1-207 E                          | 11.85              | 80 50 | 11.85          |
| 939771 | AE1-208 C                          | 6.8                | 80 50 | 6.8            |
| 939772 | AE1-208 E                          | 9.27               | 80 50 | 9.27           |
| 939781 | AE1-209 C O1                       | 4.82               | 80 50 | 4.82           |
| 939782 | AE1-209 E O1                       | 32.29              | 80 50 | 32.29          |

| Bus #  | Bus          | Gendeliv MW Impact | Type  | Full MW Impact |
|--------|--------------|--------------------|-------|----------------|
| 939791 | AE1-210 C O1 | 4.82               | 80 50 | 4.82           |
| 939792 | AE1-210 E O1 | 32.29              | 80 50 | 32.29          |
| 940981 | AE2-089 C O1 | 11.25              | 80 50 | 11.25          |
| 940982 | AE2-089 E O1 | 7.5                | 80 50 | 7.5            |
| 941691 | AE2-169      | 4.08               | 80 50 | 4.08           |
| 941721 | AE2-172      | 5.11               | 80 50 | 5.11           |
| 942071 | AE2-219 C    | 6.11               | 80 50 | 6.11           |
| 942072 | AE2-219 E    | 8.44               | 80 50 | 8.44           |
| 942081 | AE2-220 C    | 16.82              | 80 50 | 16.82          |
| 942082 | AE2-220 E    | 23.23              | 80 50 | 23.23          |
| 942221 | AE2-234 C O1 | 1.83               | Adder | 2.15           |
| 942222 | AE2-234 E O1 | 0.83               | Adder | 0.98           |
| 944031 | AF1-071 C    | 0.62               | Adder | 0.73           |
| 944032 | AF1-071 E    | 1.01               | Adder | 1.19           |
| 944531 | AF1-118 C O1 | 99.79              | 80 50 | 99.79          |
| 944532 | AF1-118 E O1 | 30.1               | 80 50 | 30.1           |
| 944541 | AF1-119 C O1 | 51.95              | 80 50 | 51.95          |
| 944542 | AF1-119 E O1 | 22.27              | 80 50 | 22.27          |
| 944831 | AF1-148 C O1 | 35.4               | 80 50 | 35.4           |
| 944832 | AF1-148 E O1 | 23.6               | 80 50 | 23.6           |
| 945371 | AF1-202 C O1 | 12.62              | 80 50 | 12.62          |
| 945372 | AF1-202 E O1 | 61.6               | 80 50 | 61.6           |
| 945561 | AF1-221 C O1 | 9.94               | Adder | 11.69          |
| 945562 | AF1-221 E O1 | 2.99               | Adder | 3.52           |
| 945581 | AF1-223 C O1 | 33.4               | 80 50 | 33.4           |
| 945582 | AF1-223 E O1 | 22.27              | 80 50 | 22.27          |
| 946031 | AF1-268 C O1 | 13.78              | 80 50 | 13.78          |
| 946032 | AF1-268 E O1 | 6.25               | 80 50 | 6.25           |
| 957741 | AF2-068 C O1 | 14.48              | 80 50 | 14.48          |
| 957742 | AF2-068 E O1 | 9.65               | 80 50 | 9.65           |
| 958711 | AF2-162 C    | 11.13              | 80 50 | 11.13          |
| 958712 | AF2-162 E    | 5.57               | 80 50 | 5.57           |
| 958821 | AF2-173 C    | 31.17              | 80 50 | 31.17          |
| 958822 | AF2-173 E    | 43.05              | 80 50 | 43.05          |
| 958861 | AF2-177 C O1 | 9.65               | 80 50 | 9.65           |
| 958862 | AF2-177 E O1 | 64.57              | 80 50 | 64.57          |
| 960441 | AF2-335 C    | 10.88              | 80 50 | 10.88          |
| 960442 | AF2-335 E    | 7.25               | 80 50 | 7.25           |
| 960791 | AF2-370      | 3.63               | 80 50 | 3.63           |

| Bus #             | Bus                                  | Gendeliv MW Impact | Type          | Full MW Impact |
|-------------------|--------------------------------------|--------------------|---------------|----------------|
| 960971            | AF2-388 C                            | 13.06              | 80 50         | 13.06          |
| 960972            | AF2-388 E                            | 61.16              | 80 50         | 61.16          |
| 961162            | AF2-407 BAT                          | 92.18              | 80 50         | 92.18          |
| 961172            | AF2-408 BAT                          | 13.29              | 80 50         | 13.29          |
| 961761            | AG1-017 C                            | 0.47               | 80 50         | 0.47           |
| 961762            | AG1-017 E                            | 2.21               | 80 50         | 2.21           |
| 962031            | AG1-047 C                            | 9.65               | 80 50         | 9.65           |
| 962032            | AG1-047 E                            | 6.44               | 80 50         | 6.44           |
| 962051            | AG1-049                              | 1.44               | Adder         | 1.69           |
| 963731            | AG1-225 C                            | 16.74              | Adder         | 19.69          |
| 963732            | AG1-225 E                            | 11.24              | Adder         | 13.22          |
| 964353            | AG1-297 BAT                          | 40.83              | Adder         | 48.04          |
| 964611            | AG1-324 C O1                         | 5.59               | 80 50         | 5.59           |
| 964612            | AG1-324 E O1                         | 2.4                | 80 50         | 2.4            |
| 965031            | AG1-367 C                            | 22.27              | 80 50         | 22.27          |
| 965032            | AG1-367 E                            | 14.84              | 80 50         | 14.84          |
| 965101            | AG1-375 C                            | 22.27              | 80 50         | 22.27          |
| 965102            | AG1-375 E                            | 14.84              | 80 50         | 14.84          |
| 965461            | AG1-414 C O1                         | 3.4                | Adder         | 4.0            |
| 965462            | AG1-414 E O1                         | 2.27               | Adder         | 2.67           |
| 965651            | AG1-433 C                            | 6.53               | 80 50         | 6.53           |
| 965652            | AG1-433 E                            | 30.58              | 80 50         | 30.58          |
| LTFEXP_AC1-056    | LTFEXP_AC1-056->LTFIMP_AC1-056       | 3.5957             | Confirmed LTF | 3.5957         |
| LTFEXP_AC1-131    | LTFEXP_AC1-131->LTFIMP_AC1-131       | 0.3345             | Confirmed LTF | 0.3345         |
| LTFEXP_BlueG      | LTFEXP_BlueG->LTFIMP_BlueG           | 3.2441             | Confirmed LTF | 3.2441         |
| LTFEXP_CALDERWOOD | LTFEXP_CALDERWOOD->LTFIMP_CALDERWOOD | 0.6233             | Confirmed LTF | 0.6233         |
| LTFEXP_CATAWBA    | LTFEXP_CATAWBA->LTFIMP_CATAWBA       | 0.2232             | Confirmed LTF | 0.2232         |
| LTFEXP_CBM-N      | LTFEXP_CBM-N->LTFIMP_CBM-N           | 0.2387             | LTF/CBM       | 0.2387         |
| LTFEXP_CHEOAH     | LTFEXP_CHEOAH->LTFIMP_CHEOAH         | 0.6181             | Confirmed LTF | 0.6181         |
| LTFEXP_COTTONWOOD | LTFEXP_COTTONWOOD->LTFIMP_COTTONWOOD | 4.5443             | Confirmed LTF | 4.5443         |

| <b>Bus #</b>              | <b>Bus</b>                             | <b>Gendeliv MW Impact</b> | <b>Type</b>   | <b>Full MW Impact</b> |
|---------------------------|----------------------------------------|---------------------------|---------------|-----------------------|
| <b>LTFEXP_G-007A</b>      | LTFEXP_G-007A->LTFIMP_G-007A           | 0.4714                    | LTF/CMTX      | 0.4714                |
| <b>LTFEXP_GIBSON</b>      | LTFEXP_GIBSON->LTFIMP_GIBSON           | 3.8822                    | Confirmed LTF | 3.8822                |
| <b>LTFEXP_HAMLET</b>      | LTFEXP_HAMLET->LTFIMP_HAMLET           | 0.3114                    | Confirmed LTF | 0.3114                |
| <b>LTFEXP_LGE-0012019</b> | LTFEXP_LGE-0012019->LTFIMP_LGE-0012019 | 0.4903                    | Confirmed LTF | 0.4903                |
| <b>LTFEXP_PRAIRIE</b>     | LTFEXP_PRAIRIE->LTFIMP_PRAIRIE         | 8.6267                    | Confirmed LTF | 8.6267                |
| <b>LTFEXP_TRIMBLE</b>     | LTFEXP_TRIMBLE->LTFIMP_TRIMBLE         | 0.8839                    | Confirmed LTF | 0.8839                |
| <b>LTFEXP_VFT</b>         | LTFEXP_VFT->LTFIMP_VFT                 | 1.273                     | Confirmed LTF | 1.273                 |

#### 11.7.4 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 |
|-----------|-----------|----------|---------------|---------|---------|-------------|---------|------------------------------|---------|------------|------------------------|-------------------------|--------|-----------|
| 164200101 | 243233    | 05TANNER | AEP           | 248001  | 06DEARB | OVER        | Z1      | AEP_P4_#14920_05TANNER 345_T | breaker | 1204.0     | 131.93                 | 132.96                  | AC     | 14.44     |

| Bus #  | Bus                                | Gendeliv MW Impact | Type  | Full MW Impact |
|--------|------------------------------------|--------------------|-------|----------------|
| 243415 | 05WWVSTA                           | 2.63               | 80 50 | 2.63           |
| 243795 | 05HDWTR1G C                        | 1.14               | 80 50 | 1.14           |
| 246991 | 05WLD G1 C                         | 0.34               | 80 50 | 0.34           |
| 247255 | 05WLD G2 C                         | 0.33               | 80 50 | 0.33           |
| 247264 | 05LAWG1A                           | 16.0               | 80 50 | 16.0           |
| 247265 | 05LAWG1B                           | 16.0               | 80 50 | 16.0           |
| 247266 | 05LAWG1S                           | 25.56              | 80 50 | 25.56          |
| 247267 | 05LAWG2A                           | 16.0               | 80 50 | 16.0           |
| 247268 | 05LAWG2B                           | 16.0               | 80 50 | 16.0           |
| 247269 | 05LAWG2S                           | 25.56              | 80 50 | 25.56          |
| 247288 | 05RICHG1                           | 0.91               | 80 50 | 0.91           |
| 247289 | 05RICHG2                           | 0.91               | 80 50 | 0.91           |
| 247295 | 05KEY G4                           | 1.42               | 80 50 | 1.42           |
| 247536 | 05BLUFF P WF                       | 0.59               | 80 50 | 0.59           |
| 247543 | V3-007 C                           | 1.14               | 80 50 | 1.14           |
| 247621 | Y3-024                             | 0.05               | 80 50 | 0.05           |
| 247929 | S-071 E                            | 14.44              | 80 50 | 14.44          |
| 247935 | V3-007 E                           | 46.55              | 80 50 | 46.55          |
| 247958 | 05WLD G2 E                         | 27.24              | 80 50 | 27.24          |
| 247963 | 05HDWTR1G E                        | 46.55              | 80 50 | 46.55          |
| 247968 | Z2-115 E                           | 0.12               | Adder | 0.14           |
| 923881 | AB2-028 C (Withdrawn : 06/17/2021) | 4.82               | 80 50 | 4.82           |
| 923882 | AB2-028 E (Withdrawn : 06/17/2021) | 32.23              | 80 50 | 32.23          |
| 926881 | AC1-175 C                          | 20.33              | 80 50 | 20.33          |
| 926882 | AC1-175 E                          | 33.17              | 80 50 | 33.17          |
| 932681 | AC2-090 C                          | 10.17              | 80 50 | 10.17          |
| 932682 | AC2-090 E                          | 16.59              | 80 50 | 16.59          |
| 932841 | AC2-111 C O1                       | 5.55               | 80 50 | 5.55           |
| 932842 | AC2-111 E O1                       | 9.05               | 80 50 | 9.05           |
| 933596 | AC2-176 E                          | 13.88              | Adder | 16.33          |
| 934161 | AD1-043 C O1                       | 7.42               | 80 50 | 7.42           |

| Bus #  | Bus          | Gendeliv MW Impact | Type  | Full MW Impact |
|--------|--------------|--------------------|-------|----------------|
| 934162 | AD1-043 E O1 | 12.11              | 80 50 | 12.11          |
| 934961 | AD1-128 C    | 10.65              | 80 50 | 10.65          |
| 934962 | AD1-128 E    | 17.38              | 80 50 | 17.38          |
| 936561 | AD2-071 C    | 9.89               | 80 50 | 9.89           |
| 936562 | AD2-071 E    | 4.87               | 80 50 | 4.87           |
| 939761 | AE1-207 C    | 8.2                | Adder | 9.65           |
| 939762 | AE1-207 E    | 11.32              | Adder | 13.32          |
| 939771 | AE1-208 C    | 8.92               | 80 50 | 8.92           |
| 939772 | AE1-208 E    | 12.16              | 80 50 | 12.16          |
| 939781 | AE1-209 C O1 | 2.74               | 80 50 | 2.74           |
| 939782 | AE1-209 E O1 | 18.34              | 80 50 | 18.34          |
| 939791 | AE1-210 C O1 | 2.74               | 80 50 | 2.74           |
| 939792 | AE1-210 E O1 | 18.34              | 80 50 | 18.34          |
| 940981 | AE2-089 C O1 | 9.86               | Adder | 11.6           |
| 940982 | AE2-089 E O1 | 6.57               | Adder | 7.73           |
| 941691 | AE2-169      | 5.35               | 80 50 | 5.35           |
| 941721 | AE2-172      | 4.88               | Adder | 5.74           |
| 942071 | AE2-219 C    | 6.54               | 80 50 | 6.54           |
| 942072 | AE2-219 E    | 9.03               | 80 50 | 9.03           |
| 942081 | AE2-220 C    | 14.05              | 80 50 | 14.05          |
| 942082 | AE2-220 E    | 19.4               | 80 50 | 19.4           |
| 942221 | AE2-234 C O1 | 2.48               | Adder | 2.92           |
| 942222 | AE2-234 E O1 | 1.12               | Adder | 1.32           |
| 942791 | AE2-297 C O1 | 22.66              | 80 50 | 22.66          |
| 942792 | AE2-297 E O1 | 15.11              | 80 50 | 15.11          |
| 944031 | AF1-071 C    | 1.39               | 80 50 | 1.39           |
| 944032 | AF1-071 E    | 2.26               | 80 50 | 2.26           |
| 944531 | AF1-118 C O1 | 31.1               | Adder | 36.59          |
| 944532 | AF1-118 E O1 | 9.38               | Adder | 11.04          |
| 944541 | AF1-119 C O1 | 23.86              | 80 50 | 23.86          |
| 944542 | AF1-119 E O1 | 10.23              | 80 50 | 10.23          |
| 944831 | AF1-148 C O1 | 11.49              | Adder | 13.52          |
| 944832 | AF1-148 E O1 | 7.66               | Adder | 9.01           |
| 945371 | AF1-202 C O1 | 6.04               | 80 50 | 6.04           |
| 945372 | AF1-202 E O1 | 29.51              | 80 50 | 29.51          |
| 945561 | AF1-221 C O1 | 34.41              | 80 50 | 34.41          |
| 945562 | AF1-221 E O1 | 10.34              | 80 50 | 10.34          |
| 945581 | AF1-223 C O1 | 16.0               | 80 50 | 16.0           |
| 945582 | AF1-223 E O1 | 10.67              | 80 50 | 10.67          |

| Bus #  | Bus          | Gendeliv MW Impact | Type  | Full MW Impact |
|--------|--------------|--------------------|-------|----------------|
| 946031 | AF1-268 C O1 | 10.37              | 80 50 | 10.37          |
| 946032 | AF1-268 E O1 | 4.71               | 80 50 | 4.71           |
| 957741 | AF2-068 C O1 | 11.05              | Adder | 13.0           |
| 957742 | AF2-068 E O1 | 7.37               | Adder | 8.67           |
| 958711 | AF2-162 C    | 5.11               | 80 50 | 5.11           |
| 958712 | AF2-162 E    | 2.56               | 80 50 | 2.56           |
| 958821 | AF2-173 C    | 17.7               | 80 50 | 17.7           |
| 958822 | AF2-173 E    | 24.45              | 80 50 | 24.45          |
| 958861 | AF2-177 C O1 | 4.38               | 80 50 | 4.38           |
| 958862 | AF2-177 E O1 | 29.32              | 80 50 | 29.32          |
| 959131 | AF2-204 C    | 7.65               | Adder | 9.0            |
| 959132 | AF2-204 E    | 4.04               | Adder | 4.75           |
| 960441 | AF2-335 C    | 10.87              | 80 50 | 10.87          |
| 960442 | AF2-335 E    | 7.25               | 80 50 | 7.25           |
| 960791 | AF2-370      | 3.62               | 80 50 | 3.62           |
| 960971 | AF2-388 C    | 5.74               | 80 50 | 5.74           |
| 960972 | AF2-388 E    | 26.87              | 80 50 | 26.87          |
| 961161 | AF2-407      | 52.6               | 80 50 | 52.6           |
| 961171 | AF2-408      | 14.32              | 80 50 | 14.32          |
| 961761 | AG1-017 C    | 0.36               | Adder | 0.42           |
| 961762 | AG1-017 E    | 1.68               | Adder | 1.98           |
| 962031 | AG1-047 C    | 7.37               | Adder | 8.67           |
| 962032 | AG1-047 E    | 4.91               | Adder | 5.78           |
| 962051 | AG1-049      | 3.21               | 80 50 | 3.21           |
| 963721 | AG1-224 C O1 | 39.18              | 80 50 | 39.18          |
| 963722 | AG1-224 E O1 | 26.12              | 80 50 | 26.12          |
| 963731 | AG1-225 C    | 19.72              | Adder | 23.2           |
| 963732 | AG1-225 E    | 13.24              | Adder | 15.58          |
| 963791 | AG1-232 C    | 6.44               | Adder | 7.58           |
| 963792 | AG1-232 E    | 4.29               | Adder | 5.05           |
| 964351 | AG1-297 C    | 55.66              | 80 50 | 55.66          |
| 964352 | AG1-297 E    | 83.49              | 80 50 | 83.49          |
| 964611 | AG1-324 C O1 | 4.79               | 80 50 | 4.79           |
| 964612 | AG1-324 E O1 | 2.05               | 80 50 | 2.05           |
| 965031 | AG1-367 C    | 12.65              | 80 50 | 12.65          |
| 965032 | AG1-367 E    | 8.43               | 80 50 | 8.43           |
| 965101 | AG1-375 C    | 10.11              | 80 50 | 10.11          |
| 965102 | AG1-375 E    | 6.74               | 80 50 | 6.74           |
| 965461 | AG1-414 C O1 | 4.96               | Adder | 5.84           |

| Bus #              | Bus                                    | Gendeliv MW Impact | Type          | Full MW Impact |
|--------------------|----------------------------------------|--------------------|---------------|----------------|
| 965462             | AG1-414 E O1                           | 3.31               | Adder         | 3.89           |
| 965651             | AG1-433 C                              | 2.87               | 80 50         | 2.87           |
| 965652             | AG1-433 E                              | 13.43              | 80 50         | 13.43          |
| 953351             | J805                                   | 18.87              | Queue MISO    | 18.87          |
| 954351             | J903                                   | 9.63               | Queue MISO    | 9.63           |
| 955151             | J993                                   | 19.16              | Queue MISO    | 19.16          |
| 956561             | J1152                                  | 21.98              | Queue MISO    | 21.98          |
| LTFEXP_AC1-131     | LTFEXP_AC1-131->LTFIMP_AC1-131         | 0.7339             | Confirmed LTF | 0.7339         |
| LTFEXP_BlueG       | LTFEXP_BlueG->LTFIMP_BlueG             | 6.4066             | Confirmed LTF | 6.4066         |
| LTFEXP_CALDERWOOD  | LTFEXP_CALDERWOOD->LTFIMP_CALDERWOOD   | 0.1727             | Confirmed LTF | 0.1727         |
| LTFEXP_CATAWBA     | LTFEXP_CATAWBA->LTFIMP_CATAWBA         | 0.2994             | Confirmed LTF | 0.2994         |
| LTFEXP_CBM-S1      | LTFEXP_CBM-S1->LTFIMP_CBM-S1           | 0.0301             | LTF/CBM       | 0.0301         |
| LTFEXP_CBM-W1      | LTFEXP_CBM-W1->LTFIMP_CBM-W1           | 45.7907            | LTF/CBM       | 45.7907        |
| LTFEXP_CBM-W2      | LTFEXP_CBM-W2->LTFIMP_CBM-W2           | 26.9599            | LTF/CBM       | 26.9599        |
| LTFEXP_CHEOAH      | LTFEXP_CHEOAH->LTFIMP_CHEOAH           | 0.181              | Confirmed LTF | 0.181          |
| LTFEXP_G-007       | LTFEXP_G-007->LTFIMP_G-007             | 1.133              | LTF/CMTX NF   | 1.133          |
| LTFEXP_HAMLET      | LTFEXP_HAMLET->LTFIMP_HAMLET           | 0.523              | Confirmed LTF | 0.523          |
| LTFEXP_LAGN        | LTFEXP_LAGN->LTFIMP_LAGN               | 2.3207             | Confirmed LTF | 2.3207         |
| LTFEXP_LGE-0012019 | LTFEXP_LGE-0012019->LTFIMP_LGE-0012019 | 1.1924             | Confirmed LTF | 1.1924         |
| LTFEXP_MEC         | LTFEXP_MEC->LTFIMP_MEC                 | 5.6033             | Confirmed LTF | 5.6033         |
| LTFEXP_NY          | LTFEXP_NY->LTFIMP_NY                   | 0.5728             | Confirmed LTF | 0.5728         |
| LTFEXP_O-066       | LTFEXP_O-066->LTFIMP_O-066             | 7.2523             | LTF/CMTX NF   | 7.2523         |
| LTFEXP_SIGE        | LTFEXP_SIGE->LTFIMP_SIGE               | 0.4277             | Confirmed LTF | 0.4277         |
| LTFEXP_TRIMBLE     | LTFEXP_TRIMBLE->LTFIMP_TRIMBLE         | 2.4311             | Confirmed LTF | 2.4311         |



| <b>Bus #</b>      | <b>Bus</b>             | <b>Gendeliv MW Impact</b> | <b>Type</b>   | <b>Full MW Impact</b> |
|-------------------|------------------------|---------------------------|---------------|-----------------------|
| <b>LTFEXP_TVA</b> | LTFEXP_TVA->LTFIMP_TVA | 0.9977                    | Confirmed LTF | 0.9977                |
| <b>LTFEXP_WEC</b> | LTFEXP_WEC->LTFIMP_WEC | 1.2911                    | Confirmed LTF | 1.2911                |

### 11.7.5 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 |
|-----------|-----------|-------------|---------------|---------|----------|-------------|--------|-------------|---------|------------|-----------------------|------------------------|-------|-----------|
| 180310428 | 243262    | 05COLLEGE C | AEP           | 250001  | 08COLINV | DEO&K       | 1      | 914_TRENTON | breaker | 167.0      | 120.8                 | 123.41                 | AC    | 5.19      |

| Bus #          | Bus                            | Gendeliv MW Impact | Type          | Full MW Impact |
|----------------|--------------------------------|--------------------|---------------|----------------|
| 243415         | 05WWVSTA                       | 2.7                | 80 50         | 2.7            |
| 247288         | 05RICHG1                       | 0.89               | 80 50         | 0.89           |
| 247289         | 05RICHG2                       | 0.89               | 80 50         | 0.89           |
| 247929         | S-071 E                        | 6.6                | Adder         | 7.76           |
| 932841         | AC2-111 C O1                   | 7.72               | 80 50         | 7.72           |
| 932842         | AC2-111 E O1                   | 12.59              | 80 50         | 12.59          |
| 933596         | AC2-176 E                      | 4.99               | Adder         | 5.87           |
| 934961         | AD1-128 C                      | 4.56               | Adder         | 5.36           |
| 934962         | AD1-128 E                      | 7.44               | Adder         | 8.75           |
| 942071         | AE2-219 C                      | 4.3                | 80 50         | 4.3            |
| 942072         | AE2-219 E                      | 5.93               | 80 50         | 5.93           |
| 944031         | AF1-071 C                      | 1.93               | 80 50         | 1.93           |
| 944032         | AF1-071 E                      | 3.15               | 80 50         | 3.15           |
| 945561         | AF1-221 C O1                   | 28.3               | 80 50         | 28.3           |
| 945562         | AF1-221 E O1                   | 8.51               | 80 50         | 8.51           |
| 957741         | AF2-068 C O1                   | 3.97               | Adder         | 4.67           |
| 957742         | AF2-068 E O1                   | 2.65               | Adder         | 3.12           |
| 961761         | AG1-017 C                      | 0.13               | Adder         | 0.15           |
| 961762         | AG1-017 E                      | 0.61               | Adder         | 0.72           |
| 962031         | AG1-047 C                      | 2.65               | Adder         | 3.12           |
| 962032         | AG1-047 E                      | 1.77               | Adder         | 2.08           |
| 962051         | AG1-049                        | 4.47               | 80 50         | 4.47           |
| LTFEXP_AC1-131 | LTFEXP_AC1-131->LTFIMP_AC1-131 | 0.0384             | Confirmed LTF | 0.0384         |
| LTFEXP_CATAWBA | LTFEXP_CATAWBA->LTFIMP_CATAWBA | 0.0119             | Confirmed LTF | 0.0119         |
| LTFEXP_CBM-S1  | LTFEXP_CBM-S1->LTFIMP_CBM-S1   | 0.0475             | LTF/CBM       | 0.0475         |
| LTFEXP_CBM-W1  | LTFEXP_CBM-W1->LTFIMP_CBM-W1   | 6.7654             | LTF/CBM       | 6.7654         |
| LTFEXP_CBM-W2  | LTFEXP_CBM-W2->LTFIMP_CBM-W2   | 3.2844             | LTF/CBM       | 3.2844         |

| <b>Bus #</b>         | <b>Bus</b>                   | <b>Gendeliv MW Impact</b> | <b>Type</b>   | <b>Full MW Impact</b> |
|----------------------|------------------------------|---------------------------|---------------|-----------------------|
| <b>LTFEXP_G-007</b>  | LTFEXP_G-007->LTFIMP_G-007   | 0.0886                    | LTF/CMTX NF   | 0.0886                |
| <b>LTFEXP_HAMLET</b> | LTFEXP_HAMLET->LTFIMP_HAMLET | 0.0241                    | Confirmed LTF | 0.0241                |
| <b>LTFEXP_LAGN</b>   | LTFEXP_LAGN->LTFIMP_LAGN     | 0.3845                    | Confirmed LTF | 0.3845                |
| <b>LTFEXP_LGEE</b>   | LTFEXP_LGEE->LTFIMP_LGEE     | 0.0133                    | Confirmed LTF | 0.0133                |
| <b>LTFEXP_MEC</b>    | LTFEXP_MEC->LTFIMP_MEC       | 0.7836                    | Confirmed LTF | 0.7836                |
| <b>LTFEXP_NY</b>     | LTFEXP_NY->LTFIMP_NY         | 0.0446                    | Confirmed LTF | 0.0446                |
| <b>LTFEXP_O-066</b>  | LTFEXP_O-066->LTFIMP_O-066   | 0.567                     | LTF/CMTX NF   | 0.567                 |
| <b>LTFEXP_SIGE</b>   | LTFEXP_SIGE->LTFIMP_SIGE     | 0.0476                    | Confirmed LTF | 0.0476                |
| <b>LTFEXP_TVA</b>    | LTFEXP_TVA->LTFIMP_TVA       | 0.207                     | Confirmed LTF | 0.207                 |
| <b>LTFEXP_WEC</b>    | LTFEXP_WEC->LTFIMP_WEC       | 0.1826                    | Confirmed LTF | 0.1826                |

## 11.7.6 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 |
|-----------|-----------|--------------|---------------|---------|----------|-------------|--------|-------------------|-------|------------|-----------------------|------------------------|-------|-----------|
| 161407010 | 243792    | 05LOSANTVILL | AEP           | 243233  | 05TANNER | AEP         | 2      | AEP_P7-1_#11019-D | tower | 648.0      | 114.66                | 115.81                 | AC    | 8.7       |

| Bus #  | Bus                                | Gendeliv MW Impact | Type  | Full MW Impact |
|--------|------------------------------------|--------------------|-------|----------------|
| 243795 | 05HDWTR1G C                        | 1.28               | 80 50 | 1.28           |
| 247292 | 05KEY G1                           | 1.67               | 80 50 | 1.67           |
| 247293 | 05KEY G2                           | 1.68               | 80 50 | 1.68           |
| 247294 | 05KEY G3                           | 1.73               | 80 50 | 1.73           |
| 247295 | 05KEY G4                           | 1.73               | 80 50 | 1.73           |
| 247543 | V3-007 C                           | 1.28               | 80 50 | 1.28           |
| 247929 | S-071 E                            | 6.44               | Adder | 7.58           |
| 247935 | V3-007 E                           | 52.19              | 80 50 | 52.19          |
| 247958 | 05WLD G2 E                         | 12.31              | Adder | 14.48          |
| 247963 | 05HDWTR1G E                        | 52.19              | 80 50 | 52.19          |
| 247968 | Z2-115 E                           | 0.07               | Adder | 0.08           |
| 923881 | AB2-028 C (Withdrawn : 06/17/2021) | 3.16               | 80 50 | 3.16           |
| 923882 | AB2-028 E (Withdrawn : 06/17/2021) | 21.15              | 80 50 | 21.15          |
| 926881 | AC1-175 C                          | 22.79              | 80 50 | 22.79          |
| 926882 | AC1-175 E                          | 37.19              | 80 50 | 37.19          |
| 932681 | AC2-090 C                          | 11.4               | 80 50 | 11.4           |
| 932682 | AC2-090 E                          | 18.59              | 80 50 | 18.59          |
| 933596 | AC2-176 E                          | 8.36               | Adder | 9.84           |
| 934161 | AD1-043 C O1                       | 3.24               | Adder | 3.81           |
| 934162 | AD1-043 E O1                       | 5.29               | Adder | 6.22           |
| 934961 | AD1-128 C                          | 6.23               | 80 50 | 6.23           |
| 934962 | AD1-128 E                          | 10.16              | 80 50 | 10.16          |
| 936561 | AD2-071 C                          | 4.53               | Adder | 5.33           |
| 936562 | AD2-071 E                          | 2.23               | Adder | 2.62           |
| 939761 | AE1-207 C                          | 5.33               | Adder | 6.27           |
| 939762 | AE1-207 E                          | 7.37               | Adder | 8.67           |
| 939771 | AE1-208 C                          | 4.66               | Adder | 5.48           |
| 939772 | AE1-208 E                          | 6.36               | Adder | 7.48           |
| 939781 | AE1-209 C O1                       | 2.29               | 80 50 | 2.29           |
| 939782 | AE1-209 E O1                       | 15.32              | 80 50 | 15.32          |

| Bus #  | Bus          | Gendeliv MW Impact | Type  | Full MW Impact |
|--------|--------------|--------------------|-------|----------------|
| 939791 | AE1-210 C O1 | 2.29               | 80 50 | 2.29           |
| 939792 | AE1-210 E O1 | 15.32              | 80 50 | 15.32          |
| 940981 | AE2-089 C O1 | 5.46               | Adder | 6.42           |
| 940982 | AE2-089 E O1 | 3.64               | Adder | 4.28           |
| 941691 | AE2-169      | 2.8                | Adder | 3.29           |
| 941721 | AE2-172      | 3.17               | Adder | 3.73           |
| 942071 | AE2-219 C    | 2.65               | Adder | 3.12           |
| 942072 | AE2-219 E    | 3.66               | Adder | 4.31           |
| 942081 | AE2-220 C    | 15.75              | 80 50 | 15.75          |
| 942082 | AE2-220 E    | 21.74              | 80 50 | 21.74          |
| 942221 | AE2-234 C O1 | 1.31               | Adder | 1.54           |
| 942222 | AE2-234 E O1 | 0.59               | Adder | 0.69           |
| 942791 | AE2-297 C O1 | 5.16               | Adder | 6.07           |
| 942792 | AE2-297 E O1 | 3.44               | Adder | 4.05           |
| 944531 | AF1-118 C O1 | 47.35              | 80 50 | 47.35          |
| 944532 | AF1-118 E O1 | 14.28              | 80 50 | 14.28          |
| 944541 | AF1-119 C O1 | 24.65              | 80 50 | 24.65          |
| 944542 | AF1-119 E O1 | 10.56              | 80 50 | 10.56          |
| 944831 | AF1-148 C O1 | 16.8               | 80 50 | 16.8           |
| 944832 | AF1-148 E O1 | 11.2               | 80 50 | 11.2           |
| 945371 | AF1-202 C O1 | 5.99               | 80 50 | 5.99           |
| 945372 | AF1-202 E O1 | 29.23              | 80 50 | 29.23          |
| 945581 | AF1-223 C O1 | 15.85              | 80 50 | 15.85          |
| 945582 | AF1-223 E O1 | 10.56              | 80 50 | 10.56          |
| 946031 | AF1-268 C O1 | 7.4                | 80 50 | 7.4            |
| 946032 | AF1-268 E O1 | 3.35               | 80 50 | 3.35           |
| 957741 | AF2-068 C O1 | 6.65               | Adder | 7.82           |
| 957742 | AF2-068 E O1 | 4.44               | Adder | 5.22           |
| 958711 | AF2-162 C    | 5.28               | 80 50 | 5.28           |
| 958712 | AF2-162 E    | 2.64               | 80 50 | 2.64           |
| 958821 | AF2-173 C    | 14.79              | 80 50 | 14.79          |
| 958822 | AF2-173 E    | 20.42              | 80 50 | 20.42          |
| 958861 | AF2-177 C O1 | 4.58               | 80 50 | 4.58           |
| 958862 | AF2-177 E O1 | 30.64              | 80 50 | 30.64          |
| 959131 | AF2-204 C    | 3.95               | Adder | 4.65           |
| 959132 | AF2-204 E    | 2.08               | Adder | 2.45           |
| 960441 | AF2-335 C    | 7.33               | 80 50 | 7.33           |
| 960442 | AF2-335 E    | 4.88               | 80 50 | 4.88           |
| 960791 | AF2-370      | 2.44               | 80 50 | 2.44           |

| Bus #          | Bus                            | Gendeliv MW Impact | Type          | Full MW Impact |
|----------------|--------------------------------|--------------------|---------------|----------------|
| 960971         | AF2-388 C                      | 6.2                | 80 50         | 6.2            |
| 960972         | AF2-388 E                      | 29.02              | 80 50         | 29.02          |
| 961161         | AF2-407                        | 30.11              | 80 50         | 30.11          |
| 961171         | AF2-408                        | 6.21               | Adder         | 7.31           |
| 961761         | AG1-017 C                      | 0.22               | Adder         | 0.26           |
| 961762         | AG1-017 E                      | 1.01               | Adder         | 1.19           |
| 962031         | AG1-047 C                      | 4.44               | Adder         | 5.22           |
| 962032         | AG1-047 E                      | 2.96               | Adder         | 3.48           |
| 963731         | AG1-225 C                      | 10.11              | Adder         | 11.89          |
| 963732         | AG1-225 E                      | 6.79               | Adder         | 7.99           |
| 964611         | AG1-324 C O1                   | 2.56               | Adder         | 3.01           |
| 964612         | AG1-324 E O1                   | 1.1                | Adder         | 1.29           |
| 965031         | AG1-367 C                      | 10.56              | 80 50         | 10.56          |
| 965032         | AG1-367 E                      | 7.04               | 80 50         | 7.04           |
| 965101         | AG1-375 C                      | 10.56              | 80 50         | 10.56          |
| 965102         | AG1-375 E                      | 7.04               | 80 50         | 7.04           |
| 965461         | AG1-414 C O1                   | 3.05               | Adder         | 3.59           |
| 965462         | AG1-414 E O1                   | 2.03               | Adder         | 2.39           |
| 965651         | AG1-433 C                      | 3.1                | 80 50         | 3.1            |
| 965652         | AG1-433 E                      | 14.51              | 80 50         | 14.51          |
| LTFEXP_AC1-131 | LTFEXP_AC1-131->LTFIMP_AC1-131 | 0.0221             | Confirmed LTF | 0.0221         |
| LTFEXP_BlueG   | LTFEXP_BlueG->LTFIMP_BlueG     | 0.1409             | Confirmed LTF | 0.1409         |
| LTFEXP_CBM-S1  | LTFEXP_CBM-S1->LTFIMP_CBM-S1   | 0.1624             | LTF/CBM       | 0.1624         |
| LTFEXP_CBM-S2  | LTFEXP_CBM-S2->LTFIMP_CBM-S2   | 0.3775             | LTF/CBM       | 0.3775         |
| LTFEXP_CBM-W1  | LTFEXP_CBM-W1->LTFIMP_CBM-W1   | 14.9119            | LTF/CBM       | 14.9119        |
| LTFEXP_CBM-W2  | LTFEXP_CBM-W2->LTFIMP_CBM-W2   | 10.697             | LTF/CBM       | 10.697         |
| LTFEXP_G-007   | LTFEXP_G-007->LTFIMP_G-007     | 0.1725             | LTF/CMTX NF   | 0.1725         |
| LTFEXP_HAMLET  | LTFEXP_HAMLET->LTFIMP_HAMLET   | 0.0005             | Confirmed LTF | 0.0005         |
| LTFEXP_LAGN    | LTFEXP_LAGN->LTFIMP_LAGN       | 1.2112             | Confirmed LTF | 1.2112         |
| LTFEXP_MEC     | LTFEXP_MEC->LTFIMP_MEC         | 1.9677             | Confirmed LTF | 1.9677         |

| <b>Bus #</b>          | <b>Bus</b>                     | <b>Gendeliv MW Impact</b> | <b>Type</b>   | <b>Full MW Impact</b> |
|-----------------------|--------------------------------|---------------------------|---------------|-----------------------|
| <b>LTFEXP_NY</b>      | LTFEXP_NY->LTFIMP_NY           | 0.0884                    | Confirmed LTF | 0.0884                |
| <b>LTFEXP_O-066</b>   | LTFEXP_O-066->LTFIMP_O-066     | 1.105                     | LTF/CMTX NF   | 1.105                 |
| <b>LTFEXP_SIGE</b>    | LTFEXP_SIGE->LTFIMP_SIGE       | 0.1697                    | Confirmed LTF | 0.1697                |
| <b>LTFEXP_TRIMBLE</b> | LTFEXP_TRIMBLE->LTFIMP_TRIMBLE | 0.1168                    | Confirmed LTF | 0.1168                |
| <b>LTFEXP_TVA</b>     | LTFEXP_TVA->LTFIMP_TVA         | 0.7468                    | Confirmed LTF | 0.7468                |
| <b>LTFEXP_WEC</b>     | LTFEXP_WEC->LTFIMP_WEC         | 0.4172                    | Confirmed LTF | 0.4172                |

## 11.8 Queue Dependencies

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

| Queue Number | Project Name                      | Status                      |
|--------------|-----------------------------------|-----------------------------|
| AA2-074      | CPLP-PJM                          | Confirmed                   |
| AB2-028      | Fall Creek-Desoto 345kV           | Withdrawn                   |
| AC1-056      | PJM-AMIL                          | Confirmed                   |
| AC1-131      | PJM-CPLP                          | Confirmed                   |
| AC1-175      | Losantville 345kV                 | Under Construction          |
| AC2-090      | Losantville 345kV                 | Active                      |
| AC2-111      | College Corner 138kV              | Engineering and Procurement |
| AC2-176      | Jay 138 kV                        | In Service                  |
| AD1-043      | Makahoy 138 kV                    | Active                      |
| AD1-128      | Modoc-Delaware 138 kV             | Active                      |
| AD2-071      | Strawton-Pipe Creek 138 kV        | Active                      |
| AE1-207      | Mississinewa-Gaston 138 kV        | Active                      |
| AE1-208      | Delaware-Van Buren 138 kV         | Active                      |
| AE1-209      | Desoto 345 kV                     | Active                      |
| AE1-210      | Desoto 345 kV                     | Active                      |
| AE2-089      | Pennville-Adams 138 kV            | Active                      |
| AE2-169      | Delaware-Van Buren 138 kV         | Active                      |
| AE2-172      | Mississinewa-Gaston 138 kV        | Active                      |
| AE2-219      | Bluff Point-Randolph 138 kV       | Active                      |
| AE2-220      | Losantville 345 kV                | Active                      |
| AE2-234      | Liberty Center-Buckeye Tap 69 kV  | Active                      |
| AE2-297      | Madison-Tanners Creek 138 kV      | Active                      |
| AF1-071      | College Corner 138 kV             | Active                      |
| AF1-118      | Sorenson-Desoto 345 kV            | Active                      |
| AF1-119      | Keystone-Desoto 345 kV            | Active                      |
| AF1-148      | Sorenson-Desoto 345 kV            | Active                      |
| AF1-202      | Keystone-Desoto 345 kV            | Active                      |
| AF1-221      | College Corner-Drewersburg 138 kV | Active                      |
| AF1-223      | Keystone-Desoto 345 kV            | Active                      |
| AF1-268      | Desoto-Jay 138 kV                 | Active                      |



| <b>Queue Number</b> | <b>Project Name</b>            | <b>Status</b>                             |
|---------------------|--------------------------------|-------------------------------------------|
| <b>AF2-068</b>      | Jay 138 kV                     | Active                                    |
| <b>AF2-162</b>      | Keystone-Desoto 345 kV         | Active                                    |
| <b>AF2-173</b>      | Desoto 345 kV                  | Active                                    |
| <b>AF2-177</b>      | Sorenson-DeSoto #2 345 kV      | Active                                    |
| <b>AF2-204</b>      | Van Buren-Delaware 138 kV      | Active                                    |
| <b>AF2-335</b>      | West Del-Royerton 138 kV       | Active                                    |
| <b>AF2-370</b>      | West Del-Royerton 138 kV       | Active                                    |
| <b>AF2-388</b>      | Keystone-Desoto 345 kV         | Active                                    |
| <b>AF2-407</b>      | Fall Creek 345 kV              | Active                                    |
| <b>AF2-408</b>      | Fall Creek 138 kV              | Active                                    |
| <b>AG1-017</b>      | Jay 138 kV                     | Active                                    |
| <b>AG1-047</b>      | Jay 138 kV                     | Active                                    |
| <b>AG1-049</b>      | College Corner 138 kV          | Active                                    |
| <b>AG1-224</b>      | Pendleton-Tanners Creek 138 kV | Active                                    |
| <b>AG1-225</b>      | Adams 138 kV                   | Active                                    |
| <b>AG1-232</b>      | Magley 138 kV                  | Active                                    |
| <b>AG1-297</b>      | Hanna-Tanners Creek 345 kV     | Active                                    |
| <b>AG1-324</b>      | Jay-Desoto 138 kV              | Active                                    |
| <b>AG1-367</b>      | DeSoto 345 kV                  | Active                                    |
| <b>AG1-375</b>      | Sorenson-Desoto 345 kV         | Active                                    |
| <b>AG1-414</b>      | Mississinewa 138 kV            | Active                                    |
| <b>AG1-433</b>      | DeSoto-Keystone 345 kV         | Active                                    |
| <b>V3-007</b>       | Desoto-Tanners Creek #1 345kV  | Partially in Service - Under Construction |
| <b>Y3-024</b>       | Bluff Point 12kV               | In Service                                |
| <b>Z2-115</b>       | Deer Creek 12.47kV             | In Service                                |
| <b>J1152</b>        | MISO                           | MISO                                      |
| <b>J805</b>         | MISO                           | MISO                                      |
| <b>J903</b>         | MISO                           | MISO                                      |
| <b>J993</b>         | MISO                           | MISO                                      |

## 11.9 Contingency Descriptions

| Contingency Name                    | Contingency Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AEP_P4_#14047_05DESOTO 138_F</b> | CONTINGENCY 'AEP_P4_#14047_05DESOTO 138_F'<br>/* OPEN BRANCH FROM BUS 243278 TO BUS 247837 CKT 1 /<br>243278 05DESOTO 138 247837 05PERCH 138 1<br>OPEN BRANCH FROM BUS 243278 TO BUS 946030 CKT 1 /<br>243278 05DESOTO 138 946030 AF1-268 TAP 138 1<br>/* OPEN BRANCH FROM BUS 243319 TO BUS 247837 CKT 1 /<br>243319 05JAY 138 247837 05PERCH 138 1<br>OPEN BRANCH FROM BUS 243278 TO BUS 243340 CKT 1 /<br>243278 05DESOTO 138 243340 05MEDFOR 138 1<br>END                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>AEP_P4_#14539_05DESOTO 138_M</b> | CONTINGENCY 'AEP_P4_#14539_05DESOTO 138_M'<br>OPEN BRANCH FROM BUS 243278 TO BUS 243373 CKT 1 /<br>243278 05DESOTO 138 243373 05SELMA P_BP 138 1<br>/* OPEN BRANCH FROM BUS 243344 TO BUS 246085 CKT 1 /<br>243344 05MODOC 138 246085 05MODOC EQ 999 1<br>/* OPEN BRANCH FROM BUS 246083 TO BUS 246085 CKT 1 /<br>246083 05MODOC 69.0 246085 05MODOC EQ 999 1<br>/* OPEN BRANCH FROM BUS 246084 TO BUS 246085 CKT 1 /<br>246084 05MODOC L 12.0 246085 05MODOC EQ 999 1<br>/* OPEN BRANCH FROM BUS 243259 TO BUS 243262 CKT 1 /<br>243259 05CNTRVL 138 243262 05COLLEGE C 138 1<br>/* OPEN BRANCH FROM BUS 243259 TO BUS 243344 CKT 1 /<br>243259 05CNTRVL 138 243344 05MODOC 138 1<br>OPEN BRANCH FROM BUS 243278 TO BUS 246629 CKT 1 /<br>243278 05DESOTO 138 246629 05SELMA P_BP 138 1<br>/* OPEN BRANCH FROM BUS 243344 TO BUS 246629 CKT 1 /<br>243344 05MODOC 138 246629 05SELMA P_BP 138 1<br>OPEN BRANCH FROM BUS 934960 TO BUS 246629 CKT 1 /<br>934960 AD1-128 TAP 138 246629 05SELMA P_BP 138 1<br>OPEN BRANCH FROM BUS 243278 TO BUS 946030 CKT 1 /<br>243278 05DESOTO 138 946030 AF1-268 TAP 138 1<br>END |

|                                    |                                                   |          |
|------------------------------------|---------------------------------------------------|----------|
| <b>AEP_P5_#11291_05DESO_05DESO</b> | CONTINGENCY 'AEP_P5_#11291_05DESO_05DESO'         |          |
|                                    | OPEN BRANCH FROM BUS 243218 TO BUS 945370 CKT 1   | /        |
|                                    | 243218 05DESOTO 345 945370 AF1-202 TAP 345 1      |          |
|                                    | OPEN BRANCH FROM BUS 243218 TO BUS 243792 CKT 2   | /        |
|                                    | 243218 05DESOTO 345 243792 05LOSANTVILL 345 2     |          |
|                                    | OPEN BRANCH FROM BUS 243218 TO BUS 958860 CKT 2   | /        |
|                                    | 243218 05DESOTO 345 958860 AF2-177 TAP 345 2      |          |
|                                    | OPEN BRANCH FROM BUS 243218 TO BUS 243233 CKT 1   | /        |
|                                    | 243218 05DESOTO 345 243233 05TANNER 345 1         |          |
|                                    | OPEN BRANCH FROM BUS 243218 TO BUS 923880 CKT 1   | /        |
|                                    | 243218 05DESOTO 345 923880 AB2-028 TAP 345 1      |          |
|                                    | OPEN BRANCH FROM BUS 243218 TO BUS 243278 CKT 1   | /        |
|                                    | 243218 05DESOTO 345 243278 05DESOTO 138 1         |          |
|                                    | OPEN BRANCH FROM BUS 243218 TO BUS 243278 CKT 2   | /        |
|                                    | 243218 05DESOTO 345 243278 05DESOTO 138 2         |          |
|                                    | OPEN BRANCH FROM BUS 243235 TO BUS 246625 CKT 1   | /        |
|                                    | 243235 0523RD 138 246625 05MEDFORD_BP 138 1       |          |
|                                    | / OPEN BRANCH FROM BUS 243274 TO BUS 243343 CKT 1 | /        |
|                                    | 243274 05DEER CRK1 138 243343 05MISSIS 138 1      |          |
|                                    | / OPEN BRANCH FROM BUS 243275 TO BUS 243393 CKT 1 | /        |
|                                    | 243275 05DELAWR1 138 243393 05WESDEL 138 1        |          |
|                                    | OPEN BRANCH FROM BUS 243278 TO BUS 243296 CKT 1   | /        |
|                                    | 243278 05DESOTO 138 243296 05GASTON 138 1         |          |
|                                    | OPEN BRANCH FROM BUS 243278 TO BUS 946030 CKT 1   | /        |
|                                    | 243278 05DESOTO 138 946030 AF1-268 TAP 138 1      |          |
|                                    | / OPEN BRANCH FROM BUS 247837 TO BUS 243319 CKT 1 | /        |
|                                    | 247837 05PERCH 138 243319 05JAY 138 1             |          |
|                                    | OPEN BRANCH FROM BUS 243278 TO BUS 243337 CKT 1   | /        |
|                                    | 243278 05DESOTO 138 243337 05MAYFIE 138 1         |          |
|                                    | OPEN BRANCH FROM BUS 243278 TO BUS 243369 CKT 1   | /        |
|                                    | 243278 05DESOTO 138 243369 05ROYERT 138 1         |          |
|                                    | OPEN BRANCH FROM BUS 243296 TO BUS 939760 CKT 1   | /        |
|                                    | 243296 05GASTON 138 939760 AE1-207 TAP 138 1      |          |
|                                    | OPEN BRANCH FROM BUS 243337 TO BUS 246625 CKT 1   | /        |
|                                    | 243337 05MAYFIE 138 246625 05MEDFORD_BP 138 1     |          |
|                                    | OPEN BRANCH FROM BUS 243369 TO BUS 960440 CKT 1   | /        |
|                                    | 243369 05ROYERT 138 960440 AF2-335 TAP 138 1      |          |
|                                    | / REMOVE LOAD D4 FROM BUS 246051                  | / 246051 |
|                                    | 05DEER CRK2 138                                   |          |
|                                    | / REMOVE SWSHUNT FROM BUS 245803                  | / 245803 |
|                                    | 05DELAWR2 138                                     |          |
|                                    | REMOVE LOAD D2 FROM BUS 243296                    | / 243296 |
|                                    | 05GASTON 138                                      |          |

| Contingency Name                    | Contingency Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | / REMOVE SWSHUNT FROM BUS 243319 / 243319<br>05JAY 138<br>/ REMOVE LOAD D3 FROM BUS 243319 / 243319<br>05JAY 138<br>/ REMOVE LOAD D1 FROM BUS 243337 / 243337<br>05MAYFIE 138<br>/ REMOVE LOAD C1 FROM BUS 243343 / 243343<br>05MISSIS 138<br>/ REMOVE LOAD C2 FROM BUS 243343 / 243343<br>05MISSIS 138<br>/ REMOVE LOAD D1 FROM BUS 243343 / 243343<br>05MISSIS 138<br>REMOVE LOAD D1 FROM BUS 243369 / 243369<br>05ROYERT 138<br>/ REMOVE LOAD D1 FROM BUS 243393 / 243393<br>05WESDEL 138<br>END |
| <b>AEP_P1-2_#10526-B</b>            | CONTINGENCY 'AEP_P1-2_#10526-B'<br>OPEN BRANCH FROM BUS 942070 TO BUS 243362 CKT 1 /<br>942070 AE2-219 TAP 138 243362 05RANDOL 138 1<br>END                                                                                                                                                                                                                                                                                                                                                         |
| <b>AEP_P4_#14920_05TANNER 345_T</b> | CONTINGENCY 'AEP_P4_#14920_05TANNER 345_T'<br>OPEN BRANCH FROM BUS 243233 TO BUS 249565 CKT 1 /<br>243233 05TANNER 345 249565 08EBEND                                                                                                                                                                                                                                                                                                                                                               |
| <b>AEP_P1-2_#4817_6341</b>          | CONTINGENCY 'AEP_P1-2_#4817_6341'<br>OPEN BRANCH FROM BUS 243225 TO BUS 243232 CKT 1 /<br>243225 05KEYSTN 345 243232 05SORENS 345 1<br>END                                                                                                                                                                                                                                                                                                                                                          |
| <b>914_TRENTON</b>                  | CONTINGENCY '914_TRENTON'<br>OPEN BUS 250168<br>END                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

| Contingency Name                          | Contingency Definition                                                                                                                                                                                                                        |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DEOK_P7_4504MFTANNERS4512EBTANNERS</b> | CONTINGENCY 'DEOK_P7_4504MFTANNERS4512EBTANNERS'<br>OPEN BRANCH FROM BUS 243233 TO BUS 249567 CKT 1<br>OPEN BRANCH FROM BUS 243233 TO BUS 249565 CKT 1<br>END                                                                                 |
| <b>AEP_P1-2_#8702_2543-C</b>              | CONTINGENCY 'AEP_P1-2_#8702_2543-C'<br>OPEN BRANCH FROM BUS 944530 TO BUS 243232 CKT 2 /<br>944530 AF1-118 TAP 345 243232 05SORENS 345 2<br>END                                                                                               |
| <b>DEOK_P1_TODHUNTER JCT 138</b>          | CONTINGENCY 'DEOK_P1_TODHUNTER JCT 138'<br>OPEN BUS 250106<br>END                                                                                                                                                                             |
| <b>AEP_P1-2_#15020-A</b>                  | CONTINGENCY 'AEP_P1-2_#15020-A'<br>OPEN BRANCH FROM BUS 243278 TO BUS 946030 CKT 1 /<br>243278 05DESOTO 138 946030 AF1-268 TAP 138 1<br>END                                                                                                   |
| <b>AEP_P7-1_#11019-D</b>                  | CONTINGENCY 'AEP_P7-1_#11019-D'<br>OPEN BRANCH FROM BUS 944530 TO BUS 243232 CKT 2 /<br>944530 AF1-118 TAP 345 243232 05SORENS 345 2<br>OPEN BRANCH FROM BUS 243225 TO BUS 243232 CKT 1 /<br>243225 05KEYSTN 345 243232 05SORENS 345 1<br>END |
| <b>DEOK_P2-2_TRENTON2</b>                 | CONTINGENCY 'DEOK_P2-2_TRENTON2'<br>OPEN BUS 250168<br>END                                                                                                                                                                                    |
| <b>Base Case</b>                          |                                                                                                                                                                                                                                               |

| Contingency Name         | Contingency Definition                                                                                                                                                                                                                           |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AEP_P7-1_#11087-H</b> | CONTINGENCY 'AEP_P7-1_#11087-H'<br>OPEN BRANCH FROM BUS 960970 TO BUS 243225 CKT 1 /<br>960970 AF2-388 TAP 345 243225 05KEYSTN 345 1<br>OPEN BRANCH FROM BUS 944530 TO BUS 243232 CKT 2 /<br>944530 AF1-118 TAP 345 243232 05SORENS 345 2<br>END |

## **12 Light Load Analysis**

Not applicable.

## **13 Short Circuit Analysis**

The following Breakers are overdutied:

None.

## **14 Stability and Reactive Power**

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

To be determined in the Facilities Study Phase.

## **15 Affected Systems**

### **15.1 TVA**

None

### **15.2 Duke Energy Progress**

None

### **15.3 MISO**

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

### **15.4 LG&E**

None



## 16 Attachment 1: One Line Diagram and Project Site Location

