# Generation Interconnection

# Feasibility Study Report

# for

# Queue Project AG1-523

# SULLIVAN-ROCKPORT 765 KV

# 180 MW Capacity / 300 MW Energy

# Solar Project

January 2021

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# 1 Introduction

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

# 2 Preface

The intent of the feasibility study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. Cost allocation rules for network upgrades can be found in PJM Manual 14A, Attachment B. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

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

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

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

## 3 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Sullivan County, Indiana. AG1-523 is an uprate to AG1-522.

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

| Queue Number | AG1-523 |
|---|---|
| Project Name | SULLIVAN-ROCKPORT 765 KV |
| State | Indiana |
| County | Sullivan |
| Transmission Owner | AEP |
| MFO | 600 |
| MWE | 300 |
| MWC | 180 |
| Fuel | Solar |
| Basecase Study Year | 2024 |

Any new service customers who can feasibly be commercially operable prior to June 1st of the basecase study year are required to request interim deliverability analysis.

## 4 Point of Interconnection

AG1-523 will interconnect with the AEP transmission system via a direct connection to the AG1-522 proposed 765 kV station, as an uprate to the PJM project AG1-522.

Note: It is assumed that the existing 765 kV revenue metering system, generation lead and Protection & Control Equipment that will be installed for AG1-522 will be adequate for the increased generation of AG1-523. Depending on the timing of the completion of the AG1-522 interconnection construction relative to the AG1-523 completion, there may (or may not) be a need to review and revise the relay settings for the increased generation of AG1-523.

## 5 Cost Summary

The AG1-523 project will be responsible for the following costs:

| Description | Total Cost |
|---|---|
| **Total Physical Interconnection Costs** | $45,000 |
| **Total System Network Upgrade Costs** | $49,795,000 |
| **Total Costs** | $49,840,000 |

This cost excludes a Federal Income Tax Gross Up charges. This tax may or may not be charged based on whether this project meets the eligibility requirements of IRS Notice 2016-36, 2016-25 I.R.B. (6/20/2016). If at a future date it is determined that the Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

Cost allocations for any System Upgrades will be provided in the System Impact Study Report.

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

# 6 Transmission Owner Scope of Work

The total physical interconnection costs is given in the table 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 |
|---|---|
| | $ 0 |
| **Total Attachment Facility Costs** | **$** 0 |

## 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 |
|---|---|
| | $ 0 |
| **Total Direct Connection Facility Costs** | **$** 0 |

## 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 line protection and control settings at the AG1-522 proposed 765 kV substation | $ 45,000 |
| **Total Non-Direct Connection Facility Costs** | **$** 45,000 |

## 7 Schedule

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

## 8 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.

# 9 Revenue Metering and SCADA Requirements

## 9.1 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.

## 9.2 Meteorological Data Reporting Requirements

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

- Back Panel temperature (Fahrenheit) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Irradiance (Watts/meter2) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Ambient air temperature (Fahrenheit) - (Accepted, not required)
- Wind speed (meters/second) - (Accepted, not required)
- Wind direction (decimal degrees from true north) - (Accepted, not required)

## 9.3 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/

## 10 Summer Peak - Load Flow Analysis

The Queue Project AG1-523 was evaluated as a 300.0 MW (Capacity 180.0 MW) injection tapping the Sullivan to Rockport 765 kV line in the AEP area. Project AG1-523 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-523 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

## 10.1 Generation Deliverability

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

None

## 10.2 Multiple Facility Contingency

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

None

## 10.3 Contribution to Previously Identified Overloads

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

| ID | FROM BUS# | FROM BUS | kV | FROM BUS AREA | TO BUS# | TO BUS | kV | TO BUS AREA | CKT ID | CONT NAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC\|DC | MW IMPACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **164764225** | 242865 | 05JEFRSO | 345.0 | AEP | 248000 | 06CLIFTY | 345.0 | OVEC | Z1 | AEP_P4_#1760_05JEFRSO 765_A | breaker | 1868.0 | 193.86 | 199.42 | DC | 102.43 |
| **164764226** | 242865 | 05JEFRSO | 345.0 | AEP | 248000 | 06CLIFTY | 345.0 | OVEC | Z1 | AEP_P4_#6189_05HANG R 765_D1 | breaker | 1868.0 | 162.78 | 164.92 | DC | 70.7 |
| **164764543** | 242865 | 05JEFRSO | 345.0 | AEP | 248000 | 06CLIFTY | 345.0 | OVEC | Z1 | AEP_P1-2_#709_546 | single | 1868.0 | 143.21 | 143.96 | DC | 42.47 |
| **167479437** | 242865 | 05JEFRSO | 345.0 | AEP | 248000 | 06CLIFTY | 345.0 | OVEC | Z1 | AEP_P4_#1760_05JEFRSO | breaker | 1868.0 | 193.86 | 199.42 | DC | 102.43 |
| **167479438** | 242865 | 05JEFRSO | 345.0 | AEP | 248000 | 06CLIFTY | 345.0 | OVEC | Z1 | AEP_P4_#6189_05HANG | breaker | 1868.0 | 162.78 | 164.92 | DC | 70.7 |
| **167479547** | 243208 | 05JEFRSO | 765.0 | AEP | 242865 | 05JEFRSO | 345.0 | AEP | 2 | AEP_P4_#1760_05JEFRSO | breaker | 3039.0 | 119.16 | 122.58 | DC | 102.43 |
| **167479548** | 243208 | 05JEFRSO | 765.0 | AEP | 242865 | 05JEFRSO | 345.0 | AEP | 2 | AEP_P4_#6189_05HANG | breaker | 3039.0 | 100.06 | 101.37 | DC | 70.7 |
| **161930818** | 243209 | 05ROCKPT | 765.0 | AEP | 243208 | 05JEFRSO | 765.0 | AEP | 1 | AEP_P7-1_#11042-B | tower | 3854.0 | 131.93 | 135.48 | DC | 139.28 |
| **161930819** | 243209 | 05ROCKPT | 765.0 | AEP | 243208 | 05JEFRSO | 765.0 | AEP | 1 | AEP_P7-1_#11042-A | tower | 3854.0 | 131.4 | 134.95 | DC | 139.28 |
| **168275213** | 247712 | 05SULLIVAN | 345.0 | AEP | 254529 | 16PETE | 345.0 | IPL | 1 | AEP_P1-2_#363_1682 | single | 1409.0 | 105.7 | 108.97 | DC | 46.06 |
| **168275224** | 247712 | 05SULLIVAN | 345.0 | AEP | 243221 | 05EUGENE | 345.0 | AEP | 1 | AEP_P1-2_#363_1682 | single | 1335.0 | 116.92 | 119.86 | DC | 39.33 |
| **164764379** | 248000 | 06CLIFTY | 345.0 | OVEC | 248001 | 06DEARB1 | 345.0 | OVEC | 1 | AEP_P4_#1760_05JEFRSO 765_A | breaker | 1099.0 | 106.03 | 107.09 | DC | 25.59 |

## 10.4 Potential Congestion due to Local Energy Deliverability

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

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

| ID | FROM BUS# | FROM BUS | kV | FROM BUS AREA | TO BUS# | TO BUS | kV | TO BUS AREA | CKT ID | CONT NAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC\|DC | MW IMPACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **164764542** | 242865 | 05JEFRSO | 345.0 | AEP | 248000 | 06CLIFTY | 345.0 | OVEC | Z1 | AEP_P1-2_#709_546 | operation | 1868.0 | 160.79 | 162.85 | DC | 70.78 |
| **168275493** | 243208 | 05JEFRSO | 765.0 | AEP | 242865 | 05JEFRSO | 345.0 | AEP | 2 | AEP_P1-2_#709_546 | operation | 3039.0 | 98.83 | 100.1 | DC | 70.78 |
| **168275315** | 243209 | 05ROCKPT | 765.0 | AEP | 243208 | 05JEFRSO | 765.0 | AEP | 1 | AEP_P1-2_#8905_1697 | operation | 3854.0 | 117.35 | 120.92 | DC | 139.79 |
| **168275317** | 243209 | 05ROCKPT | 765.0 | AEP | 243208 | 05JEFRSO | 765.0 | AEP | 1 | Base Case | operation | 3854.0 | 109.18 | 112.63 | DC | 132.94 |
| **168275287** | 243210 | 05SULLIVAN | 765.0 | AEP | 247712 | 05SULLIVAN | 345.0 | AEP | 1 | AEP_P1-2_#363_1682 | operation | 1737.0 | 106.71 | 115.23 | DC | 147.9 |
| **168275424** | 243217 | 05DEQUIN | 345.0 | AEP | 243878 | 05MEADOW | 345.0 | AEP | 1 | AEP_P1-2_#6490_16000 | operation | 1959.0 | 101.92 | 103.51 | DC | 31.06 |
| **168275436** | 243217 | 05DEQUIN | 345.0 | AEP | 243878 | 05MEADOW | 345.0 | AEP | 2 | AEP_P1-2_#6472_15258 | operation | 1959.0 | 101.19 | 102.77 | DC | 30.83 |
| **168275182** | 243878 | 05MEADOW | 345.0 | AEP | 255205 | 17REYNOLDS | 345.0 | NIPS | 2 | AEP_P1-2_#8695-B | operation | 1868.0 | 161.61 | 163.35 | DC | 32.62 |
| **168275196** | 243878 | 05MEADOW | 345.0 | AEP | 958970 | AF2-188 TAP | 345.0 | AEP | 1 | AEP_P1-2_#8807 | operation | 1868.0 | 157.18 | 158.92 | DC | 32.54 |
| **168275211** | 247712 | 05SULLIVAN | 345.0 | AEP | 254529 | 16PETE | 345.0 | IPL | 1 | AEP_P1-2_#363_1682 | operation | 1409.0 | 143.79 | 149.25 | DC | 76.77 |
| **168275222** | 247712 | 05SULLIVAN | 345.0 | AEP | 243221 | 05EUGENE | 345.0 | AEP | 1 | AEP_P1-2_#363_1682 | operation | 1335.0 | 142.67 | 147.58 | DC | 65.54 |
| **168275340** | 247712 | 05SULLIVAN | 345.0 | AEP | 243217 | 05DEQUIN | 345.0 | AEP | 1 | AEP_P1-2_#363_1682 | operation | 1318.0 | 112.14 | 115.47 | DC | 43.84 |
| **168571065** | 255204 | 17REYNOLDS | 765.0 | NIPS | 243207 | 05GRNTWN | 765.0 | AEP | 1 | AEP_P1-2_#363_1682 | operation | 2669.0 | 104.34 | 104.94 | DC | 31.25 |
| **164764650** | 324010 | 7TRIMBL REAC | 345.0 | LGEE | 248000 | 06CLIFTY | 345.0 | OVEC | 1 | AEP_P1-2_#363_1682 | operation | 1451.0 | 123.09 | 123.66 | DC | 18.53 |
| **169800479** | 923880 | AB2-028 TAP | 345.0 | AEP | 243218 | 05DESOTO | 345.0 | AEP | 1 | AEP_P1-2_#363_1682 | operation | 1318.0 | 104.38 | 105.2 | DC | 24.03 |
| **170076892** | 958970 | AF2-188 TAP | 345.0 | AEP | 255205 | 17REYNOLDS | 345.0 | NIPS | 1 | AEP_P1-2_#8807 | operation | 1868.0 | 161.73 | 163.47 | DC | 32.54 |
| **170077122** | 963840 | AG1-237 TAP | 345.0 | AEP | 243217 | 05DEQUIN | 345.0 | AEP | 1 | AEP_P1-2_#363_1682 | operation | 1959.0 | 100.8 | 101.38 | DC | 25.01 |
| **170077060** | 966530 | AG1-522 TAP | 765.0 | AEP | 243210 | 05SULLIVAN | 765.0 | AEP | 1 | AEP_P1-2_#363_1682 | operation | 3859.0 | 96.07 | 103.74 | DC | 295.81 |

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

| ID | Idx | Facility | Upgrade Description | Cost |
|---|---|---|---|---|
| 164764379 | 6 | 06CLIFTY 345.0 kV - 06DEARB1 345.0 kV Ckt 1 | OVEC<br>b2943 (2170) : PJM Baseline Upgrade b2943. Perform a LIDAR study on the Clifty Creek - Dearborn 345 kV line to increase the Summer Emergency rating. The baseline project had a projected in-service date of 12/01/2020.<br>Project Type : FAC<br>Cost : $0<br>Time Estimate : N/A Months | $0 |
| 168275224 | 5 | 05SULLIVAN 345.0 kV - 05EUGENE 345.0 kV Ckt 1 | AEP<br>AEPI0036a (352) : Rebuild 3.83 miles of 2303.5 ACAR , conductor section 1<br>Project Type : FAC<br>Cost : $5,745,000<br>Time Estimate : 24- 36 Months<br><br>AEPI0036b (353) : Rebuild 47.02 miles of 1414 ACSR/PE, conductor section 2<br>Project Type : FAC<br>Cost : $7,660,000<br>Time Estimate : 24- 36 Months | $13,405,000 |

| ID | Idx | Facility | Upgrade Description | Cost |
|---|---|---|---|---|
| 164764225,167479437,164764226,167479438,164764543 | 1 | 05JEFRSO 345.0 kV - 06CLIFTY 345.0 kV Ckt Z1 | **AEP**<br>**AEPI0045a (11) : Replace 4 Clifty Switches (3000A)**<br>**Project Type : FAC**<br>**Cost : $2,000,000**<br>**Time Estimate : 12-18 Months**<br><br>**AEPI0045b (12) : A Sag Study will be required on the 0.75 mile section of ACSR ~ 2156 ~ 64/19 ~ BLUEBIRD line to mitigate the overload . New Rating after the Sag Study : S/N: 2354 MVA S/E: 3212 MVA. Depending on the sag study results, cost for this upgrade is expected to be between $20,000 (No remediations required just sag study) and 1.96 million (complete line reconductor/rebuild required). Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement.**<br>**Project Type : FAC**<br>**Cost : $20,000**<br>**Time Estimate : 6-12 Months**<br><br>**AEPI0045c (14) : Replace Clifty Bus 5"0 AL Tubular Sch 40**<br>**Project Type : FAC**<br>**Cost : $100,000**<br>**Time Estimate : 12-18 Months**<br><br>**AEPI0045d (13) : Rebuild 0.75 miles of ACSR ~ 2156 ~ 64/19 ~ BLUEBIRD conductor to mitigate the overload.**<br>**Project Type : FAC**<br>**Cost : $1,960,000**<br>**Time Estimate : 24-36 Months**<br><br>**AEPI0045e (15) : Replace Jefferson Breaker (5000A)**<br>**Project Type : FAC**<br>**Cost : $1,200,000**<br>**Time Estimate : 12-18 Months**<br><br>**AEPI0045f (245) : An engineering study will need to be conducted to determine if the Jefferson Relay Compliance Trip limits 5506 Amps settings can be adjusted to mitigate the overload, Estimated Cost $25,000. New relay packages will be required if the settings cannot be adjusted. Estimated Cost: $600,000.**<br>**Project Type : FAC**<br>**Cost : $25,000**<br>**Time Estimate : 12-18 Months**<br><br>**AEPI0045g (246) : An engineering study will need to be conducted to determine if the Clifty Relay Thermal limits 5993 Amps settings can be adjusted to mitigate the overload, Estimated Cost $25,000. New relay packages will be required if the settings cannot be adjusted. Estimated Cost: $600,000.**<br>**Project Type : FAC**<br>**Cost : $25,000**<br>**Time Estimate : 12-18 Months** | $12,015,000 |

| ID | Idx | Facility | Upgrade Description | Cost |
|---|---|---|---|---|
| 164764225,167479437,164764226,167479438,164764543 | 1 | 05JEFRSO 345.0 kV - 06CLIFTY 345.0 kV Ckt Z1 | **continued:**<br><br>**AEPI0045h (247) : An engineering study will need to be conducted to determine if the Jefferson Relay Compliance Trip limits 5993 Amps settings can be adjusted to mitigate the overload, Estimated Cost $25,000. New relay packages will be required if the settings cannot be adjusted. Estimated Cost: $600,000.**<br>**Project Type : FAC**<br>**Cost : $25,000**<br>**Time Estimate : 12-18 Months**<br><br>**AEPI0045i (248) : Replace 2 Clifty Breakers (3000A)**<br>**Project Type : FAC**<br>**Cost : $2,400,000**<br>**Time Estimate : 12-18 Months**<br><br>**AEPI0045j (249) : Replace 3 Clifty risers (Sub cond 2-3500 kcm AAC 127 Str)**<br>**Project Type : FAC**<br>**Cost : $300,000**<br>**Time Estimate : 12-18 Months**<br><br>**n4106 (252) : Perform a sag study on the 345 kV line between Jefferson and Clifty Creek. The 345 kV line between Jefferson and Clifty Creek can be sag studied to increase the emergency rating from 2354 to 3212. The cost of a sag study to identify any mitigation requirements should cost around $3,680. If remediation can only be reached through a rebuild, wed expect that to cost around $1,960,000. Note that the transformer will still be limited to 2919 MVA emergency.**<br>**Project Type : FAC**<br>**Cost : $1,960,000**<br>**Time Estimate : N/A Months**<br><br>**n4106.1 (253) : Replace 4 Clifty switches (5000A)**<br>**Project Type : FAC**<br>**Cost : $2,000,000**<br>**Time Estimate : 12-18 Months** | |

| ID | Idx | Facility | Upgrade Description | Cost |
|---|---|---|---|---|
| 167479548,167479547 | 2 | 05JEFRSO 765.0 kV - 05JEFRSO 345.0 kV Ckt 2 | **AEP**<br>**AEPI0025a (331) : Replace 765/345 Transformer**<br>**Project Type : FAC**<br>**Cost : $6,000,000**<br>**Time Estimate : 12-18 Months**<br><br>**AEPI0025b (332) : Replace Jefferson 345kV Circuit Breaker (5000A)**<br>**Project Type : FAC**<br>**Cost : $1,200,000**<br>**Time Estimate : 12-18 Months**<br><br>**AEPI0025c (333) : An engineering study will need to be conducted to determine if the Jefferson CT thermal Trip limits 2703 Amps settings can be adjusted to mitigate the overload, Estimated Cost $25,000. New relay packages will be required if the settings cannot be adjusted. Estimated Cost: $600,000.**<br>**Project Type : FAC**<br>**Cost : $25,000**<br>**Time Estimate : 12-18 Months** | $7,225,000 |
| 161930818,161930819 | 3 | 05ROCKPT 765.0 kV - 05JEFRSO 765.0 kV Ckt 1 | **AEP**<br>**AEPI0002a (271) : An engineering study will need to be conducted to determine if the Rockport Relay Thermal limits 2996 Amps settings can be adjusted to mitigate the overload, Estimated Cost $25,000. New relay packages will be required if the settings cannot be adjusted, Estimated Cost: $600,000**<br>**Project Type : FAC**<br>**Cost : $25,000**<br>**Time Estimate : 12-18 Months**<br><br>**AEPI0002c (273) : Replace 6 Rockport Current Transformers 3000Amps**<br>**Project Type : FAC**<br>**Cost : $4,800,000**<br>**Time Estimate : 12-18 Months**<br><br>**AEPI0002d (274) : Replace 2 Rockport 3000A non-oil Breakers at Rockport**<br>**Project Type : FAC**<br>**Cost : $6,000,000**<br>**Time Estimate : 12-18 Months**<br><br>**AEPI0002e (275) : Replace 3 3000A Wavetraps at Rockport**<br>**Project Type : FAC**<br>**Cost : $150,000**<br>**Time Estimate : 12-18 Months**<br><br>**AEPI0002f (276) : Replace 3 3000A Wavetraps at Jefferson**<br>**Project Type : FAC**<br>**Cost : $150,000**<br>**Time Estimate : 12-18 Months**<br><br>**AEPI0002g (277) : Replace 12 3000A switches at Rockport**<br>**Project Type : FAC**<br>**Cost : $6,000,000**<br>**Time Estimate : 12-18 Months** | $17,125,000 |

| ID | Idx | Facility | Upgrade Description | Cost |
|---|---|---|---|---|
| **168275213** | 4 | **05SULLIVAN 345.0 kV - 16PETE 345.0 kV Ckt 1** | **AEP**<br>**AEPI0039a (383) : A Sag Study will be required on the ~0.5 miles section of 954 2x Rail Conductor section 2 to mitigate the overload. New Ratings after the sag study S/N : 1410 MVA S/E: 1888 MVA. Depending on the sag study results, cost for this upgrade is expected to be between $25,000 (no remediations required just sag study) and $0.75 million (complete line reconductor/rebuild required)**<br>**Project Type : FAC**<br>**Cost : $25,000**<br>**Time Estimate : 6-12 Months**<br><br>**IPL**<br>**NonPJMArea (540) : The external (i.e. Non-PJM) Transmission Owner, IPL, will not evaluate this violation until the impact study phase.**<br>**Project Type : FAC**<br>**Cost : $0**<br>**Time Estimate : N/A Months** | $25,000 |
| | | | **TOTAL COST** | **$49,795,000** |

## 10.6 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".

### 10.6.1 Index 1

| ID | FROM BUS# | FROM BUS | FROM BUS AREA | TO BUS# | TO BUS | TO BUS AREA | CKT ID | CONT NAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC\|DC | MW IMPACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **167479437** | 242865 | 05JEFRSO | AEP | 248000 | 06CLIFTY | OVEC | Z1 | AEP_P4_#1760_05JEFRSO | breaker | 1868.0 | 193.86 | 199.42 | DC | 102.43 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|---|---|---|---|---|
| **243442** | 05RKG1 | 102.2311 | 50/50 | 102.2311 |
| **243443** | 05RKG2 | 98.0091 | 50/50 | 98.0091 |
| **247900** | 05FR-11G E | 5.3350 | Adder | 6.28 |
| **247901** | 05FR-12G E | 5.2465 | Adder | 6.17 |
| **247902** | 05FR-21G E | 5.6076 | Adder | 6.6 |
| **247903** | 05FR-22G E | 5.3691 | Adder | 6.32 |
| **247904** | 05FR-3G E | 10.8745 | Adder | 12.79 |
| **247905** | 05FR-4G E | 8.5170 | Adder | 10.02 |
| **247906** | 05MDL-1G E | 9.3352 | Adder | 10.98 |
| **247907** | 05MDL-2G E | 4.6764 | Adder | 5.5 |
| **247912** | 05MDL-3G E | 4.6764 | Adder | 5.5 |
| **247913** | 05MDL-4G E | 4.6764 | Adder | 5.5 |
| **247943** | T-127 E | 4.6764 | Adder | 5.5 |
| **276615** | W2-048 GEN | 3.3609 | Adder | 3.95 |
| **276621** | X2-022 GEN | 12.6067 | Adder | 14.83 |
| **290261** | S-027 E | 9.5285 | Adder | 11.21 |
| **290265** | S-028 E | 9.5285 | Adder | 11.21 |
| **293798** | W4-005 E | 20.4537 | Adder | 24.06 |
| **917502** | Z2-087 E | 10.1208 | Adder | 11.91 |
| **924042** | AB2-047 E O1 | 12.6510 | Adder | 14.88 |
| **924261** | AB2-070 C O1 | 1.7371 | Adder | 2.04 |
| **924262** | AB2-070 E O1 | 10.5206 | Adder | 12.38 |
| **925771** | AC1-053 C | 1.7481 | Adder | 2.06 |
| **925772** | AC1-053 E | 11.6989 | Adder | 13.76 |
| **930042** | AB1-006 E | 10.1711 | Adder | 11.97 |
| **930461** | AB1-087 CT1 | 72.3747 | 50/50 | 72.3747 |
| **930462** | AB1-087 ST1 | 57.5408 | 50/50 | 57.5408 |
| **930471** | AB1-088 CT1 | 72.3747 | 50/50 | 72.3747 |
| **930472** | AB1-088 ST1 | 57.5408 | 50/50 | 57.5408 |
| **933446** | AC2-157 1C | 8.9760 | 50/50 | 8.9760 |
| **933447** | AC2-157 2C | 8.9760 | 50/50 | 8.9760 |
| **933448** | AC2-157 1E | 14.6450 | 50/50 | 14.6450 |
| **933449** | AC2-157 2E | 14.6450 | 50/50 | 14.6450 |
| **935141** | AD1-148 | 3.3391 | Adder | 3.93 |
| **936771** | AD2-100 C | 9.1196 | Adder | 10.73 |
| **936772** | AD2-100 E | 6.0797 | Adder | 7.15 |
| **936971** | AD2-131 C | 0.6007 | Adder | 0.71 |
| **936972** | AD2-131 E | 3.0181 | Adder | 3.55 |
| **937211** | AD2-159 C | 2.2103 | Adder | 2.6 |
| **937212** | AD2-159 E | 10.3484 | Adder | 12.17 |
| **939741** | AE1-205 C O1 | 4.8859 | Adder | 5.75 |
| **939742** | AE1-205 E O1 | 6.7472 | Adder | 7.94 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|---|---|---|---|---|
| **941341** | AE2-130 C | 229.3728 | 50/50 | 229.3728 |
| **941342** | AE2-130 E | 152.9152 | 50/50 | 152.9152 |
| **941571** | AE2-154 C | 1.8998 | Adder | 2.24 |
| **941572** | AE2-154 E | 12.7139 | Adder | 14.96 |
| **941731** | AE2-173 O1 | 2.9083 | Adder | 3.42 |
| **942111** | AE2-223 C | 1.1342 | Adder | 1.33 |
| **942112** | AE2-223 E | 7.5906 | Adder | 8.93 |
| **942481** | AE2-261 C | 12.7863 | Adder | 15.04 |
| **942482** | AE2-261 E | 8.5242 | Adder | 10.03 |
| **942601** | AE2-276 | 11.8105 | 50/50 | 11.8105 |
| **944201** | AF1-088 FTIR | 236.2100 | 50/50 | 236.2100 |
| **944221** | AF1-090 C O1 | 2.6614 | Adder | 3.13 |
| **944222** | AF1-090 E O1 | 12.4601 | Adder | 14.66 |
| **945391** | AF1-204 C O1 | 6.5592 | 50/50 | 6.5592 |
| **945392** | AF1-204 E O1 | 19.6777 | 50/50 | 19.6777 |
| **945871** | AF1-252 O1 | 4.7179 | Adder | 5.55 |
| **945881** | AF1-253 | 3.2662 | Adder | 3.84 |
| **946581** | AF1-322 C | 4.9102 | Adder | 5.78 |
| **946582** | AF1-322 E | 6.7807 | Adder | 7.98 |
| **954681** | J949 C | 11.4172 | PJM External (MISO) | 11.4172 |
| **957141** | AF2-008 FTIR | 118.1050 | 50/50 | 118.1050 |
| **957142** | AF2-008 NFTI | 236.2100 | 50/50 | 236.2100 |
| **957381** | AF2-032 C | 0.9639 | Adder | 1.13 |
| **957382** | AF2-032 E | 0.4536 | Adder | 0.53 |
| **959341** | AF2-225 C | 3.6644 | Adder | 4.31 |
| **959342** | AF2-225 E | 5.0604 | Adder | 5.95 |
| **959611** | AF2-252 C | 1.2031 | Adder | 1.42 |
| **959612** | AF2-252 E | 1.8046 | Adder | 2.12 |
| **960141** | AF2-305 | 0.6147 | Adder | 0.72 |
| **960261** | AF2-317 | 1.0685 | Adder | 1.26 |
| **960611** | AF2-352 C | 1.2031 | Adder | 1.42 |
| **960612** | AF2-352 E | 1.8046 | Adder | 2.12 |
| **963741** | AG1-226 C O1 | 13.3122 | Adder | 29.55 |
| **963742** | AG1-226 E O1 | 4.7587 | Adder | 10.56 |
| **963831** | AG1-236 C | 0.9265 | Adder | 2.06 |
| **963832** | AG1-236 E | 6.2004 | Adder | 13.76 |
| **963841** | AG1-237 C O1 | 0.9708 | Adder | 2.15 |
| **963842** | AG1-237 E O1 | 6.4967 | Adder | 14.42 |
| **965091** | AG1-374 C | 5.7387 | Adder | 12.74 |
| **965092** | AG1-374 E | 3.8258 | Adder | 8.49 |
| **965331** | AG1-398 | 0.2596 | Adder | 0.58 |
| **965341** | AG1-399 C | 1.7854 | Adder | 3.96 |
| **965342** | AG1-399 E | 8.3590 | Adder | 18.55 |
| **965351** | AG1-400 | 5.0722 | Adder | 11.26 |
| **965361** | AG1-401 C | 1.7854 | Adder | 3.96 |
| **965362** | AG1-401 E | 8.3590 | Adder | 18.55 |
| **965371** | AG1-402 | 5.0722 | Adder | 11.26 |
| **965381** | AG1-403 C | 1.1903 | Adder | 2.64 |
| **965382** | AG1-403 E | 5.5726 | Adder | 12.37 |
| **965391** | AG1-404 | 3.3815 | Adder | 7.51 |
| **965911** | AG1-460 C | 0.4533 | Adder | 1.01 |
| **965912** | AG1-460 E | 0.6799 | Adder | 1.51 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|---|---|---|---|---|
| **966531** | AG1-522 C | 61.4592 | 50/50 | 61.4592 |
| **966532** | AG1-522 E | 40.9728 | 50/50 | 40.9728 |
| **966541** | AG1-523 C | 61.4592 | 50/50 | 61.4592 |
| **966542** | AG1-523 E | 40.9728 | 50/50 | 40.9728 |
| **966551** | AG1-524 C | 61.4592 | 50/50 | 61.4592 |
| **966552** | AG1-524 E | 40.9728 | 50/50 | 40.9728 |
| **966561** | AG1-525 C | 61.4592 | 50/50 | 61.4592 |
| **966562** | AG1-525 E | 40.9728 | 50/50 | 40.9728 |
| **966841** | AG1-555 C | 3.1923 | Adder | 7.09 |
| **966842** | AG1-555 E | 1.1411 | Adder | 2.53 |
| **WEC** | WEC | 1.6484 | Confirmed LTF | 1.6484 |
| **CALDERWOOD** | CALDERWOOD | 0.0199 | Confirmed LTF | 0.0199 |
| **LGE-0012019** | LGE-0012019 | 3.6443 | LTF | 3.6443 |
| **CBM-W2** | CBM-W2 | 38.5101 | Confirmed LTF | 38.5101 |
| **NY** | NY | 0.7902 | Confirmed LTF | 0.7902 |
| **TVA** | TVA | 2.2484 | Confirmed LTF | 2.2484 |
| **O-066** | O-066 | 9.6979 | Confirmed LTF | 9.6979 |
| **SIGE** | SIGE | 0.4278 | Confirmed LTF | 0.4278 |
| **CHEOAH** | CHEOAH | 0.0280 | Confirmed LTF | 0.0280 |
| **CBM-S1** | CBM-S1 | 0.0277 | Confirmed LTF | 0.0277 |
| **G-007** | G-007 | 1.5131 | Confirmed LTF | 1.5131 |
| **HAMLET** | HAMLET | 0.4424 | Confirmed LTF | 0.4424 |
| **MEC** | MEC | 8.7459 | Confirmed LTF | 8.7459 |
| **BLUEG** | BLUEG | 14.8289 | Confirmed LTF | 14.8289 |
| **TRIMBLE** | TRIMBLE | 5.2906 | Confirmed LTF | 5.2906 |
| **LAGN** | LAGN | 4.7705 | Confirmed LTF | 4.7705 |
| **CATAWBA** | CATAWBA | 0.2335 | Confirmed LTF | 0.2335 |
| **CBM-W1** | CBM-W1 | 52.0002 | Confirmed LTF | 52.0002 |

### 10.6.2 Index 2

| ID | FROM BUS# | FROM BUS | FROM BUS AREA | TO BUS# | TO BUS | TO BUS AREA | CKT ID | CONT NAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC\|DC | MW IMPACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **167479547** | 243208 | 05JEFRSO | AEP | 242865 | 05JEFRSO | AEP | 2 | AEP_P4_#1760_05JEFRSO | breaker | 3039.0 | 119.16 | 122.58 | DC | 102.43 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|---|---|---|---|---|
| **243442** | 05RKG1 | 102.2311 | 50/50 | 102.2311 |
| **243443** | 05RKG2 | 98.0091 | 50/50 | 98.0091 |
| **247900** | 05FR-11G E | 5.3350 | Adder | 6.28 |
| **247901** | 05FR-12G E | 5.2465 | Adder | 6.17 |
| **247902** | 05FR-21G E | 5.6076 | Adder | 6.6 |
| **247903** | 05FR-22G E | 5.3691 | Adder | 6.32 |
| **247904** | 05FR-3G E | 10.8745 | Adder | 12.79 |
| **247905** | 05FR-4G E | 8.5170 | Adder | 10.02 |
| **247906** | 05MDL-1G E | 9.3352 | Adder | 10.98 |
| **247907** | 05MDL-2G E | 4.6764 | Adder | 5.5 |
| **247912** | 05MDL-3G E | 4.6764 | Adder | 5.5 |
| **247913** | 05MDL-4G E | 4.6764 | Adder | 5.5 |
| **247943** | T-127 E | 4.6764 | Adder | 5.5 |
| **276615** | W2-048 GEN | 3.3609 | Adder | 3.95 |
| **276621** | X2-022 GEN | 12.6067 | Adder | 14.83 |
| **290261** | S-027 E | 9.5285 | Adder | 11.21 |
| **290265** | S-028 E | 9.5285 | Adder | 11.21 |
| **293798** | W4-005 E | 20.4537 | Adder | 24.06 |
| **917502** | Z2-087 E | 10.1208 | Adder | 11.91 |
| **924042** | AB2-047 E O1 | 12.6510 | Adder | 14.88 |
| **924261** | AB2-070 C O1 | 1.7371 | Adder | 2.04 |
| **924262** | AB2-070 E O1 | 10.5206 | Adder | 12.38 |
| **925771** | AC1-053 C | 1.7481 | Adder | 2.06 |
| **925772** | AC1-053 E | 11.6989 | Adder | 13.76 |
| **930042** | AB1-006 E | 10.1711 | Adder | 11.97 |
| **930461** | AB1-087 CT1 | 72.3747 | 50/50 | 72.3747 |
| **930462** | AB1-087 ST1 | 57.5408 | 50/50 | 57.5408 |
| **930471** | AB1-088 CT1 | 72.3747 | 50/50 | 72.3747 |
| **930472** | AB1-088 ST1 | 57.5408 | 50/50 | 57.5408 |
| **933446** | AC2-157 1C | 8.9760 | 50/50 | 8.9760 |
| **933447** | AC2-157 2C | 8.9760 | 50/50 | 8.9760 |
| **933448** | AC2-157 1E | 14.6450 | 50/50 | 14.6450 |
| **933449** | AC2-157 2E | 14.6450 | 50/50 | 14.6450 |
| **935141** | AD1-148 | 3.3391 | Adder | 3.93 |
| **936771** | AD2-100 C | 9.1196 | Adder | 10.73 |
| **936772** | AD2-100 E | 6.0797 | Adder | 7.15 |
| **936971** | AD2-131 C | 0.6007 | Adder | 0.71 |
| **936972** | AD2-131 E | 3.0181 | Adder | 3.55 |
| **937211** | AD2-159 C | 2.2103 | Adder | 2.6 |
| **937212** | AD2-159 E | 10.3484 | Adder | 12.17 |
| **939741** | AE1-205 C O1 | 4.8859 | Adder | 5.75 |
| **939742** | AE1-205 E O1 | 6.7472 | Adder | 7.94 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|---|---|---|---|---|
| **941341** | AE2-130 C | 229.3728 | 50/50 | 229.3728 |
| **941342** | AE2-130 E | 152.9152 | 50/50 | 152.9152 |
| **941571** | AE2-154 C | 1.8998 | Adder | 2.24 |
| **941572** | AE2-154 E | 12.7139 | Adder | 14.96 |
| **941731** | AE2-173 O1 | 2.9083 | Adder | 3.42 |
| **942111** | AE2-223 C | 1.1342 | Adder | 1.33 |
| **942112** | AE2-223 E | 7.5906 | Adder | 8.93 |
| **942481** | AE2-261 C | 12.7863 | Adder | 15.04 |
| **942482** | AE2-261 E | 8.5242 | Adder | 10.03 |
| **942601** | AE2-276 | 11.8105 | 50/50 | 11.8105 |
| **944201** | AF1-088 FTIR | 236.2100 | 50/50 | 236.2100 |
| **944221** | AF1-090 C O1 | 2.6614 | Adder | 3.13 |
| **944222** | AF1-090 E O1 | 12.4601 | Adder | 14.66 |
| **945391** | AF1-204 C O1 | 6.5592 | 50/50 | 6.5592 |
| **945392** | AF1-204 E O1 | 19.6777 | 50/50 | 19.6777 |
| **945871** | AF1-252 O1 | 4.7179 | Adder | 5.55 |
| **945881** | AF1-253 | 3.2662 | Adder | 3.84 |
| **946581** | AF1-322 C | 4.9102 | Adder | 5.78 |
| **946582** | AF1-322 E | 6.7807 | Adder | 7.98 |
| **954681** | J949 C | 11.4172 | PJM External (MISO) | 11.4172 |
| **957141** | AF2-008 FTIR | 118.1050 | 50/50 | 118.1050 |
| **957142** | AF2-008 NFTI | 236.2100 | 50/50 | 236.2100 |
| **957381** | AF2-032 C | 0.9639 | Adder | 1.13 |
| **957382** | AF2-032 E | 0.4536 | Adder | 0.53 |
| **959341** | AF2-225 C | 3.6644 | Adder | 4.31 |
| **959342** | AF2-225 E | 5.0604 | Adder | 5.95 |
| **959611** | AF2-252 C | 1.2031 | Adder | 1.42 |
| **959612** | AF2-252 E | 1.8046 | Adder | 2.12 |
| **960141** | AF2-305 | 0.6147 | Adder | 0.72 |
| **960261** | AF2-317 | 1.0685 | Adder | 1.26 |
| **960611** | AF2-352 C | 1.2031 | Adder | 1.42 |
| **960612** | AF2-352 E | 1.8046 | Adder | 2.12 |
| **963741** | AG1-226 C O1 | 13.3122 | Adder | 29.55 |
| **963742** | AG1-226 E O1 | 4.7587 | Adder | 10.56 |
| **963831** | AG1-236 C | 0.9265 | Adder | 2.06 |
| **963832** | AG1-236 E | 6.2004 | Adder | 13.76 |
| **963841** | AG1-237 C O1 | 0.9708 | Adder | 2.15 |
| **963842** | AG1-237 E O1 | 6.4967 | Adder | 14.42 |
| **965091** | AG1-374 C | 5.7387 | Adder | 12.74 |
| **965092** | AG1-374 E | 3.8258 | Adder | 8.49 |
| **965331** | AG1-398 | 0.2596 | Adder | 0.58 |
| **965341** | AG1-399 C | 1.7854 | Adder | 3.96 |
| **965342** | AG1-399 E | 8.3590 | Adder | 18.55 |
| **965351** | AG1-400 | 5.0722 | Adder | 11.26 |
| **965361** | AG1-401 C | 1.7854 | Adder | 3.96 |
| **965362** | AG1-401 E | 8.3590 | Adder | 18.55 |
| **965371** | AG1-402 | 5.0722 | Adder | 11.26 |
| **965381** | AG1-403 C | 1.1903 | Adder | 2.64 |
| **965382** | AG1-403 E | 5.5726 | Adder | 12.37 |
| **965391** | AG1-404 | 3.3815 | Adder | 7.51 |
| **965911** | AG1-460 C | 0.4533 | Adder | 1.01 |
| **965912** | AG1-460 E | 0.6799 | Adder | 1.51 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|---|---|---|---|---|
| **966531** | AG1-522 C | 61.4592 | 50/50 | 61.4592 |
| **966532** | AG1-522 E | 40.9728 | 50/50 | 40.9728 |
| **966541** | AG1-523 C | 61.4592 | 50/50 | 61.4592 |
| **966542** | AG1-523 E | 40.9728 | 50/50 | 40.9728 |
| **966551** | AG1-524 C | 61.4592 | 50/50 | 61.4592 |
| **966552** | AG1-524 E | 40.9728 | 50/50 | 40.9728 |
| **966561** | AG1-525 C | 61.4592 | 50/50 | 61.4592 |
| **966562** | AG1-525 E | 40.9728 | 50/50 | 40.9728 |
| **966841** | AG1-555 C | 3.1923 | Adder | 7.09 |
| **966842** | AG1-555 E | 1.1411 | Adder | 2.53 |
| **WEC** | WEC | 1.6484 | Confirmed LTF | 1.6484 |
| **CALDERWOOD** | CALDERWOOD | 0.0199 | Confirmed LTF | 0.0199 |
| **LGE-0012019** | LGE-0012019 | 3.6443 | LTF | 3.6443 |
| **CBM-W2** | CBM-W2 | 38.5101 | Confirmed LTF | 38.5101 |
| **NY** | NY | 0.7902 | Confirmed LTF | 0.7902 |
| **TVA** | TVA | 2.2484 | Confirmed LTF | 2.2484 |
| **O-066** | O-066 | 9.6979 | Confirmed LTF | 9.6979 |
| **SIGE** | SIGE | 0.4278 | Confirmed LTF | 0.4278 |
| **CHEOAH** | CHEOAH | 0.0280 | Confirmed LTF | 0.0280 |
| **CBM-S1** | CBM-S1 | 0.0277 | Confirmed LTF | 0.0277 |
| **G-007** | G-007 | 1.5131 | Confirmed LTF | 1.5131 |
| **HAMLET** | HAMLET | 0.4424 | Confirmed LTF | 0.4424 |
| **MEC** | MEC | 8.7459 | Confirmed LTF | 8.7459 |
| **BLUEG** | BLUEG | 14.8289 | Confirmed LTF | 14.8289 |
| **TRIMBLE** | TRIMBLE | 5.2906 | Confirmed LTF | 5.2906 |
| **LAGN** | LAGN | 4.7705 | Confirmed LTF | 4.7705 |
| **CATAWBA** | CATAWBA | 0.2335 | Confirmed LTF | 0.2335 |
| **CBM-W1** | CBM-W1 | 52.0002 | Confirmed LTF | 52.0002 |

### 10.6.3 Index 3

| ID | FROM BUS# | FROM BUS | FROM BUS AREA | TO BUS# | TO BUS | TO BUS AREA | CKT ID | CONT NAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC\|DC | MW IMPACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **161930818** | 243209 | 05ROCKPT | AEP | 243208 | 05JEFRSO | AEP | 1 | AEP_P7-1_#11042-B | tower | 3854.0 | 131.93 | 135.48 | DC | 139.28 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|---|---|---|---|---|
| **243442** | 05RKG1 | 135.4745 | 50/50 | 135.4745 |
| **243443** | 05RKG2 | 129.8796 | 50/50 | 129.8796 |
| **243859** | 05FR-11G C | 0.7437 | 50/50 | 0.7437 |
| **243862** | 05FR-12G C | 0.3617 | 50/50 | 0.3617 |
| **243864** | 05FR-21G C | 0.3762 | 50/50 | 0.3762 |
| **243866** | 05FR-22G C | 0.3762 | 50/50 | 0.3762 |
| **243870** | 05FR-3G C | 0.3617 | 50/50 | 0.3617 |
| **243873** | 05FR-4G C | 0.8421 | 50/50 | 0.8421 |
| **246909** | 05MDL-1G C | 0.7495 | 50/50 | 0.7495 |
| **246910** | 05MDL-2G C | 0.4398 | 50/50 | 0.4398 |
| **246976** | 05MDL-3G C | 0.4427 | 50/50 | 0.4427 |
| **246979** | 05MDL-4G C | 0.3415 | 50/50 | 0.3415 |
| **247556** | 05MDL-5G | 0.5845 | 50/50 | 0.5845 |
| **247900** | 05FR-11G E | 14.3618 | 50/50 | 14.3618 |
| **247901** | 05FR-12G E | 14.1233 | 50/50 | 14.1233 |
| **247902** | 05FR-21G E | 15.0955 | 50/50 | 15.0955 |
| **247903** | 05FR-22G E | 14.4535 | 50/50 | 14.4535 |
| **247904** | 05FR-3G E | 29.2738 | 50/50 | 29.2738 |
| **247905** | 05FR-4G E | 22.9275 | 50/50 | 22.9275 |
| **247906** | 05MDL-1G E | 29.2906 | 50/50 | 29.2906 |
| **247907** | 05MDL-2G E | 14.6728 | 50/50 | 14.6728 |
| **247912** | 05MDL-3G E | 14.6728 | 50/50 | 14.6728 |
| **247913** | 05MDL-4G E | 14.6728 | 50/50 | 14.6728 |
| **247943** | T-127 E | 14.6728 | 50/50 | 14.6728 |
| **274650** | KINCAID ;1U | 9.6185 | 50/50 | 9.6185 |
| **276615** | W2-048 GEN | 4.3025 | Adder | 5.06 |
| **276621** | X2-022 GEN | 16.1386 | Adder | 18.99 |
| **925771** | AC1-053 C | 2.2155 | Adder | 2.61 |
| **925772** | AC1-053 E | 14.8270 | Adder | 17.44 |
| **930041** | AB1-006 C | 0.7523 | 50/50 | 0.7523 |
| **930042** | AB1-006 E | 31.9133 | 50/50 | 31.9133 |
| **930461** | AB1-087 CT1 | 102.3161 | 50/50 | 102.3161 |
| **930462** | AB1-087 ST1 | 81.3453 | 50/50 | 81.3453 |
| **930471** | AB1-088 CT1 | 102.3161 | 50/50 | 102.3161 |
| **930472** | AB1-088 ST1 | 81.3453 | 50/50 | 81.3453 |
| **933446** | AC2-157 1C | 12.6893 | 50/50 | 12.6893 |
| **933447** | AC2-157 2C | 12.6893 | 50/50 | 12.6893 |
| **933448** | AC2-157 1E | 20.7037 | 50/50 | 20.7037 |
| **933449** | AC2-157 2E | 20.7037 | 50/50 | 20.7037 |
| **935141** | AD1-148 | 4.2745 | Adder | 5.03 |
| **936771** | AD2-100 C | 14.2645 | 50/50 | 14.2645 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|---|---|---|---|---|
| **936772** | AD2-100 E | 9.5096 | 50/50 | 9.5096 |
| **936971** | AD2-131 C | 0.9396 | 50/50 | 0.9396 |
| **936972** | AD2-131 E | 4.7209 | 50/50 | 4.7209 |
| **941341** | AE2-130 C | 303.9600 | 50/50 | 303.9600 |
| **941342** | AE2-130 E | 202.6400 | 50/50 | 202.6400 |
| **941571** | AE2-154 C | 5.9608 | 50/50 | 5.9608 |
| **941572** | AE2-154 E | 39.8917 | 50/50 | 39.8917 |
| **942481** | AE2-261 C | 19.8434 | 50/50 | 19.8434 |
| **942482** | AE2-261 E | 13.2290 | 50/50 | 13.2290 |
| **942601** | AE2-276 | 16.6965 | 50/50 | 16.6965 |
| **944201** | AF1-088 FTIR | 333.9300 | 50/50 | 333.9300 |
| **944221** | AF1-090 C O1 | 4.2529 | 50/50 | 4.2529 |
| **944222** | AF1-090 E O1 | 19.9111 | 50/50 | 19.9111 |
| **945391** | AF1-204 C O1 | 10.7151 | 50/50 | 10.7151 |
| **945392** | AF1-204 E O1 | 32.1453 | 50/50 | 32.1453 |
| **945871** | AF1-252 O1 | 7.5392 | 50/50 | 7.5392 |
| **945881** | AF1-253 | 5.2194 | 50/50 | 5.2194 |
| **946581** | AF1-322 C | 15.4064 | 50/50 | 15.4064 |
| **946582** | AF1-322 E | 21.2756 | 50/50 | 21.2756 |
| **954681** | J949 C | 19.3290 | PJM External (MISO) | 19.3290 |
| **957141** | AF2-008 FTIR | 166.9650 | 50/50 | 166.9650 |
| **957142** | AF2-008 NFTI | 333.9300 | 50/50 | 333.9300 |
| **957381** | AF2-032 C | 1.4912 | 50/50 | 1.4912 |
| **957382** | AF2-032 E | 0.7018 | 50/50 | 0.7018 |
| **958971** | AF2-188 C O1 | 12.3252 | 50/50 | 12.3252 |
| **958972** | AF2-188 E O1 | 8.2168 | 50/50 | 8.2168 |
| **960261** | AF2-317 | 1.3679 | Adder | 1.61 |
| **963741** | AG1-226 C O1 | 58.7948 | 50/50 | 58.7948 |
| **963742** | AG1-226 E O1 | 21.0172 | 50/50 | 21.0172 |
| **963831** | AG1-236 C | 1.1742 | Adder | 2.61 |
| **963832** | AG1-236 E | 7.8583 | Adder | 17.44 |
| **963841** | AG1-237 C O1 | 4.7211 | 50/50 | 4.7211 |
| **963842** | AG1-237 E O1 | 31.5949 | 50/50 | 31.5949 |
| **965911** | AG1-460 C | 1.3273 | 50/50 | 1.3273 |
| **965912** | AG1-460 E | 1.9910 | 50/50 | 1.9910 |
| **966531** | AG1-522 C | 83.5686 | 50/50 | 83.5686 |
| **966532** | AG1-522 E | 55.7124 | 50/50 | 55.7124 |
| **966541** | AG1-523 C | 83.5686 | 50/50 | 83.5686 |
| **966542** | AG1-523 E | 55.7124 | 50/50 | 55.7124 |
| **966551** | AG1-524 C | 83.5686 | 50/50 | 83.5686 |
| **966552** | AG1-524 E | 55.7124 | 50/50 | 55.7124 |
| **966561** | AG1-525 C | 83.5686 | 50/50 | 83.5686 |
| **966562** | AG1-525 E | 55.7124 | 50/50 | 55.7124 |
| **966841** | AG1-555 C | 16.2143 | 50/50 | 16.2143 |
| **966842** | AG1-555 E | 5.7961 | 50/50 | 5.7961 |
| **WEC** | WEC | 1.4008 | Confirmed LTF | 1.4008 |
| **LGEE** | LGEE | 0.2626 | Confirmed LTF | 0.2626 |
| **CBM-W2** | CBM-W2 | 66.5370 | Confirmed LTF | 66.5370 |
| **NY** | NY | 1.0142 | Confirmed LTF | 1.0142 |
| **TVA** | TVA | 5.6014 | Confirmed LTF | 5.6014 |
| **O-066** | O-066 | 12.3024 | Confirmed LTF | 12.3024 |
| **SIGE** | SIGE | 1.0880 | Confirmed LTF | 1.0880 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|---|---|---|---|---|
| **CBM-S2** | CBM-S2 | 0.0313 | Confirmed LTF | 0.0313 |
| **CBM-S1** | CBM-S1 | 1.2730 | Confirmed LTF | 1.2730 |
| **G-007** | G-007 | 1.9194 | Confirmed LTF | 1.9194 |
| **HAMLET** | HAMLET | 0.1819 | Confirmed LTF | 0.1819 |
| **MEC** | MEC | 10.0822 | Confirmed LTF | 10.0822 |
| **BLUEG** | BLUEG | 0.4583 | Confirmed LTF | 0.4583 |
| **TRIMBLE** | TRIMBLE | 0.4997 | Confirmed LTF | 0.4997 |
| **LAGN** | LAGN | 8.5908 | Confirmed LTF | 8.5908 |
| **CATAWBA** | CATAWBA | 0.0294 | Confirmed LTF | 0.0294 |
| **CBM-W1** | CBM-W1 | 46.3782 | Confirmed LTF | 46.3782 |

### 10.6.4 Index 4

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **168275213** | 247712 | 05SULLIVAN | AEP | 254529 | 16PETE | IPL | 1 | AEP_P1-2_#363_1682 | single | 1409.0 | 105.7 | 108.97 | DC | 46.06 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|---|---|---|---|---|
| **243442** | 05RKG1 | 54.7353 | 80/20 | 54.7353 |
| **243443** | 05RKG2 | 52.4749 | 80/20 | 52.4749 |
| **243859** | 05FR-11G C | 0.2108 | 80/20 | 0.2108 |
| **243862** | 05FR-12G C | 0.1025 | 80/20 | 0.1025 |
| **243864** | 05FR-21G C | 0.1066 | 80/20 | 0.1066 |
| **243866** | 05FR-22G C | 0.1066 | 80/20 | 0.1066 |
| **243870** | 05FR-3G C | 0.1025 | 80/20 | 0.1025 |
| **243873** | 05FR-4G C | 0.2387 | 80/20 | 0.2387 |
| **274650** | KINCAID ;1U | 4.8193 | 80/20 | 4.8193 |
| **274651** | KINCAID ;2U | 4.8176 | 80/20 | 4.8176 |
| **274880** | RADFORD R;1U | 0.3609 | 80/20 | 0.3609 |
| **924261** | AB2-070 C O1 | 1.3005 | 80/20 | 1.3005 |
| **925771** | AC1-053 C | 1.3140 | 80/20 | 1.3140 |
| **930461** | AB1-087 CT1 | 78.4139 | 80/20 | 78.4139 |
| **930462** | AB1-087 ST1 | 62.3421 | 80/20 | 62.3421 |
| **930471** | AB1-088 CT1 | 78.4139 | 80/20 | 78.4139 |
| **930472** | AB1-088 ST1 | 62.3421 | 80/20 | 62.3421 |
| **933446** | AC2-157 1C | 9.7250 | 80/20 | 9.7250 |
| **933447** | AC2-157 2C | 9.7250 | 80/20 | 9.7250 |
| **935141** | AD1-148 | 2.5308 | 80/20 | 2.5308 |
| **936771** | AD2-100 C | 7.1455 | 80/20 | 7.1455 |
| **936971** | AD2-131 C | 0.4707 | 80/20 | 0.4707 |
| **937211** | AD2-159 C | 1.6556 | 80/20 | 1.6556 |
| **941341** | AE2-130 C | 122.8080 | 80/20 | 122.8080 |
| **942481** | AE2-261 C | 9.9423 | 80/20 | 9.9423 |
| **942601** | AE2-276 | 12.7960 | 80/20 | 12.7960 |
| **944201** | AF1-088 FTIR | 255.9200 | 80/20 | 255.9200 |
| **944221** | AF1-090 C O1 | 2.1289 | 80/20 | 2.1289 |
| **945391** | AF1-204 C O1 | 4.0347 | 80/20 | 4.0347 |
| **945871** | AF1-252 O1 | 3.7740 | 80/20 | 3.7740 |
| **945881** | AF1-253 | 2.6127 | 80/20 | 2.6127 |
| **953401** | J811 | 6.6102 | PJM External (MISO) | 6.6102 |
| **953651** | J815 | 12.9700 | PJM External (MISO) | 12.9700 |
| **953881** | J848 C | 2.0849 | PJM External (MISO) | 2.0849 |
| **954411** | J912 | 5.5690 | PJM External (MISO) | 5.5690 |
| **954681** | J949 C | 12.1873 | PJM External (MISO) | 12.1873 |
| **955031** | J979 C | 1.6680 | PJM External (MISO) | 1.6680 |
| **955131** | J991 | 13.9760 | PJM External (MISO) | 13.9760 |
| **956451** | J1139 | 8.7510 | PJM External (MISO) | 8.7510 |
| **957141** | AF2-008 FTIR | 127.9600 | 80/20 | 127.9600 |
| **957381** | AF2-032 C | 0.7472 | 80/20 | 0.7472 |
| **960141** | AF2-305 | 0.4602 | 80/20 | 0.4602 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|---|---|---|---|---|
| **960261** | AF2-317 | 0.8099 | 80/20 | 0.8099 |
| **963741** | AG1-226 C O1 | 18.7132 | 80/20 | 18.7132 |
| **963831** | AG1-236 C | 1.3140 | 80/20 | 1.3140 |
| **963841** | AG1-237 C O1 | 1.3868 | 80/20 | 1.3868 |
| **965331** | AG1-398 | 0.3666 | 80/20 | 0.3666 |
| **965911** | AG1-460 C | 0.6650 | 80/20 | 0.6650 |
| **966531** | AG1-522 C | 46.0602 | 80/20 | 46.0602 |
| **966541** | AG1-523 C | 46.0602 | 80/20 | 46.0602 |
| **966551** | AG1-524 C | 46.0602 | 80/20 | 46.0602 |
| **966561** | AG1-525 C | 46.0602 | 80/20 | 46.0602 |
| **966841** | AG1-555 C | 4.5959 | 80/20 | 4.5959 |
| **WEC** | WEC | 0.8480 | Confirmed LTF | 0.8480 |
| **CALDERWOOD** | CALDERWOOD | 0.3643 | Confirmed LTF | 0.3643 |
| **NY** | NY | 0.4496 | Confirmed LTF | 0.4496 |
| **CHEOAH** | CHEOAH | 0.3654 | Confirmed LTF | 0.3654 |
| **HAMLET** | HAMLET | 0.4222 | Confirmed LTF | 0.4222 |
| **MEC** | MEC | 4.6637 | Confirmed LTF | 4.6637 |
| **GIBSON** | GIBSON | 6.3713 | Confirmed LTF | 6.3713 |
| **BLUEG** | BLUEG | 7.2877 | Confirmed LTF | 7.2877 |
| **TRIMBLE** | TRIMBLE | 2.2037 | Confirmed LTF | 2.2037 |
| **LAGN** | LAGN | 1.4298 | Confirmed LTF | 1.4298 |
| **CATAWBA** | CATAWBA | 0.2520 | Confirmed LTF | 0.2520 |
| **CBM-W1** | CBM-W1 | 26.5959 | Confirmed LTF | 26.5959 |

### 10.6.5 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **168275224** | 247712 | 05SULLIVAN | AEP | 243221 | 05EUGENE | AEP | 1 | AEP_P1-2_#363_1682 | single | 1335.0 | 116.92 | 119.86 | DC | 39.33 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|---|---|---|---|---|
| **243442** | 05RKG1 | 46.7406 | 80/20 | 46.7406 |
| **243443** | 05RKG2 | 44.8103 | 80/20 | 44.8103 |
| **930461** | AB1-087 CT1 | 66.9453 | 80/20 | 66.9453 |
| **930462** | AB1-087 ST1 | 53.2242 | 80/20 | 53.2242 |
| **930471** | AB1-088 CT1 | 66.9453 | 80/20 | 66.9453 |
| **930472** | AB1-088 ST1 | 53.2242 | 80/20 | 53.2242 |
| **933446** | AC2-157 1C | 8.3026 | 80/20 | 8.3026 |
| **933447** | AC2-157 2C | 8.3026 | 80/20 | 8.3026 |
| **941341** | AE2-130 C | 104.8704 | 80/20 | 104.8704 |
| **942601** | AE2-276 | 10.9245 | 80/20 | 10.9245 |
| **944201** | AF1-088 FTIR | 218.4900 | 80/20 | 218.4900 |
| **955131** | J991 | 10.5040 | PJM External (MISO) | 10.5040 |
| **957141** | AF2-008 FTIR | 109.2450 | 80/20 | 109.2450 |
| **966531** | AG1-522 C | 39.3264 | 80/20 | 39.3264 |
| **966541** | AG1-523 C | 39.3264 | 80/20 | 39.3264 |
| **966551** | AG1-524 C | 39.3264 | 80/20 | 39.3264 |
| **966561** | AG1-525 C | 39.3264 | 80/20 | 39.3264 |
| **LGEE** | LGEE | 0.2746 | Confirmed LTF | 0.2746 |
| **CPLE** | CPLE | 0.1058 | Confirmed LTF | 0.1058 |
| **CBM-W2** | CBM-W2 | 11.4150 | Confirmed LTF | 11.4150 |
| **NY** | NY | 0.1576 | Confirmed LTF | 0.1576 |
| **TVA** | TVA | 1.6436 | Confirmed LTF | 1.6436 |
| **SIGE** | SIGE | 0.2489 | Confirmed LTF | 0.2489 |
| **CBM-S2** | CBM-S2 | 3.0380 | Confirmed LTF | 3.0380 |
| **CBM-S1** | CBM-S1 | 0.3952 | Confirmed LTF | 0.3952 |
| **MEC** | MEC | 1.0328 | Confirmed LTF | 1.0328 |
| **LAGN** | LAGN | 2.1770 | Confirmed LTF | 2.1770 |

### 10.6.6 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 164764379 | 248000 | 06CLIFTY | OVEC | 248001 | 06DEARB1 | OVEC | 1 | AEP_P4_#1760_05JEFRSO 765_A | breaker | 1099.0 | 106.03 | 107.09 | DC | 25.59 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|---|---|---|---|---|
| **248014** | 06CLIFTY 1HP | 3.7580 | 50/50 | 3.7580 |
| **248015** | 06CLIFTY 1LP | 2.2090 | 50/50 | 2.2090 |
| **248016** | 06CLIFTY 2HP | 3.7580 | 50/50 | 3.7580 |
| **248017** | 06CLIFTY 2LP | 2.2090 | 50/50 | 2.2090 |
| **248018** | 06CLIFTY 3HP | 3.7580 | 50/50 | 3.7580 |
| **248019** | 06CLIFTY 3LP | 2.2090 | 50/50 | 2.2090 |
| **248020** | 06CLIFTY 4HP | 3.7580 | 50/50 | 3.7580 |
| **248021** | 06CLIFTY 4LP | 2.2090 | 50/50 | 2.2090 |
| **248022** | 06CLIFTY 5HP | 3.7580 | 50/50 | 3.7580 |
| **248023** | 06CLIFTY 5LP | 2.2090 | 50/50 | 2.2090 |
| **248024** | 06CLIFTY 6HP | 3.7580 | 50/50 | 3.7580 |
| **248025** | 06CLIFTY 6LP | 2.2090 | 50/50 | 2.2090 |
| **930461** | AB1-087 CT1 | 15.8009 | Adder | 18.59 |
| **930462** | AB1-087 ST1 | 12.5623 | Adder | 14.78 |
| **930471** | AB1-088 CT1 | 15.8009 | Adder | 18.59 |
| **930472** | AB1-088 ST1 | 12.5623 | Adder | 14.78 |
| **933446** | AC2-157 1C | 1.9596 | Adder | 2.31 |
| **933447** | AC2-157 2C | 1.9596 | Adder | 2.31 |
| **933448** | AC2-157 1E | 3.1973 | Adder | 3.76 |
| **933449** | AC2-157 2E | 3.1973 | Adder | 3.76 |
| **941341** | AE2-130 C | 47.8298 | Adder | 56.27 |
| **941342** | AE2-130 E | 31.8866 | Adder | 37.51 |
| **942601** | AE2-276 | 2.5785 | Adder | 3.03 |
| **944201** | AF1-088 FTIR | 60.6700 | Merchant Transmission | 60.6700 |
| **957141** | AF2-008 FTIR | 30.3350 | Merchant Transmission | 30.3350 |
| **957142** | AF2-008 NFTI | 60.6700 | Merchant Transmission | 60.6700 |
| **957961** | AF2-090 C | 3.7048 | Adder | 4.36 |
| **957962** | AF2-090 E | 1.8323 | Adder | 2.16 |
| **959691** | AF2-260 C | 2.7790 | Adder | 3.27 |
| **959692** | AF2-260 E | 1.3895 | Adder | 1.63 |
| **960171** | AF2-308 | 1.3092 | Adder | 1.54 |
| **960181** | AF2-309 C | 1.9639 | Adder | 2.31 |
| **960182** | AF2-309 E | 1.3092 | Adder | 1.54 |
| **961001** | AF2-391 C O1 | 3.5294 | Adder | 4.15 |
| **961002** | AF2-391 E O1 | 2.3529 | Adder | 2.77 |
| **962471** | AG1-096 C O1 | 0.9767 | Adder | 2.17 |
| **962472** | AG1-096 E O1 | 0.4884 | Adder | 1.08 |
| **964571** | AG1-320 C O1 | 1.3144 | Adder | 2.92 |
| **964572** | AG1-320 E O1 | 0.6524 | Adder | 1.45 |
| **966221** | AG1-491 C O1 | 1.0912 | Adder | 2.42 |
| **966222** | AG1-491 E O1 | 0.7274 | Adder | 1.61 |
| **966531** | AG1-522 C | 6.9170 | Adder | 15.35 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|---|---|---|---|---|
| **966532** | AG1-522 E | 4.6113 | Adder | 10.24 |
| **966541** | AG1-523 C | 6.9170 | Adder | 15.35 |
| **966542** | AG1-523 E | 4.6113 | Adder | 10.24 |
| **966551** | AG1-524 C | 6.9170 | Adder | 15.35 |
| **966552** | AG1-524 E | 4.6113 | Adder | 10.24 |
| **966561** | AG1-525 C | 6.9170 | Adder | 15.35 |
| **966562** | AG1-525 E | 4.6113 | Adder | 10.24 |
| **WEC** | WEC | 0.3348 | Confirmed LTF | 0.3348 |
| **LGEE** | LGEE | 5.1891 | Confirmed LTF | 5.1891 |
| **CPLE** | CPLE | 0.3938 | Confirmed LTF | 0.3938 |
| **CBM-W2** | CBM-W2 | 20.8320 | Confirmed LTF | 20.8320 |
| **NY** | NY | 0.1438 | Confirmed LTF | 0.1438 |
| **TVA** | TVA | 3.0296 | Confirmed LTF | 3.0296 |
| **O-066** | O-066 | 1.5546 | Confirmed LTF | 1.5546 |
| **SIGE** | SIGE | 0.4688 | Confirmed LTF | 0.4688 |
| **CBM-S2** | CBM-S2 | 8.5921 | Confirmed LTF | 8.5921 |
| **CBM-S1** | CBM-S1 | 1.2430 | Confirmed LTF | 1.2430 |
| **G-007** | G-007 | 0.2404 | Confirmed LTF | 0.2404 |
| **MEC** | MEC | 2.6362 | Confirmed LTF | 2.6362 |
| **LAGN** | LAGN | 3.5980 | Confirmed LTF | 3.5980 |
| **CBM-W1** | CBM-W1 | 14.6369 | Confirmed LTF | 14.6369 |

## 10.7 Queue Dependencies

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

| Queue Number | Project Name | Status |
|---|---|---|
| **AB1-006** | Meadow Lake 345kV | In Service |
| **AB1-087** | Sullivan 345kV #1 | Active |
| **AB1-088** | Sullivan 345kV #2 | Active |
| **AB2-047** | Brokaw-Pontiac Midpoint | In Service |
| **AB2-070** | Mt. Pulaski-Brokaw | Engineering and Procurement |
| **AC1-053** | Lanesville-Brokaw | Active |
| **AC2-157** | Sullivan 345 kV | Active |
| **AD1-148** | Brokaw-Lanesville | Active |
| **AD2-100** | Kincaid-Pana | Active |
| **AD2-131** | Latham Kincaid | Active |
| **AD2-159** | Chestnut 345kV | Active |
| **AE1-205** | McLean 345 kV | Active |
| **AE2-130** | Rockport 765 kV | Active |
| **AE2-154** | Meadow Lake 345 kV (MLV VIII) | Active |
| **AE2-173** | McLean 345 kV | Active |
| **AE2-223** | McLean 345 kV | Active |
| **AE2-261** | Kincaid-Pana | Active |
| **AE2-276** | Sullivan 345kV | Active |
| **AF1-088** | Sullivan 345 kV | Active |
| **AF1-090** | Kincaid-Pana | Active |
| **AF1-204** | Eugene 345 kV | Active |
| **AF1-252** | Kincaid-Pana | Active |
| **AF1-253** | Kincaid-Pana | Active |
| **AF1-322** | Meadow Lake 345 kV | Active |
| **AF2-008** | Sullivan 345 kV | Active |
| **AF2-032** | Kincaid | Active |
| **AF2-090** | Central Hardin 138 kV | Active |
| **AF2-188** | Reynolds-Meadow Lake #1 345 kV | Active |
| **AF2-225** | McLean 345 kV | Active |
| **AF2-252** | Blue Mound 345 kV | Active |
| **AF2-260** | Stephensburg 69 kV | Active |
| **AF2-305** | Brokaw-Lanesville 345 kV | Active |
| **AF2-308** | Central Hardin-Stephensburg 69 kV | Active |
| **AF2-309** | Central Hardin-Stephensburg 69 kV | Active |
| **AF2-317** | Hill Topper 345 kV | Active |
| **AF2-352** | Blue Mound 34.5 kV | Active |
| **AF2-391** | Central Hardin 69 kV | Active |
| **AG1-096** | Rineyville 69 kV | Active |
| **AG1-226** | Eugene-Dequine 345 kV | Active |

| Queue Number | Project Name | Status |
|---|---|---|
| **AG1-236** | Lanesville-Brokaw 345 kV | Active |
| **AG1-237** | Dequine-Eugene 345 kV | Active |
| **AG1-320** | Glendale-Stephensburg 69 kV | Active |
| **AG1-374** | Blue Mound 345 kV | Active |
| **AG1-398** | Brokaw-Lanesville 345 kV | Active |
| **AG1-399** | Blue Mound-Chestnut 345 kV | Active |
| **AG1-400** | Blue Mound-Chestnut 345 kV | Active |
| **AG1-401** | Blue Mound-Chestnut 345 kV | Active |
| **AG1-402** | Blue Mound-Chestnut 345 kV | Active |
| **AG1-403** | Clinton-Brokaw 345 kV | Active |
| **AG1-404** | Clinton-Brokaw 345 kV | Active |
| **AG1-460** | Kincaid-Pana 345 kV | Active |
| **AG1-491** | Central Hardin 69 kV | Active |
| **AG1-522** | Sullivan-Rockport 765 kV | Active |
| **AG1-523** | Sullivan-Rockport 765 kV | Active |
| **AG1-524** | Sullivan-Rockport 765 kV | Active |
| **AG1-525** | Sullivan-Rockport 765 kV | Active |
| **AG1-555** | Dequine 345 kV | Active |
| **W2-048** | Brokaw-Lanesville | In Service |
| **W4-005** | Blue Mound-Latham | In Service |
| **X2-022** | Brokaw-Lanesville | In Service |
| **Z2-087** | Pontiac MidPoint-Brokaw 345kV | In Service |
| **J1139** | MISO | MISO |
| **J811** | MISO | MISO |
| **J815** | MISO | MISO |
| **J848** | MISO | MISO |
| **J912** | MISO | MISO |
| **J949** | MISO | MISO |
| **J979** | MISO | MISO |
| **J991** | MISO | MISO |

## 10.8 Contingency Descriptions

| Contingency Name | Contingency Definition |
|---|---|
| **Base Case** | |
| **AEP_P7-1_#11042-A** | CONTINGENCY 'AEP_P7-1_#11042-A'<br>OPEN BRANCH FROM BUS 243878 TO BUS 958970 CKT 1 / 243878 05MEADOW 345 255205 AF2-188 TAP 345 1<br>OPEN BRANCH FROM BUS 243878 TO BUS 255205 CKT 2 / 243878 05MEADOW 345 255205 17REYNOLDS 345 2<br>END |
| **AEP_P7-1_#11042-B** | CONTINGENCY 'AEP_P7-1_#11042-B'<br>OPEN BRANCH FROM BUS 958970 TO BUS 255205 CKT 1 / 958970 AF2-188 TAP 345 255205 17REYNOLDS 345 1<br>OPEN BRANCH FROM BUS 243878 TO BUS 255205 CKT 2 / 243878 05MEADOW 345 255205 17REYNOLDS 345 2<br>END |
| **AEP_P1-2_#8905_1697** | CONTINGENCY 'AEP_P1-2_#8905_1697'<br>OPEN BRANCH FROM BUS 243217 TO BUS 247712 CKT 1 / 243217 05DEQUIN 345 247712 05SULLIVAN 345 1<br>END |
| **AEP_P1-2_#363_1682** | CONTINGENCY 'AEP_P1-2_#363_1682'<br>OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1<br>END |
| **AEP_P1-2_#6490_16000** | CONTINGENCY 'AEP_P1-2_#6490_16000'<br>OPEN BRANCH FROM BUS 243217 TO BUS 243878 CKT 2 / 243217 05DEQUIN 345 243878 05MEADOW 345 2<br>END |
| **AEP_P1-2_#8807** | CONTINGENCY 'AEP_P1-2_#8807'<br>OPEN BRANCH FROM BUS 243878 TO BUS 255205 CKT 2 / 243878 05MEADOW 345 255205 17REYNOLDS 345 2<br>END |

| Contingency Name | Contingency Definition |
|---|---|
| **AEP_P4_#6189_05HANG** | CONTINGENCY '"AEP_P4_#6189_05HANG' R 765_D1" / 1717<br>OPEN BRANCH FROM BUS 242921 TO BUS 242924 CKT 1 / 242921 05CORNU 765 242924 05HANG R 765 1<br>OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1<br>OPEN BRANCH FROM BUS 242921 TO BUS 242934 CKT 1 / 242921 05CORNU 765 242934 05CORNU 345 1<br>REMOVE MACHINE 1A FROM BUS 247245 /* 247245 05HRKG1A 18.0 DEFAULT DISPATCH<br>REMOVE MACHINE 1B FROM BUS 247246 /* 247246 05HRKG1B 18.0 DEFAULT DISPATCH<br>REMOVE MACHINE 1S FROM BUS 247247 /* 247247 05HRKG1S 18.0 DEFAULT DISPATCH<br>REMOVE MACHINE 2A FROM BUS 247248 /* 247248 05HRKG2A 18.0 DEFAULT DISPATCH<br>REMOVE MACHINE 2B FROM BUS 247249 /* 247249 05HRKG2B 18.0 DEFAULT DISPATCH<br>REMOVE MACHINE 2S FROM BUS 247250 /* 247250 05HRKG2S 18.0 DEFAULT DISPATCH<br>END |
| **AEP_P1-2_#6472_15258** | CONTINGENCY 'AEP_P1-2_#6472_15258'<br>OPEN BRANCH FROM BUS 243217 TO BUS 243878 CKT 1 / 243217 05DEQUIN 345 243878 05MEADOW 345 1<br>END |
| **AEP_P4_#6189_05HANG R 765_D1** | CONTINGENCY 'AEP_P4_#6189_05HANG R 765_D1'<br>OPEN BRANCH FROM BUS 242921 TO BUS 242924 CKT 1 / 242921 05CORNU 765 242924 05HANG R 765 1<br>OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1<br>OPEN BRANCH FROM BUS 242921 TO BUS 242934 CKT 1 / 242921 05CORNU 765 242934 05CORNU 345 1<br>REMOVE UNIT 1A FROM BUS 247245 / 247245 05HRKG1A 18.0 1A<br>REMOVE UNIT 1B FROM BUS 247246 / 247246 05HRKG1B 18.0 1B<br>REMOVE UNIT 1S FROM BUS 247247 / 247247 05HRKG1S 18.0 1S<br>REMOVE UNIT 2A FROM BUS 247248 / 247248 05HRKG2A 18.0 2A<br>REMOVE UNIT 2B FROM BUS 247249 / 247249 05HRKG2B 18.0 2B<br>REMOVE UNIT 2S FROM BUS 247250 / 247250 05HRKG2S 18.0 2S<br>END |
| **AEP_P4_#1760_05JEFRSO** | CONTINGENCY '"AEP_P4_#1760_05JEFRSO' 765_A" / 1455<br>OPEN BRANCH FROM BUS 243207 TO BUS 243208 CKT 1 / 243207 05GRNTWN 765 243208 05JEFRSO 765 1<br>OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1<br>END |

| Contingency Name | Contingency Definition |
|---|---|
| **AEP_P1-2_#709_546** | CONTINGENCY 'AEP_P1-2_#709_546'<br>OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1<br>END |
| **AEP_P1-2_#8695-B** | CONTINGENCY 'AEP_P1-2_#8695-B'<br>OPEN BRANCH FROM BUS 958970 TO BUS 255205 CKT 1 / 958970 AF2-188 TAP 345 255205 17REYNOLDS 345 1<br>END |
| **AEP_P4_#1760_05JEFRSO 765_A** | CONTINGENCY 'AEP_P4_#1760_05JEFRSO 765_A'<br>OPEN BRANCH FROM BUS 243207 TO BUS 243208 CKT 1 / 243207 05GRNTWN 765 243208 05JEFRSO 765 1<br>OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1<br>END |

## 11 Short Circuit Analysis

The following Breakers are overdutied:

None.

# 12 Affected Systems

## 12.1 TVA

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

## 12.2 Duke Energy Progress

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

## 12.3 MISO

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

## 12.4 LG&E

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