



**Generation Interconnection  
Feasibility Study Report  
for  
Queue Project AE2-221  
CLINTON-STUART 345 KV  
180 MW Capacity / 300 MW Energy**

July, 2019

## 1 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.

PJM utilizes manufacturer models to ensure the performance of turbines is properly captured during the simulations performed for stability verification and, where applicable, for compliance with low voltage ride through requirements. Turbine manufacturers provide such models to their customers. The list of manufacturer models PJM has already validated is contained in Attachment B of Manual 14G. Manufacturer models may be updated from time to time, for various reasons such as to reflect changes to the control systems or to more accurately represent the capabilities turbines and controls which are currently available in the field. Additionally, as new turbine models are developed, turbine manufacturers provide such new models which must be used in the conduct of these studies. PJM needs adequate time to evaluate the new models in order to reduce delays to the System Impact Study process timeline for the Interconnection Customer as well as other Interconnection Customers in the study group. Therefore, PJM will require that any Interconnection Customer with a new manufacturer model must supply that model to PJM, along with a \$10,000 fully refundable deposit, no later than three (3) months prior to the starting date of the System Impact Study (See Section 4.3 for starting dates) for the Interconnection Request which shall specify the use of the new model. The Interconnection Customer will be required to submit a completed dynamic model study request form (Attachment B-1 of Manual 14G) in order to document the request for the study.

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.

## 2 General

The Interconnection Customer (IC) has proposed a Solar generating facility located in Clinton County, Ohio. The installed facilities will have a total capability of 300 MW with 180 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is December 31, 2021. **This study does not imply a TO commitment to this in-service date.**

|                     |                       |
|---------------------|-----------------------|
| Queue Number        | AE2-221               |
| Project Name        | CLINTON-STUART 345 KV |
| State               | Ohio                  |
| County              | Clinton               |
| Transmission Owner  | Dayton                |
| MFO                 | 300                   |
| MWE                 | 300                   |
| MWC                 | 180                   |
| Fuel                | Solar                 |
| Basecase Study Year | 2022                  |

### 2.1 Point of Interconnection

The AE2-221 project will interconnect with the Dayton Power & Light Company transmission system via a new 345 kV three-breaker ring bus switchyard that will tap the Clinton-AC1-085 345 kV segment of the Clinton – Stuart 345 kV Line. The Point of Interconnection (POI) will be the 345kV takeoff structure leaving the new three breaker ring bus switchyard. The Interconnection Customer will own the generator lead line conductor terminating onto the structure.

## 2.2 Cost Summary

The AE2-221 project will be responsible for the following costs:

| Description                            | Total Cost         |
|----------------------------------------|--------------------|
| Attachment Facilities                  | \$0                |
| Direct Connection Network Upgrade      | \$6,500,000        |
| Non Direct Connection Network Upgrades | \$150,000          |
| <b>Total Costs</b>                     | <b>\$6,650,000</b> |

In addition, the AE2-221 project may be responsible for a contribution to the following costs

| Description     | Total Cost           |
|-----------------|----------------------|
| System Upgrades | <b>\$120,515,000</b> |

Cost allocations for these upgrades will be provided in the System Impact Study Report.

## 3 Attachment Facilities

There are no Attachment Facilities to be constructed by the Transmission Owner.

This report assumes that the Interconnection Customer will construct and own the attachment line from its generating facility into the proposed Point of Interconnection as depicted on the one line diagram in Attachment 1. The IC will also be responsible for the fiber/OPGW that Dayton requires on the generator line for the communication assisted trip scheme.

The metering may be classified as an Attachment Facility in future study reports.

## 4 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         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Install a new 345 kV three breaker ring bus switchyard to interconnect the AE2-221 project. This will include the installation of all physical structures, P&C equipment, communications equipment, metering equipment, and associated facilities. | \$5,000,000        |
| Transmission Line Tie-In work to accommodate new AE2-221 Interconnection Switchyard.                                                                                                                                                               | \$1,500,000        |
| <b>Total Direct Connection Facility Costs</b>                                                                                                                                                                                                      | <b>\$6,500,000</b> |

The direct connection cost estimate for the AE2-221 project is approximately \$6,500,000. The substation direct connection work for this project includes the construction of a 345 kV three breaker ring bus switchyard

which will be tapped off the Clinton-AC1-085 345kV line. There will also be 345 kV transmission line construction required to accommodate the new switchyard. The 345 kV generator lead line will be constructed by the developer and will be terminated onto the 345 kV takeoff structure leaving the new three breaker ring bus switchyard. The new 345kV breakers will be equipped with the necessary communication systems to facilitate remote supervisory control of the breaker and status monitoring. Dayton will install the line relaying, communications, and interconnection metering to accommodate the interconnection of the AE2-221 generator.

## 5 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       |
|---------------------------------------------------|------------------|
| Clinton Substation: Upgrade 345kV line relaying   | \$75,000         |
| AC1-085 Substation: Upgrade 345kV line relaying   | \$75,000         |
| <b>Total Non-Direct Connection Facility Costs</b> | <b>\$150,000</b> |

The substation non-direct connection cost estimate for the AE2-221 project is approximately **\$150,000**. Remote end relaying will need to be evaluated for settings changes at Clinton and AC1-085 Substations to facilitate the interconnection of the new generation.

## 6 Schedule

Based on the extent of the Dayton primary Direct Connection and Non-Direct Connection upgrades required to support the AE2-221 generation project, it is expected to take a minimum of **24 months** from the date of a fully executed Interconnection Construction Service Agreement to complete the installation subject to market conditions and vendor lead times. This includes the requirement for the Interconnection Customer to make a preliminary payment to Dayton which funds the first three months of engineering design that is related to the construction of the Non-Direct Connection facilities. It assumes that there will be no environmental or permitting issues to implement the Non-Direct Connection upgrades for this project and that all system outages will be allowed when requested.

## 7 Interconnection Customer Requirements

### 7.1 PJM Requirements

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.

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.

## **7.2 Dayton Interconnection Requirements**

The Dayton Power and Light Company (DP&L) has prepared this Facilities Connection Requirements document to ensure compliance with North American Electric Reliability Council (NERC) Reliability Standards and applicable Regional Reliability Organization, sub regional, Power Pool, and individual Transmission Owner planning criteria and facility connection requirements in compliance to NERC Standard FAC-001-2. These connection requirements apply to all generation facilities, transmission facilities, and end-users connecting to the DP&L transmission system. Detailed information outlining DP&L interconnection requirements can be reviewed utilizing the following link:

<https://www.pjm.com/~media/planning/plan-standards/private-dayton/dayton-facilities-connection-requirements.ashx>

## **8 Revenue Metering and SCADA Requirements**

### **8.1 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.

### **8.2 Dayton Requirements**

The Interconnection Customer will be required to comply with all Dayton Revenue Metering Requirements for Generation Interconnection Customers as outlined in the link below. The Revenue Metering Requirements may be found within the Dayton Power & Light Co. "Requirements for the Connection of Facilities to the Dayton Power & Light Co. Transmission System" document located at the following link:

<http://www.pjm.com/~media/planning/plan-standards/private-dayton/dayton-facilities-connection-requirements.ashx>  
<http://www.pjm.com/planning/design-engineering/to-tech-standards.aspx>

## 9 Network Impacts

The Queue Project AE2-221 was evaluated as a 300.0 MW (Capacity 180.0 MW) injection tapping the Clinton to Stuart 345kV line in the Dayton area. Project AE2-221 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-221 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

## Summer Peak Load Flow

## 10 Generation Deliverability

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

None

## 11 Multiple Facility Contingency

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

| ID      | FROM BUS# | FROM BUS    | 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 |
|---------|-----------|-------------|---------------|---------|----------|-------------|--------|---------------------------------------------------|---------|------------|-----------------------|------------------------|-------|-----------|
| 7210919 | 243453    | 05BEATTY    | AEP           | 243454  | 05BIXBY  | AEP         | 1      | AEP_P4_#10715_05C OLE 345_C                       | breaker | 1203.0     | 99.84                 | 103.38                 | DC    | 42.51     |
| 8852859 | 253014    | 09CLINTO    | DAY           | 253027  | 09GREENE | DAY         | 1      | DAY_P7_34569 34598 34524                          | tower   | 1374.0     | 98.48                 | 109.02                 | DC    | 144.69    |
| 8852860 | 253014    | 09CLINTO    | DAY           | 253027  | 09GREENE | DAY         | 1      | .345.DEO&K-DAY.C5 4524FOSTRUGRCRK 34598FOSTERBATH | tower   | 1374.0     | 92.7                  | 103.01                 | DC    | 141.61    |
| 7211013 | 253038    | 09KILLEN    | DAY           | 242938  | 05MARQUI | AEP         | 1      | AEP_P4_#2085_05BE ATTY 345_304C                   | breaker | 1372.0     | 96.97                 | 98.56                  | DC    | 48.51     |
| 7211014 | 253038    | 09KILLEN    | DAY           | 242938  | 05MARQUI | AEP         | 1      | AEP_P4_#2866_05BE ATTY 345_304W                   | breaker | 1372.0     | 97.19                 | 98.75                  | DC    | 47.56     |
| 8851600 | 253100    | 09ATLNTA    | DAY           | 253110  | 09ADKINS | DAY         | 1      | DAY_P2_GREENE_34 5                                | bus     | 1195.0     | 98.09                 | 101.75                 | DC    | 43.74     |
| 8852034 | 253100    | 09ATLNTA    | DAY           | 253110  | 09ADKINS | DAY         | 1      | AEP_P4_#6774_05M ARQUI 345_D                      | breaker | 1195.0     | 99.39                 | 100.45                 | DC    | 27.98     |
| 8852035 | 253100    | 09ATLNTA    | DAY           | 253110  | 09ADKINS | DAY         | 1      | AEP_P4_#2900_05M ARQUI 345_D2                     | breaker | 1195.0     | 95.77                 | 96.85                  | DC    | 28.72     |
| 8852886 | 253100    | 09ATLNTA    | DAY           | 253110  | 09ADKINS | DAY         | 1      | DAY_P7_34522 34598-A                              | tower   | 1195.0     | 97.84                 | 101.57                 | DC    | 44.53     |
| 8851978 | 942090    | AE2-221 TAP | DAY           | 253014  | 09CLINTO | DAY         | 1      | .345.DEO&K.FOSTER 345 BUS1+RELAYFAIL              | breaker | 1374.0     | 98.03                 | 110.24                 | DC    | 167.7     |
| 8851979 | 942090    | AE2-221 TAP | DAY           | 253014  | 09CLINTO | DAY         | 1      | .345.DEO&K.C2 1349_FOSTER                         | breaker | 1374.0     | 97.44                 | 109.72                 | DC    | 168.7     |

## 12 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 | 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 |
|---------|-----------|----------|---------------|---------|----------|-------------|--------|---------------------------------------|---------|------------|-----------------------|------------------------|-------|-----------|
| 7210825 | 243453    | 05BEATTY | AEP           | 244022  | 05COLE   | AEP         | 1      | AEP_P4_#8094_05BIXBY 345_C            | breaker | 1203.0     | 107.83                | 111.14                 | DC    | 39.79     |
| 7210826 | 243453    | 05BEATTY | AEP           | 244022  | 05COLE   | AEP         | 1      | AEP_P4_#3195_05BEAT TY 345_304E       | breaker | 1203.0     | 107.36                | 110.8                  | DC    | 41.37     |
| 7210918 | 243453    | 05BEATTY | AEP           | 243454  | 05BIXBY  | AEP         | 1      | AEP_P4_#3196_05BEAT TY 345_302E       | breaker | 1203.0     | 101.78                | 105.48                 | DC    | 44.5      |
| 7212208 | 253038    | 09KILLEN | DAY           | 242938  | 05MARQUI | AEP         | 1      | DAY_P7_BEATTY-S. CHARLESTON 34542_1-A | tower   | 1372.0     | 109.85                | 111.63                 | DC    | 54.28     |
| 7212209 | 253038    | 09KILLEN | DAY           | 242938  | 05MARQUI | AEP         | 1      | DAY_P7_BEATTY-S. CHARLESTON 34542_1-B | tower   | 1372.0     | 107.75                | 109.53                 | DC    | 54.28     |
| 7210115 | 253110    | 09ADKINS | DAY           | 243453  | 05BEATTY | AEP         | 1      | DAY_P2_GREENE_345                     | bus     | 1372.0     | 111.05                | 112.47                 | DC    | 42.95     |
| 7210808 | 253110    | 09ADKINS | DAY           | 243453  | 05BEATTY | AEP         | 1      | AEP_P4_#6774_05MAR QUI 345_D          | breaker | 1372.0     | 113.14                | 114.04                 | DC    | 27.19     |

| 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 |
|---------|-----------|-------------|---------------|---------|----------|-------------|--------|--------------------------------------------------|--------|------------|-----------------------|------------------------|-------|-----------|
| 7211723 | 253110    | 09ADKINS    | DAY           | 243453  | 05BEATTY | AEP         | 1      | DAY_P1_34509-A-A                                 | single | 1372.0     | 108.03                | 109.92                 | DC    | 25.79     |
| 7211725 | 253110    | 09ADKINS    | DAY           | 243453  | 05BEATTY | AEP         | 1      | DAY_P1_34522                                     | single | 1372.0     | 107.64                | 109.53                 | DC    | 25.82     |
| 7212183 | 253110    | 09ADKINS    | DAY           | 243453  | 05BEATTY | AEP         | 1      | DAY_P7_34522 34598-A                             | tower  | 1372.0     | 110.84                | 112.29                 | DC    | 43.74     |
| 8852794 | 942090    | AE2-221 TAP | DAY           | 253014  | 09CLINTO | DAY         | 1      | DAY_P7_34569 34598 34524                         | tower  | 1374.0     | 109.91                | 121.57                 | DC    | 160.21    |
| 8852795 | 942090    | AE2-221 TAP | DAY           | 253014  | 09CLINTO | DAY         | 1      | .345.DE0&K-DAY.C5 4524FOSTRUGCRK34 598FOSTERBATH | tower  | 1374.0     | 103.97                | 115.39                 | DC    | 156.86    |

### 13 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    | 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 |
|---------|-----------|-------------|---------------|---------|----------|-------------|--------|------------------|-----------|------------|-----------------------|------------------------|-------|-----------|
| 7211848 | 243453    | 05BEATTY    | AEP           | 244022  | 05COLE   | AEP         | 1      | AEP_P1-2_#713    | operation | 1203.0     | 99.98                 | 103.25                 | DC    | 39.31     |
| 7211929 | 243453    | 05BEATTY    | AEP           | 243454  | 05BIXBY  | AEP         | 1      | AEP_P1-2_#10137  | operation | 1203.0     | 92.87                 | 96.41                  | DC    | 42.51     |
| 7211923 | 253038    | 09KILLEN    | DAY           | 242938  | 05MARQUI | AEP         | 1      | AEP_P1-2_#762    | operation | 1372.0     | 96.98                 | 98.54                  | DC    | 47.53     |
| 8852650 | 253100    | 09ATLNTA    | DAY           | 253110  | 09ADKINS | DAY         | 1      | DAY_P1_34509-A-A | operation | 1195.0     | 93.98                 | 97.64                  | DC    | 43.78     |
| 7211720 | 253110    | 09ADKINS    | DAY           | 243453  | 05BEATTY | AEP         | 1      | Base Case        | operation | 1233.0     | 108.17                | 108.92                 | DC    | 20.46     |
| 7211721 | 253110    | 09ADKINS    | DAY           | 243453  | 05BEATTY | AEP         | 1      | DAY_P1_34509-A-A | operation | 1372.0     | 107.66                | 109.08                 | DC    | 42.99     |
| 7211886 | 941510    | AE2-148 TAP | DAY           | 243453  | 05BEATTY | AEP         | 1      | AEP_P1-2_#762    | operation | 1374.0     | 102.24                | 103.94                 | DC    | 51.7      |
| 8852592 | 942090    | AE2-221 TAP | DAY           | 253014  | 09CLINTO | DAY         | 1      | AEP_P1-2_#762    | operation | 1374.0     | 94.98                 | 107.46                 | DC    | 171.59    |
| 8852597 | 942090    | AE2-221 TAP | DAY           | 253014  | 09CLINTO | DAY         | 1      | Base Case        | operation | 1255.0     | 86.6                  | 100.01                 | DC    | 168.33    |

## 14 System Reinforcements

| ID                                                      | Index | Facility                                       | Upgrade Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Cost         |
|---------------------------------------------------------|-------|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| 7210115,<br>7211723,<br>7210808,<br>7211725,<br>7212183 | 7     | 09ADKINS 345.0 kV -<br>05BEATTY 345.0 kV Ckt 1 | <p><b>AEPO0004a (109):</b> Rebuild 13.0 miles of 2-983.1 ACAR 30/7 Rail 5 conductors on Beatty-Adkins circuit (3.7 miles of double circuit construction). Bare minimum conductor is 2-1024.5 ACAR 30/7 Rail1 which provide no additional margin. Upgrade other elements previously rated by DP&amp;L. Ratings validation of this equipment is currently underway. This will require relay upgrades at Beatty and Adkins.<br/> <b>Project Type :</b> FAC<br/> <b>Cost :</b> \$55,000,000<br/> <b>Time Estimate :</b> 24-36 Months</p> <p><b>AEPO0004b (110):</b> Replace equipment at Adkins station formerly owned by DP&amp;L that is now owned by AEP. Further investigation is required to see exactly what equipment is to be replaced and whether it can be simply re-rated according to AEP's standards.<br/> <b>Project Type :</b> FAC<br/> <b>Cost :</b> \$1,000,000<br/> <b>Time Estimate :</b> 36-48 Months</p> | \$56,000,000 |
| 8852860,<br>8852859                                     | 4     | 09CLINTO 345.0 kV -<br>09GREENE 345.0 kV Ckt 1 | <p><b>r190005 (296) :</b> Replace 2000A wave trap with 3000A<br/> <b>Project Type :</b> FAC<br/> <b>Cost :</b> \$100,000<br/> <b>Time Estimate :</b> 12.0 Months</p> <p><b>r190007 (298) :</b> Replace 2000A wave trap with 3000A<br/> <b>Project Type :</b> FAC<br/> <b>Cost :</b> \$100,000<br/> <b>Time Estimate :</b> 12.0 Months</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | \$200,000    |
| 7210919,<br>7210918                                     | 3     | 05BEATTY 345.0 kV -<br>05BIXBY 345.0 kV Ckt 1  | <p><b>AEPO0003a (108) :</b> Upgrade/Replace Three 345kV 1600A switches at Beatty station<br/> <b>Project Type :</b> FAC<br/> <b>Cost :</b> \$1,500,000<br/> <b>Time Estimate :</b> 12-18 Months</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | \$1,500,000  |
| 7210825,<br>7210826                                     | 6     | 05BEATTY 345.0 kV -<br>05COLE 345.0 kV Ckt 1   | <p><b>AEPO0001a (102) :</b> Upgrade/Replace 3-345kV 1600A switches at Beatty station<br/> <b>Project Type :</b> FAC<br/> <b>Cost :</b> \$1,500,000<br/> <b>Time Estimate :</b> 12-18 Months</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | \$1,500,000  |

| ID                                                      | Index | Facility                                          | Upgrade Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Cost          |
|---------------------------------------------------------|-------|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 7211013,<br>7211924,<br>7212208,<br>7212209,<br>7211014 | 1     | 09KILLEN 345.0 kV -<br>05MARQUI 345.0 kV Ckt 1    | <p><b>AEPO0007a (116) :</b><br/>Perform sag study on Don Marquis-Killen 345kV circuit, 32.1 miles of 2-983.1 ACAR 30/7 Rail5 conductor. Since Killen will be retired, the conductor between Don Marquis and Stuart will become a complete circuit and the whole circuit will need to be sag studied.<br/>Perform sag study on Killen-Stuart 345kV circuit, 15.2 miles of 2-983.1 ACAR 30/7 Rail5 conductor.<br/><b>Project Type :</b> FAC<br/><b>Cost :</b> \$190,000<br/><b>Time Estimate :</b> 6-12 Months</p> <p><b>r190008 (299) :</b> Reconductor line with 795 ACCR high temperature conductor in a twin bundle<br/><b>Project Type :</b> FAC<br/><b>Cost :</b> \$6,500,000<br/><b>Time Estimate :</b> 18.0 Months</p> <p><b>r190009 (300) :</b> Replace 2000A wave trap with 3000A<br/><b>Project Type :</b> FAC<br/><b>Cost :</b> \$100,000<br/><b>Time Estimate :</b> 12.0 Months</p>                                  | \$6,790,000   |
| 8852035,<br>8852654,<br>8851600,<br>8852886,<br>8852034 | 2     | 09ATLNTA 345.0 kV -<br>09ADKINS 345.0 kV Ckt 1    | <p><b>r190011 (302) :</b> Replace metering equipment to increase thermal line rating<br/><b>Project Type :</b> FAC<br/><b>Cost :</b> \$100,000<br/><b>Time Estimate :</b> 12.0 Months</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | \$100,000     |
| 8852794,<br>8852795,<br>8851979,<br>8851978             | 5     | AE2-221 TAP 345.0 kV -<br>09CLINTO 345.0 kV Ckt 1 | <p><b>r190001 (292) :</b> Replace 2000A wave trap with 3000A<br/><b>Project Type :</b> FAC<br/><b>Cost :</b> \$100,000<br/><b>Time Estimate :</b> 12.0 Months</p> <p><b>r190002 (293) :</b> Replace substation riser conductor with 2500AAC (parallel)<br/><b>Project Type :</b> FAC<br/><b>Cost :</b> \$100,000<br/><b>Time Estimate :</b> 12.0 Months</p> <p><b>r190003 (294) :</b> Reconductor line with 795 ACCR high temperature conductor in a twin bundle<br/><b>Project Type :</b> FAC<br/><b>Cost :</b> \$54,000,000<br/><b>Time Estimate :</b> 42.0 Months</p> <p><b>r190005 (296) :</b> Replace 2000A wave trap with 3000A<br/><b>Project Type :</b> FAC<br/><b>Cost :</b> \$100,000<br/><b>Time Estimate :</b> 12.0 Months</p> <p><b>r190006 (297) :</b> Replace 2000A disconnect switch with 1600A (parallel)<br/><b>Project Type :</b> FAC<br/><b>Cost :</b> \$125,000<br/><b>Time Estimate :</b> 12.0 Months</p> | \$54,425,000  |
|                                                         |       |                                                   | TOTAL COST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | \$120,515,000 |

## 15 Flow Gate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact. It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

## 16 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 |
|---------|-----------|----------|---------------|---------|----------|-------------|--------|---------------------------------------|-------|------------|-----------------------|------------------------|-------|-----------|
| 7212208 | 253038    | 09KILLEN | DAY           | 242938  | 05MARQUI | AEP         | 1      | DAY_P7_BEATTY-S. CHARLESTON 34542_1-A | tower | 1372.0     | 109.85                | 111.63                 | DC    | 54.28     |

| Bus #  | Bus          | MW Impact |
|--------|--------------|-----------|
| 253038 | 09KILLEN     | 298.51    |
| 253077 | 09STUART     | 478.92    |
| 902531 | W2-040 C     | 0.7       |
| 902532 | W2-040 E     | 1.13      |
| 904722 | V4-073 E     | 0.15      |
| 913222 | Y1-054 E     | 1.77      |
| 914372 | Y2-111 E     | 1.12      |
| 915582 | Y3-080 E     | 0.75      |
| 915662 | Y3-099 E     | 0.16      |
| 915672 | Y3-100 E     | 0.16      |
| 916182 | Z1-065 E     | 0.54      |
| 916272 | Z1-080 E     | 0.47      |
| 918802 | AA1-099 E    | 0.31      |
| 925242 | AB2-178 E    | 1.56      |
| 925921 | AC1-068 C    | 7.92      |
| 925922 | AC1-068 E    | 3.71      |
| 925931 | AC1-069 C    | 7.92      |
| 925932 | AC1-069 E    | 3.71      |
| 925981 | AC1-074 C O1 | 7.04      |
| 925982 | AC1-074 E O1 | 3.02      |
| 926061 | AC1-085 C O1 | 34.6      |
| 926062 | AC1-085 E O1 | 56.44     |
| 926101 | AC1-089 C O1 | 4.35      |
| 926102 | AC1-089 E O1 | 7.1       |
| 926791 | AC1-165 C    | 7.83      |
| 926792 | AC1-165 E    | 3.8       |
| 926801 | AC1-166 C    | 7.83      |
| 926802 | AC1-166 E    | 3.8       |
| 930062 | AB1-014 E    | 13.64     |
| 931181 | AB1-169      | 301.62    |
| 932462 | AC2-066 E    | 0.44      |
| 932481 | AC2-068 C    | 2.36      |
| 932482 | AC2-068 E    | 3.86      |
| 932551 | AC2-075 C    | 1.67      |
| 932552 | AC2-075 E    | 0.84      |
| 932661 | AC2-088 C O1 | 7.58      |
| 932662 | AC2-088 E O1 | 6.24      |
| 935011 | AD1-134      | 7.68      |
| 935031 | AD1-136 C    | 1.07      |

| Bus #  | Bus          | MW Impact |
|--------|--------------|-----------|
| 935032 | AD1-136 E    | 0.91      |
| 935041 | AD1-140 C O1 | 7.32      |
| 935042 | AD1-140 E O1 | 6.06      |
| 936251 | AD2-031 C O1 | 2.3       |
| 936252 | AD2-031 E O1 | 3.76      |
| 936281 | AD2-036 C    | 5.03      |
| 936282 | AD2-036 E    | 2.51      |
| 936381 | AD2-048 C    | 5.59      |
| 936382 | AD2-048 E    | 2.79      |
| 936571 | AD2-072 C O1 | 4.96      |
| 936572 | AD2-072 E O1 | 2.43      |
| 937111 | AD2-147 C O1 | 4.65      |
| 937112 | AD2-147 E O1 | 6.41      |
| 937151 | AD2-151 C O1 | 7.55      |
| 937152 | AD2-151 E O1 | 10.43     |
| 938051 | AE1-007 C    | 0.68      |
| 938052 | AE1-007 E    | 1.1       |
| 938271 | AE1-040 C O1 | 2.56      |
| 938272 | AE1-040 E O1 | 1.29      |
| 938921 | AE1-120      | 7.75      |
| 939141 | AE1-144 C O1 | 13.3      |
| 939142 | AE1-144 E O1 | 6.6       |
| 940531 | AE2-038 C O1 | 8.87      |
| 940532 | AE2-038 E O1 | 4.39      |
| 941411 | AE2-138 C    | 26.57     |
| 941412 | AE2-138 E    | 9.83      |
| 941511 | AE2-148 C    | 43.93     |
| 941512 | AE2-148 E    | 19.87     |
| 941981 | AE2-210 C O1 | 9.04      |
| 941982 | AE2-210 E O1 | 3.4       |
| 942061 | AE2-218 C    | 8.21      |
| 942062 | AE2-218 E    | 5.58      |
| 942091 | AE2-221 C    | 32.57     |
| 942092 | AE2-221 E    | 21.71     |
| 942231 | AE2-235 C O1 | 6.33      |
| 942232 | AE2-235 E O1 | 2.73      |
| 942411 | AE2-254 C O1 | 2.36      |
| 942412 | AE2-254 E O1 | 1.57      |
| 942521 | AE2-267 C O1 | 2.99      |
| 942522 | AE2-267 E O1 | 1.85      |
| 942591 | AE2-275 C O1 | 6.97      |
| 942592 | AE2-275 E O1 | 2.62      |
| 942781 | AE2-296 O1   | 9.52      |
| 942891 | AE2-308 C O1 | 11.94     |
| 942892 | AE2-308 E O1 | 4.34      |
| 942951 | AE2-315      | 2.31      |
| 942981 | AE2-320 C O1 | 15.59     |
| 942982 | AE2-320 E O1 | 7.71      |
| 943111 | AE2-339 C    | 4.02      |
| 943112 | AE2-339 E    | 1.98      |
| 943191 | AE2-318 C    | 10.18     |
| 943192 | AE2-318 E    | 4.97      |

| <b>Bus #</b>      | <b>Bus</b>   | <b>MW Impact</b> |
|-------------------|--------------|------------------|
| <b>943201</b>     | AE2-319 C O1 | 15.59            |
| <b>943202</b>     | AE2-319 E O1 | 7.71             |
| <b>CARR</b>       | CARR         | 0.47             |
| <b>CATAWBA</b>    | CATAWBA      | 0.07             |
| <b>CBM-S1</b>     | CBM-S1       | 8.51             |
| <b>CBM-W1</b>     | CBM-W1       | 10.07            |
| <b>CBM-W2</b>     | CBM-W2       | 56.95            |
| <b>CIN</b>        | CIN          | 9.04             |
| <b>G-007</b>      | G-007        | 1.37             |
| <b>HAMLET</b>     | HAMLET       | 0.22             |
| <b>IPL</b>        | IPL          | 6.18             |
| <b>LGEE</b>       | LGEE         | 3.95             |
| <b>MEC</b>        | MEC          | 9.91             |
| <b>MECS</b>       | MECS         | 3.8              |
| <b>O-066</b>      | O-066        | 8.76             |
| <b>RENSSELAER</b> | RENSSELAER   | 0.37             |
| <b>WEC</b>        | WEC          | 1.35             |

## 16.1 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 |
|---------|-----------|----------|---------------|---------|----------|-------------|--------|----------------------|-------|------------|-----------------------|------------------------|-------|-----------|
| 8852886 | 253100    | 09ATLNTA | DAY           | 253110  | 09ADKINS | DAY         | 1      | DAY_P7_34522 34598-A | tower | 1195.0     | 97.84                 | 101.57                 | DC    | 44.53     |

| Bus #  | Bus          | MW Impact |
|--------|--------------|-----------|
| 253038 | 09KILLEN     | 67.5      |
| 253077 | 09STUART     | 259.27    |
| 342960 | 1SPURLK2G    | 7.12      |
| 342963 | 1SPURLK3G    | 3.74      |
| 342966 | 1SPURLK4G    | 3.74      |
| 925921 | AC1-068 C    | 18.63     |
| 925922 | AC1-068 E    | 8.71      |
| 925931 | AC1-069 C    | 18.63     |
| 925932 | AC1-069 E    | 8.71      |
| 925981 | AC1-074 C O1 | 3.92      |
| 925982 | AC1-074 E O1 | 1.68      |
| 926061 | AC1-085 C O1 | 22.56     |
| 926062 | AC1-085 E O1 | 36.81     |
| 926791 | AC1-165 C    | 18.41     |
| 926792 | AC1-165 E    | 8.93      |
| 926801 | AC1-166 C    | 18.41     |
| 926802 | AC1-166 E    | 8.93      |
| 930062 | AB1-014 E    | 6.98      |
| 931181 | AB1-169      | 163.28    |
| 932381 | AC2-055 C    | 1.82      |
| 932382 | AC2-055 E    | 2.97      |
| 932421 | AC2-060 C    | 6.46      |
| 932422 | AC2-060 E    | 3.63      |
| 932462 | AC2-066 E    | 0.23      |
| 932551 | AC2-075 C    | 0.93      |
| 932552 | AC2-075 E    | 0.47      |
| 932651 | AC2-087 C O1 | 4.79      |
| 932652 | AC2-087 E O1 | 3.8       |
| 932661 | AC2-088 C O1 | 4.0       |
| 932662 | AC2-088 E O1 | 3.29      |
| 934491 | AD1-073 C    | 1.33      |
| 934492 | AD1-073 E    | 0.69      |
| 935031 | AD1-136 C    | 0.56      |
| 935032 | AD1-136 E    | 0.48      |
| 936251 | AD2-031 C O1 | 1.75      |
| 936252 | AD2-031 E O1 | 2.85      |
| 936281 | AD2-036 C    | 2.8       |
| 936282 | AD2-036 E    | 1.4       |
| 936381 | AD2-048 C    | 3.14      |
| 936382 | AD2-048 E    | 1.57      |
| 937151 | AD2-151 C O1 | 3.84      |
| 937152 | AD2-151 E O1 | 5.31      |

| <b>Bus #</b> | <b>Bus</b>   | <b>MW Impact</b> |
|--------------|--------------|------------------|
| 938271       | AE1-040 C O1 | 4.12             |
| 938272       | AE1-040 E O1 | 2.07             |
| 938921       | AE1-120      | 3.96             |
| 939141       | AE1-144 C O1 | 7.37             |
| 939142       | AE1-144 E O1 | 3.66             |
| 940531       | AE2-038 C O1 | 4.91             |
| 940532       | AE2-038 E O1 | 2.43             |
| 941411       | AE2-138 C    | 14.76            |
| 941412       | AE2-138 E    | 5.46             |
| 941981       | AE2-210 C O1 | 5.02             |
| 941982       | AE2-210 E O1 | 1.89             |
| 942091       | AE2-221 C    | 26.72            |
| 942092       | AE2-221 E    | 17.81            |
| 942231       | AE2-235 C O1 | 3.53             |
| 942232       | AE2-235 E O1 | 1.52             |
| 942981       | AE2-320 C O1 | 36.66            |
| 942982       | AE2-320 E O1 | 18.14            |
| 943111       | AE2-339 C    | 2.26             |
| 943112       | AE2-339 E    | 1.11             |
| 943191       | AE2-318 C    | 5.14             |
| 943192       | AE2-318 E    | 2.51             |
| 943201       | AE2-319 C O1 | 36.66            |
| 943202       | AE2-319 E O1 | 18.14            |
| CARR         | CARR         | 0.25             |
| CBM-S1       | CBM-S1       | 6.38             |
| CBM-S2       | CBM-S2       | 1.3              |
| CBM-W1       | CBM-W1       | 3.42             |
| CBM-W2       | CBM-W2       | 37.52            |
| CIN          | CIN          | 4.89             |
| CPL          | CPL          | 0.37             |
| G-007        | G-007        | 0.63             |
| IPL          | IPL          | 3.27             |
| LGEE         | LGEE         | 2.34             |
| MEC          | MEC          | 5.26             |
| O-066        | O-066        | 4.08             |
| RENSSELAER   | RENSSELAER   | 0.19             |
| WEC          | WEC          | 0.57             |

## 16.2 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 |
|---------|-----------|----------|---------------|---------|---------|-------------|--------|--------------------------------|---------|------------|-----------------------|------------------------|-------|-----------|
| 7210918 | 243453    | 05BEATTY | AEP           | 243454  | 05BIXBY | AEP         | 1      | AEP_P4_#3196_05BEATTY 345_302E | breaker | 1203.0     | 101.78                | 105.48                 | DC    | 44.5      |

| Bus #  | Bus          | MW Impact |
|--------|--------------|-----------|
| 253038 | 09KILLEN     | 52.29     |
| 253077 | 09STUART     | 214.43    |
| 253110 | 09ADKINS     | 24.08     |
| 253261 | 09MON D      | 0.21      |
| 902531 | W2-040 C     | 0.97      |
| 902532 | W2-040 E     | 1.58      |
| 904722 | V4-073 E     | 0.21      |
| 913222 | Y1-054 E     | 1.61      |
| 914372 | Y2-111 E     | 1.61      |
| 915582 | Y3-080 E     | 1.07      |
| 915662 | Y3-099 E     | 0.15      |
| 915672 | Y3-100 E     | 0.15      |
| 916182 | Z1-065 E     | 0.5       |
| 916272 | Z1-080 E     | 0.49      |
| 918802 | AA1-099 E    | 0.32      |
| 925242 | AB2-178 E    | 1.5       |
| 925921 | AC1-068 C    | 11.33     |
| 925922 | AC1-068 E    | 5.3       |
| 925931 | AC1-069 C    | 11.33     |
| 925932 | AC1-069 E    | 5.3       |
| 925981 | AC1-074 C O1 | 4.21      |
| 925982 | AC1-074 E O1 | 1.8       |
| 926011 | AC1-078 C O1 | 8.49      |
| 926012 | AC1-078 E O1 | 14.15     |
| 926061 | AC1-085 C O1 | 20.6      |
| 926062 | AC1-085 E O1 | 33.61     |
| 926101 | AC1-089 C O1 | 4.17      |
| 926102 | AC1-089 E O1 | 6.8       |
| 926791 | AC1-165 C    | 11.2      |
| 926792 | AC1-165 E    | 5.43      |
| 926801 | AC1-166 C    | 11.2      |
| 926802 | AC1-166 E    | 5.43      |
| 927182 | AC1-212 E    | 1.27      |
| 930062 | AB1-014 E    | 8.46      |
| 931181 | AB1-169      | 135.05    |
| 932381 | AC2-055 C    | 1.77      |
| 932382 | AC2-055 E    | 2.89      |
| 932421 | AC2-060 C    | 6.29      |
| 932422 | AC2-060 E    | 3.54      |
| 932431 | AC2-061 C    | 4.26      |
| 932432 | AC2-061 E    | 4.32      |
| 932462 | AC2-066 E    | 0.27      |

| Bus #  | Bus          | MW Impact |
|--------|--------------|-----------|
| 932481 | AC2-068 C    | 3.29      |
| 932482 | AC2-068 E    | 5.39      |
| 932551 | AC2-075 C    | 1.0       |
| 932552 | AC2-075 E    | 0.5       |
| 932651 | AC2-087 C O1 | 4.66      |
| 932652 | AC2-087 E O1 | 3.7       |
| 932661 | AC2-088 C O1 | 4.24      |
| 932662 | AC2-088 E O1 | 3.49      |
| 932841 | AC2-111 C O1 | 2.16      |
| 932842 | AC2-111 E O1 | 3.52      |
| 934491 | AD1-073 C    | 1.3       |
| 934492 | AD1-073 E    | 0.67      |
| 934561 | AD1-081 C    | 1.7       |
| 934562 | AD1-081 E    | 0.87      |
| 935031 | AD1-136 C    | 0.6       |
| 935032 | AD1-136 E    | 0.51      |
| 935041 | AD1-140 C O1 | 12.37     |
| 935042 | AD1-140 E O1 | 10.23     |
| 936251 | AD2-031 C O1 | 2.51      |
| 936252 | AD2-031 E O1 | 4.09      |
| 936281 | AD2-036 C    | 3.01      |
| 936282 | AD2-036 E    | 1.5       |
| 936381 | AD2-048 C    | 3.42      |
| 936382 | AD2-048 E    | 1.71      |
| 937111 | AD2-147 C O1 | 13.71     |
| 937112 | AD2-147 E O1 | 18.93     |
| 937151 | AD2-151 C O1 | 4.66      |
| 937152 | AD2-151 E O1 | 6.43      |
| 938051 | AE1-007 C    | 0.94      |
| 938052 | AE1-007 E    | 1.54      |
| 938061 | AE1-008 C    | 0.54      |
| 938062 | AE1-008 E    | 0.88      |
| 938271 | AE1-040 C O1 | 4.04      |
| 938272 | AE1-040 E O1 | 2.03      |
| 938921 | AE1-120      | 4.8       |
| 939141 | AE1-144 C O1 | 7.14      |
| 939142 | AE1-144 E O1 | 3.54      |
| 940531 | AE2-038 C O1 | 4.76      |
| 940532 | AE2-038 E O1 | 2.36      |
| 941411 | AE2-138 C    | 14.74     |
| 941412 | AE2-138 E    | 5.45      |
| 941511 | AE2-148 C    | 169.93    |
| 941512 | AE2-148 E    | 76.86     |
| 941771 | AE2-180 C    | 7.08      |
| 941772 | AE2-180 E    | 4.72      |
| 941941 | AE2-206 C O1 | 2.91      |
| 941942 | AE2-206 E O1 | 4.02      |
| 941981 | AE2-210 C O1 | 5.04      |
| 941982 | AE2-210 E O1 | 1.89      |
| 942051 | AE2-217 C    | 10.75     |
| 942052 | AE2-217 E    | 7.17      |
| 942061 | AE2-218 C    | 11.36     |

| <b>Bus #</b> | <b>Bus</b>   | <b>MW Impact</b> |
|--------------|--------------|------------------|
| 942062       | AE2-218 E    | 7.72             |
| 942091       | AE2-221 C    | 26.7             |
| 942092       | AE2-221 E    | 17.8             |
| 942231       | AE2-235 C O1 | 3.55             |
| 942232       | AE2-235 E O1 | 1.54             |
| 942521       | AE2-267 C O1 | 2.88             |
| 942522       | AE2-267 E O1 | 1.78             |
| 942621       | AE2-278 C    | 7.48             |
| 942622       | AE2-278 E    | 4.99             |
| 942781       | AE2-296 O1   | 13.29            |
| 942951       | AE2-315      | 3.23             |
| 942981       | AE2-320 C O1 | 22.29            |
| 942982       | AE2-320 E O1 | 11.03            |
| 943111       | AE2-339 C    | 2.36             |
| 943112       | AE2-339 E    | 1.16             |
| 943191       | AE2-318 C    | 6.94             |
| 943192       | AE2-318 E    | 3.39             |
| 943201       | AE2-319 C O1 | 22.29            |
| 943202       | AE2-319 E O1 | 11.03            |
| CARR         | CARR         | 0.55             |
| CBM-S1       | CBM-S1       | 8.63             |
| CBM-S2       | CBM-S2       | 0.95             |
| CBM-W1       | CBM-W1       | 9.32             |
| CBM-W2       | CBM-W2       | 59.99            |
| CIN          | CIN          | 8.94             |
| CPL          | CPL          | 0.14             |
| G-007        | G-007        | 1.49             |
| IPL          | IPL          | 6.15             |
| LGEE         | LGEE         | 3.45             |
| MEC          | MEC          | 10.24            |
| MECS         | MECS         | 1.52             |
| O-066        | O-066        | 9.56             |
| RENSSELAER   | RENSSELAER   | 0.43             |
| WEC          | WEC          | 1.36             |

## 16.3 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 |
|---------|-----------|----------|---------------|---------|----------|-------------|--------|-----------------------------|-------|------------|-----------------------|------------------------|-------|-----------|
| 8852859 | 253014    | 09CLINTO | DAY           | 253027  | 09GREENE | DAY         | 1      | DAY_P7_34569<br>34598 34524 | tower | 1374.0     | 98.48                 | 109.02                 | DC    | 144.69    |

| Bus #  | Bus          | MW Impact |
|--------|--------------|-----------|
| 253038 | 09KILLEN     | 67.86     |
| 253077 | 09STUART     | 257.41    |
| 914372 | Y2-111 E     | 1.6       |
| 915582 | Y3-080 E     | 1.06      |
| 920061 | AA2-100      | 0.07      |
| 925981 | AC1-074 C O1 | 3.41      |
| 925982 | AC1-074 E O1 | 1.46      |
| 926061 | AC1-085 C O1 | 47.84     |
| 926062 | AC1-085 E O1 | 78.05     |
| 927182 | AC1-212 E    | 1.42      |
| 930061 | AB1-014 C    | 0.71      |
| 930062 | AB1-014 E    | 9.57      |
| 931181 | AB1-169      | 162.12    |
| 932381 | AC2-055 C    | 1.4       |
| 932382 | AC2-055 E    | 2.29      |
| 932421 | AC2-060 C    | 4.98      |
| 932422 | AC2-060 E    | 2.8       |
| 932461 | AC2-066 C    | 0.43      |
| 932462 | AC2-066 E    | 0.31      |
| 932551 | AC2-075 C    | 0.81      |
| 932552 | AC2-075 E    | 0.41      |
| 932651 | AC2-087 C O1 | 3.69      |
| 932652 | AC2-087 E O1 | 2.93      |
| 932661 | AC2-088 C O1 | 4.49      |
| 932662 | AC2-088 E O1 | 3.69      |
| 934491 | AD1-073 C    | 1.03      |
| 934492 | AD1-073 E    | 0.53      |
| 935011 | AD1-134      | 3.88      |
| 935031 | AD1-136 C    | 0.63      |
| 935032 | AD1-136 E    | 0.54      |
| 936251 | AD2-031 C O1 | 6.11      |
| 936252 | AD2-031 E O1 | 9.98      |
| 936281 | AD2-036 C    | 2.44      |
| 936282 | AD2-036 E    | 1.22      |
| 936381 | AD2-048 C    | 2.72      |
| 936382 | AD2-048 E    | 1.36      |
| 937151 | AD2-151 C O1 | 5.84      |
| 937152 | AD2-151 E O1 | 8.06      |
| 938271 | AE1-040 C O1 | 2.59      |
| 938272 | AE1-040 E O1 | 1.3       |
| 938921 | AE1-120      | 5.43      |
| 939141 | AE1-144 C O1 | 6.83      |

| <b>Bus #</b> | <b>Bus</b>   | <b>MW Impact</b> |
|--------------|--------------|------------------|
| 939142       | AE1-144 E O1 | 3.39             |
| 940531       | AE2-038 C O1 | 4.56             |
| 940532       | AE2-038 E O1 | 2.26             |
| 941411       | AE2-138 C    | 13.37            |
| 941412       | AE2-138 E    | 4.94             |
| 941981       | AE2-210 C O1 | 4.54             |
| 941982       | AE2-210 E O1 | 1.71             |
| 942091       | AE2-221 C    | 86.82            |
| 942092       | AE2-221 E    | 57.88            |
| 942231       | AE2-235 C O1 | 3.21             |
| 942232       | AE2-235 E O1 | 1.39             |
| 942591       | AE2-275 C O1 | 3.48             |
| 942592       | AE2-275 E O1 | 1.31             |
| 942891       | AE2-308 C O1 | 5.94             |
| 942892       | AE2-308 E O1 | 2.16             |
| 943111       | AE2-339 C    | 1.98             |
| 943112       | AE2-339 E    | 0.98             |
| 943191       | AE2-318 C    | 5.63             |
| 943192       | AE2-318 E    | 2.75             |
| CARR         | CARR         | 0.12             |
| CBM-S1       | CBM-S1       | 4.3              |
| CBM-S2       | CBM-S2       | 1.18             |
| CBM-W2       | CBM-W2       | 19.31            |
| CIN          | CIN          | 1.97             |
| CPL          | CPL          | 0.38             |
| G-007        | G-007        | 0.26             |
| IPL          | IPL          | 1.19             |
| LGEE         | LGEE         | 1.51             |
| MEC          | MEC          | 1.55             |
| O-066        | O-066        | 1.71             |
| RENSSELAER   | RENSSELAER   | 0.09             |
| WEC          | WEC          | 0.01             |

## 16.4 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 |
|---------|-----------|-------------|---------------|---------|----------|-------------|--------|--------------------------|-------|------------|-----------------------|------------------------|-------|-----------|
| 8852794 | 942090    | AE2-221 TAP | DAY           | 253014  | 09CLINTO | DAY         | 1      | DAY_P7_34569 34598 34524 | tower | 1374.0     | 109.91                | 121.57                 | DC    | 160.21    |

| Bus #  | Bus          | MW Impact |
|--------|--------------|-----------|
| 253038 | 09KILLEN     | 72.83     |
| 253077 | 09STUART     | 278.48    |
| 914372 | Y2-111 E     | 1.71      |
| 915582 | Y3-080 E     | 1.14      |
| 920061 | AA2-100      | 0.07      |
| 925981 | AC1-074 C O1 | 3.59      |
| 925982 | AC1-074 E O1 | 1.54      |
| 926061 | AC1-085 C O1 | 52.68     |
| 926062 | AC1-085 E O1 | 85.96     |
| 927182 | AC1-212 E    | 1.37      |
| 930061 | AB1-014 C    | 0.77      |
| 930062 | AB1-014 E    | 10.27     |
| 931181 | AB1-169      | 175.38    |
| 932461 | AC2-066 C    | 0.46      |
| 932462 | AC2-066 E    | 0.33      |
| 932551 | AC2-075 C    | 0.85      |
| 932552 | AC2-075 E    | 0.43      |
| 932661 | AC2-088 C O1 | 4.76      |
| 932662 | AC2-088 E O1 | 3.92      |
| 935011 | AD1-134      | 4.1       |
| 935031 | AD1-136 C    | 0.67      |
| 935032 | AD1-136 E    | 0.57      |
| 936281 | AD2-036 C    | 2.57      |
| 936282 | AD2-036 E    | 1.28      |
| 936381 | AD2-048 C    | 2.78      |
| 936382 | AD2-048 E    | 1.39      |
| 937151 | AD2-151 C O1 | 6.3       |
| 937152 | AD2-151 E O1 | 8.7       |
| 938921 | AE1-120      | 5.83      |
| 939141 | AE1-144 C O1 | 7.14      |
| 939142 | AE1-144 E O1 | 3.54      |
| 940531 | AE2-038 C O1 | 4.76      |
| 940532 | AE2-038 E O1 | 2.36      |
| 941411 | AE2-138 C    | 14.26     |
| 941412 | AE2-138 E    | 5.27      |
| 941981 | AE2-210 C O1 | 4.84      |
| 941982 | AE2-210 E O1 | 1.82      |
| 942091 | AE2-221 C    | 96.13     |
| 942092 | AE2-221 E    | 64.08     |
| 942231 | AE2-235 C O1 | 3.27      |
| 942232 | AE2-235 E O1 | 1.41      |
| 942591 | AE2-275 C O1 | 3.67      |

| <b>Bus #</b>      | <b>Bus</b>   | <b>MW Impact</b> |
|-------------------|--------------|------------------|
| <b>942592</b>     | AE2-275 E O1 | 1.38             |
| <b>942891</b>     | AE2-308 C O1 | 6.27             |
| <b>942892</b>     | AE2-308 E O1 | 2.28             |
| <b>943111</b>     | AE2-339 C    | 2.1              |
| <b>943112</b>     | AE2-339 E    | 1.04             |
| <b>943191</b>     | AE2-318 C    | 5.94             |
| <b>943192</b>     | AE2-318 E    | 2.9              |
| <b>CARR</b>       | CARR         | 0.12             |
| <b>CBM-S1</b>     | CBM-S1       | 4.49             |
| <b>CBM-S2</b>     | CBM-S2       | 1.19             |
| <b>CBM-W2</b>     | CBM-W2       | 20.59            |
| <b>CIN</b>        | CIN          | 2.14             |
| <b>CPL</b>        | CPL          | 0.38             |
| <b>G-007</b>      | G-007        | 0.28             |
| <b>IPL</b>        | IPL          | 1.31             |
| <b>LGEE</b>       | LGEE         | 1.58             |
| <b>MEC</b>        | MEC          | 1.79             |
| <b>O-066</b>      | O-066        | 1.84             |
| <b>RENSSELAER</b> | RENSSELAER   | 0.1              |
| <b>WEC</b>        | WEC          | 0.05             |

## 16.5 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 |
|---------|-----------|----------|---------------|---------|--------|-------------|--------|-------------------------------|---------|------------|-----------------------|------------------------|-------|-----------|
| 7210825 | 243453    | 05BEATTY | AEP           | 244022  | 05COLE | AEP         | 1      | AEP_P4_#8094_05BIXBY<br>345_C | breaker | 1203.0     | 107.83                | 111.14                 | DC    | 39.79     |

| Bus #  | Bus          | MW Impact |
|--------|--------------|-----------|
| 247965 | Y1-063 E     | 0.31      |
| 253038 | 09KILLEN     | 57.08     |
| 253077 | 09STUART     | 203.01    |
| 253110 | 09ADKINS     | 20.92     |
| 902531 | W2-040 C     | 0.83      |
| 902532 | W2-040 E     | 1.35      |
| 904722 | V4-073 E     | 0.18      |
| 913222 | Y1-054 E     | 1.48      |
| 914372 | Y2-111 E     | 1.36      |
| 915582 | Y3-080 E     | 0.91      |
| 915662 | Y3-099 E     | 0.14      |
| 915672 | Y3-100 E     | 0.14      |
| 916182 | Z1-065 E     | 0.45      |
| 916272 | Z1-080 E     | 0.48      |
| 918802 | AA1-099 E    | 0.32      |
| 924371 | AB2-085 C O1 | 3.61      |
| 924372 | AB2-085 E O1 | 1.7       |
| 925242 | AB2-178 E    | 1.41      |
| 925921 | AC1-068 C    | 9.96      |
| 925922 | AC1-068 E    | 4.66      |
| 925931 | AC1-069 C    | 9.96      |
| 925932 | AC1-069 E    | 4.66      |
| 925981 | AC1-074 C O1 | 3.98      |
| 925982 | AC1-074 E O1 | 1.71      |
| 926011 | AC1-078 C O1 | 7.53      |
| 926012 | AC1-078 E O1 | 12.54     |
| 926061 | AC1-085 C O1 | 18.91     |
| 926062 | AC1-085 E O1 | 30.86     |
| 926101 | AC1-089 C O1 | 4.31      |
| 926102 | AC1-089 E O1 | 7.03      |
| 926791 | AC1-165 C    | 9.84      |
| 926792 | AC1-165 E    | 4.77      |
| 926801 | AC1-166 C    | 9.84      |
| 926802 | AC1-166 E    | 4.77      |
| 930062 | AB1-014 E    | 7.84      |
| 931181 | AB1-169      | 127.85    |
| 932201 | AC2-029 C    | 2.07      |
| 932202 | AC2-029 E    | 3.38      |
| 932381 | AC2-055 C    | 2.19      |
| 932382 | AC2-055 E    | 3.57      |
| 932411 | AC2-059 C    | 4.02      |
| 932412 | AC2-059 E    | 4.14      |

| Bus #  | Bus          | MW Impact |
|--------|--------------|-----------|
| 932421 | AC2-060 C    | 7.76      |
| 932422 | AC2-060 E    | 4.36      |
| 932431 | AC2-061 C    | 4.42      |
| 932432 | AC2-061 E    | 4.49      |
| 932462 | AC2-066 E    | 0.25      |
| 932481 | AC2-068 C    | 2.78      |
| 932482 | AC2-068 E    | 4.55      |
| 932551 | AC2-075 C    | 0.95      |
| 932552 | AC2-075 E    | 0.48      |
| 932651 | AC2-087 C O1 | 5.74      |
| 932652 | AC2-087 E O1 | 4.56      |
| 932661 | AC2-088 C O1 | 3.98      |
| 932662 | AC2-088 E O1 | 3.28      |
| 934481 | AD1-072 C    | 0.88      |
| 934482 | AD1-072 E    | 0.4       |
| 934491 | AD1-073 C    | 1.6       |
| 934492 | AD1-073 E    | 0.82      |
| 934561 | AD1-081 C    | 1.51      |
| 934562 | AD1-081 E    | 0.78      |
| 935031 | AD1-136 C    | 0.56      |
| 935032 | AD1-136 E    | 0.48      |
| 935041 | AD1-140 C O1 | 9.8       |
| 935042 | AD1-140 E O1 | 8.1       |
| 936111 | AD2-016 C    | 4.02      |
| 936112 | AD2-016 E    | 4.14      |
| 936251 | AD2-031 C O1 | 2.35      |
| 936252 | AD2-031 E O1 | 3.83      |
| 936281 | AD2-036 C    | 2.85      |
| 936282 | AD2-036 E    | 1.42      |
| 936381 | AD2-048 C    | 3.26      |
| 936382 | AD2-048 E    | 1.63      |
| 936751 | AD2-096 C O1 | 1.34      |
| 936752 | AD2-096 E O1 | 0.34      |
| 937111 | AD2-147 C O1 | 11.82     |
| 937112 | AD2-147 E O1 | 16.32     |
| 937151 | AD2-151 C O1 | 4.31      |
| 937152 | AD2-151 E O1 | 5.95      |
| 937231 | AD2-162 C    | 5.05      |
| 937232 | AD2-162 E    | 2.48      |
| 938051 | AE1-007 C    | 0.8       |
| 938052 | AE1-007 E    | 1.3       |
| 938271 | AE1-040 C O1 | 4.45      |
| 938272 | AE1-040 E O1 | 2.24      |
| 938921 | AE1-120      | 4.45      |
| 939141 | AE1-144 C O1 | 6.81      |
| 939142 | AE1-144 E O1 | 3.38      |
| 940531 | AE2-038 C O1 | 4.54      |
| 940532 | AE2-038 E O1 | 2.25      |
| 941411 | AE2-138 C    | 13.95     |
| 941412 | AE2-138 E    | 5.16      |
| 941511 | AE2-148 C    | 146.53    |
| 941512 | AE2-148 E    | 66.28     |

| Bus #      | Bus          | MW Impact |
|------------|--------------|-----------|
| 941771     | AE2-180 C    | 6.83      |
| 941772     | AE2-180 E    | 4.56      |
| 941981     | AE2-210 C O1 | 4.77      |
| 941982     | AE2-210 E O1 | 1.79      |
| 942051     | AE2-217 C    | 7.67      |
| 942052     | AE2-217 E    | 5.11      |
| 942061     | AE2-218 C    | 8.97      |
| 942062     | AE2-218 E    | 6.09      |
| 942091     | AE2-221 C    | 23.88     |
| 942092     | AE2-221 E    | 15.92     |
| 942231     | AE2-235 C O1 | 3.4       |
| 942232     | AE2-235 E O1 | 1.47      |
| 942521     | AE2-267 C O1 | 2.6       |
| 942522     | AE2-267 E O1 | 1.61      |
| 942781     | AE2-296 O1   | 11.35     |
| 942951     | AE2-315      | 2.77      |
| 942981     | AE2-320 C O1 | 19.59     |
| 942982     | AE2-320 E O1 | 9.69      |
| 943041     | AE2-327 C    | 2.14      |
| 943042     | AE2-327 E    | 1.43      |
| 943111     | AE2-339 C    | 2.24      |
| 943112     | AE2-339 E    | 1.1       |
| 943191     | AE2-318 C    | 6.42      |
| 943192     | AE2-318 E    | 3.14      |
| 943201     | AE2-319 C O1 | 19.59     |
| 943202     | AE2-319 E O1 | 9.69      |
| CARR       | CARR         | 0.47      |
| CBM-S1     | CBM-S1       | 8.19      |
| CBM-S2     | CBM-S2       | 1.35      |
| CBM-W1     | CBM-W1       | 4.99      |
| CBM-W2     | CBM-W2       | 51.55     |
| CIN        | CIN          | 7.52      |
| CPL        | CPL          | 0.33      |
| G-007      | G-007        | 1.24      |
| IPL        | IPL          | 5.21      |
| LGEE       | LGEE         | 3.21      |
| MEC        | MEC          | 7.31      |
| O-066      | O-066        | 8.0       |
| RENSSELAER | RENSSELAER   | 0.37      |
| WEC        | WEC          | 0.81      |

## 16.6 Index 7

| 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 |
|---------|-----------|----------|---------------|---------|----------|-------------|--------|-----------------------------|---------|------------|-----------------------|------------------------|-------|-----------|
| 7210808 | 253110    | 09ADKINS | DAY           | 243453  | 05BEATTY | AEP         | 1      | AEP_P4_#6774_05MARQUI 345_D | breaker | 1372.0     | 113.14                | 114.04                 | DC    | 27.19     |

| Bus #  | Bus          | MW Impact |
|--------|--------------|-----------|
| 253038 | 09KILLEN     | 102.99    |
| 253077 | 09STUART     | 285.55    |
| 253110 | 09ADKINS     | 43.35     |
| 925921 | AC1-068 C    | 18.75     |
| 925922 | AC1-068 E    | 8.77      |
| 925931 | AC1-069 C    | 18.75     |
| 925932 | AC1-069 E    | 8.77      |
| 925981 | AC1-074 C O1 | 4.26      |
| 925982 | AC1-074 E O1 | 1.83      |
| 926061 | AC1-085 C O1 | 19.32     |
| 926062 | AC1-085 E O1 | 31.52     |
| 926791 | AC1-165 C    | 18.53     |
| 926792 | AC1-165 E    | 8.99      |
| 926801 | AC1-166 C    | 18.53     |
| 926802 | AC1-166 E    | 8.99      |
| 930062 | AB1-014 E    | 7.76      |
| 931181 | AB1-169      | 179.84    |
| 932381 | AC2-055 C    | 1.61      |
| 932382 | AC2-055 E    | 2.63      |
| 932421 | AC2-060 C    | 5.71      |
| 932422 | AC2-060 E    | 3.21      |
| 932462 | AC2-066 E    | 0.25      |
| 932551 | AC2-075 C    | 1.01      |
| 932552 | AC2-075 E    | 0.51      |
| 932651 | AC2-087 C O1 | 4.23      |
| 932652 | AC2-087 E O1 | 3.35      |
| 932661 | AC2-088 C O1 | 4.42      |
| 932662 | AC2-088 E O1 | 3.64      |
| 934491 | AD1-073 C    | 1.18      |
| 934492 | AD1-073 E    | 0.61      |
| 935031 | AD1-136 C    | 0.62      |
| 935032 | AD1-136 E    | 0.53      |
| 936251 | AD2-031 C O1 | 1.43      |
| 936252 | AD2-031 E O1 | 2.34      |
| 936281 | AD2-036 C    | 3.05      |
| 936282 | AD2-036 E    | 1.52      |
| 936381 | AD2-048 C    | 3.41      |
| 936382 | AD2-048 E    | 1.7       |
| 937151 | AD2-151 C O1 | 4.28      |
| 937152 | AD2-151 E O1 | 5.91      |
| 938271 | AE1-040 C O1 | 3.82      |
| 938272 | AE1-040 E O1 | 1.92      |

| Bus #      | Bus          | MW Impact |
|------------|--------------|-----------|
| 938921     | AE1-120      | 4.4       |
| 939141     | AE1-144 C O1 | 8.04      |
| 939142     | AE1-144 E O1 | 3.99      |
| 940531     | AE2-038 C O1 | 5.36      |
| 940532     | AE2-038 E O1 | 2.66      |
| 941411     | AE2-138 C    | 16.07     |
| 941412     | AE2-138 E    | 5.94      |
| 941981     | AE2-210 C O1 | 5.47      |
| 941982     | AE2-210 E O1 | 2.06      |
| 942091     | AE2-221 C    | 16.31     |
| 942092     | AE2-221 E    | 10.88     |
| 942231     | AE2-235 C O1 | 3.84      |
| 942232     | AE2-235 E O1 | 1.66      |
| 942981     | AE2-320 C O1 | 36.9      |
| 942982     | AE2-320 E O1 | 18.26     |
| 943111     | AE2-339 C    | 2.45      |
| 943112     | AE2-339 E    | 1.2       |
| 943191     | AE2-318 C    | 5.73      |
| 943192     | AE2-318 E    | 2.8       |
| 943201     | AE2-319 C O1 | 36.9      |
| 943202     | AE2-319 E O1 | 18.26     |
| CARR       | CARR         | 0.39      |
| CBM-S1     | CBM-S1       | 6.15      |
| CBM-S2     | CBM-S2       | 0.73      |
| CBM-W1     | CBM-W1       | 3.31      |
| CBM-W2     | CBM-W2       | 36.43     |
| CIN        | CIN          | 5.15      |
| CPL        | CPL          | 0.12      |
| G-007      | G-007        | 1.05      |
| IPL        | IPL          | 3.48      |
| LGEE       | LGEE         | 2.48      |
| MEC        | MEC          | 5.14      |
| O-066      | O-066        | 6.75      |
| RENSSELAER | RENSSELAER   | 0.31      |
| WEC        | WEC          | 0.57      |

## Affected Systems

## **17 Affected Systems**

### **17.1 LG&E**

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

### **17.2 MISO**

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

### **17.3 TVA**

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

### **17.4 Duke Energy Progress**

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

### **17.5 NYISO**

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

| Contingency Name               | Contingency Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AEP_P4_#2866_05BEATTY 345_304W | CONTINGENCY 'AEP_P4_#2866_05BEATTY 345_304W'<br>OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110<br>09ADKINS 345 1<br>OPEN BRANCH FROM BUS 243453 TO BUS 243469 CKT 3 / 243453 05BEATTY 345 243469<br>05BEATTY 138 3<br>END                                                                                                                                                                                                                                                                                                                                                                                          |
| DAY_P7_34522 34598-A           | CONTINGENCY 'DAY_P7_34522 34598-A'<br>OPEN BRANCH FROM BUS 249566 TO BUS 253006 CKT 1 / 249566 08FOSTER 345 253006<br>09BATH 345 1<br>OPEN BRANCH FROM BUS 253014 TO BUS 253027 CKT 1 / 253014 09CLINTO 345 253027<br>09GREENE 345 1<br>OPEN BRANCH FROM BUS 253014 TO BUS 253013 CKT 1 / 253014 09CLINTO 345 253013<br>09CLINTO 69 1<br>OPEN BRANCH FROM BUS 253014 TO BUS 942090 CKT 1 / 253014 09CLINTO 345 942090 AE2-<br>221 TAP 345 1<br>END                                                                                                                                                                                               |
| AEP_P1-2_#762                  | CONTINGENCY 'AEP_P1-2_#762'<br>OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110<br>09ADKINS 345 1<br>END                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| DAY_P2_GREENE_345              | CONTINGENCY 'DAY_P2_GREENE_345'<br>OPEN BRANCH FROM BUS 253027 TO BUS 253248 CKT 1 / 253027 09GREENE 345 253027<br>09SCHARL 345 1<br>OPEN BRANCH FROM BUS 253006 TO BUS 253027 CKT 1 / 253006 09BATH 345 253027<br>09GREENE 345 1<br>OPEN BRANCH FROM BUS 253014 TO BUS 253027 CKT 1 / 253014 09CLINTO 345 253027<br>09GREENE 345 1<br>OPEN BRANCH FROM BUS 253027 TO BUS 253079 CKT 1 / 253027 09GREENE 345 253079<br>09SUGRCK 345 1<br>OPEN BRANCH FROM BUS 253027 TO BUS 253026 CKT 1 / 253027 09GREENE 345 253026<br>09GREENE 138 1<br>OPEN BRANCH FROM BUS 253027 TO BUS 253026 CKT 2 / 253027 09GREENE 345 253026<br>09GREENE 138 2<br>END |
| AEP_P4_#3195_05BEATTY 345_304E | CONTINGENCY 'AEP_P4_#3195_05BEATTY 345_304E'<br>OPEN BRANCH FROM BUS 243453 TO BUS 243454 CKT 1 / 243453 05BEATTY 345 243454<br>05BIXBY 345 1<br>OPEN BRANCH FROM BUS 243453 TO BUS 243468 CKT 4 / 243453 05BEATTY 345 243468<br>05BEATTX 138 4<br>END                                                                                                                                                                                                                                                                                                                                                                                           |
| .345.DEO&K.C2 1349_FOSTER      | CONTINGENCY '.345.DEO&K.C2 1349_FOSTER'<br>OPEN BRANCH FROM BUS 253006 TO BUS 249566 CKT 1<br>OPEN BRANCH FROM BUS 249566 TO BUS 249578 CKT 1<br>END                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| AEP_P1-2_#764                  | CONTINGENCY 'AEP_P1-2_#764'<br>OPEN BRANCH FROM BUS 242938 TO BUS 253038 CKT 1 / 242938 05MARQUI 345 253038<br>09KILLEN 345 1<br>END                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Contingency Name                                    | Contingency Definition                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DAY_P7_34569 34598 34524                            | CONTINGENCY 'DAY_P7_34569 34598 34524'<br>OPEN BRANCH FROM BUS 249566 TO BUS 249578 CKT 1 /<br>OPEN BRANCH FROM BUS 249566 TO BUS 253006 CKT 1 / 249566 08FOSTER 345 253006<br>09BATH 345 1<br>OPEN BRANCH FROM BUS 249566 TO BUS 253079 CKT 1 / 249566 08FOSTER 345 253079<br>09SUGRCK 345 1<br>END                                                    |
| AEP_P4_#2900_05MARQUI 345_D2                        | CONTINGENCY 'AEP_P4_#2900_05MARQUI 345_D2'<br>OPEN BRANCH FROM BUS 242938 TO BUS 248003 CKT 1 / 242938 05MARQUI 345 248003<br>06DOE530 345 1<br>OPEN BRANCH FROM BUS 242938 TO BUS 253038 CKT 1 / 242938 05MARQUI 345 253038<br>09KILLEN 345 1<br>OPEN BRANCH FROM BUS 242938 TO BUS 243034 CKT 3 / 242938 05MARQUI 345 243034<br>05MARQUI 138 3<br>END |
| AEP_P4_#10715_05COLE 345_C                          | CONTINGENCY 'AEP_P4_#10715_05COLE 345_C'<br>OPEN BRANCH FROM BUS 244022 TO BUS 243457 CKT 1 / 244022 05COLE 345 243457<br>05HAYDEN 345 1<br>OPEN BRANCH FROM BUS 244022 TO BUS 244023 CKT 1 / 244022 05COLE 345 244023 05COLE<br>138 1<br>END                                                                                                           |
| AEP_P4_#8094_05BIXBY 345_C                          | CONTINGENCY 'AEP_P4_#8094_05BIXBY 345_C'<br>OPEN BRANCH FROM BUS 243453 TO BUS 243454 CKT 1 / 243453 05BEATTY 345 243454<br>05BIXBY 345 1<br>OPEN BRANCH FROM BUS 941520 TO BUS 243454 CKT 1 / 941520 AE2-149 TAP 345 243454<br>05BIXBY 345 1 /* CONTINGENCY LINE ADDED FOR AE2 BUILD<br>END                                                            |
| .345.DEO&K-DAY.C5<br>4524FOSTRUGRCRK34598FOSTERBATH | CONTINGENCY '.345.DEO&K-DAY.C5 4524FOSTRUGRCRK34598FOSTERBATH'<br>OPEN BRANCH FROM BUS 253079 TO BUS 249566 CKT 1<br>OPEN BRANCH FROM BUS 253006 TO BUS 249566 CKT 1<br>END                                                                                                                                                                             |
| .345.DEO&K.FOSTER345<br>BUS1+RELAYFAIL              | CONTINGENCY '.345.DEO&K.FOSTER345 BUS1+RELAYFAIL'<br>OPEN BRANCH FROM BUS 249566 TO BUS 250035 CKT 1<br>OPEN BRANCH FROM BUS 249566 TO BUS 249578 CKT 1<br>OPEN BRANCH FROM BUS 249566 TO BUS 253079 CKT 1<br>END                                                                                                                                       |
| AEP_P4_#2085_05BEATTY 345_304C                      | CONTINGENCY 'AEP_P4_#2085_05BEATTY 345_304C'<br>OPEN BRANCH FROM BUS 243453 TO BUS 243454 CKT 1 / 243453 05BEATTY 345 243454<br>05BIXBY 345 1<br>OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110<br>09ADKINS 345 1<br>END                                                                                                  |
| Base Case                                           |                                                                                                                                                                                                                                                                                                                                                         |

| Contingency Name                      | Contingency Definition                                                                                                                                                                                                                                                                                                                |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AEP_P1-2_#713                         | CONTINGENCY 'AEP_P1-2_#713'<br>OPEN BRANCH FROM BUS 243453 TO BUS 243454 CKT 1 / 243453 05BEATTY 345 243454<br>05BIXBY 345 1<br>END                                                                                                                                                                                                   |
| DAY_P1_34509-A-A                      | CONTINGENCY 'DAY_P1_34509-A-A'<br>OPEN BRANCH FROM BUS 253014 TO BUS 942090 CKT 1 / 253014 09CLINTO 345 942090 AE2-<br>221 TAP 345 1<br>END                                                                                                                                                                                           |
| DAY_P1_34522                          | CONTINGENCY 'DAY_P1_34522'<br>OPEN BRANCH FROM BUS 253014 TO BUS 253027 CKT 1 / 253014 09CLINTO 345 253027<br>09GREENE 345 1<br>OPEN BRANCH FROM BUS 253014 TO BUS 253013 CKT 1 / 253014 09CLINTO 345 253013<br>09CLINTO 69 1<br>OPEN BRANCH FROM BUS 253014 TO BUS 253013 CKT 2 / 253014 09CLINTO 345 253013<br>09CLINTO 69 2<br>END |
| AEP_P1-2_#10137                       | CONTINGENCY 'AEP_P1-2_#10137'<br>OPEN BRANCH FROM BUS 243453 TO BUS 244022 CKT 1 / 243453 05BEATTY 345 244022<br>05COLE 345 1<br>END                                                                                                                                                                                                  |
| DAY_P7_BEATTY-S. CHARLESTON 34542_1-B | CONTINGENCY 'DAY_P7_BEATTY-S. CHARLESTON 34542_1-B'<br>OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110<br>09ADKINS 345 1<br>OPEN BRANCH FROM BUS 941510 TO BUS 253248 CKT 1 / 941510 AE2-148 TAP 345 253248<br>09SCHARL 345 1<br>END                                                                     |
| DAY_P7_BEATTY-S. CHARLESTON 34542_1-A | CONTINGENCY 'DAY_P7_BEATTY-S. CHARLESTON 34542_1-A'<br>OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110<br>09ADKINS 345 1<br>OPEN BRANCH FROM BUS 243453 TO BUS 941510 CKT 1 / 243453 05BEATTY 345 941510 AE2-<br>148 TAP 345 1<br>END                                                                    |
| AEP_P4_#6774_05MARQUI 345_D           | CONTINGENCY 'AEP_P4_#6774_05MARQUI 345_D'<br>OPEN BRANCH FROM BUS 246888 TO BUS 242938 CKT 1 / 246888 05BIERSR 345 242938<br>05MARQUI 345 1<br>OPEN BRANCH FROM BUS 242938 TO BUS 253038 CKT 1 / 242938 05MARQUI 345 253038<br>09KILLEN 345 1<br>END                                                                                  |
| AEP_P4_#3196_05BEATTY 345_302E        | CONTINGENCY 'AEP_P4_#3196_05BEATTY 345_302E'<br>OPEN BRANCH FROM BUS 243453 TO BUS 244022 CKT 1 / 243453 05BEATTY 345 244022<br>05COLE 345 1<br>OPEN BRANCH FROM BUS 243453 TO BUS 243468 CKT 4 / 243453 05BEATTY 345 243468<br>05BEATTX 138 4<br>END                                                                                 |

## Short Circuit

## 18 Short Circuit

The following Breakers are over duty

None.