# Generation Interconnection

# Feasibility Study Report

# for

# Queue Project AF1-142

# MOSHANNON-MILESBURG 230 KV

# 121.44 MW Capacity / 202.4 MW Energy

January 2020

# Table of Contents

# 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 Pennsylvania Electric Company (PENELEC zone).

# 2 Preface

The intent of the feasibility study is to determine a plan, with estimated 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.

## 3 General

The Interconnection Customer (IC), has proposed a Solar and Storage generating facility located in Clearfield County, Pennsylvania. The installed facilities will have a capability of 202.4 MW with 121.44 of new request MW of this output being recognized by PJM as capacity. Note that this project is an increase to the Interconnection Customer's AF1-099 project, which will share the same property and connection point. The conduct of light load analysis as required under the PJM planning process is not performed during the Generation Interconnection Feasibility Study phase of the PJM study process. Additional reinforcement requirements for this Interconnection Request may be defined during the conduct of the light load analysis which shall be performed following execution of the System Impact Study agreement. The proposed in-service date for this project is 04/01/2022. This study does not imply a TO commitment to this in-service date.

| Queue Number | AF1-142 |
|---|---|
| Project Name | MOSHANNON-MILESBURG 230 KV |
| State | Pennsylvania |
| County | Clearfield |
| Transmission Owner | PENELEC |
| MFO | 202.4 |
| MWE | 202.4 |
| MWC | 121.44 |
| Fuel | Solar; Storage |
| Basecase Study Year | 2023 |

## 3.1 Point of Interconnection

AF1-142 will interconnect with the PENELEC transmission system tapping the Moshannon to Milesburg 230 kV line.

The project is an upgrade to the proposed AF1-099 project and the point of interconnection will remain unchanged. The IC will not incur any connection facility upgrade costs for this project.

Please note: the interconnection of the project at the Primary POI will be accomplished by expanding the future AE2-262/AE2-263 ring bus to a five breaker ring bus by installing 1-230 kV breaker. This scope of work assumes the scope of work associated with the AE2-262 and AE2-263 projects has been completed prior to the interconnection of AF1-099. Delay or withdrawal of the AE2-262 and/or AE2-263 project(s) may result in additional scope to accommodate the interconnection of the AF1-099 project.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AF1-142 generation project to connect to the FirstEnergy ("FE") transmission system. IC will be responsible for constructing all of the facilities on its side of the POI, including the Attachment facilities which connect the generator to the FE transmission system.

## 3.2 Cost Summary

The project is an upgrade to the proposed AF1-099 project and the point of interconnection will remain unchanged. The IC will not incur any connection facility upgrade costs for this project.

| Description | Total Cost |
|---|---|
| **Attachment Facilities** | $0 |
| **Direct Connection Network Upgrade** | $0 |
| **Non Direct Connection Network Upgrades** | $0 |
| **Total Costs** | $0 |

.In addition, the AF1-142 project may be responsible for a contribution to the following costs

| Description | Total Cost |
|---|---|
| **System Upgrades** | **$699,110,790** |

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

The Feasibility Study is used to make a preliminary determination of the type and scope of Attachment Facilities, Local Upgrades, and Network Upgrades that will be necessary to accommodate the Interconnection Request and to provide the Interconnection Customer a preliminary estimate of the time that will be required to construct any necessary facilities and upgrades and the Interconnection Customer's cost responsibility. The System Impact Study provides refined and comprehensive estimates of cost responsibility and construction lead

times for new facilities and system upgrades. Facilities Studies will include, commensurate with the degree of engineering specificity as provided in the Facilities Study Agreement, good faith estimates of the cost, determined in accordance with Section 217 of the Tariff,

(a) to be charged to each affected New Service Customer for the Facilities and System Upgrades that are necessary to accommodate this queue project;

(b) the time required to complete detailed design and construction of the facilities and upgrades; and

(c) a description of any site-specific environmental issues or requirements that could reasonably be anticipated to affect the cost or time required to complete construction of such facilities and upgrades.

The costs provided above exclude the Contribution in Aid of Construction ("CIAC") Federal Income Tax Gross Up charge. If, at a future date, it is determined that the CIAC Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

The required Attachment Facilities and Direct and Non-Direct Connection work for the interconnection of the AF1-142 generation project to the FE Transmission System is detailed in the following sections. The associated one-line with the generation project Attachment Facilities and the Primary Direct and Non-Direct Connection facilities are shown in Attachment 1.

## 4 Transmission Owner Scope of Work

The project is an upgrade to the proposed AF1-099 project and the point of interconnection will remain unchanged. The IC will not incur any connection facility upgrade costs for this project.

## 5 Attachment Facilities

Attachment Facility scope of work is not required.

## 6 Direct Connection Cost Estimate

Direct Connection scope of work is not required.

## 7 Non-Direct Connection Cost Estimate

Non-Direct Connection scope of work is not required.

## 8 Schedule

The project is an upgrade to the proposed AF1-099 project and the point of interconnection will remain unchanged. There is no Attachment Facilities or Direct and/or Non-Direct Connection facilities scope of work.

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

## 9 Transmission Owner Analysis

FE performed an analysis of its underlying transmission <100 kV system. The AF1-142 project did not contribute to any overloads on the FE transmission <100 kV system.

# 10 Interconnection Customer Requirements

## 10.1 System Protection

The IC must design its Customer Facilities in accordance with all applicable standards, including the standards in FE's "Requirements for Transmission Connected Facilities" document located at: http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx.

Preliminary Protection requirements will be provided as part of the Facilities Study. Detailed Protection Requirements will be provided once the project enters the construction phase.

## 10.2 Compliance Issues and Interconnection Customer Requirements

The proposed Customer Facilities must be designed in accordance with FE's "Requirements for Transmission Connected Facilities" document located at: http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx. In particular, the IC is responsible for the following:

1. The purchase and installation of a fully rated 34.5 kV circuit breaker to protect the AF1-142 generator lead line. A single circuit breaker must be used to protect this line; if the project has several GSU transformers, the individual GSU transformer breakers cannot be used to protect this line.

2. The purchase and installation of the minimum required FE generation interconnection relaying and control facilities. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.

3. The purchase and installation of supervisory control and data acquisition ("SCADA") equipment to provide information in a compatible format to the FE Transmission System Control Center.

4. Compliance with the FE and PJM generator power factor and voltage control requirements.

5. The execution of a back-up service agreement to serve the customer load supplied from the AF1-142 generation project metering point when the units are out-of-service. This assumes the intent of the IC is to net the generation with the load.

The IC will also be required to meet all PJM, ReliabilityFirst, and NERC reliability criteria and operating procedures for standards compliance. For example, the IC will need to properly locate and report the over and under voltage and over and under frequency system protection elements for its units as well as the submission of the generator model and protection data required to satisfy the PJM and ReliabilityFirst audits. Failure to comply with these requirements may result in a disconnection of service if the violation is found to compromise the reliability of the FE system.

## 10.3 Power Factor Requirements

The IC shall design its non-synchronous Customer Facility with the ability to maintain a power factor of at least 0.95 leading (absorbing VARs) to 0.95 lagging (supplying VARs) measured at the high-side of the facility substation transformer(s) connected to the FE transmission system.

# 11 Revenue Metering and SCADA Requirements

## 11.1 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.

### 11.1.1 Meteorological Data Reporting Requirement

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

- Temperature (degrees Fahrenheit)
- Atmospheric pressure (hectopascals)
- Irradiance
- Forced outage data

## 11.2 PENELEC – FirstEnergy Requirements

The IC will be required to comply with all FE revenue metering requirements for generation interconnection customers which can be found in FE's "Requirements for Transmission Connected Facilities" document located at: http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx

## 12 Network Impacts

The Queue Project AF1-142 was evaluated as a 202.4 MW (Capacity 121.4 MW) injection tapping the Moshannon to Milesburg 230 kV line in the PENELEC area. Project AF1-142 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-142 was studied with a commercial probability of 53%. Potential network impacts were as follows:

# Summer Peak Load Flow

## 12.1 Generation Deliverability

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

| ID | FROM BUS# | FROM BUS | kV | FROM BUS AREA | TO BUS# | TO BUS | kV | TO BUS AREA | CKT ID | CONT NAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC\|DC | MW IMPACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41229504** | 200727 | 26SHAW. 2 | 115.0 | PENELEC | 200716 | 26PHILIPSB | 115.0 | PENELEC | 1 | AP-P1-2-WP-230-323T | single | 185.0 | 96.99 | 103.14 | DC | 11.37 |
| **41229505** | 200727 | 26SHAW. 2 | 115.0 | PENELEC | 200716 | 26PHILIPSB | 115.0 | PENELEC | 1 | AP-P1-3-WP-230-326T | single | 185.0 | 96.94 | 102.97 | DC | 11.16 |
| **41229666** | 999394 | STAR599 | 1.0 | PENELEC | 200714 | 26SHAWVL 1 | 115.0 | PENELEC | 1A | AP-P1-2-WP-230-323T | single | 126.0 | 99.76 | 107.67 | DC | 9.97 |

## 12.2 Multiple Facility Contingency

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

| ID | FROM BUS# | FROM BUS | kV | FROM BUS AREA | TO BUS# | TO BUS | kV | TO BUS AREA | CKT ID | CONT NAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC\|DC | MW IMPACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41560340** | 200512 | 26LEWISTWN | 115.0 | PENELEC | 200519 | 26REED TAP | 115.0 | PENELEC | 1 | PL_P42_100548 | breaker | 225.0 | 96.72 | 100.63 | DC | 19.54 |

## 12.3 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41560027** | 200513 | 26LEWISTWN | 230.0 | PENELEC | 208005 | JUNI BU2 | 230.0 | PPL | 1 | AP-P2-3-WP-230-446T | breaker | 624.0 | 112.35 | 123.84 | DC | 71.76 |
| **41812725** | 200513 | 26LEWISTWN | 230.0 | PENELEC | 208005 | JUNI BU2 | 230.0 | PPL | 1 | PN-P2-2-PN-115-032 | bus | 624.0 | 110.83 | 120.14 | DC | 60.65 |
| **41560238** | 200519 | 26REED TAP | 115.0 | PENELEC | 200522 | 26SHADE GP | 115.0 | PENELEC | 1 | PL_P42_100548 | breaker | 225.0 | 100.73 | 104.64 | DC | 19.54 |
| **41229340** | 200522 | 26SHADE GP | 115.0 | PENELEC | 938380 | AE1-071 TAP | 115.0 | PENELEC | 1 | PL_P12_100618 | single | 160.0 | 111.4 | 118.72 | DC | 11.71 |
| **41229341** | 200522 | 26SHADE GP | 115.0 | PENELEC | 938380 | AE1-071 TAP | 115.0 | PENELEC | 1 | PN-P1-2-PN-230-103T | single | 160.0 | 109.51 | 116.83 | DC | 11.71 |
| **42172020** | 200593 | 26GLADE | 230.0 | PENELEC | 200811 | 26WARREN | 230.0 | PENELEC | 1 | PN-P2-3-PN-345-003A | breaker | 621.0 | 155.31 | 156.94 | DC | 22.64 |
| **42463133** | 200593 | 26GLADE | 230.0 | PENELEC | 200811 | 26WARREN | 230.0 | PENELEC | 1 | Base Case | single | 520.0 | 122.25 | 124.72 | DC | 12.97 |
| **42463135** | 200593 | 26GLADE | 230.0 | PENELEC | 200811 | 26WARREN | 230.0 | PENELEC | 1 | PN-P1-2-PN-345-003 | single | 621.0 | 121.17 | 123.32 | DC | 13.44 |
| **49507716** | 200599 | 26ERIE W | 345.0 | PENELEC | 238547 | 02AT | 345.0 | ATSI | 1 | Base Case | single | 1560.0 | 106.48 | 107.03 | DC | 19.08 |
| **41229309** | 200674 | 26TOWANDA | 115.0 | PENELEC | 200677 | 26NO MESHO | 115.0 | PENELEC | 1 | PN-P1-2-PN-230-013A | single | 202.0 | 128.43 | 131.47 | DC | 6.13 |

| ID | FROM BUS# | FROM BUS | kV | FROM BUS AREA | TO BUS# | TO BUS | kV | TO BUS AREA | CKT ID | CONT NAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC\|DC | MW IMPACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 42463029 | 200675 | 26E.TWANDA | 230.0 | PENELEC | 200924 | 26CANYON | 230.0 | PENELEC | 1 | Base Case | single | 515.0 | 107.68 | 109.96 | DC | 11.78 |
| 41560356 | 200713 | 26ROCKTON | 115.0 | PENELEC | 200712 | 26DUBOIS | 115.0 | PENELEC | 1 | AP-P2-3-WP-230-446T | breaker | 190.0 | 107.11 | 111.42 | DC | 18.12 |
| 41560357 | 200713 | 26ROCKTON | 115.0 | PENELEC | 200712 | 26DUBOIS | 115.0 | PENELEC | 1 | AP-P2-2-WP-230-001T | breaker | 190.0 | 107.01 | 111.31 | DC | 18.12 |
| 41560358 | 200713 | 26ROCKTON | 115.0 | PENELEC | 200712 | 26DUBOIS | 115.0 | PENELEC | 1 | AP-P2-3-WP-230-443T * | breaker | 190.0 | 106.9 | 111.21 | DC | 18.12 |
| 41812916 | 200713 | 26ROCKTON | 115.0 | PENELEC | 200712 | 26DUBOIS | 115.0 | PENELEC | 1 | AP-P2-2-WP-230-001T | bus | 190.0 | 107.01 | 111.31 | DC | 18.12 |
| 41560332 | 200714 | 26SHAWVL1 | 115.0 | PENELEC | 200713 | 26ROCKTON | 115.0 | PENELEC | 1 | AP-P2-3-WP-230-446T | breaker | 190.0 | 108.75 | 113.05 | DC | 18.12 |
| 41560333 | 200714 | 26SHAWVL1 | 115.0 | PENELEC | 200713 | 26ROCKTON | 115.0 | PENELEC | 1 | AP-P2-2-WP-230-001T | breaker | 190.0 | 108.64 | 112.94 | DC | 18.12 |
| 41560334 | 200714 | 26SHAWVL1 | 115.0 | PENELEC | 200713 | 26ROCKTON | 115.0 | PENELEC | 1 | AP-P2-3-WP-230-443T * | breaker | 190.0 | 108.59 | 112.89 | DC | 18.12 |
| 41812721 | 200714 | 26SHAWVL1 | 115.0 | PENELEC | 999394 | STAR599 | 1.0 | PENELEC | 1A | PN-P2-2-PN-230-014T | bus | 126.0 | 119.95 | 124.53 | DC | 5.77 |
| 41812906 | 200714 | 26SHAWVL1 | 115.0 | PENELEC | 200713 | 26ROCKTON | 115.0 | PENELEC | 1 | AP-P2-2-WP-230-001T | bus | 190.0 | 108.64 | 112.94 | DC | 18.12 |
| 41560129 | 200716 | 26PHILIPSB | 115.0 | PENELEC | 200904 | 26EAGLVAL | 115.0 | PENELEC | 1 | AP-P2-3-WP-230-460T | breaker | 174.0 | 100.15 | 104.92 | DC | 18.38 |
| 41229285 | 200726 | 26SHAWVL2 | 230.0 | PENELEC | 235248 | 01SHINGL | 230.0 | AP | 1 | AP-P1-3-WP-230-005 | single | 554.0 | 106.71 | 111.76 | DC | 29.05 |
| 41229286 | 200726 | 26SHAWVL2 | 230.0 | PENELEC | 235248 | 01SHINGL | 230.0 | AP | 1 | AP-P1-2-WP-230-005B | single | 554.0 | 106.71 | 111.76 | DC | 29.05 |
| 41560139 | 200727 | 26SHAW. 2 | 115.0 | PENELEC | 200716 | 26PHILIPSB | 115.0 | PENELEC | 1 | AP-P2-3-WP-230-460T | breaker | 185.0 | 101.77 | 106.25 | DC | 18.38 |
| 42171935 | 200767 | 26HOMERCT | 230.0 | PENELEC | 200795 | 26SHELOCTA | 230.0 | PENELEC | 1 | PN_P4-500-002A | breaker | 917.0 | 146.62 | 148.1 | DC | 29.77 |
| 42171936 | 200767 | 26HOMERCT | 230.0 | PENELEC | 200795 | 26SHELOCTA | 230.0 | PENELEC | 1 | PN_P4-500-002F | breaker | 917.0 | 146.63 | 148.12 | DC | 29.77 |
| 42172159 | 200769 | 26HOMERCY | 345.0 | PENELEC | 999392 | STAR601 | 1.0 | PENELEC | N | PN-P2-3-PN-230-9E | breaker | 807.0 | 125.46 | 126.4 | DC | 16.47 |
| 42171945 | 200795 | 26SHELOCTA | 230.0 | PENELEC | 200810 | 26KEYSTONE | 230.0 | PENELEC | 1 | PN_P4-500-002F | breaker | 917.0 | 126.19 | 127.84 | DC | 33.11 |
| 42171946 | 200795 | 26SHELOCTA | 230.0 | PENELEC | 200810 | 26KEYSTONE | 230.0 | PENELEC | 1 | PN_P4-500-002A | breaker | 917.0 | 126.19 | 127.84 | DC | 33.11 |
| 42172051 | 200810 | 26KEYSTONE | 230.0 | PENELEC | 999401 | STAR592 | 1.0 | PJM | 4 | PJM500_PN_P4-500-001A | breaker | 635.0 | 105.76 | 107.1 | DC | 18.6 |
| 42172052 | 200810 | 26KEYSTONE | 230.0 | PENELEC | 999401 | STAR592 | 1.0 | PJM | 4 | PJM500_PN_P4-500-001D | breaker | 635.0 | 105.74 | 107.08 | DC | 18.6 |
| 42172298 | 200811 | 26WARREN | 230.0 | PENELEC | 200918 | 26ERIE S TIE | 230.0 | PENELEC | 1 | PN-P2-3-PN-115-71CT | breaker | 621.0 | 113.25 | 114.65 | DC | 19.58 |
| 42172299 | 200811 | 26WARREN | 230.0 | PENELEC | 200918 | 26ERIE S TIE | 230.0 | PENELEC | 1 | PN-P2-3-PN-115-71ET | breaker | 621.0 | 113.25 | 114.65 | DC | 19.58 |
| 46797875 | 200811 | 26WARREN | 230.0 | PENELEC | 200918 | 26ERIE S TIE | 230.0 | PENELEC | 1 | PN-P2-3-PN-345-003A | breaker | 621.0 | 116.85 | 118.16 | DC | 17.96 |
| 41560098 | 200904 | 26EAGLVAL | 115.0 | PENELEC | 200527 | 26TYRONEN | 115.0 | PENELEC | 1 | PN-P2-3-PN-115-28B_A | breaker | 191.0 | 114.53 | 117.5 | DC | 12.56 |
| 41560099 | 200904 | 26EAGLVAL | 115.0 | PENELEC | 200527 | 26TYRONEN | 115.0 | PENELEC | 1 | PN-P2-3-PN-115-59B | breaker | 191.0 | 114.53 | 117.5 | DC | 12.56 |
| 41812712 | 200904 | 26EAGLVAL | 115.0 | PENELEC | 200527 | 26TYRONEN | 115.0 | PENELEC | 1 | AP-P2-2-WP-230-005T | bus | 191.0 | 133.36 | 137.75 | DC | 18.59 |
| 42463125 | 200924 | 26CANYON | 230.0 | PENELEC | 200706 | 26N.MESHPN | 230.0 | PENELEC | 1 | Base Case | single | 546.0 | 100.58 | 102.73 | DC | 11.78 |
| 41229141 | 235248 | 01SHINGL | 230.0 | AP | 200513 | 26LEWISTWN | 230.0 | PENELEC | 1 | Base Case | single | 491.0 | 114.67 | 124.03 | DC | 47.51 |
| 41559900 | 235248 | 01SHINGL | 230.0 | AP | 200513 | 26LEWISTWN | 230.0 | PENELEC | 1 | AP-P2-3-WP-230-446T | breaker | 570.0 | 157.87 | 176.41 | DC | 105.69 |
| 41559901 | 235248 | 01SHINGL | 230.0 | AP | 200513 | 26LEWISTWN | 230.0 | PENELEC | 1 | AP-P2-3-WP-230-443T * | breaker | 570.0 | 157.73 | 176.27 | DC | 105.69 |
| 41559902 | 235248 | 01SHINGL | 230.0 | AP | 200513 | 26LEWISTWN | 230.0 | PENELEC | 1 | AP-P2-2-WP-230-001T | breaker | 570.0 | 157.73 | 176.27 | DC | 105.69 |
| 41812625 | 235248 | 01SHINGL | 230.0 | AP | 200513 | 26LEWISTWN | 230.0 | PENELEC | 1 | AP-P2-2-WP-230-001T | bus | 570.0 | 157.73 | 176.27 | DC | 105.69 |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 49507356 | 235248 | 01SHINGL | 230.0 | AP | 200513 | 26LEWISTWN | 230.0 | PENELEC | 1 | PN-P1-2-PN-230-004 | single | 570.0 | 113.26 | 121.91 | DC | 49.38 |
| 42726484 | 239036 | 02PERRY | 345.0 | ATSI | 239334 | 02L.CENTER | 345.0 | ATSI | 1 | ATSI-P7-1-CEI-345-012 | tower | 1667.0 | 131.23 | 131.81 | DC | 20.86 |
| 42726554 | 239036 | 02PERRY | 345.0 | ATSI | 238684 | 02EASTLK | 345.0 | ATSI | 1 | ATSI-P7-1-CEI-345-016 | tower | 1667.0 | 123.45 | 124.0 | DC | 20.15 |
| 41812644 | 938380 | AE1-071 TAP | 115.0 | PENELEC | 200520 | 26ROXBURY | 115.0 | PENELEC | 1 | AP-P2-2-WP-230-001T | bus | 160.0 | 119.02 | 122.51 | DC | 12.38 |
| 42172164 | 999392 | STAR601 | 1.0 | PENELEC | 200767 | 26HOMERCT | 230.0 | PENELEC | N | PN-P2-3-PN-230-9E | breaker | 807.0 | 125.46 | 126.4 | DC | 16.47 |
| 41560400 | 999393 | STAR600 | 1.0 | PENELEC | 200727 | 26SHAW. 2 | 115.0 | PENELEC | 2A | AP-P2-3-WP-230-446T | breaker | 148.0 | 109.96 | 115.65 | DC | 18.69 |
| 41560402 | 999393 | STAR600 | 1.0 | PENELEC | 200727 | 26SHAW. 2 | 115.0 | PENELEC | 2A | AP-P2-2-WP-230-001T | breaker | 148.0 | 109.89 | 115.58 | DC | 18.69 |
| 41812718 | 999393 | STAR600 | 1.0 | PENELEC | 200727 | 26SHAW. 2 | 115.0 | PENELEC | 2A | AP-P2-2-WP-230-001T | bus | 148.0 | 109.89 | 115.58 | DC | 18.69 |
| 41229665 | 999394 | STAR599 | 1.0 | PENELEC | 200714 | 26SHAWVL1 | 115.0 | PENELEC | 1A | PN-P1-3-PN-115-005 | single | 126.0 | 113.57 | 120.82 | DC | 9.14 |
| 41560189 | 999394 | STAR599 | 1.0 | PENELEC | 200714 | 26SHAWVL1 | 115.0 | PENELEC | 1A | AP-P2-3-WP-230-446T | breaker | 126.0 | 127.77 | 134.51 | DC | 18.83 |
| 41560190 | 999394 | STAR599 | 1.0 | PENELEC | 200714 | 26SHAWVL1 | 115.0 | PENELEC | 1A | AP-P2-2-WP-230-001T | breaker | 126.0 | 127.61 | 134.35 | DC | 18.83 |
| 41812817 | 999394 | STAR599 | 1.0 | PENELEC | 200714 | 26SHAWVL1 | 115.0 | PENELEC | 1A | AP-P2-2-WP-230-001T | bus | 126.0 | 127.61 | 134.35 | DC | 18.83 |
| 41560154 | 999401 | STAR592 | 1.0 | PJM | 200011 | KEYSTONE | 500.0 | PJM | 4 | PJM500_PN_P4-500-001D | breaker | 634.0 | 105.19 | 106.53 | DC | 18.6 |
| 41560155 | 999401 | STAR592 | 1.0 | PJM | 200011 | KEYSTONE | 500.0 | PJM | 4 | PJM500_PN_P4-500-001A | breaker | 634.0 | 105.19 | 106.53 | DC | 18.6 |

## 12.4 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41229259 | 200513 | 26LEWISTWN | 230.0 | PENELEC | 208005 | JUNI BU2 | 230.0 | PPL | 1 | Base Case | operation | 493.0 | 115.38 | 126.13 | DC | 55.18 |
| 41229260 | 200513 | 26LEWISTWN | 230.0 | PENELEC | 208005 | JUNI BU2 | 230.0 | PPL | 1 | PN-P1-2-PN-115-094-A | operation | 624.0 | 110.78 | 120.09 | DC | 60.67 |
| 41229672 | 200519 | 26REED TAP | 115.0 | PENELEC | 200522 | 26SHADEGP | 115.0 | PENELEC | 1 | PL_P12_100618 | operation | 225.0 | 99.3 | 103.21 | DC | 19.52 |
| 41229338 | 200522 | 26SHADEGP | 115.0 | PENELEC | 938380 | AE1-071 TAP | 115.0 | PENELEC | 1 | PL_P12_100618 | operation | 160.0 | 124.64 | 130.14 | DC | 19.52 |
| 42463129 | 200593 | 26GLADE | 230.0 | PENELEC | 200811 | 26WARREN | 230.0 | PENELEC | 1 | Base Case | operation | 520.0 | 152.89 | 154.75 | DC | 21.61 |
| 42463130 | 200593 | 26GLADE | 230.0 | PENELEC | 200811 | 26WARREN | 230.0 | PENELEC | 1 | PN-P1-2-PN-345-003 | operation | 621.0 | 153.43 | 155.04 | DC | 22.4 |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41230121 | 200599 | 26ERIE W | 345.0 | PENELEC | 238547 | 02AT | 345.0 | ATSI | 1 | Base Case | operation | 1560.0 | 122.95 | 123.87 | DC | 31.8 |
| 41230122 | 200599 | 26ERIE W | 345.0 | PENELEC | 238547 | 02AT | 345.0 | ATSI | 1 | ATSI-P1-1-CEI-345-711 | operation | 1900.0 | 112.62 | 113.37 | DC | 31.8 |
| 41229308 | 200674 | 26TOWANDA | 115.0 | PENELEC | 200677 | 26NO MESHO | 115.0 | PENELEC | 1 | PN-P1-2-PN-230-013A | operation | 202.0 | 151.08 | 153.39 | DC | 10.22 |
| 42463024 | 200675 | 26E.TWANDA | 230.0 | PENELEC | 200924 | 26CANYON | 230.0 | PENELEC | 1 | Base Case | operation | 515.0 | 124.46 | 126.2 | DC | 19.63 |
| 41229431 | 200714 | 26SHAWVL1 | 115.0 | PENELEC | 200872 | 26BIOENTP | 115.0 | PENELEC | 1 | AP-P1-2-WP-230-323T | operation | 185.0 | 110.0 | 121.03 | DC | 20.38 |
| 41229482 | 200716 | 26PHILIPSB | 115.0 | PENELEC | 200904 | 26EAGLVAL | 115.0 | PENELEC | 1 | AP-P1-2-WP-230-323T | operation | 174.0 | 99.76 | 104.68 | DC | 18.96 |
| 41229280 | 200726 | 26SHAWVL2 | 230.0 | PENELEC | 235248 | 01SHINGL | 230.0 | AP | 1 | AP-P1-3-WP-230-005 | operation | 554.0 | 122.02 | 130.43 | DC | 48.42 |
| 41229281 | 200726 | 26SHAWVL2 | 230.0 | PENELEC | 235248 | 01SHINGL | 230.0 | AP | 1 | AP-P1-2-WP-230-005B | operation | 554.0 | 122.02 | 130.43 | DC | 48.42 |
| 41229824 | 200726 | 26SHAWVL2 | 230.0 | PENELEC | 235175 | 01ELKO | 230.0 | AP | 1 | AP-P1-2-WP-230-004 | operation | 554.0 | 94.11 | 103.09 | DC | 49.77 |
| 41229502 | 200727 | 26SHAW. 2 | 115.0 | PENELEC | 200716 | 26PHILIPSB | 115.0 | PENELEC | 1 | AP-P1-2-WP-230-323T | operation | 185.0 | 101.42 | 106.05 | DC | 18.96 |
| 41229386 | 200755 | 26WESTOVER | 115.0 | PENELEC | 200801 | 26GARMAN | 115.0 | PENELEC | 1 | AP-P1-2-WP-230-323T | operation | 246.0 | 107.4 | 115.69 | DC | 20.38 |
| 42463049 | 200767 | 26HOMER CT | 230.0 | PENELEC | 200795 | 26SHELOCTA | 230.0 | PENELEC | 1 | PN-P1-3-PN-230-001T | operation | 917.0 | 141.91 | 143.4 | DC | 29.82 |
| 42463050 | 200767 | 26HOMER CT | 230.0 | PENELEC | 200795 | 26SHELOCTA | 230.0 | PENELEC | 1 | PN-P1-2-PN-230-025 | operation | 917.0 | 141.91 | 143.4 | DC | 29.82 |
| 42463051 | 200767 | 26HOMER CT | 230.0 | PENELEC | 200795 | 26SHELOCTA | 230.0 | PENELEC | 1 | Base Case | operation | 731.0 | 145.51 | 146.91 | DC | 22.2 |
| 42463588 | 200769 | 26HOMER CY | 345.0 | PENELEC | 999392 | STAR601 | 1.0 | PENELEC | N | PN-P1-3-PN-230-004A | operation | 807.0 | 108.0 | 108.95 | DC | 16.66 |
| 42463618 | 200769 | 26HOMER CY | 345.0 | PENELEC | 999391 | STAR602 | 1.0 | PENELEC | S | PN-P1-3-PN-230-003A | operation | 824.0 | 105.2 | 106.12 | DC | 16.56 |
| 42463065 | 200795 | 26SHELOCTA | 230.0 | PENELEC | 200810 | 26KEYSTONE | 230.0 | PENELEC | 1 | PN-P1-2-PN-230-025 | operation | 917.0 | 120.84 | 122.49 | DC | 33.18 |
| 42463066 | 200795 | 26SHELOCTA | 230.0 | PENELEC | 200810 | 26KEYSTONE | 230.0 | PENELEC | 1 | PN-P1-3-PN-230-001T | operation | 917.0 | 120.84 | 122.49 | DC | 33.18 |
| 42463067 | 200795 | 26SHELOCTA | 230.0 | PENELEC | 200810 | 26KEYSTONE | 230.0 | PENELEC | 1 | Base Case | operation | 731.0 | 123.29 | 124.86 | DC | 25.14 |
| 42463265 | 200810 | 26KEYSTONE | 230.0 | PENELEC | 999401 | STAR592 | 1.0 | PJM | 4 | PN-P1-3-PN-500-001AT | operation | 635.0 | 99.35 | 100.7 | DC | 18.66 |
| 42463489 | 200811 | 26WARREN | 230.0 | PENELEC | 200918 | 26ERIE S TIE | 230.0 | PENELEC | 1 | Base Case | operation | 520.0 | 112.13 | 113.62 | DC | 17.11 |
| 42463493 | 200811 | 26WARREN | 230.0 | PENELEC | 200918 | 26ERIE S TIE | 230.0 | PENELEC | 1 | PN-P1-2-PN-345-003 | operation | 621.0 | 115.14 | 116.43 | DC | 17.73 |
| 41229293 | 200904 | 26EAGLVAL | 115.0 | PENELEC | 200527 | 26TYRONEN | 115.0 | PENELEC | 1 | PN-P1-2-PN-115-048 | operation | 191.0 | 114.37 | 117.34 | DC | 12.56 |
| 41229296 | 200904 | 26EAGLVAL | 115.0 | PENELEC | 200527 | 26TYRONEN | 115.0 | PENELEC | 1 | Base Case | operation | 147.0 | 103.11 | 106.29 | DC | 10.36 |
| 42463149 | 200908 | 26CHAPMAN+ | 230.0 | PENELEC | 945070 | AF1-172 TAP | 230.0 | PENELEC | 1 | Base Case | operation | 520.0 | 138.07 | 139.97 | DC | 9.95 |
| 49507592 | 200908 | 26CHAPMAN+ | 230.0 | PENELEC | 945070 | AF1-172 TAP | 230.0 | PENELEC | 1 | PN-P1-2-PN-230-101T | operation | 621.0 | 125.28 | 126.83 | DC | 9.74 |
| 42463120 | 200924 | 26CANYON | 230.0 | PENELEC | 200706 | 26N.MESH PN | 230.0 | PENELEC | 1 | Base Case | operation | 546.0 | 116.41 | 118.05 | DC | 19.63 |
| 41229135 | 235248 | 01SHINGL | 230.0 | AP | 200513 | 26LEWISTWN | 230.0 | PENELEC | 1 | Base Case | operation | 491.0 | 144.56 | 160.17 | DC | 79.19 |
| 41229138 | 235248 | 01SHINGL | 230.0 | AP | 200513 | 26LEWISTWN | 230.0 | PENELEC | 1 | AP-P1-2-WP-230-324T_FSA_B | operation | 570.0 | 136.13 | 151.52 | DC | 90.25 |
| 49507351 | 235248 | 01SHINGL | 230.0 | AP | 200513 | 26LEWISTWN | 230.0 | PENELEC | 1 | 200909 26LOBO+ 230 919490 AA2-000 TAP 230 1 | operation | 570.0 | 136.13 | 151.52 | DC | 90.25 |
| 42463175 | 919490 | AA2-000 TAP | 230.0 | PENELEC | 200908 | 26CHAPMAN+ | 230.0 | PENELEC | 1 | Base Case | operation | 546.0 | 131.59 | 133.4 | DC | 9.95 |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **49507645** | 919490 | AA2-000 TAP | 230.0 | PENELEC | 200908 | 26CHAPMAN+ | 230.0 | PENELEC | 1 | PN-P1-2-PN-230-101T | operation | 666.0 | 116.89 | 118.34 | DC | 9.74 |
| **41229342** | 944180 | AF1-086 TAP | 115.0 | PENELEC | 200755 | 26WESTOVER | 115.0 | PENELEC | 1 | AP-P1-2-WP-230-323T | operation | 237.0 | 112.24 | 120.85 | DC | 20.38 |
| **41229344** | 944180 | AF1-086 TAP | 115.0 | PENELEC | 200755 | 26WESTOVER | 115.0 | PENELEC | 1 | Base Case | operation | 175.0 | 99.91 | 103.03 | DC | 12.11 |
| **41229315** | 945070 | AF1-172 TAP | 230.0 | PENELEC | 235220 | 01MOSHAN | 230.0 | AP | 1 | Base Case | operation | 520.0 | 138.01 | 139.92 | DC | 9.95 |
| **41229319** | 945070 | AF1-172 TAP | 230.0 | PENELEC | 235220 | 01MOSHAN | 230.0 | AP | 1 | PN-P1-2-PN-230-101T | operation | 621.0 | 125.24 | 126.8 | DC | 9.74 |
| **42463620** | 999391 | STAR602 | 1.0 | PENELEC | 200767 | 26HOMER CT | 230.0 | PENELEC | S | PN-P1-3-PN-230-003A | operation | 824.0 | 105.19 | 106.11 | DC | 16.56 |
| **42463591** | 999392 | STAR601 | 1.0 | PENELEC | 200767 | 26HOMER CT | 230.0 | PENELEC | N | PN-P1-3-PN-230-004A | operation | 807.0 | 108.0 | 108.95 | DC | 16.66 |
| **41229925** | 999393 | STAR600 | 1.0 | PENELEC | 200727 | 26SHAW. 2 | 115.0 | PENELEC | 2A | PN-P1-3-PN-115-004 | operation | 148.0 | 100.88 | 105.51 | DC | 15.21 |
| **41229664** | 999394 | STAR599 | 1.0 | PENELEC | 200714 | 26SHAWVL1 | 115.0 | PENELEC | 1A | PN-P1-3-PN-115-005 | operation | 126.0 | 117.82 | 123.27 | DC | 15.23 |
| **41229596** | 999401 | STAR592 | 1.0 | PJM | 200011 | KEYSTONE | 500.0 | PJM | 4 | PN-P1-3-PN-500-001AT | operation | 634.0 | 98.78 | 100.13 | DC | 18.66 |

## 12.5 System Reinforcements

| ID | Index | Facility | Upgrade Description | Cost |
|---|---|---|---|---|
| 41229341,41229340 | 6 | 26SHADE GP 115.0 kV - AE1-071 TAP 115.0 kV Ckt 1 | **PENELEC**<br>**PN-AF1-F-0005a: Reconductor Shade Gap - AE1-071 (~7.2 miles).**<br>**Project Type : FAC**<br>**Cost : $12,852,000**<br>**Time Estimate : 6.0 Months**<br><br>**PN-AF1-F-0005b : Replace substation conductor at Roxbury and Shade Gap**<br>**Replace Wave Trap at Shade Gap**<br>**Project Type : FAC**<br>**Cost : $119,000**<br>**Time Estimate : 6.0 Months** | $12,971,000 |
| 41812712,41560099, 41560098 | 21 | 26EAGL VAL 115.0 kV - 26TYRONE N 115.0 kV Ckt 1 | **PENELEC**<br>**s1776.1: Supplemental upgrade s1776.1: Tyrone North - Construct a four breaker 115 kV ring bus. The supplemental project has a projected in-service date of 12/31/2020.**<br>**Project Type: CON**<br>**Cost : $0**<br><br>**s1776.2: Supplemental upgrade s1776.2: Replace the Tyrone North #2 115/46 kV 45/60/75 MVA transformer. The supplemental project has a projected in-service date of 12/31/2020.**<br>**Project Type: CON**<br>**Cost : $0**<br><br>**s1776.3: Supplemental upgrade s1776.3: Install a 46 kV 1200 A bypass switch between the Tipton and Warrior Ridge 46 kV lines. The supplemental project has a projected in-service date of 12/31/2020.**<br>**Project Type: CON**<br>**Cost : $0** | $0 |
| 41560129 | 14 | 26PHILIPSB 115.0 kV - 26EAGL VAL 115.0 kV Ckt 1 | **PENELEC**<br>**s1919: Supplemental upgrade s1919: Construct a 115 kV ring bus at the Philipsburg substation.**<br>• **Build a four breaker 115 kV ring bus at the Philipsburg substation. (s1919.1)**<br>• **Replace limiting CTs, substation conductor / drop, line trap and circuit breakers on Shawville 115 kV line exit at the Philipsburg substation. (s1919.2)**<br>• **Replace limiting CTs, substation conductor / drop, and circuit breakers on Eagle Valley 115 kV line exit at the Philipsburg substation. (s1919.3)**<br>• **Replace line trap on Philipsburg 115 kV line exit at the Shawville substation and adjust line relaying as necessary. (s1919.4)**<br>**The supplemental project has a projected in-service date of 12/01/2023.**<br>**Project Type: CON**<br>**Cost : $0** | $0 |
| 41560139,41229505, 41229504 | 1 | 26SHAW. 2 115.0 kV - 26PHILIPSB 115.0 kV Ckt 1 | | |

| ID | Index | Facility | Upgrade Description | Cost |
|---|---|---|---|---|
| 42172164 | 27 | STAR601 1.0 kV - 26HOMER CT 230.0 kV Ckt N | **PENELEC**<br>**PN-AF1-F-0079 : Replace Homer City 345/230 kV North transformer**<br>**Project Type : FAC**<br>**Cost : $7,140,000**<br>**Time Estimate : 24.0 Months** | $7,140,000 |
| 42172159 | 17 | 26HOMER CY 345.0 kV - STAR601 1.0 kV Ckt N | | |
| 41812718,41560400, 41560402 | 28 | STAR600 1.0 kV - 26SHAW. 2 115.0 kV Ckt 2A | **PENELEC**<br>**PN-AF1-F-0080a : Replace Shawville 230/115 kV 2A transformer**<br>**Project Type : FAC**<br>**Cost : $4,165,000**<br>**Time Estimate : 24.0 Months** | $4,165,000 |
| 42463029 | 10 | 26E.TWANDA 230.0 kV - 26CANYON 230.0 kV Ckt 1 | **PENELEC**<br>**PN-AF1-F-0014a: Replace substation conductor at East Towanda. Replace disconnect switch at Canyon Switching Reconductor East Towanda - Canyon 230 kV (~12.3 miles)**<br>**Project Type : FAC**<br>**Cost : $22,193,500**<br>**Time Estimate : 9.0 Months** | $22,193,500 |
| 41560027,41812725 | 4 | 26LEWISTWN 230.0 kV - JUNI BU2 230.0 kV Ckt 1 | **PENELEC**<br>**PN-AF1-F-0003b: Reconductor Lewistown - Juniata (~24.5 miles).**<br>**Project Type : FAC**<br>**Cost : $102,042,500**<br>**Time Estimate : 6.0 Months**<br><br>**PN-AF1-F-0003c: Replace relays at Lewistown**<br>**Project Type : FAC**<br>**Cost : $297,500**<br>**Time Estimate : 12.0 Months**<br><br>**PPL**<br>**R-PL-0006 : Re-conductor PPL's ~0.9mi LEWI-JUNI 230kV Line**<br>**Project Type : FAC**<br>**Cost : $900,000**<br>**Time Estimate : 24.0 Months** | $103,240,000 |

| ID | Index | Facility | Upgrade Description | Cost |
|---|---|---|---|---|
| 41229285,41229286 | 15 | 26SHAWVL 2 230.0 kV - 01SHINGL 230.0 kV Ckt 1 | APS<br>WP-AF1-F-0002a: Replace Wave Trap at Shawville<br>Project Type : FAC<br>Cost : $126,000<br>Time Estimate : 9.0 Months<br><br>WP-AF1-F-0002b: Replace Wave Trap at Shingletown and CT at Shingletown<br>Project Type : FAC<br>Cost : $756,000<br>Time Estimate : 12.0 Months<br><br>WP-AF1-F-0002c: Replace substation conductor at Shingletown<br>Project Type : FAC<br>Cost : $126,000<br>Time Estimate : 6.0 Months<br><br>WP-AF1-F-0002d: Replace substation conductor at Shingletown<br>Project Type : FAC<br>Cost : $126,000<br>Time Estimate : 6.0 Months<br><br>WP-AF1-F-0002e: Replace substation conductor at Shawville<br>Project Type : FAC<br>Cost : $126,000<br>Time Estimate : 6.0 Months<br><br>APS / PENELEC<br>s2051: Supplemental upgrade s2051: Replace terminal equipment on the Shawville – Shingletown 230 kV Line.<br>• Shawville 230 kV Substation – Replace line trap and substation conductor on the Shawville – Shingletown 230 kV Line. (s2051.1)<br>• Shingletown 230 kV Substation – Replace line relaying, line trap, and substation conductor on the Shawville – Shingletown 230 kV Line. (s2051.2)<br>The supplemental project has a projected in-service date of 12/01/2020.<br>Project Type: FAC<br>Cost : $0 | $2,160,000 |
| 41560238 | 5 | 26REED TAP 115.0 kV - 26SHADE GP 115.0 kV Ckt 1 | PENELEC<br>PN-AF1-F-0004a: Reconductor Reeds Tap - Shade Gap (~22.4 miles).<br>Project Type : FAC<br>Cost : $39,984,000<br>Time Estimate : 6.0 Months<br><br>PN-AF1-F-0004b : Replace CTs at Shade Gap<br>Reconductor Reeds Tap - Shade Gap (~0.2 miles).<br>Project Type : FAC<br>Cost : $1,042,440<br>Time Estimate : 12.0 Months | $41,026,440 |

| ID | Index | Facility | Upgrade Description | Cost |
|---|---|---|---|---|
| 42172299,42172298, 46797875 | 20 | 26WARREN 230.0 kV - 26ERIE S TIE 230.0 kV Ckt 1 | PENELEC<br>PN-AF1-F-0047a: Replace substation conductor at Erie South and Warren).<br>Project Type : FAC<br>Cost : $119,000<br>Time Estimate : 6.0 Months<br><br>PN-AF1-F-0047b: Reconductor line. At Erie South substation, upgrade/replace current transformers.<br>Project Type : FAC<br>Cost : $714,000<br>Time Estimate : 12.0 Months<br><br>PN-AF1-F-0047c: At Erie South substation, replace circuit breaker and adjust relays. At Warren substation, replace relays.<br>Project Type : FAC<br>Cost : $ 1,011,500<br>Time Estimate : 12.0 Months | $1,844,500 |
| 41229666,41560189, 41812817,41229665, 41560190 | 2 | STAR599 1.0 kV - 26SHAWVL 1 115.0 kV Ckt 1A | PENELEC<br>PN-AF1-F-0081: Replace Shawville 230/115 kV 1A transformer<br>Project Type : FAC<br>Cost : $4,165,000<br>Time Estimate : 24.0 Months | $4,165,000 |
| 41812721 | 13 | 26SHAWVL 1 115.0 kV - STAR599 1.0 kV Ckt 1A | | |
| 42463125 | 22 | 26CANYON 230.0 kV - 26N.MESHPN 230.0 kV Ckt 1 | PENELEC<br>PN-AF1-F-0055a : Replace subsation conductor at Canyon and North Meshoppen<br>Replace disconnect switch at Canyon<br>Reconductor Canyon - North Meshoppen 230 kV (~10 miles)<br>Project Type : FAC<br>Cost : $17,731,000<br>Time Estimate : 9.0 Months | $17,731,000 |
| 42171935,42171936 | 16 | 26HOMER CT 230.0 kV - 26SHELOCTA 230.0 kV Ckt 1 | PENELEC<br>PN-AF1-F-0040a : Replace Wave Trap at Homer City<br>Project Type : FAC<br>Cost : $119,000<br>Time Estimate : 9.0 Months<br><br>PN-AF1-F-0040b : Reconductor Homer City - Sheloctoa 230 kV (~11 miles)<br>Project Type : FAC<br>Cost : $19,188,750<br>Time Estimate : 6.0 Months<br><br>PN-AF1-F-0040c : Replace line drops at Shelocta<br>Project Type : FAC<br>Cost : $119,000<br>Time Estimate : 6.0 Months<br><br>PN-AF1-F-0040d : Replace disconnect switch at Shelocta<br>Project Type : FAC<br>Cost : $119,000<br>Time Estimate : 9.0 Months | $19,545,750 |

| ID | Index | Facility | Upgrade Description | Cost |
|---|---|---|---|---|
| 41560340 | 3 | 26LEWISTWN 115.0 kV - 26REED TAP 115.0 kV Ckt 1 | PENELEC<br>PN-AF1-F-0002a : Reconductor Lewistown - Shade Gap 115 kV (~10 miles)<br>Project Type : FAC<br>Cost : $17,850,000<br>Time Estimate : 30.0 Months | $17,850,000 |
| 41812644 | 26 | AE1-071 TAP 115.0 kV - 26ROXBURY 115.0 kV Ckt 1 | PENELEC<br>PN-AF1-F-0066a : Reconductor AE1-071 - Roxbury 115 kV (~6 miles)<br>Project Type : FAC<br>Cost : $11,424,000<br>Time Estimate : 6.0 Months | $11,424,000 |
| 42171945,42171946 | 18 | 26SHELOCTA 230.0 kV - 26KEYSTONE 230.0 kV Ckt 1 | PENELEC<br>PN-AF1-F-0044a : Replace Wave Trap at Keystone<br>Project Type : FAC<br>Cost : $119,000<br>Time Estimate : 9.0 Months<br><br>PN-AF1-F-0044b : Reconductor Shelocta - Keystone 230 kV (~3 miles)<br>Project Type : FAC<br>Cost : $4,034,100<br>Time Estimate : 6.0 Months<br><br>PN-AF1-F-0044c : Replace substation conductor at Shelocta and Keystone<br>Project Type : FAC<br>Cost : $178,500<br>Time Estimate : 6.0 Months<br><br>PN-AF1-F-0044d : Replace disconnect switch at Shelocta<br>Project Type : FAC<br>Cost : $178,500<br>Time Estimate : 6.0 Months | $4,510,100 |
| 49507716 | 8 | 26ERIE W 345.0 kV - 02AT 345.0 kV Ckt 1 | PENELEC<br>PN-AF1-F-0090a: Reconductor line (13.7 miles).<br>Project Type : FAC<br>Cost : $48,909,000<br>Time Estimate : 36.0 Months<br><br>PN-AF1-F-0090b: Reconductor line (7.2 miles).<br>Project Type : FAC<br>Cost : $25,704,000<br>Time Estimate : 30.0 Months<br><br>ATSI<br>AT-AF1-F-0001: Reconductor line. At Ashtabula substation, replace the line trap, disconnect switch, relaying, and bus conductor.<br>Project Type : FAC<br>Cost : $88,920,000<br>Time Estimate : 40.0 Months | $163,533,000 |

| ID | Index | Facility | Upgrade Description | Cost |
|---|---|---|---|---|
| 41560154,41560155 | 29 | STAR592 1.0 kV - KEYSTONE 500.0 kV Ckt 4 | PENELEC<br>PN-AF1-F-0046a : Replace transformer<br>Replace substation conductor at Keystone (3A)<br>Project Type : FAC<br>Cost : $26,180,000<br>Time Estimate : 24.0 Months | $26,180,000 |
| 42172052,42172051 | 19 | 26KEYSTONE 230.0 kV - STAR592 1.0 kV Ckt 4 | | |
| 49507356,41229141, 41812625,41559901, 41559900,41559902 | 23 | 01SHINGL 230.0 kV - 26LEWISTWN 230.0 kV Ckt 1 | APS<br>WP-AF1-F-0005a : Replace substation conductor at Shingletown<br>Project Type : FAC<br>Cost : $126,000<br>Time Estimate : 6.0 Months<br><br>WP-AF1-F-0005b : Replace substation conductor<br>Replace switches at Shingletown<br>Project Type : FAC<br>Cost : $378,000<br>Time Estimate : 9.0 Months<br><br>WP-AF1-F-0005c : Replace substation conductor and relays at Lewistown and Shingletown<br>Project Type : FAC<br>Cost : $441,000<br>Time Estimate : 12.0 Months<br><br>PENELEC<br>PN-AF1-F-0061a : Replace substation conductor at Shingletown<br>Project Type : FAC<br>Cost : $238,000<br>Time Estimate : 6.0 Months<br><br>PN-AF1-F-0061b : Replace substation conductor at Shingletown<br>Replace disconnect switches at Shingletown<br>Reconductor Shingletown - Lewistown 115 kV (~26 miles)<br>Project Type : FAC<br>Cost : $46,826,500<br>Time Estimate : 9.0 Months<br><br>PN-AF1-F-0061c : Replace disconnect switches at Shingletown. Replace substation conductor at Shingletown. Replace relays at Lewistown and Shingletown<br>Project Type : FAC<br>Cost : $714,000<br>Time Estimate : 12.0 Months | $48,723,500 |

| ID | Index | Facility | Upgrade Description | Cost |
|---|---|---|---|---|
| 42463135,42463133, 42172020 | 7 | 26GLADE 230.0 kV - 26WARREN 230.0 kV Ckt 1 | **PENELEC**<br>**PN-AF1-F-0011a : Replace substation conductor at Glade and Warren. Reconductor Glade - Warren 230 kV (~11.5 miles).**<br>**Project Type : FAC**<br>**Cost : $20,706,000**<br>**Time Estimate : 12 Months**<br><br>**Note: AF1-142 currently has a cost responsibility for the above upgrade. The following baseline project is "on-hold"; if the following baseline project is approved for construction, then AF1-142 will not have a cost responsibility and can take advantage of the following baseline project. If additional mitigations beyond the following baseline project are needed, AF1-142 will have a cost responsibility for those additional mitigations.**<br><br>**b3017 : PJM Baseline Upgrade b3017:**<br>• **Rebuild Glade to Warren 230 kV line with hi-temp conductor 11.53 miles. New conductor will be 1033 ACSS. Existing conductor is 1033 ACSR. (b3017.1)**<br>• **Glade substation terminal upgrades. Replace bus conductor, wave traps, and relaying. (b3017.2)**<br>• **Warren substation terminal upgrades. Replace bus conductor, wave traps, and relaying. (b3017.3)**<br>**The baseline project has a projected in-service date of 06/01/2021.** | $20,706,000 |
| 42726484 | 24 | 02PERRY 345.0 kV - 02L.CENTER 345.0 kV Ckt 1 | **ATSI**<br>**CEI-002A : Reconductor the Leroy Center-Perry S6 345 kV Line (~10 miles from Leroy Center to Perry). The existing conductor is (2) 954 ACSR conductor and the new conductor is (2) 954 kcmil ACSS conductor. Upgrade terminals as required.**<br>**Project Type : FAC**<br>**Cost : $29,400,000**<br>**Time Estimate : 30.0 Months** | $29,400,000 |
| 42726554 | 25 | 02PERRY 345.0 kV - 02EASTLK 345.0 kV Ckt 1 | **ATSI**<br>**CEI-003A : Reconductor the Eastlake-Perry S8 345 kV Line (~22 miles from Eastlake to Perry). The existing conductor is (2) 954 ACSR conductor and the new conductor is (2) 954 kcmil ACSS conductor. Upgrade terminals as required.**<br>**Project Type : FAC**<br>**Cost : $64,680,000**<br>**Time Estimate : 48.0 Months** | $64,680,000 |

| ID | Index | Facility | Upgrade Description | Cost |
|---|---|---|---|---|
| 41560334,41560332, 41560333,41812906 | 12 | 26SHAWVL 1 115.0 kV - 26ROCKTON 115.0 kV Ckt 1 | PENELEC<br>PN-AF1-F-0021a : Reconductor Dubois - Rockton 115 kV (~0.01 miles)<br>Project Type : FAC<br>Cost : $0<br>Time Estimate : 6.0 Months<br><br>PN-AF1-F-0021b : Replace wave trap at Shawville<br>Project Type : FAC<br>Cost : $119,000<br>Time Estimate : 9.0 Months<br><br>PN-AF1-F-0021c : Replace substation conductor at Shawville Reconductor Rockton - Shawville 115 kV (~9 miles)<br>Project Type : FAC<br>Cost : $15,529,500<br>Time Estimate : 6.0 Months | $15,648,500 |
| 41229309 | 9 | 26TOWANDA 115.0 kV - 26NO MESHO 115.0 kV Ckt 1 | PENELEC<br>PN-AF1-F-0012 :<br>• Replace disconnect switch at East Towanda<br>• Replace substation conductor at East Towanda and North Meshoppen<br>• Replace Wave Trap at East Towanda<br>• Reconductor East Towanda - North Meshoppen 115 kV (~21 miles)<br>• Replace relays at East Towanda and North Meshoppen<br>• Replace CTs at East Towanda and North Meshoppen<br>• Replace meters at East Towanda and North Meshoppen<br>Project Type : FAC<br>Cost : $39,151,000<br>Time Estimate : 12.0 Months | $39,151,000 |
| 41560356,41560357, 41560358,41812916 | 11 | 26ROCKTON 115.0 kV - 26DUBOIS 115.0 kV Ckt 1 | PENELEC<br>PN-AF1-F-0020a : Replace wave trap at Dubois<br>Project Type : FAC<br>Cost : $119,000<br>Time Estimate : 9.0 Months<br><br>PN-AF1-F-0020b : Reconductor Dubois - Rockton 115 kV (~12 miles)<br>Project Type : FAC<br>Cost : $21,003,500<br>Time Estimate : 6.0 Months | $21,122,500 |
| | | | TOTAL COST | $699,110,790 |

## 13 Flow Gate Details

The following indices contain additional information about each flowgate presented in the body of the report. For each index, 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.

## 13.1 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41560139** | 200727 | 26SHAW. 2 | PENELEC | 200716 | 26PHILIPSB | PENELEC | 1 | AP-P2-3-WP-230-460T | breaker | 185.0 | 101.77 | 106.25 | DC | 18.38 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200665** | 26SHAWVL 3 | 2.5587 |
| **200666** | 26SHAWVL 4 | 2.5143 |
| **200715** | 26SHAWVL 1 | 2.2640 |
| **200722** | 26SHAWVL 2 | 2.3277 |
| **200913** | 26SHAW-D | 0.1367 |
| **235003** | AC1-025 E | 0.1151 |
| **236828** | 01GRAYMONT | 0.3073 |
| **919491** | AA2-000 | 28.4615 |
| **930511** | AB1-092 | 1.0450 |
| **936421** | AD2-055 | 2.1515 |
| **939171** | AE1-147 C | 0.9222 |
| **939172** | AE1-147 E | 0.6148 |
| **940201** | AE2-001 C | 0.9221 |
| **940202** | AE2-001 E | 0.6147 |
| **940681** | AE2-055 C | 0.9209 |
| **940682** | AE2-055 E | 0.6139 |
| **941191** | AE2-113 C | 2.9356 |
| **941192** | AE2-113 E | 3.1607 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **1.9622** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **1.3082** |
| **941261** | AE2-120 C | 0.9220 |
| **941262** | AE2-120 E | 0.6147 |
| **941271** | AE2-121 C | 0.4903 |
| **941272** | AE2-121 E | 0.3274 |
| **941321** | AE2-126 C | 1.4376 |
| **941322** | AE2-126 E | 0.9584 |
| **942351** | AE2-248 C | 0.7371 |
| **942352** | AE2-248 E | 0.4914 |
| **942491** | AE2-262 C | 3.8594 |
| **942492** | AE2-262 E | 2.5935 |
| **942501** | AE2-263 C | 3.6279 |
| **942502** | AE2-263 E | 2.4222 |
| **943751** | AF1-043 | 3.4209 |
| **944001** | AF1-068 C O1 | 0.5208 |
| **944002** | AF1-068 E O1 | 0.2929 |
| **944311** | AF1-099 C | 3.1051 |
| **944312** | AF1-099 E | 2.0700 |
| **944321** | AF1-100 C O1 | 15.8010 |
| **944322** | AF1-100 E O1 | 10.5340 |
| **944471** | AF1-112 C | 0.4884 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **944472** | AF1-112 E | 0.3256 |
| **944671** | AF1-132 C O1 | 0.4882 |
| **944672** | AF1-132 E O1 | 0.3254 |
| **944691** | AF1-134 C O1 | 0.4457 |
| **944692** | AF1-134 E O1 | 0.4457 |
| **944701** | AF1-135 C | 0.5349 |
| **944702** | AF1-135 E | 0.3566 |
| **944771** | AF1-142 C | 4.9681 |
| **944772** | AF1-142 E | 3.3121 |
| **944841** | AF1-149 C | 0.9220 |
| **944842** | AF1-149 E | 0.6147 |
| **944881** | AF1-153 C O1 | 0.3830 |
| **944882** | AF1-153 E O1 | 0.2553 |
| **944901** | AF1-155 C | 0.3801 |
| **944902** | AF1-155 E | 0.2534 |
| **945071** | AF1-172 C | 5.4202 |
| **945072** | AF1-172 E | 3.6135 |
| **945161** | AF1-181 | 0.0842 |
| **945171** | AF1-182 | 0.4214 |
| **945181** | AF1-183 | 0.1329 |
| **945481** | AF1-213 C | 11.8413 |
| **945482** | AF1-213 E | 7.8942 |
| **945491** | AF1-214 C | 0.4887 |
| **945492** | AF1-214 E | 0.3258 |
| **945551** | AF1-220 C | 3.6843 |
| **945552** | AF1-220 E | 2.4575 |
| **945771** | AF1-242 C | 0.3801 |
| **945772** | AF1-242 E | 0.2534 |
| **946091** | AF1-274 C | 5.6671 |
| **946092** | AF1-274 E | 3.7781 |
| **946421** | AF1-306 C | 2.0140 |
| **946422** | AF1-306 E | 8.0561 |
| **DUCKCREEK** | DUCKCREEK | 0.0046 |
| **NEWTON** | NEWTON | 0.0097 |
| **FARMERCITY** | FARMERCITY | 0.0006 |
| **CBM-W1** | CBM-W1 | 0.1126 |
| **PRAIRIE** | PRAIRIE | 0.0310 |
| **O-066** | O-066 | 0.3091 |
| **COFFEEN** | COFFEEN | 0.0042 |
| **EDWARDS** | EDWARDS | 0.0010 |
| **CHEOAH** | CHEOAH | 0.0175 |
| **TILTON** | TILTON | 0.0031 |
| **G-007** | G-007 | 0.0634 |
| **GIBSON** | GIBSON | 0.0044 |
| **CALDERWOOD** | CALDERWOOD | 0.0169 |
| **BLUEG** | BLUEG | 0.0174 |
| **TRIMBLE** | TRIMBLE | 0.0056 |
| **CATAWBA** | CATAWBA | 0.0182 |

## 13.2 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41812817** | 999394 | STAR599 | PENELEC | 200714 | 26SHAWVL 1 | PENELEC | 1A | AP-P2-2-WP-230-001T | bus | 126.0 | 127.61 | 134.35 | DC | 18.83 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200665** | 26SHAWVL 3 | 2.9147 |
| **200666** | 26SHAWVL 4 | 2.7597 |
| **235003** | AC1-025 E | 0.0991 |
| **236828** | 01GRAYMONT | 0.2735 |
| **919491** | AA2-000 | 31.0983 |
| **930511** | AB1-092 | 1.1418 |
| **936421** | AD2-055 | 2.3508 |
| **939171** | AE1-147 C | 0.8250 |
| **939172** | AE1-147 E | 0.5500 |
| **940201** | AE2-001 C | 0.8225 |
| **940202** | AE2-001 E | 0.5484 |
| **940681** | AE2-055 C | 0.7851 |
| **940682** | AE2-055 E | 0.5234 |
| **941261** | AE2-120 C | 0.8212 |
| **941262** | AE2-120 E | 0.5475 |
| **941271** | AE2-121 C | 0.4409 |
| **941272** | AE2-121 E | 0.2944 |
| **942351** | AE2-248 C | 0.6406 |
| **942352** | AE2-248 E | 0.4270 |
| **942491** | AE2-262 C | 3.9546 |
| **942492** | AE2-262 E | 2.6575 |
| **942501** | AE2-263 C | 3.7173 |
| **942502** | AE2-263 E | 2.4819 |
| **943751** | AF1-043 | 3.7378 |
| **944001** | AF1-068 C O1 | 0.4500 |
| **944002** | AF1-068 E O1 | 0.2531 |
| **944311** | AF1-099 C | 3.1817 |
| **944312** | AF1-099 E | 2.1211 |
| **944321** | AF1-100 C O1 | 17.3430 |
| **944322** | AF1-100 E O1 | 11.5620 |
| **944471** | AF1-112 C | 0.4265 |
| **944472** | AF1-112 E | 0.2844 |
| **944671** | AF1-132 C O1 | 0.4205 |
| **944672** | AF1-132 E O1 | 0.2803 |
| **944771** | AF1-142 C | 5.0906 |
| **944772** | AF1-142 E | 3.3938 |
| **944841** | AF1-149 C | 0.8210 |
| **944842** | AF1-149 E | 0.5473 |
| **945071** | AF1-172 C | 6.0034 |
| **945072** | AF1-172 E | 4.0022 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **945161** | AF1-181 | 0.0959 |
| **945171** | AF1-182 | 0.4625 |
| **945181** | AF1-183 | 0.0432 |
| **945483** | AF1-213 BAT | 7.8550 |
| **945491** | AF1-214 C | 0.4352 |
| **945492** | AF1-214 E | 0.2902 |
| **DUCKCREEK** | DUCKCREEK | 0.2591 |
| **NEWTON** | NEWTON | 0.2364 |
| **FARMERCITY** | FARMERCITY | 0.0122 |
| **G-007A** | G-007A | 0.9566 |
| **VFT** | VFT | 2.6187 |
| **PRAIRIE** | PRAIRIE | 0.5553 |
| **COFFEEN** | COFFEEN | 0.1168 |
| **EDWARDS** | EDWARDS | 0.0791 |
| **CHEOAH** | CHEOAH | 0.0921 |
| **TILTON** | TILTON | 0.1424 |
| **MADISON** | MADISON | 0.0141 |
| **GIBSON** | GIBSON | 0.1212 |
| **CALDERWOOD** | CALDERWOOD | 0.0919 |
| **BLUEG** | BLUEG | 0.3837 |
| **TRIMBLE** | TRIMBLE | 0.1230 |
| **CATAWBA** | CATAWBA | 0.0543 |

## 13.3 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41560340** | 200512 | 26LEWISTWN | PENELEC | 200519 | 26REED TAP | PENELEC | 1 | PL_P42_100548 | breaker | 225.0 | 96.72 | 100.63 | DC | 19.54 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200812** | 26ALY HYDR | 0.3760 |
| **200852** | 26WARR RDG | 0.1074 |
| **235003** | AC1-025 E | 0.1809 |
| **236828** | 01GRAYMONT | 0.4655 |
| **290086** | Q-036 E | 2.0611 |
| **293301** | N-039 E | 3.5812 |
| **294515** | O38_P22 | 3.1335 |
| **919491** | AA2-000 | 26.2577 |
| **930511** | AB1-092 | 0.9641 |
| **936421** | AD2-055 | 1.9849 |
| **936991** | AD2-133 C | 0.9275 |
| **936992** | AD2-133 E | 4.2422 |
| **939171** | AE1-147 C | 1.3885 |
| **939172** | AE1-147 E | 0.9257 |
| **940201** | AE2-001 C | 1.3931 |
| **940202** | AE2-001 E | 0.9287 |
| **940681** | AE2-055 C | 1.4624 |
| **940682** | AE2-055 E | 0.9750 |
| **941231** | AE2-117 C | 1.5395 |
| **941232** | AE2-117 E | 1.0263 |
| **941241** | AE2-118 C | 1.5395 |
| **941242** | AE2-118 E | 1.0263 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **0.7308** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **0.4872** |
| **941261** | AE2-120 C | 1.3956 |
| **941262** | AE2-120 E | 0.9304 |
| **941271** | AE2-121 C | 0.7340 |
| **941272** | AE2-121 E | 0.4901 |
| **941321** | AE2-126 C | 0.6666 |
| **941322** | AE2-126 E | 0.4444 |
| **941331** | AE2-129 C | 0.6690 |
| **941332** | AE2-129 E | 0.4460 |
| **941351** | AE2-131 C | 0.6690 |
| **941352** | AE2-131 E | 0.4460 |
| **942351** | AE2-248 C | 1.1468 |
| **942352** | AE2-248 E | 0.7645 |
| **942491** | AE2-262 C | 4.1025 |
| **942492** | AE2-262 E | 2.7569 |
| **942501** | AE2-263 C | 3.8564 |
| **942502** | AE2-263 E | 2.5747 |
| **942511** | AE2-264 C | 5.0630 |
| **942512** | AE2-264 E | 3.3754 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **943751** | AF1-043 | 3.1560 |
| **944001** | AF1-068 C O1 | 1.5383 |
| **944002** | AF1-068 E O1 | 0.8653 |
| **944311** | AF1-099 C | 3.3006 |
| **944312** | AF1-099 E | 2.2004 |
| **944321** | AF1-100 C O1 | 5.6135 |
| **944322** | AF1-100 E O1 | 3.7423 |
| **944471** | AF1-112 C | 1.4258 |
| **944472** | AF1-112 E | 0.9506 |
| **944671** | AF1-132 C O1 | 1.4471 |
| **944672** | AF1-132 E O1 | 0.9647 |
| **944691** | AF1-134 C O1 | 0.2510 |
| **944692** | AF1-134 E O1 | 0.2510 |
| **944701** | AF1-135 C | 0.3012 |
| **944702** | AF1-135 E | 0.2008 |
| **944731** | AF1-138 C O1 | 1.5395 |
| **944732** | AF1-138 E O1 | 1.0263 |
| **944771** | AF1-142 C | 5.2810 |
| **944772** | AF1-142 E | 3.5207 |
| **944841** | AF1-149 C | 1.3958 |
| **944842** | AF1-149 E | 0.9306 |
| **944881** | AF1-153 C O1 | 0.3383 |
| **944882** | AF1-153 E O1 | 0.2255 |
| **944901** | AF1-155 C | 0.3363 |
| **944902** | AF1-155 E | 0.2242 |
| **945071** | AF1-172 C | 4.9350 |
| **945072** | AF1-172 E | 3.2900 |
| **945161** | AF1-181 | 0.0299 |
| **945171** | AF1-182 | 0.1497 |
| **945181** | AF1-183 | 0.0349 |
| **945481** | AF1-213 C | 2.6018 |
| **945482** | AF1-213 E | 1.7345 |
| **945491** | AF1-214 C | 1.3954 |
| **945492** | AF1-214 E | 0.9302 |
| **945551** | AF1-220 C | 2.5011 |
| **945552** | AF1-220 E | 1.6683 |
| **945771** | AF1-242 C | 0.3363 |
| **945772** | AF1-242 E | 0.2242 |
| **946091** | AF1-274 C | 1.4725 |
| **946092** | AF1-274 E | 0.9817 |
| **946312** | AF1-295 BAT | 7.5751 |
| **946421** | AF1-306 C | 1.7269 |
| **946422** | AF1-306 E | 6.9075 |
| **LGEE** | LGEE | 0.0650 |
| **WEC** | WEC | 0.0435 |
| **CBM-W2** | CBM-W2 | 0.5897 |
| **CBM-W1** | CBM-W1 | 2.0892 |
| **TVA** | TVA | 0.0364 |
| **O-066** | O-066 | 1.5456 |
| **CHEOAH** | CHEOAH | 0.0070 |
| **CBM-S1** | CBM-S1 | 0.3578 |
| **G-007** | G-007 | 0.2735 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **MEC** | MEC | 0.1796 |
| **CALDERWOOD** | CALDERWOOD | 0.0050 |
| **CATAWBA** | CATAWBA | 0.0399 |

## 13.4 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41560027** | 200513 | 26LEWISTWN | PENELEC | 208005 | JUNI BU2 | PPL | 1 | AP-P2-3-WP-230-446T | breaker | 624.0 | 112.35 | 123.84 | DC | 71.76 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200665** | 26SHAWVL 3 | 7.7967 |
| **200666** | 26SHAWVL 4 | 7.6716 |
| **200715** | 26SHAWVL 1 | 4.9146 |
| **200722** | 26SHAWVL 2 | 5.0397 |
| **200812** | 26ALY HYDR | 1.1301 |
| **200852** | 26WARR RDG | 0.3229 |
| **200883** | Q-053 E | 6.8957 |
| **200886** | 26ARWF_N39 | 0.4288 |
| **200894** | 26K02 | 9.1554 |
| **200898** | 26AA1-106 | 1.9579 |
| **200905** | 26Q36 | 0.2813 |
| **200913** | 26SHAW-D | 0.2124 |
| **200915** | 26CHSTN_FL | 0.1524 |
| **203034** | 26NA_O38_P22 | 0.3752 |
| **203905** | 26W1-045 C | 0.6853 |
| **235003** | AC1-025 E | 0.6133 |
| **236828** | 01GRAYMONT | 1.5971 |
| **290086** | Q-036 E | 8.0600 |
| **293301** | N-039 E | 12.2874 |
| **293393** | V3-030E | 2.7472 |
| **294515** | O38_P22 | 10.7514 |
| **901242** | W1-045 E OP1 | 1.1181 |
| **919491** | AA2-000 | 117.3103 |
| **930511** | AB1-092 | 4.3073 |
| **936421** | AD2-055 | 8.8679 |
| **936471** | AD2-062 C O1 | 5.0032 |
| **936472** | AD2-062 E O1 | 2.5063 |
| **936991** | AD2-133 C | 3.6270 |
| **936992** | AD2-133 E | 16.5895 |
| **938381** | AE1-071 C | 13.1348 |
| **938382** | AE1-071 E | 8.0374 |
| **939171** | AE1-147 C | 4.7732 |
| **939172** | AE1-147 E | 3.1822 |
| **940201** | AE2-001 C | 4.7834 |
| **940202** | AE2-001 E | 3.1890 |
| **940681** | AE2-055 C | 4.9397 |
| **940682** | AE2-055 E | 3.2931 |
| **941231** | AE2-117 C | 4.6266 |
| **941232** | AE2-117 E | 3.0844 |
| **941241** | AE2-118 C | 4.6266 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **941242** | AE2-118 E | 3.0844 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **3.0438** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **2.0292** |
| **941261** | AE2-120 C | 4.7891 |
| **941262** | AE2-120 E | 3.1927 |
| **941271** | AE2-121 C | 2.5283 |
| **941272** | AE2-121 E | 1.6882 |
| **941321** | AE2-126 C | 2.1067 |
| **941322** | AE2-126 E | 1.4045 |
| **941331** | AE2-129 C | 2.7008 |
| **941332** | AE2-129 E | 1.8006 |
| **941351** | AE2-131 C | 2.7008 |
| **941352** | AE2-131 E | 1.8006 |
| **941421** | AE2-139 C | 5.5361 |
| **941422** | AE2-139 E | 3.6907 |
| **942031** | AE2-215 C | 14.8871 |
| **942032** | AE2-215 E | 9.9247 |
| **942121** | AE2-224 C | 7.2840 |
| **942122** | AE2-224 E | 4.8560 |
| **942351** | AE2-248 C | 3.8996 |
| **942352** | AE2-248 E | 2.5997 |
| **942491** | AE2-262 C | 17.7280 |
| **942492** | AE2-262 E | 11.9132 |
| **942501** | AE2-263 C | 16.6643 |
| **942502** | AE2-263 E | 11.1261 |
| **942511** | AE2-264 C | 15.1296 |
| **942512** | AE2-264 E | 10.0864 |
| **943751** | AF1-043 | 26.6038 |
| **944001** | AF1-068 C O1 | 5.2205 |
| **944002** | AF1-068 E O1 | 2.9365 |
| **944181** | AF1-086 C O1 | 2.8312 |
| **944182** | AF1-086 E O1 | 12.3174 |
| **944311** | AF1-099 C | 26.9111 |
| **944312** | AF1-099 E | 17.9407 |
| **944321** | AF1-100 C O1 | 48.2115 |
| **944322** | AF1-100 E O1 | 32.1410 |
| **944471** | AF1-112 C | 4.8575 |
| **944472** | AF1-112 E | 3.2383 |
| **944671** | AF1-132 C O1 | 4.9052 |
| **944672** | AF1-132 E O1 | 3.2702 |
| **944691** | AF1-134 C O1 | 1.8754 |
| **944692** | AF1-134 E O1 | 1.8754 |
| **944701** | AF1-135 C | 2.2505 |
| **944702** | AF1-135 E | 1.5003 |
| **944731** | AF1-138 C O1 | 4.6266 |
| **944732** | AF1-138 E O1 | 3.0844 |
| **944751** | AF1-140 C | 1.1435 |
| **944752** | AF1-140 E | 0.7623 |
| **944771** | AF1-142 C | 43.0578 |
| **944772** | AF1-142 E | 28.7052 |
| **944841** | AF1-149 C | 4.7897 |
| **944842** | AF1-149 E | 3.1931 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **945071** | AF1-172 C | 42.2760 |
| **945072** | AF1-172 E | 28.1840 |
| **945161** | AF1-181 | 0.2565 |
| **945171** | AF1-182 | 1.2856 |
| **945181** | AF1-183 | 0.2886 |
| **945481** | AF1-213 C | 19.9893 |
| **945482** | AF1-213 E | 13.3262 |
| **945491** | AF1-214 C | 4.7887 |
| **945492** | AF1-214 E | 3.1925 |
| **945551** | AF1-220 C | 11.0811 |
| **945552** | AF1-220 E | 7.3914 |
| **945901** | AF1-255 C | 0.2695 |
| **945902** | AF1-255 E | 0.3722 |
| **946091** | AF1-274 C | 8.1585 |
| **946092** | AF1-274 E | 5.4390 |
| **946241** | AF1-289 C O1 | 1.2428 |
| **946242** | AF1-289 E O1 | 0.8286 |
| **946311** | AF1-295 | 4.9624 |
| **LGEE** | LGEE | 0.5465 |
| **CPLE** | CPLE | 0.3744 |
| **WEC** | WEC | 0.3115 |
| **CBM-W2** | CBM-W2 | 7.4120 |
| **CBM-W1** | CBM-W1 | 12.8478 |
| **TVA** | TVA | 1.1872 |
| **O-066** | O-066 | 18.8832 |
| **CBM-S2** | CBM-S2 | 3.7743 |
| **CBM-S1** | CBM-S1 | 7.3954 |
| **G-007** | G-007 | 2.9432 |
| **MEC** | MEC | 1.5207 |

## 13.5 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41560238** | 200519 | 26REED TAP | PENELEC | 200522 | 26SHADE GP | PENELEC | 1 | PL_P42_100548 | breaker | 225.0 | 100.73 | 104.64 | DC | 19.54 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200812** | 26ALY HYDR | 0.3760 |
| **200852** | 26WARR RDG | 0.1074 |
| **235003** | AC1-025 E | 0.1809 |
| **236828** | 01GRAYMONT | 0.4655 |
| **290086** | Q-036 E | 2.0611 |
| **293301** | N-039 E | 3.5812 |
| **294515** | O38_P22 | 3.1335 |
| **919491** | AA2-000 | 26.2577 |
| **930511** | AB1-092 | 0.9641 |
| **936421** | AD2-055 | 1.9849 |
| **936991** | AD2-133 C | 0.9275 |
| **936992** | AD2-133 E | 4.2422 |
| **939171** | AE1-147 C | 1.3885 |
| **939172** | AE1-147 E | 0.9257 |
| **940201** | AE2-001 C | 1.3931 |
| **940202** | AE2-001 E | 0.9287 |
| **940681** | AE2-055 C | 1.4624 |
| **940682** | AE2-055 E | 0.9750 |
| **941231** | AE2-117 C | 1.5395 |
| **941232** | AE2-117 E | 1.0263 |
| **941241** | AE2-118 C | 1.5395 |
| **941242** | AE2-118 E | 1.0263 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **0.7308** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **0.4872** |
| **941261** | AE2-120 C | 1.3956 |
| **941262** | AE2-120 E | 0.9304 |
| **941271** | AE2-121 C | 0.7340 |
| **941272** | AE2-121 E | 0.4901 |
| **941321** | AE2-126 C | 0.6666 |
| **941322** | AE2-126 E | 0.4444 |
| **941331** | AE2-129 C | 0.6690 |
| **941332** | AE2-129 E | 0.4460 |
| **941351** | AE2-131 C | 0.6690 |
| **941352** | AE2-131 E | 0.4460 |
| **942031** | AE2-215 C | 13.2746 |
| **942032** | AE2-215 E | 8.8498 |
| **942351** | AE2-248 C | 1.1468 |
| **942352** | AE2-248 E | 0.7645 |
| **942491** | AE2-262 C | 4.1025 |
| **942492** | AE2-262 E | 2.7569 |
| **942501** | AE2-263 C | 3.8564 |
| **942502** | AE2-263 E | 2.5747 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **942511** | AE2-264 C | 5.0630 |
| **942512** | AE2-264 E | 3.3754 |
| **943751** | AF1-043 | 3.1560 |
| **944001** | AF1-068 C O1 | 1.5383 |
| **944002** | AF1-068 E O1 | 0.8653 |
| **944311** | AF1-099 C | 3.3006 |
| **944312** | AF1-099 E | 2.2004 |
| **944321** | AF1-100 C O1 | 5.6135 |
| **944322** | AF1-100 E O1 | 3.7423 |
| **944471** | AF1-112 C | 1.4258 |
| **944472** | AF1-112 E | 0.9506 |
| **944671** | AF1-132 C O1 | 1.4471 |
| **944672** | AF1-132 E O1 | 0.9647 |
| **944691** | AF1-134 C O1 | 0.2510 |
| **944692** | AF1-134 E O1 | 0.2510 |
| **944701** | AF1-135 C | 0.3012 |
| **944702** | AF1-135 E | 0.2008 |
| **944731** | AF1-138 C O1 | 1.5395 |
| **944732** | AF1-138 E O1 | 1.0263 |
| **944771** | AF1-142 C | 5.2810 |
| **944772** | AF1-142 E | 3.5207 |
| **944841** | AF1-149 C | 1.3958 |
| **944842** | AF1-149 E | 0.9306 |
| **944881** | AF1-153 C O1 | 0.3383 |
| **944882** | AF1-153 E O1 | 0.2255 |
| **944901** | AF1-155 C | 0.3363 |
| **944902** | AF1-155 E | 0.2242 |
| **945071** | AF1-172 C | 4.9350 |
| **945072** | AF1-172 E | 3.2900 |
| **945161** | AF1-181 | 0.0299 |
| **945171** | AF1-182 | 0.1497 |
| **945181** | AF1-183 | 0.0349 |
| **945481** | AF1-213 C | 2.6018 |
| **945482** | AF1-213 E | 1.7345 |
| **945491** | AF1-214 C | 1.3954 |
| **945492** | AF1-214 E | 0.9302 |
| **945551** | AF1-220 C | 2.5011 |
| **945552** | AF1-220 E | 1.6683 |
| **945771** | AF1-242 C | 0.3363 |
| **945772** | AF1-242 E | 0.2242 |
| **946091** | AF1-274 C | 1.4725 |
| **946092** | AF1-274 E | 0.9817 |
| **946311** | AF1-295 | 4.4249 |
| **946421** | AF1-306 C | 1.7269 |
| **946422** | AF1-306 E | 6.9075 |
| **LGEE** | LGEE | 0.0650 |
| **WEC** | WEC | 0.0435 |
| **CBM-W2** | CBM-W2 | 0.5897 |
| **CBM-W1** | CBM-W1 | 2.0892 |
| **TVA** | TVA | 0.0364 |
| **O-066** | O-066 | 1.5456 |
| **CHEOAH** | CHEOAH | 0.0070 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **CBM-S1** | CBM-S1 | 0.3578 |
| **G-007** | G-007 | 0.2735 |
| **MEC** | MEC | 0.1796 |
| **CALDERWOOD** | CALDERWOOD | 0.0050 |
| **CATAWBA** | CATAWBA | 0.0399 |

## 13.6 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41229340** | 200522 | 26SHADE GP | PENELEC | 938380 | AE1-071 TAP | PENELEC | 1 | PL_P12_100618 | single | 160.0 | 111.4 | 118.72 | DC | 11.71 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200649** | 26PENNTECH | 0.3546 |
| **200665** | 26SHAWVL 3 | 2.0128 |
| **200666** | 26SHAWVL 4 | 1.9806 |
| **200715** | 26SHAWVL 1 | 1.3184 |
| **200722** | 26SHAWVL 2 | 1.3520 |
| **200812** | 26ALY HYDR | 0.3758 |
| **200852** | 26WARR RDG | 0.1074 |
| **200886** | 26ARWF_N39 | 0.1468 |
| **200905** | 26Q36 | 0.0845 |
| **200913** | 26SHAW-D | 0.0599 |
| **203034** | 26NA_O38_P22 | 0.1284 |
| **919491** | AA2-000 | 30.8497 |
| **930511** | AB1-092 | 1.1327 |
| **936421** | AD2-055 | 2.3320 |
| **936991** | AD2-133 C | 1.0894 |
| **939171** | AE1-147 C | 1.3877 |
| **940201** | AE2-001 C | 1.3922 |
| **940681** | AE2-055 C | 1.4616 |
| **941231** | AE2-117 C | 1.5386 |
| **941241** | AE2-118 C | 1.5386 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **0.8587** |
| **941261** | AE2-120 C | 1.3948 |
| **941271** | AE2-121 C | 0.7336 |
| **941321** | AE2-126 C | 0.7831 |
| **941331** | AE2-129 C | 0.7860 |
| **941351** | AE2-131 C | 0.7860 |
| **942031** | AE2-215 C | 13.2754 |
| **942351** | AE2-248 C | 1.1461 |
| **942491** | AE2-262 C | 4.8230 |
| **942501** | AE2-263 C | 4.5336 |
| **942511** | AE2-264 C | 5.0592 |
| **943751** | AF1-043 | 6.9961 |
| **944001** | AF1-068 C O1 | 1.5374 |
| **944311** | AF1-099 C | 7.3213 |
| **944321** | AF1-100 C O1 | 12.4470 |
| **944471** | AF1-112 C | 1.4251 |
| **944671** | AF1-132 C O1 | 1.4462 |
| **944691** | AF1-134 C O1 | 0.5562 |
| **944701** | AF1-135 C | 0.6674 |
| **944731** | AF1-138 C O1 | 1.5386 |
| **944771** | AF1-142 C | 11.7141 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **944841** | AF1-149 C | 1.3950 |
| **944881** | AF1-153 C O1 | 0.7498 |
| **944901** | AF1-155 C | 0.7454 |
| **945071** | AF1-172 C | 10.9410 |
| **945161** | AF1-181 | 0.0662 |
| **945171** | AF1-182 | 0.3319 |
| **945181** | AF1-183 | 0.0774 |
| **945481** | AF1-213 C | 5.7672 |
| **945491** | AF1-214 C | 1.3945 |
| **945551** | AF1-220 C | 5.5437 |
| **945771** | AF1-242 C | 0.7454 |
| **946091** | AF1-274 C | 3.2640 |
| **946311** | AF1-295 | 4.4251 |
| **946421** | AF1-306 C | 3.8280 |
| **LGEE** | LGEE | 0.0633 |
| **WEC** | WEC | 0.0425 |
| **CBM-W2** | CBM-W2 | 0.5651 |
| **CBM-W1** | CBM-W1 | 2.0391 |
| **TVA** | TVA | 0.0336 |
| **CHEOAH** | CHEOAH | 0.0080 |
| **CBM-S1** | CBM-S1 | 0.3408 |
| **MEC** | MEC | 0.1748 |
| **CALDERWOOD** | CALDERWOOD | 0.0060 |
| **CATAWBA** | CATAWBA | 0.0403 |

## 13.7 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **42172020** | 200593 | 26GLADE | PENELEC | 200811 | 26WARREN | PENELEC | 1 | PN-P2-3-PN-345-003A | breaker | 621.0 | 155.31 | 156.94 | DC | 22.64 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200642** | 26SENECA#1 | 11.2398 |
| **200643** | 26SENECA#2 | 10.6153 |
| **200644** | 26SENECA#3 | 1.0612 |
| **200649** | 26PENNTECH | 1.0703 |
| **200665** | 26SHAWVL 3 | 2.9713 |
| **200666** | 26SHAWVL 4 | 2.9187 |
| **200894** | 26K02 | 3.9122 |
| **200898** | 26AA1-106 | 1.2431 |
| **235003** | AC1-025 E | 0.1202 |
| **236828** | 01GRAYMONT | 0.3311 |
| **290086** | Q-036 E | 2.7363 |
| **915952** | Y3-092 NFTWR | 143.9500 |
| **916202** | Z1-069 E | 5.4537 |
| **919491** | AA2-000 | 41.4133 |
| **922932** | AB1-082 OP | 2.9396 |
| **923443** | AB1-160 E | 1.5582 |
| **923821** | AB2-019 FTWR | 4.0306 |
| **930511** | AB1-092 | 1.5206 |
| **936421** | AD2-055 | 3.1306 |
| **936991** | AD2-133 C | 1.2313 |
| **936992** | AD2-133 E | 5.6320 |
| **939171** | AE1-147 C | 0.9983 |
| **939172** | AE1-147 E | 0.6655 |
| **940201** | AE2-001 C | 0.9954 |
| **940202** | AE2-001 E | 0.6636 |
| **940681** | AE2-055 C | 0.9525 |
| **940682** | AE2-055 E | 0.6350 |
| **940861** | AE2-074 C | 2.2320 |
| **940862** | AE2-074 E | 2.9382 |
| **941191** | AE2-113 C | 11.0858 |
| **941192** | AE2-113 E | 11.9359 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **1.1559** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **0.7706** |
| **941261** | AE2-120 C | 0.9939 |
| **941262** | AE2-120 E | 0.6626 |
| **941271** | AE2-121 C | 0.5334 |
| **941272** | AE2-121 E | 0.3561 |
| **941321** | AE2-126 C | 1.7676 |
| **941322** | AE2-126 E | 1.1784 |
| **941331** | AE2-129 C | 0.9711 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **941332** | AE2-129 E | 0.6474 |
| **941351** | AE2-131 C | 0.9711 |
| **941352** | AE2-131 E | 0.6474 |
| **942351** | AE2-248 C | 0.7763 |
| **942352** | AE2-248 E | 0.5176 |
| **942491** | AE2-262 C | 4.7536 |
| **942492** | AE2-262 E | 3.1944 |
| **942501** | AE2-263 C | 4.4684 |
| **942502** | AE2-263 E | 2.9834 |
| **942813** | AE2-299 BAT | 29.7008 |
| **942961** | AE2-316 C | 3.6176 |
| **942962** | AE2-316 E | 5.1587 |
| **943751** | AF1-043 | 4.9776 |
| **944001** | AF1-068 C O1 | 0.5456 |
| **944002** | AF1-068 E O1 | 0.3069 |
| **944311** | AF1-099 C | 3.8245 |
| **944312** | AF1-099 E | 2.5497 |
| **944321** | AF1-100 C O1 | 18.3420 |
| **944322** | AF1-100 E O1 | 12.2280 |
| **944382** | AF1-103 BAT | 10.7388 |
| **944392** | AF1-104 BAT | 3.0956 |
| **944471** | AF1-112 C | 0.5168 |
| **944472** | AF1-112 E | 0.3445 |
| **944671** | AF1-132 C O1 | 0.5098 |
| **944672** | AF1-132 E O1 | 0.3399 |
| **944691** | AF1-134 C O1 | 0.3673 |
| **944692** | AF1-134 E O1 | 0.3673 |
| **944701** | AF1-135 C | 0.4408 |
| **944702** | AF1-135 E | 0.2939 |
| **944771** | AF1-142 C | 6.1192 |
| **944772** | AF1-142 E | 4.0794 |
| **944841** | AF1-149 C | 0.9938 |
| **944842** | AF1-149 E | 0.6625 |
| **944881** | AF1-153 C O1 | 1.6386 |
| **944882** | AF1-153 E O1 | 1.0924 |
| **944901** | AF1-155 C | 1.6288 |
| **944902** | AF1-155 E | 1.0858 |
| **945071** | AF1-172 C | 7.6042 |
| **945072** | AF1-172 E | 5.0695 |
| **945161** | AF1-181 | 0.0978 |
| **945171** | AF1-182 | 0.4891 |
| **945181** | AF1-183 | 0.0531 |
| **945331** | AF1-198 | 0.0858 |
| **945481** | AF1-213 C | 3.9764 |
| **945482** | AF1-213 E | 2.6509 |
| **945491** | AF1-214 C | 0.5268 |
| **945492** | AF1-214 E | 0.3512 |
| **945551** | AF1-220 C | 15.5337 |
| **945552** | AF1-220 E | 10.3615 |
| **945771** | AF1-242 C | 1.6288 |
| **945772** | AF1-242 E | 1.0858 |
| **946091** | AF1-274 C | 7.8581 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **946092** | AF1-274 E | 5.2387 |
| **946131** | AF1-278 | 42.0788 |
| **946381** | AF1-302 C | 0.8373 |
| **946382** | AF1-302 E | 1.1163 |
| **946421** | AF1-306 C | 9.4557 |
| **946422** | AF1-306 E | 37.8230 |
| **DUCKCREEK** | DUCKCREEK | 1.5845 |
| **NEWTON** | NEWTON | 1.4216 |
| **FARMERCITY** | FARMERCITY | 0.0731 |
| **G-007A** | G-007A | 3.6418 |
| **VFT** | VFT | 9.9330 |
| **PRAIRIE** | PRAIRIE | 3.3088 |
| **COFFEEN** | COFFEEN | 0.7034 |
| **EDWARDS** | EDWARDS | 0.4854 |
| **CHEOAH** | CHEOAH | 0.5090 |
| **TILTON** | TILTON | 0.8625 |
| **MADISON** | MADISON | 0.0444 |
| **GIBSON** | GIBSON | 0.7240 |
| **CALDERWOOD** | CALDERWOOD | 0.5089 |
| **BLUEG** | BLUEG | 2.2672 |
| **TRIMBLE** | TRIMBLE | 0.7285 |
| **CATAWBA** | CATAWBA | 0.2835 |

## 13.8 Index 8

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **49507716** | 200599 | 26ERIE W | PENELEC | 238547 | 02AT | ATSI | 1 | Base Case | single | 1560.0 | 106.48 | 107.03 | DC | 19.08 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200608** | 26PINEY #1 | 1.0365 |
| **200642** | 26SENECA#1 | 9.8431 |
| **200643** | 26SENECA#2 | 9.2963 |
| **200644** | 26SENECA#3 | 0.9293 |
| **200649** | 26PENNTECH | 1.2689 |
| **200662** | 26SCRUB GR | 4.0539 |
| 200805 | **26COLVER13 (Deativation : 09/01/20)** | **12.9404** |
| **200828** | 26HNSMLK 1 | 2.7282 |
| **200829** | 26HNSMLK 2 | 2.7282 |
| **200830** | 26HNSMLK 3 | 2.7282 |
| **200831** | 26HNSMLK 4 | 2.7282 |
| **200832** | 26HNSMLK 5 | 2.7282 |
| **200849** | 26LAKVU GN | 0.3599 |
| **200898** | 26AA1-106 | 2.5433 |
| **201144** | W3-099 C OP1 | 6.4428 |
| **201201** | 26WRREN CT | 2.8418 |
| **201477** | 26Y2-055 | 10.3498 |
| **203910** | 26Z1-091 | 2.3793 |
| **915951** | Y3-092 FTIR | 588.3200 |
| **919201** | AA1-144 OP | 19.2529 |
| **919491** | AA2-000 | 63.2750 |
| **920341** | AA2-132 | 2.5685 |
| **922932** | AB1-082 OP | 4.2204 |
| **930511** | AB1-092 | 2.3233 |
| **935191** | AD1-154 | 3.2292 |
| **936421** | AD2-055 | 4.7832 |
| **936991** | AD2-133 C | 2.1296 |
| **938951** | AE1-123 | 4.1434 |
| **939171** | AE1-147 C | 1.4423 |
| **939291** | AE1-160 C | 4.6863 |
| **939381** | AE1-169 C O1 | 18.2141 |
| **940201** | AE2-001 C | 1.4391 |
| **940861** | AE2-074 C | 3.2045 |
| **941191** | AE2-113 C | 13.8465 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **1.6880** |
| **941261** | AE2-120 C | 1.4374 |
| **941271** | AE2-121 C | 0.7697 |
| **941321** | AE2-126 C | 1.9350 |
| **941331** | AE2-129 C | 1.5399 |
| **941351** | AE2-131 C | 1.5399 |
| **941421** | AE2-139 C | 7.2982 |
| **942351** | AE2-248 C | 1.1288 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **942491** | AE2-262 C | 6.6768 |
| **942501** | AE2-263 C | 6.2761 |
| **942811** | AE2-299 C | 15.7184 |
| **942961** | AE2-316 C | 6.6875 |
| **943151** | AE2-344 C | 35.4183 |
| **943351** | AF1-006 C | 6.7809 |
| **943751** | AF1-043 | 7.6053 |
| **943871** | AF1-055 C O1 | 17.5857 |
| **944001** | AF1-068 C O1 | 0.7943 |
| **944181** | AF1-086 C O1 | 1.3393 |
| **944261** | AF1-094 C | 5.4823 |
| **944281** | AF1-096 C | 4.4280 |
| **944301** | AF1-098 C | 22.9061 |
| **944311** | AF1-099 C | 5.3717 |
| **944321** | AF1-100 C O1 | 11.3938 |
| **944381** | AF1-103 O1 | 7.1436 |
| **944391** | AF1-104 O1 | 11.2794 |
| **944411** | AF1-106 O1 | 1.4398 |
| **944471** | AF1-112 C | 0.7506 |
| **944671** | AF1-132 C O1 | 0.7428 |
| **944691** | AF1-134 C O1 | 0.6922 |
| **944701** | AF1-135 C | 0.8307 |
| **944741** | AF1-139 C O1 | 0.8209 |
| **944771** | AF1-142 C | 8.5947 |
| **944841** | AF1-149 C | 1.4372 |
| **944881** | AF1-153 C O1 | 1.0525 |
| **944901** | AF1-155 C | 1.0529 |
| **945021** | AF1-167 C | 0.7979 |
| **945051** | AF1-170 C | 24.9728 |
| **945071** | AF1-172 C | 11.1039 |
| **945121** | AF1-177 | 1.7859 |
| **945161** | AF1-181 | 0.0608 |
| **945171** | AF1-182 | 0.3038 |
| **945181** | AF1-183 | 0.0753 |
| **945331** | AF1-198 | 0.1826 |
| **945451** | AF1-210 C | 0.7391 |
| **945481** | AF1-213 C | 6.5400 |
| **945491** | AF1-214 C | 0.7619 |
| **945551** | AF1-220 C | 18.7806 |
| **945751** | AF1-240 C O1 | 1.0269 |
| **945771** | AF1-242 C | 1.0529 |
| **946091** | AF1-274 C | 4.4697 |
| **946131** | AF1-278 | 47.4740 |
| **946211** | AF1-286 C O1 | 0.5831 |
| **946221** | AF1-287 C | 6.0526 |
| **946381** | AF1-302 C | 1.5478 |
| **946401** | AF1-304 C | 21.0258 |
| **946421** | AF1-306 C | 5.2606 |
| **946771** | AF1-217 C O1 | 6.0526 |
| **DUCKCREEK** | DUCKCREEK | 3.9681 |
| **NEWTON** | NEWTON | 3.5437 |
| **FARMERCITY** | FARMERCITY | 0.1822 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **G-007A** | G-007A | 8.9475 |
| **VFT** | VFT | 24.3810 |
| **PRAIRIE** | PRAIRIE | 8.2294 |
| **COFFEEN** | COFFEEN | 1.7546 |
| **EDWARDS** | EDWARDS | 1.2166 |
| **CHEOAH** | CHEOAH | 1.2397 |
| **TILTON** | TILTON | 2.1565 |
| **MADISON** | MADISON | 0.0907 |
| **GIBSON** | GIBSON | 1.8040 |
| **CALDERWOOD** | CALDERWOOD | 1.2405 |
| **BLUEG** | BLUEG | 5.6368 |
| **TRIMBLE** | TRIMBLE | 1.8103 |
| **CATAWBA** | CATAWBA | 0.6755 |

## 13.9 Index 9

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41229309** | 200674 | 26TOWANDA | PENELEC | 200677 | 26NO MESHO | PENELEC | 1 | PN-P1-2-PN-230-013A | single | 202.0 | 128.43 | 131.47 | DC | 6.13 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200649** | 26PENNTECH | 0.3018 |
| **200665** | 26SHAWVL 3 | 1.2430 |
| **200666** | 26SHAWVL 4 | 1.2132 |
| **200887** | 26ARMNA MT | 0.4796 |
| **200898** | 26AA1-106 | 3.3133 |
| **200949** | 26X1-109 | 21.2878 |
| **203261** | 26BLOSSBCT | 0.3948 |
| **203283** | 26MANOR_T86 | 0.0421 |
| **203349** | 26Z1-069 C | 0.2024 |
| **203350** | 26MILZ1-092 | 0.4868 |
| **203351** | 26GROZ1-110 | 0.4625 |
| **203352** | 26CANZ2-011 | 0.4625 |
| **919201** | AA1-144 OP | 32.0050 |
| **919491** | AA2-000 | 44.7721 |
| **920351** | AA2-133 | 0.1861 |
| **922932** | AB1-082 OP | 1.6286 |
| **923442** | AB1-160 C | 0.0578 |
| **930511** | AB1-092 | 1.6439 |
| **934801** | AD1-108 | 0.0349 |
| **934811** | AD1-109 | 0.0256 |
| **935061** | AD1-142 | 0.0269 |
| **936421** | AD2-055 | 3.3845 |
| **940861** | AE2-074 C | 1.2366 |
| **941191** | AE2-113 C | 3.4868 |
| **941421** | AE2-139 C | 10.9402 |
| **942491** | AE2-262 C | 2.5255 |
| **942501** | AE2-263 C | 2.3740 |
| **943751** | AF1-043 | 10.1535 |
| **944311** | AF1-099 C | 3.8337 |
| **944321** | AF1-100 C O1 | 7.6245 |
| **944411** | AF1-106 O1 | 3.5054 |
| **944771** | AF1-142 C | 6.1339 |
| **945071** | AF1-172 C | 12.0300 |
| **945161** | AF1-181 | 0.0409 |
| **945171** | AF1-182 | 0.2033 |
| **945331** | AF1-198 | 0.3721 |
| **946131** | AF1-278 | 9.9041 |
| **946211** | AF1-286 C O1 | 1.4197 |
| **LGEE** | LGEE | 0.3041 |
| **CPLE** | CPLE | 0.2117 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **WEC** | WEC | 0.1739 |
| **CBM-W2** | CBM-W2 | 4.1359 |
| **CBM-W1** | CBM-W1 | 7.2058 |
| **TVA** | TVA | 0.6622 |
| **CBM-S2** | CBM-S2 | 2.1155 |
| **CBM-S1** | CBM-S1 | 4.1237 |
| **MEC** | MEC | 0.8485 |

## 13.10 Index 10

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **42463029** | 200675 | 26E.TWANDA | PENELEC | 200924 | 26CANYON | PENELEC | 1 | Base Case | single | 515.0 | 107.68 | 109.96 | DC | 11.78 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200642** | 26SENECA#1 | 2.7894 |
| **200643** | 26SENECA#2 | 2.6344 |
| **200649** | 26PENNTECH | 0.5618 |
| **200665** | 26SHAWVL 3 | 2.3763 |
| **200666** | 26SHAWVL 4 | 2.3188 |
| **200715** | 26SHAWVL 1 | 1.5716 |
| **200722** | 26SHAWVL 2 | 1.6043 |
| **200887** | 26ARMNA MT | 0.6693 |
| **200898** | 26AA1-106 | 6.0058 |
| **200913** | 26SHAW-D | 0.0723 |
| **200949** | 26X1-109 | 42.4561 |
| **201477** | 26Y2-055 | 1.9054 |
| **203261** | 26BLOSSBCT | 0.6572 |
| **203283** | 26MANOR_T86 | 0.0501 |
| **203349** | 26Z1-069 C | 0.3211 |
| **203350** | 26MILZ1-092 | 0.7063 |
| **203351** | 26GROZ1-110 | 0.8383 |
| **203352** | 26CANZ2-011 | 0.8383 |
| **919201** | AA1-144 OP | 63.7835 |
| **919491** | AA2-000 | 87.5163 |
| **920351** | AA2-133 | 0.3184 |
| **922932** | AB1-082 OP | 2.7054 |
| **923442** | AB1-160 C | 0.0917 |
| **930511** | AB1-092 | 3.2133 |
| **934801** | AD1-108 | 0.0632 |
| **934811** | AD1-109 | 0.0463 |
| **935061** | AD1-142 | 0.0390 |
| **936421** | AD2-055 | 6.6157 |
| **939171** | AE1-147 C | 0.8133 |
| **940201** | AE2-001 C | 0.8099 |
| **940681** | AE2-055 C | 0.7569 |
| **940861** | AE2-074 C | 2.0542 |
| **941191** | AE2-113 C | 6.3051 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **1.0362** |
| **941261** | AE2-120 C | 0.8079 |
| **941271** | AE2-121 C | 0.4356 |
| **941321** | AE2-126 C | 1.0838 |
| **941331** | AE2-129 C | 0.7609 |
| **941351** | AE2-131 C | 0.7609 |
| **941421** | AE2-139 C | 21.7122 |
| **942351** | AE2-248 C | 0.6232 |
| **942491** | AE2-262 C | 4.8485 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **942501** | AE2-263 C | 4.5576 |
| **942961** | AE2-316 C | 2.5479 |
| **943751** | AF1-043 | 19.8471 |
| **944001** | AF1-068 C O1 | 0.4366 |
| **944311** | AF1-099 C | 7.3600 |
| **944321** | AF1-100 C O1 | 14.5725 |
| **944381** | AF1-103 O1 | 0.6960 |
| **944411** | AF1-106 O1 | 5.0856 |
| **944471** | AF1-112 C | 0.4159 |
| **944671** | AF1-132 C O1 | 0.4073 |
| **944771** | AF1-142 C | 11.7760 |
| **944841** | AF1-149 C | 0.8077 |
| **944881** | AF1-153 C O1 | 1.0640 |
| **944901** | AF1-155 C | 1.0591 |
| **945071** | AF1-172 C | 23.3955 |
| **945121** | AF1-177 | 0.1740 |
| **945161** | AF1-181 | 0.0782 |
| **945171** | AF1-182 | 0.3886 |
| **945181** | AF1-183 | 0.0923 |
| **945331** | AF1-198 | 0.6195 |
| **945481** | AF1-213 C | 3.1726 |
| **945491** | AF1-214 C | 0.4283 |
| **945551** | AF1-220 C | 8.4685 |
| **945771** | AF1-242 C | 1.0591 |
| **946091** | AF1-274 C | 4.6466 |
| **946131** | AF1-278 | 17.9548 |
| **946211** | AF1-286 C O1 | 2.0597 |
| **946381** | AF1-302 C | 0.5897 |
| **946421** | AF1-306 C | 5.4706 |
| **LGEE** | LGEE | 0.5414 |
| **CPLE** | CPLE | 0.3698 |
| **WEC** | WEC | 0.3100 |
| **CBM-W2** | CBM-W2 | 7.3546 |
| **CBM-W1** | CBM-W1 | 12.8728 |
| **TVA** | TVA | 1.1746 |
| **CBM-S2** | CBM-S2 | 3.7223 |
| **CBM-S1** | CBM-S1 | 7.3187 |
| **MEC** | MEC | 1.5111 |

## 13.11 Index 11

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41812916** | 200713 | 26ROCKTON | PENELEC | 200712 | 26DUBOIS | PENELEC | 1 | AP-P2-2-WP-230-001T | bus | 190.0 | 107.01 | 111.31 | DC | 18.12 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200665** | 26SHAWVL 3 | 2.7651 |
| **200666** | 26SHAWVL 4 | 2.7179 |
| **200715** | 26SHAWVL 1 | 2.4750 |
| **200722** | 26SHAWVL 2 | 2.5383 |
| **200905** | 26Q36 | 0.1493 |
| **200913** | 26SHAW-D | 0.1506 |
| **235003** | AC1-025 E | 0.0984 |
| **236828** | 01GRAYMONT | 0.2698 |
| **290086** | Q-036 E | 4.2796 |
| **919491** | AA2-000 | 28.5639 |
| **930511** | AB1-092 | 1.0488 |
| **936421** | AD2-055 | 2.1593 |
| **936991** | AD2-133 C | 1.9258 |
| **936992** | AD2-133 E | 8.8085 |
| **939171** | AE1-147 C | 0.8128 |
| **939172** | AE1-147 E | 0.5419 |
| **940201** | AE2-001 C | 0.8108 |
| **940202** | AE2-001 E | 0.5405 |
| **940681** | AE2-055 C | 0.7805 |
| **940682** | AE2-055 E | 0.5203 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **2.1564** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **1.4376** |
| **941261** | AE2-120 C | 0.8098 |
| **941262** | AE2-120 E | 0.5399 |
| **941271** | AE2-121 C | 0.4340 |
| **941272** | AE2-121 E | 0.2898 |
| **941331** | AE2-129 C | 1.6717 |
| **941332** | AE2-129 E | 1.1145 |
| **941351** | AE2-131 C | 1.6717 |
| **941352** | AE2-131 E | 1.1145 |
| **942351** | AE2-248 C | 0.6345 |
| **942352** | AE2-248 E | 0.4230 |
| **942491** | AE2-262 C | 3.8054 |
| **942492** | AE2-262 E | 2.5573 |
| **942501** | AE2-263 C | 3.5771 |
| **942502** | AE2-263 E | 2.3883 |
| **943751** | AF1-043 | 3.4332 |
| **944001** | AF1-068 C O1 | 0.4463 |
| **944002** | AF1-068 E O1 | 0.2510 |
| **944181** | AF1-086 C O1 | 0.6200 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **944182** | AF1-086 E O1 | 2.6972 |
| **944311** | AF1-099 C | 3.0616 |
| **944312** | AF1-099 E | 2.0411 |
| **944321** | AF1-100 C O1 | 17.0805 |
| **944322** | AF1-100 E O1 | 11.3870 |
| **944382** | AF1-103 BAT | 1.3802 |
| **944471** | AF1-112 C | 0.4222 |
| **944472** | AF1-112 E | 0.2814 |
| **944671** | AF1-132 C O1 | 0.4172 |
| **944672** | AF1-132 E O1 | 0.2782 |
| **944691** | AF1-134 C O1 | 1.1545 |
| **944692** | AF1-134 E O1 | 1.1545 |
| **944701** | AF1-135 C | 1.3854 |
| **944702** | AF1-135 E | 0.9236 |
| **944771** | AF1-142 C | 4.8986 |
| **944772** | AF1-142 E | 3.2657 |
| **944841** | AF1-149 C | 0.8097 |
| **944842** | AF1-149 E | 0.5398 |
| **945071** | AF1-172 C | 5.6013 |
| **945072** | AF1-172 E | 3.7342 |
| **945161** | AF1-181 | 0.0910 |
| **945171** | AF1-182 | 0.4555 |
| **945181** | AF1-183 | 0.1453 |
| **945481** | AF1-213 C | 13.3514 |
| **945482** | AF1-213 E | 8.9009 |
| **945491** | AF1-214 C | 0.4292 |
| **945492** | AF1-214 E | 0.2861 |
| **946423** | AF1-306 BAT | 38.2075 |
| **DUCKCREEK** | DUCKCREEK | 0.3362 |
| **NEWTON** | NEWTON | 0.3030 |
| **FARMERCITY** | FARMERCITY | 0.0155 |
| **G-007A** | G-007A | 1.1196 |
| **VFT** | VFT | 3.0315 |
| **NY** | NY | 0.0481 |
| **PRAIRIE** | PRAIRIE | 0.7052 |
| **COFFEEN** | COFFEEN | 0.1496 |
| **EDWARDS** | EDWARDS | 0.1029 |
| **CHEOAH** | CHEOAH | 0.1086 |
| **TILTON** | TILTON | 0.1833 |
| **MADISON** | MADISON | 0.0181 |
| **GIBSON** | GIBSON | 0.1551 |
| **CALDERWOOD** | CALDERWOOD | 0.1088 |
| **BLUEG** | BLUEG | 0.4878 |
| **TRIMBLE** | TRIMBLE | 0.1564 |
| **CATAWBA** | CATAWBA | 0.0595 |

## 13.12 Index 12

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41560332** | 200714 | 26SHAWVL 1 | PENELEC | 200713 | 26ROCKTON | PENELEC | 1 | AP-P2-3-WP-230-446T | breaker | 190.0 | 108.75 | 113.05 | DC | 18.12 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200665** | 26SHAWVL 3 | 2.7651 |
| **200666** | 26SHAWVL 4 | 2.7179 |
| **200715** | 26SHAWVL 1 | 2.4750 |
| **200722** | 26SHAWVL 2 | 2.5383 |
| **200905** | 26Q36 | 0.1493 |
| **200913** | 26SHAW-D | 0.1506 |
| **235003** | AC1-025 E | 0.0984 |
| **236828** | 01GRAYMONT | 0.2698 |
| **290086** | Q-036 E | 4.2796 |
| **919491** | AA2-000 | 28.5639 |
| **930511** | AB1-092 | 1.0488 |
| **936421** | AD2-055 | 2.1593 |
| **936991** | AD2-133 C | 1.9258 |
| **936992** | AD2-133 E | 8.8085 |
| **939171** | AE1-147 C | 0.8128 |
| **939172** | AE1-147 E | 0.5419 |
| **940201** | AE2-001 C | 0.8108 |
| **940202** | AE2-001 E | 0.5405 |
| **940681** | AE2-055 C | 0.7805 |
| **940682** | AE2-055 E | 0.5203 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **2.1564** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **1.4376** |
| **941261** | AE2-120 C | 0.8098 |
| **941262** | AE2-120 E | 0.5399 |
| **941271** | AE2-121 C | 0.4340 |
| **941272** | AE2-121 E | 0.2898 |
| **941331** | AE2-129 C | 1.6717 |
| **941332** | AE2-129 E | 1.1145 |
| **941351** | AE2-131 C | 1.6717 |
| **941352** | AE2-131 E | 1.1145 |
| **942351** | AE2-248 C | 0.6345 |
| **942352** | AE2-248 E | 0.4230 |
| **942491** | AE2-262 C | 3.8054 |
| **942492** | AE2-262 E | 2.5573 |
| **942501** | AE2-263 C | 3.5771 |
| **942502** | AE2-263 E | 2.3883 |
| **943751** | AF1-043 | 3.4332 |
| **944001** | AF1-068 C O1 | 0.4463 |
| **944002** | AF1-068 E O1 | 0.2510 |
| **944181** | AF1-086 C O1 | 0.6200 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **944182** | AF1-086 E O1 | 2.6972 |
| **944311** | AF1-099 C | 3.0616 |
| **944312** | AF1-099 E | 2.0411 |
| **944321** | AF1-100 C O1 | 17.0805 |
| **944322** | AF1-100 E O1 | 11.3870 |
| **944382** | AF1-103 BAT | 1.3802 |
| **944471** | AF1-112 C | 0.4222 |
| **944472** | AF1-112 E | 0.2814 |
| **944671** | AF1-132 C O1 | 0.4172 |
| **944672** | AF1-132 E O1 | 0.2782 |
| **944691** | AF1-134 C O1 | 1.1545 |
| **944692** | AF1-134 E O1 | 1.1545 |
| **944701** | AF1-135 C | 1.3854 |
| **944702** | AF1-135 E | 0.9236 |
| **944771** | AF1-142 C | 4.8986 |
| **944772** | AF1-142 E | 3.2657 |
| **944841** | AF1-149 C | 0.8097 |
| **944842** | AF1-149 E | 0.5398 |
| **945071** | AF1-172 C | 5.6013 |
| **945072** | AF1-172 E | 3.7342 |
| **945161** | AF1-181 | 0.0910 |
| **945171** | AF1-182 | 0.4555 |
| **945181** | AF1-183 | 0.1453 |
| **945481** | AF1-213 C | 13.3514 |
| **945482** | AF1-213 E | 8.9009 |
| **945491** | AF1-214 C | 0.4292 |
| **945492** | AF1-214 E | 0.2861 |
| **946423** | AF1-306 BAT | 38.2075 |
| **DUCKCREEK** | DUCKCREEK | 0.3362 |
| **NEWTON** | NEWTON | 0.3030 |
| **FARMERCITY** | FARMERCITY | 0.0155 |
| **G-007A** | G-007A | 1.1196 |
| **VFT** | VFT | 3.0315 |
| **NY** | NY | 0.0481 |
| **PRAIRIE** | PRAIRIE | 0.7052 |
| **COFFEEN** | COFFEEN | 0.1496 |
| **EDWARDS** | EDWARDS | 0.1029 |
| **CHEOAH** | CHEOAH | 0.1086 |
| **TILTON** | TILTON | 0.1833 |
| **MADISON** | MADISON | 0.0181 |
| **GIBSON** | GIBSON | 0.1551 |
| **CALDERWOOD** | CALDERWOOD | 0.1088 |
| **BLUEG** | BLUEG | 0.4878 |
| **TRIMBLE** | TRIMBLE | 0.1564 |
| **CATAWBA** | CATAWBA | 0.0595 |

## 13.13 Index 13

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41812721** | 200714 | 26SHAWVL 1 | PENELEC | 999394 | STAR599 | PENELEC | 1A | PN-P2-2-PN-230-014T | bus | 126.0 | 119.95 | 124.53 | DC | 5.77 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200722** | 26SHAWVL 2 | 5.5954 |
| 200805 | **26COLVER13 (Deativation : 09/01/20)** | **5.3622** |
| **200883** | Q-053 E | 2.8740 |
| **200905** | 26Q36 | 0.2661 |
| **200913** | 26SHAW-D | 0.2690 |
| **235007** | AC1-025 BAT | 0.0869 |
| **236828** | 01GRAYMONT | -0.2139 |
| **290086** | Q-036 E | 7.6260 |
| **293393** | V3-030E | 1.6446 |
| **936991** | AD2-133 C | 3.4317 |
| **936992** | AD2-133 E | 15.6962 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **3.8524** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **2.5682** |
| **941321** | AE2-126 C | 2.0305 |
| **941322** | AE2-126 E | 1.3537 |
| **941331** | AE2-129 C | 2.9881 |
| **941332** | AE2-129 E | 1.9921 |
| **941351** | AE2-131 C | 2.9881 |
| **941352** | AE2-131 E | 1.9921 |
| **944181** | AF1-086 C O1 | 2.6632 |
| **944182** | AF1-086 E O1 | 11.5864 |
| **944313** | AF1-099 BAT | 3.6183 |
| **944321** | AF1-100 C O1 | 48.0690 |
| **944322** | AF1-100 E O1 | 32.0460 |
| **944691** | AF1-134 C O1 | 2.1188 |
| **944692** | AF1-134 E O1 | 2.1188 |
| **944701** | AF1-135 C | 2.5426 |
| **944702** | AF1-135 E | 1.6950 |
| **944773** | AF1-142 BAT | 5.7720 |
| **944841** | AF1-149 C | -0.6423 |
| **944842** | AF1-149 E | -0.4282 |
| **945481** | AF1-213 C | 24.1098 |
| **945482** | AF1-213 E | 16.0732 |
| **945551** | AF1-220 C | 2.6438 |
| **945552** | AF1-220 E | 1.7635 |
| **946091** | AF1-274 C | 7.0819 |
| **946092** | AF1-274 E | 4.7212 |
| **LGEE** | LGEE | 0.0685 |
| **CPLE** | CPLE | 0.0549 |
| **WEC** | WEC | 0.0381 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **CBM-W2** | CBM-W2 | 0.9419 |
| **NY** | NY | 0.3069 |
| **CBM-W1** | CBM-W1 | 1.5262 |
| **TVA** | TVA | 0.1540 |
| **O-066** | O-066 | 2.0429 |
| **CBM-S2** | CBM-S2 | 0.5260 |
| **CBM-S1** | CBM-S1 | 0.9542 |
| **G-007** | G-007 | 0.3026 |
| **MEC** | MEC | 0.1891 |

## 13.14 Index 14

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41560129** | 200716 | 26PHILIPSB | PENELEC | 200904 | 26EAGL VAL | PENELEC | 1 | AP-P2-3-WP-230-460T | breaker | 174.0 | 100.15 | 104.92 | DC | 18.38 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200665** | 26SHAWVL 3 | 2.5587 |
| **200666** | 26SHAWVL 4 | 2.5143 |
| **200715** | 26SHAWVL 1 | 2.2640 |
| **200722** | 26SHAWVL 2 | 2.3277 |
| **200913** | 26SHAW-D | 0.1367 |
| **235003** | AC1-025 E | 0.1151 |
| **236828** | 01GRAYMONT | 0.3073 |
| **919491** | AA2-000 | 28.4615 |
| **930511** | AB1-092 | 1.0450 |
| **936421** | AD2-055 | 2.1515 |
| **939171** | AE1-147 C | 0.9222 |
| **939172** | AE1-147 E | 0.6148 |
| **940201** | AE2-001 C | 0.9221 |
| **940202** | AE2-001 E | 0.6147 |
| **940681** | AE2-055 C | 0.9209 |
| **940682** | AE2-055 E | 0.6139 |
| **941191** | AE2-113 C | 2.9356 |
| **941192** | AE2-113 E | 3.1607 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **1.9622** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **1.3082** |
| **941261** | AE2-120 C | 0.9220 |
| **941262** | AE2-120 E | 0.6147 |
| **941271** | AE2-121 C | 0.4903 |
| **941272** | AE2-121 E | 0.3274 |
| **941321** | AE2-126 C | 1.4376 |
| **941322** | AE2-126 E | 0.9584 |
| **941331** | AE2-129 C | 4.2830 |
| **941332** | AE2-129 E | 2.8554 |
| **941351** | AE2-131 C | 4.2830 |
| **941352** | AE2-131 E | 2.8554 |
| **942351** | AE2-248 C | 0.7371 |
| **942352** | AE2-248 E | 0.4914 |
| **942491** | AE2-262 C | 3.8594 |
| **942492** | AE2-262 E | 2.5935 |
| **942501** | AE2-263 C | 3.6279 |
| **942502** | AE2-263 E | 2.4222 |
| **943751** | AF1-043 | 3.4209 |
| **944001** | AF1-068 C O1 | 0.5208 |
| **944002** | AF1-068 E O1 | 0.2929 |
| **944181** | AF1-086 C O1 | 0.4680 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **944182** | AF1-086 E O1 | 2.0362 |
| **944311** | AF1-099 C | 3.1051 |
| **944312** | AF1-099 E | 2.0700 |
| **944321** | AF1-100 C O1 | 15.8010 |
| **944322** | AF1-100 E O1 | 10.5340 |
| **944471** | AF1-112 C | 0.4884 |
| **944472** | AF1-112 E | 0.3256 |
| **944671** | AF1-132 C O1 | 0.4882 |
| **944672** | AF1-132 E O1 | 0.3254 |
| **944691** | AF1-134 C O1 | 0.4457 |
| **944692** | AF1-134 E O1 | 0.4457 |
| **944701** | AF1-135 C | 0.5349 |
| **944702** | AF1-135 E | 0.3566 |
| **944771** | AF1-142 C | 4.9681 |
| **944772** | AF1-142 E | 3.3121 |
| **944841** | AF1-149 C | 0.9220 |
| **944842** | AF1-149 E | 0.6147 |
| **944881** | AF1-153 C O1 | 0.3830 |
| **944882** | AF1-153 E O1 | 0.2553 |
| **944901** | AF1-155 C | 0.3801 |
| **944902** | AF1-155 E | 0.2534 |
| **945071** | AF1-172 C | 5.4202 |
| **945072** | AF1-172 E | 3.6135 |
| **945161** | AF1-181 | 0.0842 |
| **945171** | AF1-182 | 0.4214 |
| **945181** | AF1-183 | 0.1329 |
| **945481** | AF1-213 C | 11.8413 |
| **945482** | AF1-213 E | 7.8942 |
| **945491** | AF1-214 C | 0.4887 |
| **945492** | AF1-214 E | 0.3258 |
| **945551** | AF1-220 C | 3.6843 |
| **945552** | AF1-220 E | 2.4575 |
| **945771** | AF1-242 C | 0.3801 |
| **945772** | AF1-242 E | 0.2534 |
| **946091** | AF1-274 C | 5.6671 |
| **946092** | AF1-274 E | 3.7781 |
| **946421** | AF1-306 C | 2.0140 |
| **946422** | AF1-306 E | 8.0561 |
| **DUCKCREEK** | DUCKCREEK | 0.0046 |
| **NEWTON** | NEWTON | 0.0097 |
| **FARMERCITY** | FARMERCITY | 0.0006 |
| **CBM-W1** | CBM-W1 | 0.1126 |
| **PRAIRIE** | PRAIRIE | 0.0310 |
| **O-066** | O-066 | 0.3091 |
| **COFFEEN** | COFFEEN | 0.0042 |
| **EDWARDS** | EDWARDS | 0.0010 |
| **CHEOAH** | CHEOAH | 0.0175 |
| **TILTON** | TILTON | 0.0031 |
| **G-007** | G-007 | 0.0634 |
| **GIBSON** | GIBSON | 0.0044 |
| **CALDERWOOD** | CALDERWOOD | 0.0169 |
| **BLUEG** | BLUEG | 0.0174 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **TRIMBLE** | TRIMBLE | 0.0056 |
| **CATAWBA** | CATAWBA | 0.0182 |

## 13.15 Index 15

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41229286** | 200726 | 26SHAWVL 2 | PENELEC | 235248 | 01SHINGL | AP | 1 | AP-P1-2-WP-230-005B | single | 554.0 | 106.71 | 111.76 | DC | 29.05 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200642** | 26SENECA#1 | 3.6203 |
| **200643** | 26SENECA#2 | 3.4192 |
| **200644** | 26SENECA#3 | 0.3418 |
| **200649** | 26PENNTECH | 1.0374 |
| **200665** | 26SHAWVL 3 | 6.7845 |
| **200666** | 26SHAWVL 4 | 6.7293 |
| **200715** | 26SHAWVL 1 | 4.2656 |
| **200722** | 26SHAWVL 2 | 4.3937 |
| **200898** | 26AA1-106 | 1.8413 |
| **200905** | 26Q36 | 0.1735 |
| **200913** | 26SHAW-D | 0.1837 |
| **201201** | 26WRREN CT | 0.7527 |
| **201477** | 26Y2-055 | 2.7463 |
| **203261** | 26BLOSSBCT | 0.1992 |
| **203349** | 26Z1-069 C | 0.1377 |
| **203351** | 26GROZ1-110 | 0.2570 |
| **203352** | 26CANZ2-011 | 0.2570 |
| **919201** | AA1-144 OP | 11.2160 |
| **919491** | AA2-000 | 88.6275 |
| **922932** | AB1-082 OP | 1.6941 |
| **923442** | AB1-160 C | 0.0393 |
| **930511** | AB1-092 | 3.2541 |
| **934801** | AD1-108 | 0.0194 |
| **934811** | AD1-109 | 0.0142 |
| **936421** | AD2-055 | 6.6997 |
| **936991** | AD2-133 C | 2.2378 |
| **940861** | AE2-074 C | 1.2863 |
| **941191** | AE2-113 C | 8.1706 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **2.6318** |
| **941321** | AE2-126 C | 2.3491 |
| **941331** | AE2-129 C | 2.0046 |
| **941351** | AE2-131 C | 2.0046 |
| **941421** | AE2-139 C | 5.2304 |
| **942491** | AE2-262 C | 11.9610 |
| **942501** | AE2-263 C | 11.2433 |
| **942961** | AE2-316 C | 5.5239 |
| **943751** | AF1-043 | 20.0991 |
| **944181** | AF1-086 C O1 | 1.9969 |
| **944311** | AF1-099 C | 18.1568 |
| **944321** | AF1-100 C O1 | 42.2895 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **944381** | AF1-103 O1 | 1.8922 |
| **944691** | AF1-134 C O1 | 1.4964 |
| **944701** | AF1-135 C | 1.7957 |
| **944771** | AF1-142 C | 29.0509 |
| **944841** | AF1-149 C | -3.8741 |
| **944881** | AF1-153 C O1 | 2.2325 |
| **944901** | AF1-155 C | 2.2165 |
| **945071** | AF1-172 C | 31.7880 |
| **945121** | AF1-177 | 0.4730 |
| **945161** | AF1-181 | 0.2232 |
| **945171** | AF1-182 | 1.1277 |
| **945181** | AF1-183 | 0.2505 |
| **945331** | AF1-198 | 0.1877 |
| **945481** | AF1-213 C | 16.6977 |
| **945551** | AF1-220 C | 16.3363 |
| **945771** | AF1-242 C | 2.2165 |
| **946091** | AF1-274 C | 9.7435 |
| **946131** | AF1-278 | 16.8004 |
| **946381** | AF1-302 C | 2.4122 |
| **946421** | AF1-306 C | 11.5240 |
| **LGEE** | LGEE | 0.2305 |
| **CPLE** | CPLE | 0.0370 |
| **WEC** | WEC | 0.1380 |
| **CBM-W2** | CBM-W2 | 2.9320 |
| **CBM-W1** | CBM-W1 | 6.0173 |
| **TVA** | TVA | 0.4270 |
| **CBM-S2** | CBM-S2 | 0.7572 |
| **CBM-S1** | CBM-S1 | 2.7520 |
| **MEC** | MEC | 0.6467 |

## 13.16 Index 16

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **42171936** | 200767 | 26HOMER CT | PENELEC | 200795 | 26SHELOCTA | PENELEC | 1 | PN_P4-500-002F | breaker | 917.0 | 146.63 | 148.12 | DC | 29.77 |

| Bus # | Bus | MW Impact |
|---|---|---|
| 200503 | **26C.SLOPE (Deativation : 06/07/19)** | **28.9164** |
| **200794** | 26CONEMAGH | 0.4629 |
| 200805 | **26COLVER13 (Deativation : 09/01/20)** | **14.5103** |
| **200809** | 26SITHE | 2.2348 |
| **200823** | 26MHP_X3-003 | 1.9016 |
| **200833** | 26SEWRDB34 | 27.2507 |
| **200834** | 26SW_E13_K22 | 0.0724 |
| **200835** | 26DSGENWIN | 0.3532 |
| **200837** | 26HOMER C1 | 38.4884 |
| **200838** | 26HOMER C2 | 32.0070 |
| **200839** | 26HOMER C3 | 33.8836 |
| **200846** | 26FORWARD | 0.2587 |
| **200864** | K-013 E | 7.4126 |
| **200883** | Q-053 E | 13.4971 |
| **200886** | 26ARWF_N39 | 0.6904 |
| **200888** | 26HIGHLAND | 0.5687 |
| **200889** | 26STNY CRK | 0.4333 |
| **200890** | 26BF_G21_K23 | 0.1732 |
| **200891** | 26CSLMN_L13 | 0.2717 |
| **200892** | 26LOOKOUT | 0.2581 |
| **200894** | 26K02 | 7.0234 |
| **200898** | 26AA1-106 | 2.6973 |
| **200905** | 26Q36 | 0.3168 |
| **200915** | 26CHSTN_FL | 0.2983 |
| **200925** | 26R32 | 0.6562 |
| **201144** | W3-099 C OP1 | 1.4662 |
| **201477** | 26Y2-055 | 4.1676 |
| **202225** | 26SCI_S29B | 0.1127 |
| **203034** | 26NA_O38_P22 | 0.6041 |
| **203909** | 26Z1-038 | 1.8767 |
| **203910** | 26Z1-091 | 2.4569 |
| **203999** | P-047 E | 12.9768 |
| **235003** | AC1-025 E | 0.1729 |
| **236828** | 01GRAYMONT | 0.4680 |
| **290086** | Q-036 E | 9.0772 |
| **292350** | K-023 | 8.0052 |
| **292542** | L-013 1 | 7.7862 |
| **293301** | N-039 E | 19.7843 |
| **293393** | V3-030E | 5.3060 |
| **293432** | R-040 E | 0.4380 |
| **293603** | O-018 E | 16.2963 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **293902** | O-048 E | 7.0076 |
| **294515** | O38_P22 | 17.3113 |
| **294573** | P-028 E | 11.4097 |
| **294903** | P-060 E | 12.4160 |
| **296332** | R-032 E | 18.8034 |
| **903644** | W3-099 E OP1 | 9.8124 |
| **913142** | Y1-033 E OP1 | 5.4199 |
| **915951** | Y3-092 FTIR | 107.9900 |
| **916202** | Z1-069 E | 10.3402 |
| **917672** | Z2-108 E | 4.3798 |
| **918682** | AA1-082 E | 6.9637 |
| **919201** | AA1-144 OP | 19.7891 |
| **919491** | AA2-000 | 59.5323 |
| **920341** | AA2-132 | 2.7294 |
| **922932** | AB1-082 OP | 3.7512 |
| **923443** | AB1-160 E | 2.9544 |
| **930511** | AB1-092 | 2.1859 |
| **935191** | AD1-154 | 2.5503 |
| **936421** | AD2-055 | 4.5003 |
| **936991** | AD2-133 C | 4.0847 |
| **936992** | AD2-133 E | 18.6831 |
| **938351** | AE1-053 | 2.4332 |
| **938881** | AE1-116 | 1.2972 |
| **938951** | AE1-123 | 2.2336 |
| **938991** | AE1-128 C | 21.9514 |
| **938992** | AE1-128 E | 14.6342 |
| **939171** | AE1-147 C | 1.4073 |
| **939172** | AE1-147 E | 0.9382 |
| **939291** | AE1-160 C | 1.5320 |
| **939292** | AE1-160 E | 0.8806 |
| **939381** | AE1-169 C O1 | 6.2038 |
| **939382** | AE1-169 E O1 | 4.1359 |
| **940201** | AE2-001 C | 1.4055 |
| **940202** | AE2-001 E | 0.9370 |
| **940681** | AE2-055 C | 1.3775 |
| **940682** | AE2-055 E | 0.9183 |
| **940861** | AE2-074 C | 2.8483 |
| **940862** | AE2-074 E | 3.7494 |
| **941191** | AE2-113 C | 10.9112 |
| **941192** | AE2-113 E | 11.7479 |
| **941231** | AE2-117 C | 1.9816 |
| **941232** | AE2-117 E | 1.3210 |
| **941241** | AE2-118 C | 1.9816 |
| **941242** | AE2-118 E | 1.3210 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **1.7524** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **1.1682** |
| **941261** | AE2-120 C | 1.4044 |
| **941262** | AE2-120 E | 0.9363 |
| **941271** | AE2-121 C | 0.7499 |
| **941272** | AE2-121 E | 0.5007 |
| **941321** | AE2-126 C | 1.7879 |
| **941322** | AE2-126 E | 1.1919 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **941331** | AE2-129 C | 2.0624 |
| **941332** | AE2-129 E | 1.3750 |
| **941351** | AE2-131 C | 2.0624 |
| **941352** | AE2-131 E | 1.3750 |
| **941421** | AE2-139 C | 7.4089 |
| **941422** | AE2-139 E | 4.9393 |
| **942121** | AE2-224 C | 21.1962 |
| **942122** | AE2-224 E | 14.1308 |
| **942351** | AE2-248 C | 1.1113 |
| **942352** | AE2-248 E | 0.7409 |
| **942361** | AE2-249 C | 2.4695 |
| **942362** | AE2-249 E | 1.6464 |
| **942491** | AE2-262 C | 6.2505 |
| **942492** | AE2-262 E | 4.2003 |
| **942501** | AE2-263 C | 5.8754 |
| **942502** | AE2-263 E | 3.9228 |
| **942511** | AE2-264 C | 11.2229 |
| **942512** | AE2-264 E | 7.4819 |
| **942811** | AE2-299 C | 3.6451 |
| **942812** | AE2-299 E | 14.5803 |
| **942961** | AE2-316 C | 5.6956 |
| **942962** | AE2-316 E | 8.1220 |
| **943151** | AE2-344 C | 7.6841 |
| **943152** | AE2-344 E | 5.1228 |
| **943351** | AF1-006 C | 0.7075 |
| **943352** | AF1-006 E | 0.3980 |
| **943711** | AF1-039 C O1 | 0.7599 |
| **943712** | AF1-039 E O1 | 0.5066 |
| **943751** | AF1-043 | 7.1554 |
| **943871** | AF1-055 C O1 | 2.9015 |
| **943872** | AF1-055 E O1 | 1.9343 |
| **944001** | AF1-068 C O1 | 0.7834 |
| **944002** | AF1-068 E O1 | 0.4406 |
| **944181** | AF1-086 C O1 | 1.5310 |
| **944182** | AF1-086 E O1 | 6.6609 |
| **944261** | AF1-094 C | 0.7197 |
| **944262** | AF1-094 E | 0.4798 |
| **944281** | AF1-096 C | 0.7672 |
| **944282** | AF1-096 E | 0.5115 |
| **944301** | AF1-098 C | 2.9545 |
| **944302** | AF1-098 E | 1.9697 |
| **944311** | AF1-099 C | 5.0288 |
| **944312** | AF1-099 E | 3.3525 |
| **944321** | AF1-100 C O1 | 10.5721 |
| **944322** | AF1-100 E O1 | 7.0481 |
| **944381** | AF1-103 O1 | 1.5226 |
| **944391** | AF1-104 O1 | 1.0293 |
| **944411** | AF1-106 O1 | 1.5776 |
| **944471** | AF1-112 C | 0.7379 |
| **944472** | AF1-112 E | 0.4919 |
| **944671** | AF1-132 C O1 | 0.7333 |
| **944672** | AF1-132 E O1 | 0.4889 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **944691** | AF1-134 C O1 | 0.7576 |
| **944692** | AF1-134 E O1 | 0.7576 |
| **944701** | AF1-135 C | 0.9091 |
| **944702** | AF1-135 E | 0.6061 |
| **944731** | AF1-138 C O1 | 1.0502 |
| **944732** | AF1-138 E O1 | 0.7001 |
| **944741** | AF1-139 C O1 | 0.8723 |
| **944742** | AF1-139 E O1 | 0.5815 |
| **944751** | AF1-140 C | 2.9287 |
| **944752** | AF1-140 E | 1.9525 |
| **944771** | AF1-142 C | 8.0460 |
| **944772** | AF1-142 E | 5.3640 |
| **944781** | AF1-143 C | 14.5992 |
| **944782** | AF1-143 E | 9.7328 |
| **944841** | AF1-149 C | 1.4043 |
| **944842** | AF1-149 E | 0.9362 |
| **944881** | AF1-153 C O1 | 0.8674 |
| **944882** | AF1-153 E O1 | 0.5783 |
| **944901** | AF1-155 C | 0.8670 |
| **944902** | AF1-155 E | 0.5780 |
| **945021** | AF1-167 C | 0.5944 |
| **945022** | AF1-167 E | 0.3963 |
| **945051** | AF1-170 C | 2.5442 |
| **945052** | AF1-170 E | 1.6961 |
| **945071** | AF1-172 C | 10.3025 |
| **945072** | AF1-172 E | 6.8683 |
| **945121** | AF1-177 | 0.3806 |
| **945161** | AF1-181 | 0.0564 |
| **945171** | AF1-182 | 0.2819 |
| **945181** | AF1-183 | 0.0738 |
| **945331** | AF1-198 | 0.2114 |
| **945451** | AF1-210 C | 0.5540 |
| **945452** | AF1-210 E | 0.3694 |
| **945481** | AF1-213 C | 6.9713 |
| **945482** | AF1-213 E | 4.6475 |
| **945491** | AF1-214 C | 0.7444 |
| **945492** | AF1-214 E | 0.4963 |
| **945551** | AF1-220 C | 7.2853 |
| **945552** | AF1-220 E | 4.8595 |
| **945671** | AF1-232 C O1 | 30.5604 |
| **945672** | AF1-232 E O1 | 16.4556 |
| **945751** | AF1-240 C O1 | 0.8110 |
| **945752** | AF1-240 E O1 | 0.5407 |
| **945771** | AF1-242 C | 0.8670 |
| **945772** | AF1-242 E | 0.5780 |
| **945901** | AF1-255 C | 1.7168 |
| **945902** | AF1-255 E | 2.3708 |
| **946081** | AF1-273 C O1 | 17.6310 |
| **946082** | AF1-273 E O1 | 11.7540 |
| **946091** | AF1-274 C | 4.0432 |
| **946092** | AF1-274 E | 2.6955 |
| **946131** | AF1-278 | 42.0132 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **946191** | AF1-284 C O1 | 0.7890 |
| **946192** | AF1-284 E O1 | 0.4734 |
| **946211** | AF1-286 C O1 | 0.6389 |
| **946212** | AF1-286 E O1 | 0.4338 |
| **946221** | AF1-287 C | 0.7027 |
| **946222** | AF1-287 E | 0.4684 |
| **946241** | AF1-289 C O1 | 7.2007 |
| **946242** | AF1-289 E O1 | 4.8005 |
| **946381** | AF1-302 C | 1.3182 |
| **946382** | AF1-302 E | 1.7576 |
| **946401** | AF1-304 C | 3.8864 |
| **946402** | AF1-304 E | 2.5909 |
| **946421** | AF1-306 C | 4.2972 |
| **946422** | AF1-306 E | 17.1887 |
| **946431** | AF1-307 C | 12.0207 |
| **946432** | AF1-307 E | 8.0138 |
| **946571** | AF1-321 C O1 | 3.8779 |
| **946572** | AF1-321 E O1 | 2.5853 |
| **946771** | AF1-217 C O1 | 0.7027 |
| **946772** | AF1-217 E O1 | 0.4684 |
| **DUCKCREEK** | DUCKCREEK | 0.7128 |
| **NEWTON** | NEWTON | 0.7049 |
| **FARMERCITY** | FARMERCITY | 0.0370 |
| **PRAIRIE** | PRAIRIE | 1.7487 |
| **O-066** | O-066 | 1.6733 |
| **COFFEEN** | COFFEEN | 0.3430 |
| **EDWARDS** | EDWARDS | 0.2142 |
| **CHEOAH** | CHEOAH | 0.4109 |
| **TILTON** | TILTON | 0.3956 |
| **G-007** | G-007 | 0.3588 |
| **MADISON** | MADISON | 0.0202 |
| **GIBSON** | GIBSON | 0.3593 |
| **CALDERWOOD** | CALDERWOOD | 0.4065 |
| **BLUEG** | BLUEG | 1.1735 |
| **TRIMBLE** | TRIMBLE | 0.3756 |
| **CATAWBA** | CATAWBA | 0.3206 |

## 13.17 Index 17

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **42172159** | 200769 | 26HOMER CY | PENELEC | 999392 | STAR601 | PENELEC | N | PN-P2-3-PN-230-9E | breaker | 807.0 | 125.46 | 126.4 | DC | 16.47 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200823** | 26MHP_X3-003 | 2.2695 |
| **200830** | 26HNSMLK 3 | 1.8760 |
| **200831** | 26HNSMLK 4 | 1.8760 |
| **200832** | 26HNSMLK 5 | 1.8760 |
| **200838** | 26HOMER C2 | 45.1077 |
| **200839** | 26HOMER C3 | 47.7524 |
| **200894** | 26K02 | 6.9091 |
| **200898** | 26AA1-106 | 3.0352 |
| **201144** | W3-099 C OP1 | 1.8313 |
| **201477** | 26Y2-055 | 4.7720 |
| **203349** | 26Z1-069 C | 0.4984 |
| **203907** | 26Y2-042 | 1.4811 |
| **203909** | 26Z1-038 | 2.2372 |
| **203910** | 26Z1-091 | 3.0422 |
| **203999** | P-047 E | 16.3426 |
| **294573** | P-028 E | 13.6170 |
| **903644** | W3-099 E OP1 | 12.2557 |
| **915951** | Y3-092 FTIR | 139.8800 |
| **916202** | Z1-069 E | 15.2211 |
| **917672** | Z2-108 E | -1.9186 |
| **917673** | Z2-108 BAT | 2.2572 |
| **918682** | AA1-082 E | 8.2095 |
| **919201** | AA1-144 OP | 23.0963 |
| **919491** | AA2-000 | 46.7537 |
| **920341** | AA2-132 | 3.4204 |
| **922932** | AB1-082 OP | 5.4301 |
| **923442** | AB1-160 C | 0.1424 |
| **923443** | AB1-160 E | 4.3489 |
| **930511** | AB1-092 | 1.7167 |
| **936421** | AD2-055 | 3.5343 |
| **938352** | AE1-053 BAT | 1.2540 |
| **938882** | AE1-116 BAT | 1.3081 |
| **938951** | AE1-123 | 1.9587 |
| **939291** | AE1-160 C | 1.6593 |
| **939292** | AE1-160 E | 0.9538 |
| **939381** | AE1-169 C O1 | 6.6451 |
| **939382** | AE1-169 E O1 | 4.4301 |
| **940861** | AE2-074 C | 4.1231 |
| **940862** | AE2-074 E | 5.4274 |
| **941191** | AE2-113 C | 11.7440 |
| **941192** | AE2-113 E | 12.6445 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **941321** | AE2-126 C | 1.1333 |
| **941322** | AE2-126 E | 0.7555 |
| **941421** | AE2-139 C | 8.2218 |
| **941422** | AE2-139 E | 5.4812 |
| **942491** | AE2-262 C | 3.4582 |
| **942492** | AE2-262 E | 2.3239 |
| **942501** | AE2-263 C | 3.2507 |
| **942502** | AE2-263 E | 2.1704 |
| **942811** | AE2-299 C | 4.5557 |
| **942812** | AE2-299 E | 18.2229 |
| **942961** | AE2-316 C | 5.6140 |
| **942962** | AE2-316 E | 8.0056 |
| **943151** | AE2-344 C | 9.6181 |
| **943152** | AE2-344 E | 6.4121 |
| **943351** | AF1-006 C | 0.8869 |
| **943352** | AF1-006 E | 0.4989 |
| **943751** | AF1-043 | 5.6195 |
| **943871** | AF1-055 C O1 | 3.6302 |
| **943872** | AF1-055 E O1 | 2.4201 |
| **944261** | AF1-094 C | 0.8477 |
| **944262** | AF1-094 E | 0.5651 |
| **944281** | AF1-096 C | 0.8310 |
| **944282** | AF1-096 E | 0.5540 |
| **944301** | AF1-098 C | 3.5963 |
| **944302** | AF1-098 E | 2.3975 |
| **944311** | AF1-099 C | 2.7823 |
| **944312** | AF1-099 E | 1.8549 |
| **944321** | AF1-100 C O1 | 6.0959 |
| **944322** | AF1-100 E O1 | 4.0640 |
| **944381** | AF1-103 O1 | 1.7437 |
| **944391** | AF1-104 O1 | 1.3164 |
| **944411** | AF1-106 O1 | 1.9691 |
| **944741** | AF1-139 C O1 | 1.0931 |
| **944742** | AF1-139 E O1 | 0.7288 |
| **944771** | AF1-142 C | 4.4516 |
| **944772** | AF1-142 E | 2.9678 |
| **944881** | AF1-153 C O1 | 0.7105 |
| **944882** | AF1-153 E O1 | 0.4736 |
| **944901** | AF1-155 C | 0.7125 |
| **944902** | AF1-155 E | 0.4750 |
| **945021** | AF1-167 C | 0.6319 |
| **945022** | AF1-167 E | 0.4212 |
| **945051** | AF1-170 C | 3.2227 |
| **945052** | AF1-170 E | 2.1485 |
| **945071** | AF1-172 C | 7.4637 |
| **945072** | AF1-172 E | 4.9758 |
| **945121** | AF1-177 | 0.4359 |
| **945161** | AF1-181 | 0.0326 |
| **945171** | AF1-182 | 0.1626 |
| **945331** | AF1-198 | 0.2584 |
| **945451** | AF1-210 C | 0.6033 |
| **945452** | AF1-210 E | 0.4022 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **945551** | AF1-220 C | 5.8816 |
| **945552** | AF1-220 E | 3.9232 |
| **945673** | AF1-232 BAT | 2.9052 |
| **945771** | AF1-242 C | 0.7125 |
| **945772** | AF1-242 E | 0.4750 |
| **946091** | AF1-274 C | 2.7681 |
| **946092** | AF1-274 E | 1.8454 |
| **946131** | AF1-278 | 51.5931 |
| **946211** | AF1-286 C O1 | 0.7975 |
| **946212** | AF1-286 E O1 | 0.5415 |
| **946221** | AF1-287 C | 0.8792 |
| **946222** | AF1-287 E | 0.5861 |
| **946381** | AF1-302 C | 1.2993 |
| **946382** | AF1-302 E | 1.7324 |
| **946401** | AF1-304 C | 4.1369 |
| **946402** | AF1-304 E | 2.7580 |
| **946421** | AF1-306 C | 3.4691 |
| **946422** | AF1-306 E | 13.8766 |
| **946771** | AF1-217 C O1 | 0.8792 |
| **946772** | AF1-217 E O1 | 0.5861 |
| **LGEE** | LGEE | 0.0217 |
| **WEC** | WEC | 0.0454 |
| **CBM-W1** | CBM-W1 | 3.6654 |
| **O-066** | O-066 | 4.6435 |
| **CHEOAH** | CHEOAH | 0.1211 |
| **G-007** | G-007 | 0.8382 |
| **MEC** | MEC | 0.1208 |
| **CALDERWOOD** | CALDERWOOD | 0.1168 |
| **CATAWBA** | CATAWBA | 0.1551 |

## 13.18 Index 18

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **42171946** | 200795 | 26SHELOCTA | PENELEC | 200810 | 26KEYSTONE | PENELEC | 1 | PN_P4-500-002A | breaker | 917.0 | 126.19 | 127.84 | DC | 33.11 |

| Bus # | Bus | MW Impact |
|---|---|---|
| 200503 | **26C.SLOPE (Deativation : 06/07/19)** | **32.5076** |
| **200636** | 26IUP CO-G | 0.6752 |
| **200794** | 26CONEMAGH | 0.5468 |
| 200805 | **26COLVER13 (Deativation : 09/01/20)** | **34.8876** |
| **200809** | 26SITHE | 2.1598 |
| **200833** | 26SEWRDB34 | 28.3096 |
| **200834** | 26SW_E13_K22 | 0.0787 |
| **200835** | 26DSGENWIN | 0.3844 |
| **200837** | 26HOMER C1 | 37.1972 |
| **200838** | 26HOMER C2 | 31.2734 |
| **200839** | 26HOMER C3 | 33.1070 |
| **200846** | 26FORWARD | 0.2807 |
| **200864** | K-013 E | 8.0446 |
| **200883** | Q-053 E | 15.1296 |
| **200886** | 26ARWF_N39 | 0.7144 |
| **200888** | 26HIGHLAND | 0.6259 |
| **200889** | 26STNY CRK | 0.4725 |
| **200890** | 26BF_G21_K23 | 0.1885 |
| **200891** | 26CSLMN_L13 | 0.2957 |
| **200892** | 26LOOKOUT | 0.2809 |
| **200894** | 26K02 | 7.3804 |
| **200898** | 26AA1-106 | 2.7668 |
| **200915** | 26CHSTN_FL | 0.3344 |
| **200925** | 26R32 | 0.7222 |
| **200945** | 26CT_V3-030 | 0.2375 |
| **201144** | W3-099 C OP1 | 1.5476 |
| **201477** | 26Y2-055 | 4.3870 |
| **202158** | 26CON.GEN1 | 0.1133 |
| **202160** | 26CON.GEN2 | 0.0848 |
| **202225** | 26SCI_S29B | 0.1224 |
| **203034** | 26NA_O38_P22 | 0.6251 |
| **203910** | 26Z1-091 | 2.4645 |
| **203999** | P-047 E | 13.0226 |
| **235003** | AC1-025 E | 0.1912 |
| **236828** | 01GRAYMONT | 0.5180 |
| **290086** | Q-036 E | 8.8754 |
| **292350** | K-023 | 8.7126 |
| **292542** | L-013 1 | 8.4742 |
| **293301** | N-039 E | 20.4723 |
| **293393** | V3-030E | 8.9704 |
| **293432** | R-040 E | 0.4052 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **293603** | O-018 E | 17.9374 |
| **293902** | O-048 E | 7.6268 |
| **294515** | O38_P22 | 17.9133 |
| **294903** | P-060 E | 13.5395 |
| **296332** | R-032 E | 20.6970 |
| **903644** | W3-099 E OP1 | 10.3567 |
| **913142** | Y1-033 E OP1 | 5.9219 |
| **916202** | Z1-069 E | 10.4453 |
| **917672** | Z2-108 E | 4.0517 |
| **918682** | AA1-082 E | 7.0566 |
| **919201** | AA1-144 OP | 20.0981 |
| **919491** | AA2-000 | 64.8177 |
| **920341** | AA2-132 | 2.7367 |
| **922932** | AB1-082 OP | 3.8155 |
| **923443** | AB1-160 E | 2.9844 |
| **930511** | AB1-092 | 2.3799 |
| **935191** | AD1-154 | 4.1854 |
| **936421** | AD2-055 | 4.8998 |
| **936991** | AD2-133 C | 3.9939 |
| **936992** | AD2-133 E | 18.2677 |
| **938351** | AE1-053 | 2.2510 |
| **938881** | AE1-116 | 1.4089 |
| **938951** | AE1-123 | 2.9191 |
| **938991** | AE1-128 C | 24.0523 |
| **938992** | AE1-128 E | 16.0349 |
| **939171** | AE1-147 C | 1.5578 |
| **939172** | AE1-147 E | 1.0386 |
| **939291** | AE1-160 C | 1.8016 |
| **939292** | AE1-160 E | 1.0356 |
| **939381** | AE1-169 C O1 | 7.3470 |
| **939382** | AE1-169 E O1 | 4.8980 |
| **940201** | AE2-001 C | 1.5556 |
| **940202** | AE2-001 E | 1.0371 |
| **940681** | AE2-055 C | 1.5221 |
| **940682** | AE2-055 E | 1.0148 |
| **940861** | AE2-074 C | 2.8971 |
| **940862** | AE2-074 E | 3.8136 |
| **941191** | AE2-113 C | 11.4763 |
| **941192** | AE2-113 E | 12.3563 |
| **941231** | AE2-117 C | 2.0808 |
| **941232** | AE2-117 E | 1.3872 |
| **941241** | AE2-118 C | 2.0808 |
| **941242** | AE2-118 E | 1.3872 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **2.1153** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **1.4102** |
| **941261** | AE2-120 C | 1.5544 |
| **941262** | AE2-120 E | 1.0363 |
| **941271** | AE2-121 C | 0.8303 |
| **941272** | AE2-121 E | 0.5544 |
| **941321** | AE2-126 C | 2.0539 |
| **941322** | AE2-126 E | 1.3692 |
| **941331** | AE2-129 C | 2.4166 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **941332** | AE2-129 E | 1.6111 |
| **941351** | AE2-131 C | 2.4166 |
| **941352** | AE2-131 E | 1.6111 |
| **941421** | AE2-139 C | 7.6068 |
| **941422** | AE2-139 E | 5.0712 |
| **942121** | AE2-224 C | 21.8082 |
| **942122** | AE2-224 E | 14.5388 |
| **942351** | AE2-248 C | 1.2289 |
| **942352** | AE2-248 E | 0.8193 |
| **942361** | AE2-249 C | 2.7059 |
| **942362** | AE2-249 E | 1.8039 |
| **942491** | AE2-262 C | 6.9530 |
| **942492** | AE2-262 E | 4.6724 |
| **942501** | AE2-263 C | 6.5358 |
| **942502** | AE2-263 E | 4.3637 |
| **942511** | AE2-264 C | 9.9878 |
| **942512** | AE2-264 E | 6.6586 |
| **942811** | AE2-299 C | 3.8423 |
| **942812** | AE2-299 E | 15.3691 |
| **942961** | AE2-316 C | 6.2990 |
| **942962** | AE2-316 E | 8.9823 |
| **943151** | AE2-344 C | 8.2183 |
| **943152** | AE2-344 E | 5.4789 |
| **943351** | AF1-006 C | 0.7537 |
| **943352** | AF1-006 E | 0.4239 |
| **943711** | AF1-039 C O1 | 0.8303 |
| **943712** | AF1-039 E O1 | 0.5535 |
| **943751** | AF1-043 | 7.7907 |
| **943871** | AF1-055 C O1 | 3.1386 |
| **943872** | AF1-055 E O1 | 2.0924 |
| **944001** | AF1-068 C O1 | 0.8661 |
| **944002** | AF1-068 E O1 | 0.4872 |
| **944181** | AF1-086 C O1 | 5.9075 |
| **944182** | AF1-086 E O1 | 25.7008 |
| **944261** | AF1-094 C | 0.7983 |
| **944262** | AF1-094 E | 0.5322 |
| **944281** | AF1-096 C | 0.9022 |
| **944282** | AF1-096 E | 0.6015 |
| **944301** | AF1-098 C | 3.1348 |
| **944302** | AF1-098 E | 2.0899 |
| **944311** | AF1-099 C | 5.5940 |
| **944312** | AF1-099 E | 3.7293 |
| **944321** | AF1-100 C O1 | 11.9824 |
| **944322** | AF1-100 E O1 | 7.9883 |
| **944381** | AF1-103 O1 | 1.6028 |
| **944391** | AF1-104 O1 | 1.0955 |
| **944411** | AF1-106 O1 | 1.5856 |
| **944471** | AF1-112 C | 0.8161 |
| **944472** | AF1-112 E | 0.5441 |
| **944671** | AF1-132 C O1 | 0.8107 |
| **944672** | AF1-132 E O1 | 0.5405 |
| **944691** | AF1-134 C O1 | 1.1405 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **944692** | AF1-134 E O1 | 1.1405 |
| **944701** | AF1-135 C | 1.3686 |
| **944702** | AF1-135 E | 0.9124 |
| **944731** | AF1-138 C O1 | 1.1028 |
| **944732** | AF1-138 E O1 | 0.7352 |
| **944741** | AF1-139 C O1 | 0.8746 |
| **944742** | AF1-139 E O1 | 0.5831 |
| **944751** | AF1-140 C | 3.2443 |
| **944752** | AF1-140 E | 2.1629 |
| **944771** | AF1-142 C | 8.9503 |
| **944772** | AF1-142 E | 5.9669 |
| **944781** | AF1-143 C | 15.8892 |
| **944782** | AF1-143 E | 10.5928 |
| **944841** | AF1-149 C | 1.5543 |
| **944842** | AF1-149 E | 1.0362 |
| **944881** | AF1-153 C O1 | 0.9693 |
| **944882** | AF1-153 E O1 | 0.6462 |
| **944901** | AF1-155 C | 0.9691 |
| **944902** | AF1-155 E | 0.6461 |
| **945021** | AF1-167 C | 0.7104 |
| **945022** | AF1-167 E | 0.4736 |
| **945051** | AF1-170 C | 2.7153 |
| **945052** | AF1-170 E | 1.8102 |
| **945071** | AF1-172 C | 11.3364 |
| **945072** | AF1-172 E | 7.5576 |
| **945121** | AF1-177 | 0.4007 |
| **945161** | AF1-181 | 0.0639 |
| **945171** | AF1-182 | 0.3195 |
| **945181** | AF1-183 | 0.0864 |
| **945331** | AF1-198 | 0.2136 |
| **945451** | AF1-210 C | 0.6626 |
| **945452** | AF1-210 E | 0.4418 |
| **945481** | AF1-213 C | 9.4791 |
| **945482** | AF1-213 E | 6.3194 |
| **945491** | AF1-214 C | 0.8239 |
| **945492** | AF1-214 E | 0.5492 |
| **945551** | AF1-220 C | 8.0851 |
| **945552** | AF1-220 E | 5.3930 |
| **945671** | AF1-232 C O1 | 33.2946 |
| **945672** | AF1-232 E O1 | 17.9278 |
| **945751** | AF1-240 C O1 | 1.3310 |
| **945752** | AF1-240 E O1 | 0.8873 |
| **945771** | AF1-242 C | 0.9691 |
| **945772** | AF1-242 E | 0.6461 |
| **945901** | AF1-255 C | 1.8890 |
| **945902** | AF1-255 E | 2.6086 |
| **946071** | AF1-272 C O1 | 29.2485 |
| **946072** | AF1-272 E O1 | 19.4990 |
| **946081** | AF1-273 C O1 | 19.2084 |
| **946082** | AF1-273 E O1 | 12.8056 |
| **946091** | AF1-274 C | 4.5988 |
| **946092** | AF1-274 E | 3.0659 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **946131** | AF1-278 | 19.3364 |
| **946191** | AF1-284 C O1 | 0.8671 |
| **946192** | AF1-284 E O1 | 0.5203 |
| **946211** | AF1-286 C O1 | 0.6422 |
| **946212** | AF1-286 E O1 | 0.4360 |
| **946221** | AF1-287 C | 0.7518 |
| **946222** | AF1-287 E | 0.5012 |
| **946241** | AF1-289 C O1 | 7.9675 |
| **946242** | AF1-289 E O1 | 5.3117 |
| **946381** | AF1-302 C | 1.4578 |
| **946382** | AF1-302 E | 1.9438 |
| **946401** | AF1-304 C | 4.6208 |
| **946402** | AF1-304 E | 3.0805 |
| **946421** | AF1-306 C | 4.7503 |
| **946422** | AF1-306 E | 19.0010 |
| **946431** | AF1-307 C | 14.1382 |
| **946432** | AF1-307 E | 9.4254 |
| **946571** | AF1-321 C O1 | 4.1989 |
| **946572** | AF1-321 E O1 | 2.7993 |
| **946771** | AF1-217 C O1 | 0.7518 |
| **946772** | AF1-217 E O1 | 0.5012 |
| **DUCKCREEK** | DUCKCREEK | 0.5412 |
| **NEWTON** | NEWTON | 0.5491 |
| **FARMERCITY** | FARMERCITY | 0.0290 |
| **PRAIRIE** | PRAIRIE | 1.3845 |
| **O-066** | O-066 | 3.3130 |
| **COFFEEN** | COFFEEN | 0.2664 |
| **EDWARDS** | EDWARDS | 0.1617 |
| **CHEOAH** | CHEOAH | 0.3544 |
| **TILTON** | TILTON | 0.3018 |
| **G-007** | G-007 | 0.6157 |
| **MADISON** | MADISON | 0.0081 |
| **GIBSON** | GIBSON | 0.2796 |
| **CALDERWOOD** | CALDERWOOD | 0.3499 |
| **BLUEG** | BLUEG | 0.9218 |
| **TRIMBLE** | TRIMBLE | 0.2949 |
| **CATAWBA** | CATAWBA | 0.2902 |

## 13.19 Index 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **42172052** | 200810 | 26KEYSTONE | PENELEC | 999401 | STAR592 | PJM | 4 | PJM500_PN_P4-500-001D | breaker | 635.0 | 105.74 | 107.08 | DC | 18.6 |

| Bus # | Bus | MW Impact |
|---|---|---|
| 200503 | **26C.SLOPE (Deativation : 06/07/19)** | **16.7325** |
| **200636** | 26IUP CO-G | 0.4069 |
| **200794** | 26CONEMAGH | 0.2755 |
| 200805 | **26COLVER13 (Deativation : 09/01/20)** | **19.5371** |
| **200809** | 26SITHE | 1.2781 |
| **200833** | 26SEWRDB34 | 13.2926 |
| **200834** | 26SW_E13_K22 | 0.0419 |
| **200835** | 26DSGENWIN | 0.2043 |
| **200837** | 26HOMER C1 | 22.0118 |
| **200838** | 26HOMER C2 | 18.4521 |
| **200839** | 26HOMER C3 | 19.5339 |
| **200846** | 26FORWARD | 0.1497 |
| **200864** | K-013 E | 4.2904 |
| **200883** | Q-053 E | 7.8926 |
| **200886** | 26ARWF_N39 | 0.3654 |
| **200888** | 26HIGHLAND | 0.3256 |
| **200889** | 26STNY CRK | 0.2507 |
| **200890** | 26BF_G21_K23 | 0.1002 |
| **200891** | 26CSLMN_L13 | 0.1571 |
| **200892** | 26LOOKOUT | 0.1493 |
| **200894** | 26K02 | 4.2783 |
| **200898** | 26AA1-106 | 1.6183 |
| **200906** | 26KEYSTN#3 | 0.6753 |
| **200915** | 26CHSTN_FL | 0.1744 |
| **200925** | 26R32 | 0.3757 |
| **200945** | 26CT_V3-030 | 0.1279 |
| **201144** | W3-099 C OP1 | 0.8862 |
| **201477** | 26Y2-055 | 2.5227 |
| **202158** | 26CON.GEN1 | 0.0706 |
| **202160** | 26CON.GEN2 | 0.0494 |
| **202225** | 26SCI_S29B | 0.0652 |
| **203034** | 26NA_O38_P22 | 0.3198 |
| **203910** | 26Z1-091 | 1.4594 |
| **203999** | P-047 E | 7.6636 |
| **235003** | AC1-025 E | 0.1066 |
| **236828** | 01GRAYMONT | 0.2892 |
| **290086** | Q-036 E | 4.7474 |
| **292350** | K-023 | 4.6300 |
| **292542** | L-013 1 | 4.5034 |
| **293301** | N-039 E | 10.4723 |
| **293393** | V3-030E | 4.8293 |
| **293432** | R-040 E | 0.2153 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **293603** | O-018 E | 9.3319 |
| **293902** | O-048 E | 4.0530 |
| **294515** | O38_P22 | 9.1633 |
| **294903** | P-060 E | 7.1841 |
| **296332** | R-032 E | 10.7676 |
| **903644** | W3-099 E OP1 | 5.9308 |
| **913142** | Y1-033 E OP1 | 3.1317 |
| **916202** | Z1-069 E | 6.1155 |
| **917672** | Z2-108 E | 2.1532 |
| **918682** | AA1-082 E | 4.1617 |
| **919201** | AA1-144 OP | 11.8405 |
| **919491** | AA2-000 | 36.9701 |
| **920341** | AA2-132 | 1.6166 |
| **922932** | AB1-082 OP | 2.2258 |
| **923443** | AB1-160 E | 1.7473 |
| **930511** | AB1-092 | 1.3574 |
| **935191** | AD1-154 | 2.3565 |
| **936421** | AD2-055 | 2.7947 |
| **936991** | AD2-133 C | 2.1363 |
| **936992** | AD2-133 E | 9.7714 |
| **938351** | AE1-053 | 1.1962 |
| **938881** | AE1-116 | 0.7506 |
| **938951** | AE1-123 | 1.6552 |
| **938991** | AE1-128 C | 12.7001 |
| **938992** | AE1-128 E | 8.4667 |
| **939171** | AE1-147 C | 0.8700 |
| **939172** | AE1-147 E | 0.5800 |
| **939291** | AE1-160 C | 1.0268 |
| **939292** | AE1-160 E | 0.5902 |
| **939381** | AE1-169 C O1 | 4.1867 |
| **939382** | AE1-169 E O1 | 2.7912 |
| **940201** | AE2-001 C | 0.8686 |
| **940202** | AE2-001 E | 0.5791 |
| **940681** | AE2-055 C | 0.8483 |
| **940682** | AE2-055 E | 0.5656 |
| **940861** | AE2-074 C | 1.6901 |
| **940862** | AE2-074 E | 2.2247 |
| **941191** | AE2-113 C | 6.6183 |
| **941192** | AE2-113 E | 7.1257 |
| **941231** | AE2-117 C | 1.0872 |
| **941232** | AE2-117 E | 0.7248 |
| **941241** | AE2-118 C | 1.0872 |
| **941242** | AE2-118 E | 0.7248 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **1.1764** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **0.7842** |
| **941261** | AE2-120 C | 0.8679 |
| **941262** | AE2-120 E | 0.5786 |
| **941271** | AE2-121 C | 0.4638 |
| **941272** | AE2-121 E | 0.3097 |
| **941321** | AE2-126 C | 1.1560 |
| **941322** | AE2-126 E | 0.7706 |
| **941331** | AE2-129 C | 1.3127 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **941332** | AE2-129 E | 0.8752 |
| **941351** | AE2-131 C | 1.3127 |
| **941352** | AE2-131 E | 0.8752 |
| **941421** | AE2-139 C | 4.4582 |
| **941422** | AE2-139 E | 2.9721 |
| **942121** | AE2-224 C | 11.0976 |
| **942122** | AE2-224 E | 7.3984 |
| **942351** | AE2-248 C | 0.6854 |
| **942352** | AE2-248 E | 0.4570 |
| **942361** | AE2-249 C | 1.4288 |
| **942362** | AE2-249 E | 0.9525 |
| **942491** | AE2-262 C | 3.9062 |
| **942492** | AE2-262 E | 2.6249 |
| **942501** | AE2-263 C | 3.6718 |
| **942502** | AE2-263 E | 2.4515 |
| **942511** | AE2-264 C | 5.1734 |
| **942512** | AE2-264 E | 3.4490 |
| **942811** | AE2-299 C | 2.2018 |
| **942812** | AE2-299 E | 8.8074 |
| **942961** | AE2-316 C | 3.5892 |
| **942962** | AE2-316 E | 5.1182 |
| **943151** | AE2-344 C | 4.6968 |
| **943152** | AE2-344 E | 3.1312 |
| **943351** | AF1-006 C | 0.4299 |
| **943352** | AF1-006 E | 0.2418 |
| **943711** | AF1-039 C O1 | 0.4391 |
| **943712** | AF1-039 E O1 | 0.2927 |
| **943751** | AF1-043 | 4.4436 |
| **943871** | AF1-055 C O1 | 1.8031 |
| **943872** | AF1-055 E O1 | 1.2020 |
| **944001** | AF1-068 C O1 | 0.4829 |
| **944002** | AF1-068 E O1 | 0.2717 |
| **944181** | AF1-086 C O1 | 3.2911 |
| **944182** | AF1-086 E O1 | 14.3182 |
| **944261** | AF1-094 C | 0.4556 |
| **944262** | AF1-094 E | 0.3037 |
| **944281** | AF1-096 C | 0.5142 |
| **944282** | AF1-096 E | 0.3428 |
| **944301** | AF1-098 C | 1.7941 |
| **944302** | AF1-098 E | 1.1961 |
| **944311** | AF1-099 C | 3.1427 |
| **944312** | AF1-099 E | 2.0951 |
| **944321** | AF1-100 C O1 | 6.7325 |
| **944322** | AF1-100 E O1 | 4.4883 |
| **944381** | AF1-103 O1 | 0.9216 |
| **944391** | AF1-104 O1 | 0.6234 |
| **944411** | AF1-106 O1 | 0.9338 |
| **944471** | AF1-112 C | 0.4553 |
| **944472** | AF1-112 E | 0.3035 |
| **944671** | AF1-132 C O1 | 0.4520 |
| **944672** | AF1-132 E O1 | 0.3013 |
| **944691** | AF1-134 C O1 | 1.4096 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **944692** | AF1-134 E O1 | 1.4096 |
| **944701** | AF1-135 C | 1.6915 |
| **944702** | AF1-135 E | 1.1277 |
| **944731** | AF1-138 C O1 | 0.5762 |
| **944732** | AF1-138 E O1 | 0.3842 |
| **944741** | AF1-139 C O1 | 0.5167 |
| **944742** | AF1-139 E O1 | 0.3444 |
| **944751** | AF1-140 C | 1.6938 |
| **944752** | AF1-140 E | 1.1292 |
| **944771** | AF1-142 C | 5.0283 |
| **944772** | AF1-142 E | 3.3522 |
| **944781** | AF1-143 C | 8.4438 |
| **944782** | AF1-143 E | 5.6292 |
| **944841** | AF1-149 C | 0.8678 |
| **944842** | AF1-149 E | 0.5785 |
| **944881** | AF1-153 C O1 | 0.5496 |
| **944882** | AF1-153 E O1 | 0.3664 |
| **944901** | AF1-155 C | 0.5495 |
| **944902** | AF1-155 E | 0.3663 |
| **945021** | AF1-167 C | 0.4031 |
| **945022** | AF1-167 E | 0.2687 |
| **945051** | AF1-170 C | 1.5485 |
| **945052** | AF1-170 E | 1.0323 |
| **945071** | AF1-172 C | 6.4352 |
| **945072** | AF1-172 E | 4.2901 |
| **945121** | AF1-177 | 0.2304 |
| **945161** | AF1-181 | 0.0359 |
| **945171** | AF1-182 | 0.1795 |
| **945181** | AF1-183 | 0.0483 |
| **945331** | AF1-198 | 0.1254 |
| **945451** | AF1-210 C | 0.3750 |
| **945452** | AF1-210 E | 0.2500 |
| **945481** | AF1-213 C | 5.2754 |
| **945482** | AF1-213 E | 3.5170 |
| **945491** | AF1-214 C | 0.4601 |
| **945492** | AF1-214 E | 0.3067 |
| **945551** | AF1-220 C | 4.5899 |
| **945552** | AF1-220 E | 3.0616 |
| **945671** | AF1-232 C O1 | 17.6831 |
| **945672** | AF1-232 E O1 | 9.5217 |
| **945751** | AF1-240 C O1 | 0.7494 |
| **945752** | AF1-240 E O1 | 0.4996 |
| **945771** | AF1-242 C | 0.5495 |
| **945772** | AF1-242 E | 0.3663 |
| **945901** | AF1-255 C | 0.9932 |
| **945902** | AF1-255 E | 1.3715 |
| **946071** | AF1-272 C O1 | 17.9595 |
| **946072** | AF1-272 E O1 | 11.9730 |
| **946081** | AF1-273 C O1 | 10.2018 |
| **946082** | AF1-273 E O1 | 6.8012 |
| **946091** | AF1-274 C | 2.5949 |
| **946092** | AF1-274 E | 1.7299 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **946131** | AF1-278 | 11.2469 |
| **946191** | AF1-284 C O1 | 0.4553 |
| **946192** | AF1-284 E O1 | 0.2732 |
| **946211** | AF1-286 C O1 | 0.3782 |
| **946212** | AF1-286 E O1 | 0.2568 |
| **946221** | AF1-287 C | 0.4297 |
| **946222** | AF1-287 E | 0.2864 |
| **946241** | AF1-289 C O1 | 4.1647 |
| **946242** | AF1-289 E O1 | 2.7765 |
| **946381** | AF1-302 C | 0.8307 |
| **946382** | AF1-302 E | 1.1076 |
| **946401** | AF1-304 C | 2.6330 |
| **946402** | AF1-304 E | 1.7553 |
| **946421** | AF1-306 C | 2.6955 |
| **946422** | AF1-306 E | 10.7819 |
| **946431** | AF1-307 C | 7.1429 |
| **946432** | AF1-307 E | 4.7619 |
| **946571** | AF1-321 C O1 | 2.2446 |
| **946572** | AF1-321 E O1 | 1.4964 |
| **946771** | AF1-217 C O1 | 0.4297 |
| **946772** | AF1-217 E O1 | 0.2864 |
| **DUCKCREEK** | DUCKCREEK | 0.5619 |
| **NEWTON** | NEWTON | 0.5458 |
| **FARMERCITY** | FARMERCITY | 0.0284 |
| **PRAIRIE** | PRAIRIE | 1.3354 |
| **COFFEEN** | COFFEEN | 0.2664 |
| **EDWARDS** | EDWARDS | 0.1698 |
| **CHEOAH** | CHEOAH | 0.2933 |
| **TILTON** | TILTON | 0.3112 |
| **G-007** | G-007 | 0.0426 |
| **MADISON** | MADISON | 0.0262 |
| **GIBSON** | GIBSON | 0.2790 |
| **CALDERWOOD** | CALDERWOOD | 0.2907 |
| **BLUEG** | BLUEG | 0.9062 |
| **TRIMBLE** | TRIMBLE | 0.2905 |
| **CATAWBA** | CATAWBA | 0.2188 |

## 13.20 Index 20

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **46797875** | 200811 | 26WARREN | PENELEC | 200918 | 26ERIE S TIE | PENELEC | 1 | PN-P2-3-PN-345-003A | breaker | 621.0 | 116.85 | 118.16 | DC | 17.96 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200642** | 26SENECA#1 | 8.8930 |
| **200643** | 26SENECA#2 | 8.3989 |
| **200644** | 26SENECA#3 | 0.8396 |
| **200649** | 26PENNTECH | 0.8482 |
| **200894** | 26K02 | 3.1059 |
| **200898** | 26AA1-106 | 0.9872 |
| **201201** | 26WRREN CT | 2.5169 |
| **201477** | 26Y2-055 | 9.1985 |
| **203999** | P-047 E | 3.7552 |
| **235003** | AC1-025 E | 0.0953 |
| **236828** | 01GRAYMONT | 0.2626 |
| **290086** | Q-036 E | 2.1740 |
| **915952** | Y3-092 NFTWR | 115.7800 |
| **916202** | Z1-069 E | 4.3265 |
| **919491** | AA2-000 | 32.8614 |
| **922932** | AB1-082 OP | 2.3303 |
| **923443** | AB1-160 E | 1.2361 |
| **923821** | AB2-019 FTWR | 3.2418 |
| **930511** | AB1-092 | 1.2066 |
| **936421** | AD2-055 | 2.4841 |
| **936991** | AD2-133 C | 0.9783 |
| **936992** | AD2-133 E | 4.4746 |
| **939171** | AE1-147 C | 0.7918 |
| **939172** | AE1-147 E | 0.5279 |
| **940201** | AE2-001 C | 0.7896 |
| **940202** | AE2-001 E | 0.5264 |
| **940681** | AE2-055 C | 0.7554 |
| **940682** | AE2-055 E | 0.5036 |
| **940861** | AE2-074 C | 1.7694 |
| **940862** | AE2-074 E | 2.3291 |
| **941191** | AE2-113 C | 8.7853 |
| **941192** | AE2-113 E | 9.4589 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **0.9177** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **0.6118** |
| **941261** | AE2-120 C | 0.7884 |
| **941262** | AE2-120 E | 0.5256 |
| **941271** | AE2-121 C | 0.4230 |
| **941272** | AE2-121 E | 0.2825 |
| **941321** | AE2-126 C | 1.4018 |
| **941322** | AE2-126 E | 0.9346 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **941331** | AE2-129 C | 0.7713 |
| **941332** | AE2-129 E | 0.5142 |
| **941351** | AE2-131 C | 0.7713 |
| **941352** | AE2-131 E | 0.5142 |
| **941421** | AE2-139 C | 2.7596 |
| **941422** | AE2-139 E | 1.8397 |
| **942351** | AE2-248 C | 0.6158 |
| **942352** | AE2-248 E | 0.4105 |
| **942491** | AE2-262 C | 3.7710 |
| **942492** | AE2-262 E | 2.5341 |
| **942501** | AE2-263 C | 3.5448 |
| **942502** | AE2-263 E | 2.3667 |
| **942813** | AE2-299 BAT | 23.1728 |
| **942961** | AE2-316 C | 2.8790 |
| **942962** | AE2-316 E | 4.1055 |
| **943751** | AF1-043 | 3.9498 |
| **944001** | AF1-068 C O1 | 0.4327 |
| **944002** | AF1-068 E O1 | 0.2434 |
| **944311** | AF1-099 C | 3.0339 |
| **944312** | AF1-099 E | 2.0226 |
| **944321** | AF1-100 C O1 | 6.5555 |
| **944322** | AF1-100 E O1 | 4.3703 |
| **944381** | AF1-103 O1 | 6.3268 |
| **944392** | AF1-104 BAT | 2.3720 |
| **944471** | AF1-112 C | 0.4099 |
| **944472** | AF1-112 E | 0.2733 |
| **944671** | AF1-132 C O1 | 0.4044 |
| **944672** | AF1-132 E O1 | 0.2696 |
| **944691** | AF1-134 C O1 | 0.2930 |
| **944692** | AF1-134 E O1 | 0.2930 |
| **944701** | AF1-135 C | 0.3516 |
| **944702** | AF1-135 E | 0.2344 |
| **944771** | AF1-142 C | 4.8543 |
| **944772** | AF1-142 E | 3.2362 |
| **944841** | AF1-149 C | 0.7882 |
| **944842** | AF1-149 E | 0.5254 |
| **944881** | AF1-153 C O1 | 1.3018 |
| **944882** | AF1-153 E O1 | 0.8678 |
| **944901** | AF1-155 C | 1.2941 |
| **944902** | AF1-155 E | 0.8627 |
| **945071** | AF1-172 C | 6.0331 |
| **945072** | AF1-172 E | 4.0221 |
| **945121** | AF1-177 | 1.5817 |
| **945161** | AF1-181 | 0.0349 |
| **945171** | AF1-182 | 0.1748 |
| **945181** | AF1-183 | 0.0422 |
| **945331** | AF1-198 | 0.0682 |
| **945481** | AF1-213 C | 3.1635 |
| **945482** | AF1-213 E | 2.1090 |
| **945491** | AF1-214 C | 0.4178 |
| **945492** | AF1-214 E | 0.2786 |
| **945551** | AF1-220 C | 12.3132 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **945552** | AF1-220 E | 8.2133 |
| **945771** | AF1-242 C | 1.2941 |
| **945772** | AF1-242 E | 0.8627 |
| **946091** | AF1-274 C | 6.2312 |
| **946092** | AF1-274 E | 4.1541 |
| **946131** | AF1-278 | 33.3216 |
| **946381** | AF1-302 C | 0.6663 |
| **946382** | AF1-302 E | 0.8884 |
| **946421** | AF1-306 C | 7.4982 |
| **946422** | AF1-306 E | 29.9930 |
| **DUCKCREEK** | DUCKCREEK | 1.2943 |
| **NEWTON** | NEWTON | 1.1615 |
| **FARMERCITY** | FARMERCITY | 0.0598 |
| **G-007A** | G-007A | 2.8602 |
| **VFT** | VFT | 7.8045 |
| **PRAIRIE** | PRAIRIE | 2.7044 |
| **COFFEEN** | COFFEEN | 0.5745 |
| **EDWARDS** | EDWARDS | 0.3966 |
| **CHEOAH** | CHEOAH | 0.4184 |
| **TILTON** | TILTON | 0.7043 |
| **MADISON** | MADISON | 0.0343 |
| **GIBSON** | GIBSON | 0.5919 |
| **CALDERWOOD** | CALDERWOOD | 0.4185 |
| **BLUEG** | BLUEG | 1.8540 |
| **TRIMBLE** | TRIMBLE | 0.5955 |
| **CATAWBA** | CATAWBA | 0.2345 |

## 13.21 Index 21

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41812712** | 200904 | 26EAGL VAL | PENELEC | 200527 | 26TYRONE N | PENELEC | 1 | AP-P2-2-WP-230-005T | bus | 191.0 | 133.36 | 137.75 | DC | 18.59 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200665** | 26SHAWVL 3 | 2.5507 |
| **200666** | 26SHAWVL 4 | 2.5057 |
| **200715** | 26SHAWVL 1 | 2.2589 |
| **200722** | 26SHAWVL 2 | 2.3221 |
| **200905** | 26Q36 | 0.7172 |
| **200913** | 26SHAW-D | 0.1365 |
| **235003** | AC1-025 E | 0.1219 |
| **236828** | 01GRAYMONT | 0.3194 |
| **290086** | Q-036 E | 20.5528 |
| **919491** | AA2-000 | 28.5206 |
| **930511** | AB1-092 | 1.0472 |
| **936421** | AD2-055 | 2.1560 |
| **936991** | AD2-133 C | 9.2488 |
| **936992** | AD2-133 E | 42.3028 |
| **939171** | AE1-147 C | 0.9548 |
| **939172** | AE1-147 E | 0.6365 |
| **940201** | AE2-001 C | 0.9570 |
| **940202** | AE2-001 E | 0.6380 |
| **940681** | AE2-055 C | 0.9910 |
| **940682** | AE2-055 E | 0.6607 |
| **941191** | AE2-113 C | 2.9319 |
| **941192** | AE2-113 E | 3.1567 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **1.9591** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **1.3061** |
| **941261** | AE2-120 C | 0.9578 |
| **941262** | AE2-120 E | 0.6385 |
| **941271** | AE2-121 C | 0.5067 |
| **941272** | AE2-121 E | 0.3383 |
| **941321** | AE2-126 C | 1.4356 |
| **941322** | AE2-126 E | 0.9570 |
| **941331** | AE2-129 C | 4.2805 |
| **941332** | AE2-129 E | 2.8537 |
| **941351** | AE2-131 C | 4.2805 |
| **941352** | AE2-131 E | 2.8537 |
| **942351** | AE2-248 C | 0.7794 |
| **942352** | AE2-248 E | 0.5196 |
| **942491** | AE2-262 C | 3.9032 |
| **942492** | AE2-262 E | 2.6230 |
| **942501** | AE2-263 C | 3.6690 |
| **942502** | AE2-263 E | 2.4496 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **943751** | AF1-043 | 3.4280 |
| **944001** | AF1-068 C O1 | 0.5542 |
| **944002** | AF1-068 E O1 | 0.3117 |
| **944181** | AF1-086 C O1 | 0.4667 |
| **944182** | AF1-086 E O1 | 2.0305 |
| **944311** | AF1-099 C | 3.1403 |
| **944312** | AF1-099 E | 2.0935 |
| **944321** | AF1-100 C O1 | 15.7470 |
| **944322** | AF1-100 E O1 | 10.4980 |
| **944471** | AF1-112 C | 0.5150 |
| **944472** | AF1-112 E | 0.3433 |
| **944671** | AF1-132 C O1 | 0.5210 |
| **944672** | AF1-132 E O1 | 0.3473 |
| **944691** | AF1-134 C O1 | 0.4449 |
| **944692** | AF1-134 E O1 | 0.4449 |
| **944701** | AF1-135 C | 0.5338 |
| **944702** | AF1-135 E | 0.3559 |
| **944771** | AF1-142 C | 5.0244 |
| **944772** | AF1-142 E | 3.3496 |
| **944841** | AF1-149 C | 0.9578 |
| **944842** | AF1-149 E | 0.6385 |
| **944881** | AF1-153 C O1 | 0.3827 |
| **944882** | AF1-153 E O1 | 0.2552 |
| **944901** | AF1-155 C | 0.3798 |
| **944902** | AF1-155 E | 0.2532 |
| **945071** | AF1-172 C | 5.4317 |
| **945072** | AF1-172 E | 3.6211 |
| **945161** | AF1-181 | 0.0839 |
| **945171** | AF1-182 | 0.4199 |
| **945181** | AF1-183 | 0.1327 |
| **945481** | AF1-213 C | 11.8213 |
| **945482** | AF1-213 E | 7.8808 |
| **945491** | AF1-214 C | 0.5076 |
| **945492** | AF1-214 E | 0.3384 |
| **945551** | AF1-220 C | 3.6798 |
| **945552** | AF1-220 E | 2.4545 |
| **945771** | AF1-242 C | 0.3798 |
| **945772** | AF1-242 E | 0.2532 |
| **946091** | AF1-274 C | 5.6595 |
| **946092** | AF1-274 E | 3.7730 |
| **946421** | AF1-306 C | 2.0125 |
| **946422** | AF1-306 E | 8.0498 |
| **DUCKCREEK** | DUCKCREEK | 0.0115 |
| **NEWTON** | NEWTON | 0.0161 |
| **FARMERCITY** | FARMERCITY | 0.0009 |
| **CBM-W1** | CBM-W1 | 0.0375 |
| **PRAIRIE** | PRAIRIE | 0.0465 |
| **O-066** | O-066 | 0.3494 |
| **COFFEEN** | COFFEEN | 0.0074 |
| **EDWARDS** | EDWARDS | 0.0032 |
| **CHEOAH** | CHEOAH | 0.0205 |
| **TILTON** | TILTON | 0.0069 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **G-007** | G-007 | 0.0686 |
| **GIBSON** | GIBSON | 0.0082 |
| **CALDERWOOD** | CALDERWOOD | 0.0199 |
| **BLUEG** | BLUEG | 0.0278 |
| **TRIMBLE** | TRIMBLE | 0.0089 |
| **CATAWBA** | CATAWBA | 0.0203 |

## 13.22 Index 22

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **42463125** | 200924 | 26CANYON | PENELEC | 200706 | 26N.MESHPN | PENELEC | 1 | Base Case | single | 546.0 | 100.58 | 102.73 | DC | 11.78 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200642** | 26SENECA#1 | 2.7894 |
| **200643** | 26SENECA#2 | 2.6344 |
| **200649** | 26PENNTECH | 0.5618 |
| **200665** | 26SHAWVL 3 | 2.3763 |
| **200666** | 26SHAWVL 4 | 2.3188 |
| **200715** | 26SHAWVL 1 | 1.5716 |
| **200722** | 26SHAWVL 2 | 1.6043 |
| **200887** | 26ARMNA MT | 0.6693 |
| **200898** | 26AA1-106 | 6.0058 |
| **200913** | 26SHAW-D | 0.0723 |
| **200949** | 26X1-109 | 42.4561 |
| **201477** | 26Y2-055 | 1.9054 |
| **203261** | 26BLOSSBCT | 0.6572 |
| **203283** | 26MANOR_T86 | 0.0501 |
| **203349** | 26Z1-069 C | 0.3211 |
| **203350** | 26MILZ1-092 | 0.7063 |
| **203351** | 26GROZ1-110 | 0.8383 |
| **203352** | 26CANZ2-011 | 0.8383 |
| **919201** | AA1-144 OP | 63.7835 |
| **919491** | AA2-000 | 87.5163 |
| **920351** | AA2-133 | 0.3184 |
| **922932** | AB1-082 OP | 2.7054 |
| **923442** | AB1-160 C | 0.0917 |
| **930511** | AB1-092 | 3.2133 |
| **934801** | AD1-108 | 0.0632 |
| **934811** | AD1-109 | 0.0463 |
| **935061** | AD1-142 | 0.0390 |
| **936421** | AD2-055 | 6.6157 |
| **939171** | AE1-147 C | 0.8133 |
| **940201** | AE2-001 C | 0.8099 |
| **940681** | AE2-055 C | 0.7569 |
| **940861** | AE2-074 C | 2.0542 |
| **941191** | AE2-113 C | 6.3051 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **1.0362** |
| **941261** | AE2-120 C | 0.8079 |
| **941271** | AE2-121 C | 0.4356 |
| **941321** | AE2-126 C | 1.0838 |
| **941331** | AE2-129 C | 0.7609 |
| **941351** | AE2-131 C | 0.7609 |
| **941421** | AE2-139 C | 21.7122 |
| **942351** | AE2-248 C | 0.6232 |
| **942491** | AE2-262 C | 4.8485 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **942501** | AE2-263 C | 4.5576 |
| **942961** | AE2-316 C | 2.5479 |
| **943751** | AF1-043 | 19.8471 |
| **944001** | AF1-068 C O1 | 0.4366 |
| **944311** | AF1-099 C | 7.3600 |
| **944321** | AF1-100 C O1 | 14.5725 |
| **944381** | AF1-103 O1 | 0.6960 |
| **944411** | AF1-106 O1 | 5.0856 |
| **944471** | AF1-112 C | 0.4159 |
| **944671** | AF1-132 C O1 | 0.4073 |
| **944771** | AF1-142 C | 11.7760 |
| **944841** | AF1-149 C | 0.8077 |
| **944881** | AF1-153 C O1 | 1.0640 |
| **944901** | AF1-155 C | 1.0591 |
| **945071** | AF1-172 C | 23.3955 |
| **945121** | AF1-177 | 0.1740 |
| **945161** | AF1-181 | 0.0782 |
| **945171** | AF1-182 | 0.3886 |
| **945181** | AF1-183 | 0.0923 |
| **945331** | AF1-198 | 0.6195 |
| **945481** | AF1-213 C | 3.1726 |
| **945491** | AF1-214 C | 0.4283 |
| **945551** | AF1-220 C | 8.4685 |
| **945771** | AF1-242 C | 1.0591 |
| **946091** | AF1-274 C | 4.6466 |
| **946131** | AF1-278 | 17.9548 |
| **946211** | AF1-286 C O1 | 2.0597 |
| **946381** | AF1-302 C | 0.5897 |
| **946421** | AF1-306 C | 5.4706 |
| **LGEE** | LGEE | 0.5414 |
| **CPLE** | CPLE | 0.3698 |
| **WEC** | WEC | 0.3100 |
| **CBM-W2** | CBM-W2 | 7.3546 |
| **CBM-W1** | CBM-W1 | 12.8728 |
| **TVA** | TVA | 1.1746 |
| **CBM-S2** | CBM-S2 | 3.7223 |
| **CBM-S1** | CBM-S1 | 7.3187 |
| **MEC** | MEC | 1.5111 |

## 13.23 Index 23

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41812625** | 235248 | 01SHINGL | AP | 200513 | 26LEWISTWN | PENELEC | 1 | AP-P2-2-WP-230-001T | bus | 570.0 | 157.73 | 176.27 | DC | 105.69 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200665** | 26SHAWVL 3 | 11.2213 |
| **200666** | 26SHAWVL 4 | 11.0429 |
| **200715** | 26SHAWVL 1 | 6.8508 |
| **200722** | 26SHAWVL 2 | 7.0237 |
| **200894** | 26K02 | 13.1208 |
| **200898** | 26AA1-106 | 2.6976 |
| **200905** | 26Q36 | 0.2708 |
| **200913** | 26SHAW-D | 0.2828 |
| **203352** | 26CANZ2-011 | 0.4430 |
| **235003** | AC1-025 E | 0.9180 |
| **236828** | 01GRAYMONT | 2.3847 |
| **290086** | Q-036 E | 7.7608 |
| **919491** | AA2-000 | 169.8793 |
| **930511** | AB1-092 | 6.2375 |
| **936421** | AD2-055 | 12.8419 |
| **936991** | AD2-133 C | 3.4924 |
| **936992** | AD2-133 E | 15.9737 |
| **939171** | AE1-147 C | 7.1243 |
| **939172** | AE1-147 E | 4.7495 |
| **940201** | AE2-001 C | 7.1412 |
| **940202** | AE2-001 E | 4.7608 |
| **940681** | AE2-055 C | 7.3998 |
| **940682** | AE2-055 E | 4.9332 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **4.0520** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **2.7014** |
| **941261** | AE2-120 C | 7.1504 |
| **941262** | AE2-120 E | 4.7670 |
| **941271** | AE2-121 C | 3.7720 |
| **941272** | AE2-121 E | 2.5186 |
| **941321** | AE2-126 C | 2.6525 |
| **941322** | AE2-126 E | 1.7683 |
| **941331** | AE2-129 C | 3.1049 |
| **941332** | AE2-129 E | 2.0699 |
| **941351** | AE2-131 C | 3.1049 |
| **941352** | AE2-131 E | 2.0699 |
| **941421** | AE2-139 C | 7.8236 |
| **941422** | AE2-139 E | 5.2157 |
| **942351** | AE2-248 C | 5.8335 |
| **942352** | AE2-248 E | 3.8890 |
| **942491** | AE2-262 C | 26.1095 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **942492** | AE2-262 E | 17.5456 |
| **942501** | AE2-263 C | 24.5429 |
| **942502** | AE2-263 E | 16.3863 |
| **943751** | AF1-043 | 38.5255 |
| **944001** | AF1-068 C O1 | 7.8127 |
| **944002** | AF1-068 E O1 | 4.3947 |
| **944181** | AF1-086 C O1 | 1.2931 |
| **944182** | AF1-086 E O1 | 5.6255 |
| **944311** | AF1-099 C | 39.6342 |
| **944312** | AF1-099 E | 26.4228 |
| **944321** | AF1-100 C O1 | 69.3975 |
| **944322** | AF1-100 E O1 | 46.2650 |
| **944471** | AF1-112 C | 7.2636 |
| **944472** | AF1-112 E | 4.8424 |
| **944671** | AF1-132 C O1 | 7.3427 |
| **944672** | AF1-132 E O1 | 4.8951 |
| **944691** | AF1-134 C O1 | 2.2470 |
| **944692** | AF1-134 E O1 | 2.2470 |
| **944701** | AF1-135 C | 2.6964 |
| **944702** | AF1-135 E | 1.7976 |
| **944771** | AF1-142 C | 63.4148 |
| **944772** | AF1-142 E | 42.2765 |
| **944841** | AF1-149 C | 7.1515 |
| **944842** | AF1-149 E | 4.7677 |
| **945071** | AF1-172 C | 61.3380 |
| **945072** | AF1-172 E | 40.8920 |
| **945161** | AF1-181 | 0.3692 |
| **945171** | AF1-182 | 1.8506 |
| **945181** | AF1-183 | 0.4023 |
| **945481** | AF1-213 C | 25.4386 |
| **945482** | AF1-213 E | 16.9591 |
| **945491** | AF1-214 C | 7.1500 |
| **945492** | AF1-214 E | 4.7666 |
| **945551** | AF1-220 C | 5.7668 |
| **945552** | AF1-220 E | 3.8467 |
| **946091** | AF1-274 C | 10.0853 |
| **946092** | AF1-274 E | 6.7235 |
| **946312** | AF1-295 BAT | 1.5296 |
| **LGEE** | LGEE | 0.0673 |
| **WEC** | WEC | 0.0444 |
| **CBM-W2** | CBM-W2 | 0.6962 |
| **CBM-W1** | CBM-W1 | 2.1267 |
| **TVA** | TVA | 0.0672 |
| **O-066** | O-066 | 5.0266 |
| **CBM-S1** | CBM-S1 | 0.5197 |
| **G-007** | G-007 | 0.8403 |
| **MEC** | MEC | 0.1907 |
| **CATAWBA** | CATAWBA | 0.0231 |

## 13.24 Index 24

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **42726484** | 239036 | 02PERRY | ATSI | 239334 | 02L.CENTER | ATSI | 1 | ATSI-P7-1-CEI-345-012 | tower | 1667.0 | 131.23 | 131.81 | DC | 20.86 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200828** | 26HNSMLK 1 | 1.8459 |
| **200829** | 26HNSMLK 2 | 1.8459 |
| **200830** | 26HNSMLK 3 | 1.8459 |
| **200831** | 26HNSMLK 4 | 1.8459 |
| **200832** | 26HNSMLK 5 | 1.8459 |
| **200849** | 26LAKVU GN | 0.2451 |
| **200894** | 26K02 | 4.6600 |
| **200898** | 26AA1-106 | 1.6646 |
| **201144** | W3-099 C OP1 | 4.3853 |
| **201477** | 26Y2-055 | 5.9490 |
| **203999** | P-047 E | 7.1703 |
| 239035 | **02PERRG1 (Deativation : 05/31/21)** | **86.6075** |
| **903644** | W3-099 E OP1 | 29.3477 |
| **915951** | Y3-092 FTIR | 401.4900 |
| **916202** | Z1-069 E | 6.1087 |
| **919491** | AA2-000 | 41.5667 |
| **920341** | AA2-132 | 1.6820 |
| **922932** | AB1-082 OP | 2.3870 |
| **923443** | AB1-160 E | 1.7453 |
| **930511** | AB1-092 | 1.5262 |
| **935191** | AD1-154 | 2.1388 |
| **936421** | AD2-055 | 3.1422 |
| **938951** | AE1-123 | 2.3510 |
| **939291** | AE1-160 C | 3.1714 |
| **939292** | AE1-160 E | 1.8230 |
| **939381** | AE1-169 C O1 | 10.4699 |
| **939382** | AE1-169 E O1 | 6.9799 |
| **940861** | AE2-074 C | 1.8125 |
| **940862** | AE2-074 E | 2.3858 |
| **941191** | AE2-113 C | 7.8448 |
| **941192** | AE2-113 E | 8.4463 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **1.1107** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **0.7405** |
| **941321** | AE2-126 C | 1.2815 |
| **941322** | AE2-126 E | 0.8544 |
| **941331** | AE2-129 C | 1.0082 |
| **941332** | AE2-129 E | 0.6721 |
| **941351** | AE2-131 C | 1.0082 |
| **941352** | AE2-131 E | 0.6721 |
| **941421** | AE2-139 C | 4.7616 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **941422** | AE2-139 E | 3.1744 |
| **942491** | AE2-262 C | 4.3809 |
| **942492** | AE2-262 E | 2.9440 |
| **942501** | AE2-263 C | 4.1180 |
| **942502** | AE2-263 E | 2.7495 |
| **942811** | AE2-299 C | 10.6970 |
| **942812** | AE2-299 E | 42.7878 |
| **942961** | AE2-316 C | 4.4304 |
| **942962** | AE2-316 E | 6.3178 |
| **943151** | AE2-344 C | 24.1162 |
| **943152** | AE2-344 E | 16.0775 |
| **943351** | AF1-006 C | 4.6204 |
| **943352** | AF1-006 E | 2.5990 |
| **943751** | AF1-043 | 4.9961 |
| **943871** | AF1-055 C O1 | 11.9345 |
| **943872** | AF1-055 E O1 | 7.9564 |
| **944181** | AF1-086 C O1 | 0.8747 |
| **944182** | AF1-086 E O1 | 3.8055 |
| **944261** | AF1-094 C | 3.7262 |
| **944262** | AF1-094 E | 2.4842 |
| **944281** | AF1-096 C | 2.9966 |
| **944282** | AF1-096 E | 1.9978 |
| **944301** | AF1-098 C | 15.5808 |
| **944302** | AF1-098 E | 10.3872 |
| **944311** | AF1-099 C | 3.5246 |
| **944312** | AF1-099 E | 2.3497 |
| **944321** | AF1-100 C O1 | 7.5035 |
| **944322** | AF1-100 E O1 | 5.0024 |
| **944381** | AF1-103 O1 | 2.1763 |
| **944391** | AF1-104 O1 | 7.6928 |
| **944411** | AF1-106 O1 | 0.9455 |
| **944691** | AF1-134 C O1 | 0.4537 |
| **944692** | AF1-134 E O1 | 0.4537 |
| **944701** | AF1-135 C | 0.5444 |
| **944702** | AF1-135 E | 0.3629 |
| **944741** | AF1-139 C O1 | 0.5376 |
| **944742** | AF1-139 E O1 | 0.3584 |
| **944771** | AF1-142 C | 5.6394 |
| **944772** | AF1-142 E | 3.7596 |
| **944881** | AF1-153 C O1 | 0.6979 |
| **944882** | AF1-153 E O1 | 0.4653 |
| **944901** | AF1-155 C | 0.6981 |
| **944902** | AF1-155 E | 0.4654 |
| **945021** | AF1-167 C | 0.5280 |
| **945022** | AF1-167 E | 0.3520 |
| **945051** | AF1-170 C | 17.0195 |
| **945052** | AF1-170 E | 11.3463 |
| **945071** | AF1-172 C | 7.3028 |
| **945072** | AF1-172 E | 4.8686 |
| **945121** | AF1-177 | 0.5441 |
| **945161** | AF1-181 | 0.0400 |
| **945171** | AF1-182 | 0.2001 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **945181** | AF1-183 | 0.0496 |
| **945331** | AF1-198 | 0.1200 |
| **945451** | AF1-210 C | 0.4873 |
| **945452** | AF1-210 E | 0.3249 |
| **945481** | AF1-213 C | 4.2944 |
| **945482** | AF1-213 E | 2.8629 |
| **945551** | AF1-220 C | 5.6238 |
| **945552** | AF1-220 E | 3.7512 |
| **945751** | AF1-240 C O1 | 0.6801 |
| **945752** | AF1-240 E O1 | 0.4534 |
| **945771** | AF1-242 C | 0.6981 |
| **945772** | AF1-242 E | 0.4654 |
| **946091** | AF1-274 C | 2.9636 |
| **946092** | AF1-274 E | 1.9757 |
| **946131** | AF1-278 | 14.3242 |
| **946211** | AF1-286 C O1 | 0.3829 |
| **946212** | AF1-286 E O1 | 0.2600 |
| **946221** | AF1-287 C | 4.1209 |
| **946222** | AF1-287 E | 2.7473 |
| **946381** | AF1-302 C | 1.0254 |
| **946382** | AF1-302 E | 1.3672 |
| **946401** | AF1-304 C | 6.4026 |
| **946402** | AF1-304 E | 4.2684 |
| **946421** | AF1-306 C | 3.4932 |
| **946422** | AF1-306 E | 13.9727 |
| **946771** | AF1-217 C O1 | 4.1209 |
| **946772** | AF1-217 E O1 | 2.7473 |
| **DUCKCREEK** | DUCKCREEK | 3.4130 |
| **NEWTON** | NEWTON | 3.0752 |
| **FARMERCITY** | FARMERCITY | 0.1585 |
| **G-007A** | G-007A | 4.8382 |
| **VFT** | VFT | 13.2289 |
| **PRAIRIE** | PRAIRIE | 7.1911 |
| **COFFEEN** | COFFEEN | 1.5205 |
| **EDWARDS** | EDWARDS | 1.0448 |
| **CHEOAH** | CHEOAH | 1.1461 |
| **TILTON** | TILTON | 1.8579 |
| **MADISON** | MADISON | 0.0625 |
| **GIBSON** | GIBSON | 1.5648 |
| **CALDERWOOD** | CALDERWOOD | 1.1451 |
| **BLUEG** | BLUEG | 4.9059 |
| **TRIMBLE** | TRIMBLE | 1.5749 |
| **CATAWBA** | CATAWBA | 0.6685 |

## 13.25 Index 25

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **42726554** | 239036 | 02PERRY | ATSI | 238684 | 02EASTLK | ATSI | 1 | ATSI-P7-1-CEI-345-016 | tower | 1667.0 | 123.45 | 124.0 | DC | 20.15 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200828** | 26HNSMLK 1 | 1.7839 |
| **200829** | 26HNSMLK 2 | 1.7839 |
| **200830** | 26HNSMLK 3 | 1.7839 |
| **200831** | 26HNSMLK 4 | 1.7839 |
| **200832** | 26HNSMLK 5 | 1.7839 |
| **200849** | 26LAKVU GN | 0.2369 |
| **200894** | 26K02 | 4.5011 |
| **200898** | 26AA1-106 | 1.6078 |
| **201144** | W3-099 C OP1 | 4.2385 |
| **201477** | 26Y2-055 | 5.7491 |
| **203999** | P-047 E | 6.9260 |
| 239035 | **02PERRG1 (Deativation : 05/31/21)** | **81.5353** |
| **903644** | W3-099 E OP1 | 28.3655 |
| **915951** | Y3-092 FTIR | 388.0700 |
| **916202** | Z1-069 E | 5.9015 |
| **919491** | AA2-000 | 40.1539 |
| **920341** | AA2-132 | 1.6247 |
| **922932** | AB1-082 OP | 2.3062 |
| **923443** | AB1-160 E | 1.6861 |
| **930511** | AB1-092 | 1.4743 |
| **935191** | AD1-154 | 2.0660 |
| **936421** | AD2-055 | 3.0354 |
| **938951** | AE1-123 | 2.2713 |
| **939291** | AE1-160 C | 3.0649 |
| **939292** | AE1-160 E | 1.7617 |
| **939381** | AE1-169 C O1 | 10.1175 |
| **939382** | AE1-169 E O1 | 6.7450 |
| **940861** | AE2-074 C | 1.7511 |
| **940862** | AE2-074 E | 2.3050 |
| **941191** | AE2-113 C | 7.5792 |
| **941192** | AE2-113 E | 8.1604 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **1.0728** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **0.7152** |
| **941321** | AE2-126 C | 1.2381 |
| **941322** | AE2-126 E | 0.8254 |
| **941331** | AE2-129 C | 0.9737 |
| **941332** | AE2-129 E | 0.6491 |
| **941351** | AE2-131 C | 0.9737 |
| **941352** | AE2-131 E | 0.6491 |
| **941421** | AE2-139 C | 4.5986 |
| **941422** | AE2-139 E | 3.0657 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **942491** | AE2-262 C | 4.2317 |
| **942492** | AE2-262 E | 2.8437 |
| **942501** | AE2-263 C | 3.9778 |
| **942502** | AE2-263 E | 2.6558 |
| **942811** | AE2-299 C | 10.3389 |
| **942812** | AE2-299 E | 41.3555 |
| **942961** | AE2-316 C | 4.2798 |
| **942962** | AE2-316 E | 6.1030 |
| **943151** | AE2-344 C | 23.3096 |
| **943152** | AE2-344 E | 15.5397 |
| **943351** | AF1-006 C | 4.4658 |
| **943352** | AF1-006 E | 2.5120 |
| **943751** | AF1-043 | 4.8263 |
| **943871** | AF1-055 C O1 | 11.5342 |
| **943872** | AF1-055 E O1 | 7.6895 |
| **944181** | AF1-086 C O1 | 0.8447 |
| **944182** | AF1-086 E O1 | 3.6750 |
| **944261** | AF1-094 C | 3.6013 |
| **944262** | AF1-094 E | 2.4009 |
| **944281** | AF1-096 C | 2.8960 |
| **944282** | AF1-096 E | 1.9306 |
| **944301** | AF1-098 C | 15.0590 |
| **944302** | AF1-098 E | 10.0394 |
| **944311** | AF1-099 C | 3.4046 |
| **944312** | AF1-099 E | 2.2697 |
| **944321** | AF1-100 C O1 | 7.2481 |
| **944322** | AF1-100 E O1 | 4.8321 |
| **944381** | AF1-103 O1 | 2.1031 |
| **944391** | AF1-104 O1 | 7.4356 |
| **944411** | AF1-106 O1 | 0.9133 |
| **944691** | AF1-134 C O1 | 0.4382 |
| **944692** | AF1-134 E O1 | 0.4382 |
| **944701** | AF1-135 C | 0.5258 |
| **944702** | AF1-135 E | 0.3505 |
| **944741** | AF1-139 C O1 | 0.5192 |
| **944742** | AF1-139 E O1 | 0.3462 |
| **944771** | AF1-142 C | 5.4473 |
| **944772** | AF1-142 E | 3.6316 |
| **944881** | AF1-153 C O1 | 0.6742 |
| **944882** | AF1-153 E O1 | 0.4495 |
| **944901** | AF1-155 C | 0.6744 |
| **944902** | AF1-155 E | 0.4496 |
| **945021** | AF1-167 C | 0.5100 |
| **945022** | AF1-167 E | 0.3400 |
| **945051** | AF1-170 C | 16.4503 |
| **945052** | AF1-170 E | 10.9669 |
| **945071** | AF1-172 C | 7.0542 |
| **945072** | AF1-172 E | 4.7028 |
| **945121** | AF1-177 | 0.5258 |
| **945161** | AF1-181 | 0.0387 |
| **945171** | AF1-182 | 0.1933 |
| **945181** | AF1-183 | 0.0479 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **945331** | AF1-198 | 0.1159 |
| **945451** | AF1-210 C | 0.4706 |
| **945452** | AF1-210 E | 0.3137 |
| **945481** | AF1-213 C | 4.1479 |
| **945482** | AF1-213 E | 2.7653 |
| **945551** | AF1-220 C | 5.4331 |
| **945552** | AF1-220 E | 3.6241 |
| **945751** | AF1-240 C O1 | 0.6570 |
| **945752** | AF1-240 E O1 | 0.4380 |
| **945771** | AF1-242 C | 0.6744 |
| **945772** | AF1-242 E | 0.4496 |
| **946091** | AF1-274 C | 2.8630 |
| **946092** | AF1-274 E | 1.9087 |
| **946131** | AF1-278 | 13.8404 |
| **946211** | AF1-286 C O1 | 0.3699 |
| **946212** | AF1-286 E O1 | 0.2512 |
| **946221** | AF1-287 C | 3.9829 |
| **946222** | AF1-287 E | 2.6553 |
| **946381** | AF1-302 C | 0.9905 |
| **946382** | AF1-302 E | 1.3207 |
| **946401** | AF1-304 C | 6.1872 |
| **946402** | AF1-304 E | 4.1248 |
| **946421** | AF1-306 C | 3.3746 |
| **946422** | AF1-306 E | 13.4982 |
| **946771** | AF1-217 C O1 | 3.9829 |
| **946772** | AF1-217 E O1 | 2.6553 |
| **DUCKCREEK** | DUCKCREEK | 3.2587 |
| **NEWTON** | NEWTON | 2.9366 |
| **FARMERCITY** | FARMERCITY | 0.1514 |
| **G-007A** | G-007A | 4.6607 |
| **VFT** | VFT | 12.7452 |
| **PRAIRIE** | PRAIRIE | 6.8682 |
| **COFFEEN** | COFFEEN | 1.4518 |
| **EDWARDS** | EDWARDS | 0.9975 |
| **CHEOAH** | CHEOAH | 1.0961 |
| **TILTON** | TILTON | 1.7741 |
| **MADISON** | MADISON | 0.0645 |
| **GIBSON** | GIBSON | 1.4944 |
| **CALDERWOOD** | CALDERWOOD | 1.0944 |
| **BLUEG** | BLUEG | 4.6872 |
| **TRIMBLE** | TRIMBLE | 1.5048 |
| **CATAWBA** | CATAWBA | 0.6395 |

## 13.26 Index 26

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41812644** | 938380 | AE1-071 TAP | PENELEC | 200520 | 26ROXBURY | PENELEC | 1 | AP-P2-2-WP-230-001T | bus | 160.0 | 119.02 | 122.51 | DC | 12.38 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **235003** | AC1-025 E | 0.0892 |
| **236828** | 01GRAYMONT | 0.2325 |
| **938381** | AE1-071 C | 39.2279 |
| **938382** | AE1-071 E | 24.0042 |
| **939171** | AE1-147 C | 0.6950 |
| **939172** | AE1-147 E | 0.4634 |
| **940201** | AE2-001 C | 0.6965 |
| **940202** | AE2-001 E | 0.4643 |
| **940681** | AE2-055 C | 0.7179 |
| **940682** | AE2-055 E | 0.4786 |
| **941231** | AE2-117 C | 0.6693 |
| **941232** | AE2-117 E | 0.4462 |
| **941241** | AE2-118 C | 0.6693 |
| **941242** | AE2-118 E | 0.4462 |
| **941261** | AE2-120 C | 0.6973 |
| **941262** | AE2-120 E | 0.4648 |
| **941271** | AE2-121 C | 0.3682 |
| **941272** | AE2-121 E | 0.2459 |
| **942031** | AE2-215 C | 10.8814 |
| **942032** | AE2-215 E | 7.2542 |
| **942351** | AE2-248 C | 0.5671 |
| **942352** | AE2-248 E | 0.3781 |
| **942491** | AE2-262 C | 2.6001 |
| **942492** | AE2-262 E | 1.7473 |
| **942501** | AE2-263 C | 2.4441 |
| **942502** | AE2-263 E | 1.6319 |
| **942511** | AE2-264 C | 2.2028 |
| **942512** | AE2-264 E | 1.4685 |
| **944001** | AF1-068 C O1 | 0.4023 |
| **944002** | AF1-068 E O1 | 0.2263 |
| **944311** | AF1-099 C | 2.0919 |
| **944312** | AF1-099 E | 1.3946 |
| **944321** | AF1-100 C O1 | 3.7599 |
| **944322** | AF1-100 E O1 | 2.5066 |
| **944471** | AF1-112 C | 0.3745 |
| **944472** | AF1-112 E | 0.2496 |
| **944671** | AF1-132 C O1 | 0.3780 |
| **944672** | AF1-132 E O1 | 0.2520 |
| **944731** | AF1-138 C O1 | 0.3547 |
| **944732** | AF1-138 E O1 | 0.2365 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **944771** | AF1-142 C | 3.3471 |
| **944772** | AF1-142 E | 2.2314 |
| **944841** | AF1-149 C | 0.6973 |
| **944842** | AF1-149 E | 0.4648 |
| **945161** | AF1-181 | 0.0200 |
| **945171** | AF1-182 | 0.1003 |
| **945181** | AF1-183 | 0.0226 |
| **945491** | AF1-214 C | 0.3695 |
| **945492** | AF1-214 E | 0.2463 |
| **946311** | AF1-295 | 3.6271 |
| **DUCKCREEK** | DUCKCREEK | 0.1578 |
| **NEWTON** | NEWTON | 0.1569 |
| **FARMERCITY** | FARMERCITY | 0.0086 |
| **G-007A** | G-007A | 0.9350 |
| **VFT** | VFT | 2.6445 |
| **PRAIRIE** | PRAIRIE | 0.4081 |
| **COFFEEN** | COFFEEN | 0.0772 |
| **EDWARDS** | EDWARDS | 0.0469 |
| **CHEOAH** | CHEOAH | 0.1136 |
| **TILTON** | TILTON | 0.0857 |
| **GIBSON** | GIBSON | 0.0781 |
| **CALDERWOOD** | CALDERWOOD | 0.1113 |
| **BLUEG** | BLUEG | 0.2500 |
| **TRIMBLE** | TRIMBLE | 0.0796 |
| **CATAWBA** | CATAWBA | 0.1011 |

## 13.27 Index 27

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **42172164** | 999392 | STAR601 | PENELEC | 200767 | 26HOMER CT | PENELEC | N | PN-P2-3-PN-230-9E | breaker | 807.0 | 125.46 | 126.4 | DC | 16.47 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200823** | 26MHP_X3-003 | 2.2695 |
| **200830** | 26HNSMLK 3 | 1.8760 |
| **200831** | 26HNSMLK 4 | 1.8760 |
| **200832** | 26HNSMLK 5 | 1.8760 |
| **200838** | 26HOMER C2 | 45.1077 |
| **200839** | 26HOMER C3 | 47.7524 |
| **200894** | 26K02 | 6.9091 |
| **200898** | 26AA1-106 | 3.0352 |
| **201144** | W3-099 C OP1 | 1.8313 |
| **201477** | 26Y2-055 | 4.7720 |
| **203349** | 26Z1-069 C | 0.4984 |
| **203907** | 26Y2-042 | 1.4811 |
| **203909** | 26Z1-038 | 2.2372 |
| **203910** | 26Z1-091 | 3.0422 |
| **203999** | P-047 E | 16.3426 |
| **294573** | P-028 E | 13.6170 |
| **903644** | W3-099 E OP1 | 12.2557 |
| **915951** | Y3-092 FTIR | 139.8800 |
| **916202** | Z1-069 E | 15.2211 |
| **917672** | Z2-108 E | -1.9186 |
| **917673** | Z2-108 BAT | 2.2572 |
| **918682** | AA1-082 E | 8.2095 |
| **919201** | AA1-144 OP | 23.0963 |
| **919491** | AA2-000 | 46.7537 |
| **920341** | AA2-132 | 3.4204 |
| **922932** | AB1-082 OP | 5.4301 |
| **923442** | AB1-160 C | 0.1424 |
| **923443** | AB1-160 E | 4.3489 |
| **930511** | AB1-092 | 1.7167 |
| **936421** | AD2-055 | 3.5343 |
| **938352** | AE1-053 BAT | 1.2540 |
| **938882** | AE1-116 BAT | 1.3081 |
| **938951** | AE1-123 | 1.9587 |
| **939291** | AE1-160 C | 1.6593 |
| **939292** | AE1-160 E | 0.9538 |
| **939381** | AE1-169 C O1 | 6.6451 |
| **939382** | AE1-169 E O1 | 4.4301 |
| **940861** | AE2-074 C | 4.1231 |
| **940862** | AE2-074 E | 5.4274 |
| **941191** | AE2-113 C | 11.7440 |
| **941192** | AE2-113 E | 12.6445 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **941321** | AE2-126 C | 1.1333 |
| **941322** | AE2-126 E | 0.7555 |
| **941421** | AE2-139 C | 8.2218 |
| **941422** | AE2-139 E | 5.4812 |
| **942491** | AE2-262 C | 3.4582 |
| **942492** | AE2-262 E | 2.3239 |
| **942501** | AE2-263 C | 3.2507 |
| **942502** | AE2-263 E | 2.1704 |
| **942811** | AE2-299 C | 4.5557 |
| **942812** | AE2-299 E | 18.2229 |
| **942961** | AE2-316 C | 5.6140 |
| **942962** | AE2-316 E | 8.0056 |
| **943151** | AE2-344 C | 9.6181 |
| **943152** | AE2-344 E | 6.4121 |
| **943351** | AF1-006 C | 0.8869 |
| **943352** | AF1-006 E | 0.4989 |
| **943751** | AF1-043 | 5.6195 |
| **943871** | AF1-055 C O1 | 3.6302 |
| **943872** | AF1-055 E O1 | 2.4201 |
| **944261** | AF1-094 C | 0.8477 |
| **944262** | AF1-094 E | 0.5651 |
| **944281** | AF1-096 C | 0.8310 |
| **944282** | AF1-096 E | 0.5540 |
| **944301** | AF1-098 C | 3.5963 |
| **944302** | AF1-098 E | 2.3975 |
| **944311** | AF1-099 C | 2.7823 |
| **944312** | AF1-099 E | 1.8549 |
| **944321** | AF1-100 C O1 | 6.0959 |
| **944322** | AF1-100 E O1 | 4.0640 |
| **944381** | AF1-103 O1 | 1.7437 |
| **944391** | AF1-104 O1 | 1.3164 |
| **944411** | AF1-106 O1 | 1.9691 |
| **944741** | AF1-139 C O1 | 1.0931 |
| **944742** | AF1-139 E O1 | 0.7288 |
| **944771** | AF1-142 C | 4.4516 |
| **944772** | AF1-142 E | 2.9678 |
| **944881** | AF1-153 C O1 | 0.7105 |
| **944882** | AF1-153 E O1 | 0.4736 |
| **944901** | AF1-155 C | 0.7125 |
| **944902** | AF1-155 E | 0.4750 |
| **945021** | AF1-167 C | 0.6319 |
| **945022** | AF1-167 E | 0.4212 |
| **945051** | AF1-170 C | 3.2227 |
| **945052** | AF1-170 E | 2.1485 |
| **945071** | AF1-172 C | 7.4637 |
| **945072** | AF1-172 E | 4.9758 |
| **945121** | AF1-177 | 0.4359 |
| **945161** | AF1-181 | 0.0326 |
| **945171** | AF1-182 | 0.1626 |
| **945331** | AF1-198 | 0.2584 |
| **945451** | AF1-210 C | 0.6033 |
| **945452** | AF1-210 E | 0.4022 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **945551** | AF1-220 C | 5.8816 |
| **945552** | AF1-220 E | 3.9232 |
| **945673** | AF1-232 BAT | 2.9052 |
| **945771** | AF1-242 C | 0.7125 |
| **945772** | AF1-242 E | 0.4750 |
| **946091** | AF1-274 C | 2.7681 |
| **946092** | AF1-274 E | 1.8454 |
| **946131** | AF1-278 | 51.5931 |
| **946211** | AF1-286 C O1 | 0.7975 |
| **946212** | AF1-286 E O1 | 0.5415 |
| **946221** | AF1-287 C | 0.8792 |
| **946222** | AF1-287 E | 0.5861 |
| **946381** | AF1-302 C | 1.2993 |
| **946382** | AF1-302 E | 1.7324 |
| **946401** | AF1-304 C | 4.1369 |
| **946402** | AF1-304 E | 2.7580 |
| **946421** | AF1-306 C | 3.4691 |
| **946422** | AF1-306 E | 13.8766 |
| **946771** | AF1-217 C O1 | 0.8792 |
| **946772** | AF1-217 E O1 | 0.5861 |
| **LGEE** | LGEE | 0.0217 |
| **WEC** | WEC | 0.0454 |
| **CBM-W1** | CBM-W1 | 3.6654 |
| **O-066** | O-066 | 4.6435 |
| **CHEOAH** | CHEOAH | 0.1211 |
| **G-007** | G-007 | 0.8382 |
| **MEC** | MEC | 0.1208 |
| **CALDERWOOD** | CALDERWOOD | 0.1168 |
| **CATAWBA** | CATAWBA | 0.1551 |

## 13.28 Index 28

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41812718** | 999393 | STAR600 | PENELEC | 200727 | 26SHAW. 2 | PENELEC | 2A | AP-P2-2-WP-230-001T | bus | 148.0 | 109.89 | 115.58 | DC | 18.69 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **200665** | 26SHAWVL 3 | 2.8447 |
| **200666** | 26SHAWVL 4 | 2.9005 |
| **235003** | AC1-025 E | 0.1005 |
| **236828** | 01GRAYMONT | 0.2760 |
| **919491** | AA2-000 | 30.5395 |
| **930511** | AB1-092 | 1.1213 |
| **936421** | AD2-055 | 2.3086 |
| **939171** | AE1-147 C | 0.8319 |
| **939172** | AE1-147 E | 0.5546 |
| **940201** | AE2-001 C | 0.8298 |
| **940202** | AE2-001 E | 0.5532 |
| **940681** | AE2-055 C | 0.7967 |
| **940682** | AE2-055 E | 0.5311 |
| **941261** | AE2-120 C | 0.8285 |
| **941262** | AE2-120 E | 0.5524 |
| **941271** | AE2-121 C | 0.4443 |
| **941272** | AE2-121 E | 0.2967 |
| **942351** | AE2-248 C | 0.6484 |
| **942352** | AE2-248 E | 0.4323 |
| **942491** | AE2-262 C | 3.9236 |
| **942492** | AE2-262 E | 2.6367 |
| **942501** | AE2-263 C | 3.6882 |
| **942502** | AE2-263 E | 2.4625 |
| **943751** | AF1-043 | 3.6707 |
| **944001** | AF1-068 C O1 | 0.4558 |
| **944002** | AF1-068 E O1 | 0.2564 |
| **944311** | AF1-099 C | 3.1567 |
| **944312** | AF1-099 E | 2.1045 |
| **944321** | AF1-100 C O1 | 18.2280 |
| **944322** | AF1-100 E O1 | 12.1520 |
| **944471** | AF1-112 C | 0.4315 |
| **944472** | AF1-112 E | 0.2876 |
| **944671** | AF1-132 C O1 | 0.4261 |
| **944672** | AF1-132 E O1 | 0.2841 |
| **944771** | AF1-142 C | 5.0507 |
| **944772** | AF1-142 E | 3.3671 |
| **944841** | AF1-149 C | 0.8284 |
| **944842** | AF1-149 E | 0.5523 |
| **945071** | AF1-172 C | 5.8966 |
| **945072** | AF1-172 E | 3.9311 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **945161** | AF1-181 | 0.0936 |
| **945171** | AF1-182 | 0.4861 |
| **945483** | AF1-213 BAT | 7.7918 |
| **945491** | AF1-214 C | 0.4392 |
| **945492** | AF1-214 E | 0.2928 |
| **DUCKCREEK** | DUCKCREEK | 0.2602 |
| **NEWTON** | NEWTON | 0.2385 |
| **FARMERCITY** | FARMERCITY | 0.0122 |
| **G-007A** | G-007A | 0.9590 |
| **VFT** | VFT | 2.6251 |
| **PRAIRIE** | PRAIRIE | 0.5579 |
| **COFFEEN** | COFFEEN | 0.1173 |
| **EDWARDS** | EDWARDS | 0.0798 |
| **CHEOAH** | CHEOAH | 0.0921 |
| **TILTON** | TILTON | 0.1430 |
| **MADISON** | MADISON | 0.0161 |
| **GIBSON** | GIBSON | 0.1218 |
| **CALDERWOOD** | CALDERWOOD | 0.0924 |
| **BLUEG** | BLUEG | 0.3854 |
| **TRIMBLE** | TRIMBLE | 0.1235 |
| **CATAWBA** | CATAWBA | 0.0546 |

## 13.29 Index 29

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41560155** | 999401 | STAR592 | PJM | 200011 | KEYSTONE | PJM | 4 | PJM500_PN_P4-500-001A | breaker | 634.0 | 105.19 | 106.53 | DC | 18.6 |

| Bus # | Bus | MW Impact |
|---|---|---|
| 200503 | **26C.SLOPE (Deativation : 06/07/19)** | **16.7325** |
| **200636** | 26IUP CO-G | 0.4069 |
| **200794** | 26CONEMAGH | 0.2755 |
| 200805 | **26COLVER13 (Deativation : 09/01/20)** | **19.5371** |
| **200809** | 26SITHE | 1.2781 |
| **200833** | 26SEWRDB34 | 13.2926 |
| **200834** | 26SW_E13_K22 | 0.0419 |
| **200835** | 26DSGENWIN | 0.2043 |
| **200837** | 26HOMER C1 | 22.0118 |
| **200838** | 26HOMER C2 | 18.4521 |
| **200839** | 26HOMER C3 | 19.5339 |
| **200846** | 26FORWARD | 0.1497 |
| **200864** | K-013 E | 4.2904 |
| **200883** | Q-053 E | 7.8926 |
| **200886** | 26ARWF_N39 | 0.3654 |
| **200888** | 26HIGHLAND | 0.3256 |
| **200889** | 26STNY CRK | 0.2507 |
| **200890** | 26BF_G21_K23 | 0.1002 |
| **200891** | 26CSLMN_L13 | 0.1571 |
| **200892** | 26LOOKOUT | 0.1493 |
| **200894** | 26K02 | 4.2783 |
| **200898** | 26AA1-106 | 1.6183 |
| **200906** | 26KEYSTN#3 | 0.6753 |
| **200915** | 26CHSTN_FL | 0.1744 |
| **200925** | 26R32 | 0.3757 |
| **200945** | 26CT_V3-030 | 0.1279 |
| **201144** | W3-099 C OP1 | 0.8862 |
| **201477** | 26Y2-055 | 2.5227 |
| **202158** | 26CON.GEN1 | 0.0706 |
| **202160** | 26CON.GEN2 | 0.0494 |
| **202225** | 26SCI_S29B | 0.0652 |
| **203034** | 26NA_O38_P22 | 0.3198 |
| **203910** | 26Z1-091 | 1.4594 |
| **203999** | P-047 E | 7.6636 |
| **235003** | AC1-025 E | 0.1066 |
| **236828** | 01GRAYMONT | 0.2892 |
| **290086** | Q-036 E | 4.7474 |
| **292350** | K-023 | 4.6300 |
| **292542** | L-013 1 | 4.5034 |
| **293301** | N-039 E | 10.4723 |
| **293393** | V3-030E | 4.8293 |
| **293432** | R-040 E | 0.2153 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **293603** | O-018 E | 9.3319 |
| **293902** | O-048 E | 4.0530 |
| **294515** | O38_P22 | 9.1633 |
| **294903** | P-060 E | 7.1841 |
| **296332** | R-032 E | 10.7676 |
| **903644** | W3-099 E OP1 | 5.9308 |
| **913142** | Y1-033 E OP1 | 3.1317 |
| **916202** | Z1-069 E | 6.1155 |
| **917672** | Z2-108 E | 2.1532 |
| **918682** | AA1-082 E | 4.1617 |
| **919201** | AA1-144 OP | 11.8405 |
| **919491** | AA2-000 | 36.9701 |
| **920341** | AA2-132 | 1.6166 |
| **922932** | AB1-082 OP | 2.2258 |
| **923443** | AB1-160 E | 1.7473 |
| **930511** | AB1-092 | 1.3574 |
| **935191** | AD1-154 | 2.3565 |
| **936421** | AD2-055 | 2.7947 |
| **936991** | AD2-133 C | 2.1363 |
| **936992** | AD2-133 E | 9.7714 |
| **938351** | AE1-053 | 1.1962 |
| **938881** | AE1-116 | 0.7506 |
| **938951** | AE1-123 | 1.6552 |
| **938991** | AE1-128 C | 12.7001 |
| **938992** | AE1-128 E | 8.4667 |
| **939171** | AE1-147 C | 0.8700 |
| **939172** | AE1-147 E | 0.5800 |
| **939291** | AE1-160 C | 1.0268 |
| **939292** | AE1-160 E | 0.5902 |
| **939381** | AE1-169 C O1 | 4.1867 |
| **939382** | AE1-169 E O1 | 2.7912 |
| **940201** | AE2-001 C | 0.8686 |
| **940202** | AE2-001 E | 0.5791 |
| **940681** | AE2-055 C | 0.8483 |
| **940682** | AE2-055 E | 0.5656 |
| **940861** | AE2-074 C | 1.6901 |
| **940862** | AE2-074 E | 2.2247 |
| **941191** | AE2-113 C | 6.6183 |
| **941192** | AE2-113 E | 7.1257 |
| **941231** | AE2-117 C | 1.0872 |
| **941232** | AE2-117 E | 0.7248 |
| **941241** | AE2-118 C | 1.0872 |
| **941242** | AE2-118 E | 0.7248 |
| 941251 | **AE2-119 C (Withdrawn : 12/16/2019)** | **1.1764** |
| 941252 | **AE2-119 E (Withdrawn : 12/16/2019)** | **0.7842** |
| **941261** | AE2-120 C | 0.8679 |
| **941262** | AE2-120 E | 0.5786 |
| **941271** | AE2-121 C | 0.4638 |
| **941272** | AE2-121 E | 0.3097 |
| **941321** | AE2-126 C | 1.1560 |
| **941322** | AE2-126 E | 0.7706 |
| **941331** | AE2-129 C | 1.3127 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **941332** | AE2-129 E | 0.8752 |
| **941351** | AE2-131 C | 1.3127 |
| **941352** | AE2-131 E | 0.8752 |
| **941421** | AE2-139 C | 4.4582 |
| **941422** | AE2-139 E | 2.9721 |
| **942121** | AE2-224 C | 11.0976 |
| **942122** | AE2-224 E | 7.3984 |
| **942351** | AE2-248 C | 0.6854 |
| **942352** | AE2-248 E | 0.4570 |
| **942361** | AE2-249 C | 1.4288 |
| **942362** | AE2-249 E | 0.9525 |
| **942491** | AE2-262 C | 3.9062 |
| **942492** | AE2-262 E | 2.6249 |
| **942501** | AE2-263 C | 3.6718 |
| **942502** | AE2-263 E | 2.4515 |
| **942511** | AE2-264 C | 5.1734 |
| **942512** | AE2-264 E | 3.4490 |
| **942811** | AE2-299 C | 2.2018 |
| **942812** | AE2-299 E | 8.8074 |
| **942961** | AE2-316 C | 3.5892 |
| **942962** | AE2-316 E | 5.1182 |
| **943151** | AE2-344 C | 4.6968 |
| **943152** | AE2-344 E | 3.1312 |
| **943351** | AF1-006 C | 0.4299 |
| **943352** | AF1-006 E | 0.2418 |
| **943711** | AF1-039 C O1 | 0.4391 |
| **943712** | AF1-039 E O1 | 0.2927 |
| **943751** | AF1-043 | 4.4436 |
| **943871** | AF1-055 C O1 | 1.8031 |
| **943872** | AF1-055 E O1 | 1.2020 |
| **944001** | AF1-068 C O1 | 0.4829 |
| **944002** | AF1-068 E O1 | 0.2717 |
| **944181** | AF1-086 C O1 | 3.2911 |
| **944182** | AF1-086 E O1 | 14.3182 |
| **944261** | AF1-094 C | 0.4556 |
| **944262** | AF1-094 E | 0.3037 |
| **944281** | AF1-096 C | 0.5142 |
| **944282** | AF1-096 E | 0.3428 |
| **944301** | AF1-098 C | 1.7941 |
| **944302** | AF1-098 E | 1.1961 |
| **944311** | AF1-099 C | 3.1427 |
| **944312** | AF1-099 E | 2.0951 |
| **944321** | AF1-100 C O1 | 6.7325 |
| **944322** | AF1-100 E O1 | 4.4883 |
| **944381** | AF1-103 O1 | 0.9216 |
| **944391** | AF1-104 O1 | 0.6234 |
| **944411** | AF1-106 O1 | 0.9338 |
| **944471** | AF1-112 C | 0.4553 |
| **944472** | AF1-112 E | 0.3035 |
| **944671** | AF1-132 C O1 | 0.4520 |
| **944672** | AF1-132 E O1 | 0.3013 |
| **944691** | AF1-134 C O1 | 1.4096 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **944692** | AF1-134 E O1 | 1.4096 |
| **944701** | AF1-135 C | 1.6915 |
| **944702** | AF1-135 E | 1.1277 |
| **944731** | AF1-138 C O1 | 0.5762 |
| **944732** | AF1-138 E O1 | 0.3842 |
| **944741** | AF1-139 C O1 | 0.5167 |
| **944742** | AF1-139 E O1 | 0.3444 |
| **944751** | AF1-140 C | 1.6938 |
| **944752** | AF1-140 E | 1.1292 |
| **944771** | AF1-142 C | 5.0283 |
| **944772** | AF1-142 E | 3.3522 |
| **944781** | AF1-143 C | 8.4438 |
| **944782** | AF1-143 E | 5.6292 |
| **944841** | AF1-149 C | 0.8678 |
| **944842** | AF1-149 E | 0.5785 |
| **944881** | AF1-153 C O1 | 0.5496 |
| **944882** | AF1-153 E O1 | 0.3664 |
| **944901** | AF1-155 C | 0.5495 |
| **944902** | AF1-155 E | 0.3663 |
| **945021** | AF1-167 C | 0.4031 |
| **945022** | AF1-167 E | 0.2687 |
| **945051** | AF1-170 C | 1.5485 |
| **945052** | AF1-170 E | 1.0323 |
| **945071** | AF1-172 C | 6.4352 |
| **945072** | AF1-172 E | 4.2901 |
| **945121** | AF1-177 | 0.2304 |
| **945161** | AF1-181 | 0.0359 |
| **945171** | AF1-182 | 0.1795 |
| **945181** | AF1-183 | 0.0483 |
| **945331** | AF1-198 | 0.1254 |
| **945451** | AF1-210 C | 0.3750 |
| **945452** | AF1-210 E | 0.2500 |
| **945481** | AF1-213 C | 5.2754 |
| **945482** | AF1-213 E | 3.5170 |
| **945491** | AF1-214 C | 0.4600 |
| **945492** | AF1-214 E | 0.3067 |
| **945551** | AF1-220 C | 4.5899 |
| **945552** | AF1-220 E | 3.0616 |
| **945671** | AF1-232 C O1 | 17.6831 |
| **945672** | AF1-232 E O1 | 9.5217 |
| **945751** | AF1-240 C O1 | 0.7494 |
| **945752** | AF1-240 E O1 | 0.4996 |
| **945771** | AF1-242 C | 0.5495 |
| **945772** | AF1-242 E | 0.3663 |
| **945901** | AF1-255 C | 0.9932 |
| **945902** | AF1-255 E | 1.3715 |
| **946071** | AF1-272 C O1 | 17.9595 |
| **946072** | AF1-272 E O1 | 11.9730 |
| **946081** | AF1-273 C O1 | 10.2018 |
| **946082** | AF1-273 E O1 | 6.8012 |
| **946091** | AF1-274 C | 2.5949 |
| **946092** | AF1-274 E | 1.7299 |

| Bus # | Bus | MW Impact |
|---|---|---|
| **946131** | AF1-278 | 11.2469 |
| **946191** | AF1-284 C O1 | 0.4553 |
| **946192** | AF1-284 E O1 | 0.2732 |
| **946211** | AF1-286 C O1 | 0.3782 |
| **946212** | AF1-286 E O1 | 0.2568 |
| **946221** | AF1-287 C | 0.4297 |
| **946222** | AF1-287 E | 0.2864 |
| **946241** | AF1-289 C O1 | 4.1647 |
| **946242** | AF1-289 E O1 | 2.7765 |
| **946381** | AF1-302 C | 0.8307 |
| **946382** | AF1-302 E | 1.1076 |
| **946401** | AF1-304 C | 2.6330 |
| **946402** | AF1-304 E | 1.7553 |
| **946421** | AF1-306 C | 2.6955 |
| **946422** | AF1-306 E | 10.7819 |
| **946431** | AF1-307 C | 7.1429 |
| **946432** | AF1-307 E | 4.7619 |
| **946571** | AF1-321 C O1 | 2.2446 |
| **946572** | AF1-321 E O1 | 1.4964 |
| **946771** | AF1-217 C O1 | 0.4297 |
| **946772** | AF1-217 E O1 | 0.2864 |
| **DUCKCREEK** | DUCKCREEK | 0.5619 |
| **NEWTON** | NEWTON | 0.5458 |
| **FARMERCITY** | FARMERCITY | 0.0284 |
| **PRAIRIE** | PRAIRIE | 1.3354 |
| **COFFEEN** | COFFEEN | 0.2664 |
| **EDWARDS** | EDWARDS | 0.1698 |
| **CHEOAH** | CHEOAH | 0.2933 |
| **TILTON** | TILTON | 0.3112 |
| **G-007** | G-007 | 0.0426 |
| **MADISON** | MADISON | 0.0262 |
| **GIBSON** | GIBSON | 0.2790 |
| **CALDERWOOD** | CALDERWOOD | 0.2907 |
| **BLUEG** | BLUEG | 0.9062 |
| **TRIMBLE** | TRIMBLE | 0.2905 |
| **CATAWBA** | CATAWBA | 0.2188 |

# Affected Systems

## 13.27 Affected Systems

### 13.27.1 LG&E

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

### 13.27.2 MISO

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

### 13.27.3 TVA

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

### 13.27.4 Duke Energy Progress

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

### 13.27.5 NYISO

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

## 13.28 Contingency Definitions

| Contingency Name | Contingency Definition |
|---|---|
| **PN-P2-3-PN-345-003A** | CONTINGENCY 'PN-P2-3-PN-345-003A' /* WAYNE 345KV STUCK BREAKER<br>DISCONNECT BUS 200595 /* 26WAYNE 345<br>END |
| **AP-P2-3-WP-230-443T *** | CONTINGENCY 'AP-P2-3-WP-230-443T *' / UPDATED CON AJK 3-31-16<br>DISCONNECT BRANCH FROM BUS 200726 TO BUS 235175 CKT 1<br>DISCONNECT BRANCH FROM BUS 235175 TO BUS 235236 CKT 1<br>DISCONNECT BUS 235158<br>END |
| **AP-P1-2-WP-230-005B** | CONTINGENCY 'AP-P1-2-WP-230-005B' /* QUEUE AE2-262 - MOSHANNON 230KV<br>DISCONNECT BRANCH FROM BUS 942490 TO BUS 235219 CKT 1 /* AE2-262 TAP 230 01MILESB 230<br>END |
| **PN_P4-500-002A** | CONTINGENCY 'PN_P4-500-002A' /* CONEMAUGH 500KV BKR 1<br>DISCONNECT BRANCH FROM BUS 200005 TO BUS 200912 CKT 3 /* CONEM-GH 500 26CONEMAGH 230<br>DISCONNECT BUS 200031 /* CONE G2 22<br>END |
| **PN-P2-3-PN-115-28B_A** | CONTINGENCY 'PN-P2-3-PN-115-28B_A' /* 630<br>DISCONNECT BRANCH FROM BUS 200755 TO BUS 200801 CKT 1 /* 26WESTOVER 115 26GARMAN 115<br>DISCONNECT BRANCH FROM BUS 200682 TO BUS 200755 CKT 1 /* 26WEST.SOU 35 26WESTOVER 115<br>DISCONNECT BRANCH FROM BUS 200524 TO BUS 200801 CKT 1 /* 26SPANGLER 115 26GARMAN 115<br>DISCONNECT BRANCH FROM BUS 200524 TO BUS 200533 CKT 2 /* 26SPANGLER 115 26SPANGLER 46<br>END |
| **PN_P4-500-002F** | CONTINGENCY 'PN_P4-500-002F' /* CONEMAUGH 500KV BKR 6<br>DISCONNECT BRANCH FROM BUS 200005 TO BUS 200912 CKT 3 /* CONEM-GH 500 26CONEMAGH 230<br>DISCONNECT BUS 200030 /* CONE G1 22<br>END |
| **PN-P1-2-PN-115-094-A** | CONTINGENCY 'PN-P1-2-PN-115-094-A' /* ROXBURY - SHADE GAP 115KV<br>DISCONNECT BRANCH FROM BUS 200520 TO BUS 938380 CKT 1 /* 26ROXBURY 115 AE1-071 TAP 115<br>END |
| **PN-P2-2-PN-115-032** | CONTINGENCY 'PN-P2-2-PN-115-032' /* ROXBURY 115KV BUS FAULT<br>DISCONNECT BUS 200520 /* 26ROXBURY 115<br>END |

| Contingency Name | Contingency Definition |
|---|---|
| **AP-P2-2-WP-230-005T** | CONTINGENCY 'AP-P2-2-WP-230-005T' /* SHINGLETOWN #2 230KV BUS<br>DISCONNECT BRANCH FROM BUS 235248 TO BUS 235970 CKT 1 /* 01SHINGL 230 01DALE 230<br>DISCONNECT BRANCH FROM BUS 235248 TO BUS 200513 CKT 1 /* 01SHINGL 230 26LEWISTWN 230<br>DISCONNECT BRANCH FROM BUS 235248 TO BUS 236711 CKT 82 /* 01SHINGL 230 01SHINGLTN 46<br>DISCONNECT BUS 237058 /*SHINGLETOWN 230 KV CAPACITOR<br>END |
| **PN-P1-2-PN-230-004** | CONTINGENCY 'PN-P1-2-PN-230-004' /* GLADE - WARREN 230KV<br>DISCONNECT BRANCH FROM BUS 200811 TO BUS 200593 CKT 1 /* 26WARREN 230 26GLADE 230<br>END |
| **PL_P42_100548** | CONTINGENCY 'PL_P42_100548' /* AT JUNIATA SUB 230KV BUS TIE CB FAILED"<br>DISCONNECT BUS 208005 /*<br>DISCONNECT BUS 208004 /*<br>END |
| **AP-P2-2-WP-230-001T** | CONTINGENCY 'AP-P2-2-WP-230-001T' /* ELKO #2 230KV BUS<br>DISCONNECT BRANCH FROM BUS 235175 TO BUS 235158 CKT 1 /* 01ELKO 230 01CARB 230<br>DISCONNECT BRANCH FROM BUS 235175 TO BUS 235236 CKT 1 /* 01ELKO 230 01QUEHAN 230<br>DISCONNECT BRANCH FROM BUS 235175 TO BUS 200726 CKT 1 /* 01ELKO 230 26SHAWVL 2 230<br>REDUCE BUS 237007 SHUNT BY 100 PERCENT /* 01ELKO CAP 138<br>DISCONNECT BUS 237007 /* 01ELKO CAP 138<br>END |
| **PN-P1-2-PN-115-048** | CONTINGENCY 'PN-P1-2-PN-115-048' /* GARMAN - SPANGLER 115KV<br>DISCONNECT BRANCH FROM BUS 200801 TO BUS 200524 CKT 1 /* 26GARMAN 115 26SPANGLER 115<br>DISCONNECT BRANCH FROM BUS 200524 TO BUS 200533 CKT 2 /* 26SPANGLER 115 26SPANGLER 46<br>DISCONNECT BRANCH FROM BUS 200801 TO BUS 200755 CKT 1 /* 26GARMAN 115 26WESTOVER 115<br>DISCONNECT BUS 200524 /* 26SPANGLER 115<br>END |
| **ATSI-P7-1-CEI-345-016** | CONTINGENCY 'ATSI-P7-1-CEI-345-016' /* PERRY-NORTHFEILD AND PERRY-LC 345KV LINE OUTAGES<br>DISCONNECT BRANCH FROM BUS 239036 TO BUS 239358 CKT 1 /* 02PERRY 345 02NFIELD 345<br>DISCONNECT BRANCH FROM BUS 239036 TO BUS 239334 CKT 1 /* 02PERRY 345 02L.CENTER 345<br>END |
| **AP-P1-2-WP-230-324T_FSA_B** | CONTINGENCY 'AP-P1-2-WP-230-324T_FSA_B' /* MOSHANNON-MARSHALL 230KV APS-PN TIE<br>DISCONNECT BRANCH FROM BUS 919490 TO BUS 200909 CKT 1 /* AA2-000 TAP 230 26LOBO+ 230<br>DISCONNECT BRANCH FROM BUS 200857 TO BUS 200909 CKT 1 /* 26MARSHALL 230 26LOBO+ 230<br>DISCONNECT BRANCH FROM BUS 236829 TO BUS 200909 CKT 81 /* 01LOBO 46 46 26LOBO+ 230<br>REMOVE LOAD 1 FROM BUS 236829 /* 01LOBO 46 46<br>END |

| Contingency Name | Contingency Definition |
|---|---|
| **PN-P1-2-PN-230-013A** | CONTINGENCY 'PN-P1-2-PN-230-013A' /* EAST TOWANDA - NORTH MESHOPPEN 230KV<br>DISCONNECT BRANCH FROM BUS 200675 TO BUS 200924 CKT 1 /* 26E.TWANDA 230 26CANYON 230<br>DISCONNECT BRANCH FROM BUS 200924 TO BUS 200706 CKT 1 /* 26CANYON 230 26N.MESHPN 230<br>END |
| **AP-P1-2-WP-230-323T** | CONTINGENCY 'AP-P1-2-WP-230-323T' /* SHINGLETOWN-LEWISTOWN 230KV APS-PN TIE<br>DISCONNECT BRANCH FROM BUS 235248 TO BUS 200513 CKT 1 /* 01SHINGL 230 26LEWISTWN 230<br>END |
| **AP-P1-3-WP-230-326T** | CONTINGENCY 'AP-P1-3-WP-230-326T' /* SHINGLETOWN #82 230/46KV XFMR<br>DISCONNECT BRANCH FROM BUS 235248 TO BUS 236711 CKT 82 /* 01SHINGL 230 01SHINGLTN 46<br>DISCONNECT BRANCH FROM BUS 235248 TO BUS 200513 CKT 1 /* 01SHINGL 230 26LEWISTWN 230<br>DISCONNECT BRANCH FROM BUS 235248 TO BUS 235970 CKT 1 /* 01SHINGL 230 01DALE 230<br>DISCONNECT BUS 237058 /*SHINGLETOWN 230 KV CAPACITOR<br>END |
| **PN-P2-3-PN-115-59B** | CONTINGENCY 'PN-P2-3-PN-115-59B' /* GARMAN 115 KV STUCK CB - CB (SPANGLER - WESTOVER SOUTH)<br>DISCONNECT BRANCH FROM BUS 200755 TO BUS 944180 CKT 1 /* WESTOVER-AF1-086 TAP<br>DISCONNECT BUS 200755<br>DISCONNECT BRANCH FROM BUS 200801 TO BUS 200524 CKT 1 /* GARMAN-SPANGLER<br>DISCONNECT BRANCH FROM BUS 200524 TO BUS 200533 CKT 2 /* SPANGLER TR2<br>DISCONNECT BUS 200524<br>END |
| **PN-P2-3-PN-230-9E** | CONTINGENCY 'PN-P2-3-PN-230-9E' /* 575<br>DISCONNECT BRANCH FROM BUS 200767 TO BUS 200769 TO BUS 202641 CKT S/* 26HOMER CT 230 26HOMER CY 345 26HOMERCITYS 23.00<br>DISCONNECT BRANCH FROM BUS 200767 TO BUS 200837 CKT 1 /* 26HOMER CT 230 26HOMER C1 20<br>REMOVE MACHINE 1 FROM BUS 200837 /* 26HOMER C1 20<br>END |
| **PN-P2-3-PN-115-71CT** | CONTINGENCY 'PN-P2-3-PN-115-71CT' /* WARREN 115 KV STUCK CB - CBA (WARREN - WARREN2)<br>DISCONNECT BRANCH FROM BUS 135277 TO BUS 200579 CKT 1 /* FALCONER 115 26WARREN 115<br>DISCONNECT BRANCH FROM BUS 200570 TO BUS 200579 CKT 1 /* 26CORRY E. 115 26WARREN 115<br>DISCONNECT BRANCH FROM BUS 200579 TO BUS 200818 CKT ZB /* 26WARREN 115 26WARREN 2 115<br>DISCONNECT BRANCH FROM BUS 201201 TO BUS 200579 CKT 1 /* 26WRREN CT 14 26WARREN 115<br>DISCONNECT BRANCH FROM BUS 200579 TO BUS 201206 CKT 1 /* 26WARREN 115 26WARRN #1 35<br>DISCONNECT BRANCH FROM BUS 200579 TO BUS 200863 TO BUS 201202 CKT 2/* 26WARREN 115 26WARRN #2 35 26WRREN #2 12.00<br>DISCONNECT BRANCH FROM BUS 200580 TO BUS 200604 CKT 1 /* 26WARREN S 115 26WARREN S 35<br>DISCONNECT BRANCH FROM BUS 200818 TO BUS 201210 TO BUS 201202 CKT A/* 26WARREN 2 115 26FURN.BKR 35 26WRREN #2 12.00<br>REDUCE BUS 200579 SHUNT BY 100 PERCENT /* 26WARREN 115<br>END |

| Contingency Name | Contingency Definition |
|---|---|
| **PN-P1-3-PN-115-004** | CONTINGENCY 'PN-P1-3-PN-115-004' /* SHAWVILLE 1A 230/115KV XFMR FAULT<br>DISCONNECT BRANCH FROM BUS 200710 TO BUS 200714 TO BUS 200715 CKT 1A/* 26SHAWVL 1 230 26SHAWVL 1 115 26SHAWVL 1 18.00<br>DISCONNECT BRANCH FROM BUS 200714 TO BUS 200715 CKT 1B /* 26SHAWVL 1 115 26SHAWVL 1 18<br>DISCONNECT BUS 200715 /* 26SHAWVL 1 18<br>END |
| **PN-P1-3-PN-115-005** | CONTINGENCY 'PN-P1-3-PN-115-005' /* SHAWVILLE 2A 230/115KV XFMR FAULT<br>DISCONNECT BRANCH FROM BUS 200726 TO BUS 200727 TO BUS 200722 CKT 2A/* 26SHAWVL 2 230 26SHAW. 2 115 26SHAWVL 2 18.00<br>DISCONNECT BRANCH FROM BUS 200714 TO BUS 200722 CKT 2B /* 26SHAWVL 1 115 26SHAWVL 2 18<br>DISCONNECT BUS 200722 /* 26SHAWVL 2 18<br>END |
| **AP-P2-3-WP-230-460T** | CONTINGENCY 'AP-P2-3-WP-230-460T' /* 467<br>DISCONNECT BRANCH FROM BUS 200513 TO BUS 235248 CKT 1 /* 26LEWISTWN 230 01SHINGL 230<br>DISCONNECT BRANCH FROM BUS 200726 TO BUS 235248 CKT 1 /* 26SHAWVL 2 230 01SHINGL 230<br>DISCONNECT BRANCH FROM BUS 235248 TO BUS 235970 CKT 1 /* 01SHINGL 230 01DALE 230<br>DISCONNECT BRANCH FROM BUS 236711 TO BUS 235248 CKT 81 /* 01SHINGLTN 46 01SHINGL 230<br>DISCONNECT BRANCH FROM BUS 236711 TO BUS 235248 CKT 82 /* 01SHINGLTN 46 01SHINGL 230<br>END |
| **PN-P1-3-PN-230-004A** | CONTINGENCY 'PN-P1-3-PN-230-004A' /* HOMER CITY SOUTH 345/230KV XFMR<br>DISCONNECT BRANCH FROM BUS 200769 TO BUS 200767 TO BUS 202641 CKT S/* 26HOMER CY 345 26HOMER CT 230 26HOMERCITYS 23.00<br>END |
| **AP-P1-2-WP-230-004** | CONTINGENCY 'AP-P1-2-WP-230-004' /* ELKO - MOSHANNON 230KV<br>DISCONNECT BRANCH FROM BUS 235175 TO BUS 235236 CKT 1 /* 01ELKO 230 01QUEHAN 230<br>DISCONNECT BRANCH FROM BUS 235236 TO BUS 235220 CKT 1 /* 01QUEHAN 230 01MOSHAN 230<br>DISCONNECT BRANCH FROM BUS 235236 TO BUS 236732 CKT 81 /* 01QUEHAN 230 01QUEHANNA 46<br>DISCONNECT BUS 235236 /* 01QUEHAN 230<br>DISCONNECT BUS 236732 /* 01QUEHANNA 46<br>END |
| **PN-P2-2-PN-230-014T** | CONTINGENCY 'PN-P2-2-PN-230-014T' /* SHAWVILLE #2 230KV BUS<br>DISCONNECT BRANCH FROM BUS 200726 TO BUS 235248 CKT 1 /* 26SHAWVL 2 230 01SHINGL 230<br>DISCONNECT BRANCH FROM BUS 200726 TO BUS 235175 CKT 1 /* 26SHAWVL 2 230 01ELKO 230<br>DISCONNECT BRANCH FROM BUS 200726 TO BUS 200666 CKT 1 /* 26SHAWVL 2 230 26SHAWVL 4 22<br>DISCONNECT BRANCH FROM BUS 200726 TO BUS 200710 CKT ZB /* 26SHAWVL 2 230 26SHAWVL 1 230<br>END |

| Contingency Name | Contingency Definition |
|---|---|
| **PN-P2-3-PN-115-71ET** | CONTINGENCY 'PN-P2-3-PN-115-71ET' /* WARREN 115 KV STUCK CB - CBP (WARREN - CORRY EAST)<br>DISCONNECT BRANCH FROM BUS 135277 TO BUS 200579 CKT 1 /* FALCONER 115 26WARREN 115<br>DISCONNECT BRANCH FROM BUS 200570 TO BUS 200579 CKT 1 /* 26CORRY E. 115 26WARREN 115<br>DISCONNECT BRANCH FROM BUS 200579 TO BUS 200818 CKT ZB /* 26WARREN 115 26WARREN 2 115<br>DISCONNECT BRANCH FROM BUS 201201 TO BUS 200579 CKT 1 /* 26WRREN CT 14 26WARREN 115<br>DISCONNECT BRANCH FROM BUS 200579 TO BUS 201206 CKT 1 /* 26WARREN 115 26WARRN #1 35<br>DISCONNECT BRANCH FROM BUS 200579 TO BUS 200863 TO BUS 201202 CKT 2/* 26WARREN 115 26WARRN #2 35 26WRREN #2 12.00<br>DISCONNECT BRANCH FROM BUS 200580 TO BUS 200604 CKT 1 /* 26WARREN S 115 26WARREN S 35<br>DISCONNECT BRANCH FROM BUS 200570 TO BUS 200622 CKT 3 /* 26CORRY E. 115 26CORRY E. 35<br>REDUCE BUS 200579 SHUNT BY 100 PERCENT /* 26WARREN 115<br>END |
| **PN-P1-3-PN-500-001AT** | CONTINGENCY 'PN-P1-3-PN-500-001AT' /* KEYSTONE #3 500/230 KV XFMR<br>OPEN BRANCH FROM BUS 200011 TO BUS 200810 CKT 3 /* KEYSTONE 500.00 26KEYSTONE 230.00<br>END |
| **Base Case** | |
| **200909 26LOBO+ 230 919490 AA2-000 TAP 230 1** | CONTINGENCY '200909 26LOBO+ 230 919490 AA2-000 TAP 230 1'<br>OPEN BRANCH FROM BUS 200909 TO BUS 919490 CKT 1<br>END |
| **PN-P1-2-PN-230-025** | CONTINGENCY 'PN-P1-2-PN-230-025' /* CONEMAUGH - SEWARD 230KV<br>DISCONNECT BRANCH FROM BUS 200912 TO BUS 200793 CKT 1 /* 26CONEMAGH 230 26SEWARD 2 230<br>END |
| **PJM500_PN_P4-500-001A** | CONTINGENCY 'PJM500_PN_P4-500-001A' /* KEYSTONE 500KV BKR 1<br>DISCONNECT BRANCH FROM BUS 200011 TO BUS 200810 CKT 3 /* KEYSTONE 500 26KEYSTONE 230<br>REMOVE MACHINE H FROM BUS 200033 /* KEYS G2 20<br>REMOVE MACHINE L FROM BUS 200033 /* KEYS G2 20<br>DISCONNECT BUS 200033 /* KEYS G2 20<br>END |
| **PN-P1-2-PN-345-003** | CONTINGENCY 'PN-P1-2-PN-345-003' /* HANDSOME LAKE - WAYNE 345KV<br>DISCONNECT BRANCH FROM BUS 200826 TO BUS 200595 CKT 1 /* 26HANDSMLK 345 26WAYNE 345<br>END |
| **AP-P1-3-WP-230-005** | CONTINGENCY 'AP-P1-3-WP-230-005' /* MILESBURG #82 230/46KV XFMR<br>DISCONNECT BRANCH FROM BUS 235219 TO BUS 236745 CKT 82 /* 01MILESB 230 01MILESBG 46<br>DISCONNECT BRANCH FROM BUS 942490 TO BUS 235219 CKT 1 /* AE2-262 TAP 230 01MILESB 230<br>END |

| Contingency Name | Contingency Definition |
|---|---|
| **PJM500_PN_P4-500-001D** | CONTINGENCY 'PJM500_PN_P4-500-001D' /* KEYSTONE 500KV BKR 4<br>DISCONNECT BRANCH FROM BUS 200011 TO BUS 200810 CKT 3 /* KEYSTONE 500 26KEYSTONE 230<br>REMOVE MACHINE H FROM BUS 200032 /* KEYS G1 20<br>REMOVE MACHINE L FROM BUS 200032 /* KEYS G1 20<br>DISCONNECT BUS 200032 /* KEYS G1 20<br>END |
| **PN-P1-2-PN-230-103T** | CONTINGENCY 'PN-P1-2-PN-230-103T' /** 26LEWISTWN - JUNI BU2 230.00 LINE<br>DISCONNECT BRANCH FROM BUS 200513 TO BUS 208005 CKT 1 /* 26LEWISTWN - JUNI BU2 230.00 LINE<br>END |
| **AP-P2-3-WP-230-446T** | CONTINGENCY 'AP-P2-3-WP-230-446T' /* ELKO-MOSHANNON STK BKR AT ELKO<br>DISCONNECT BRANCH FROM BUS 200726 TO BUS 235175 CKT 1 /* 26SHAWVL 2 230 01ELKO 230<br>DISCONNECT BRANCH FROM BUS 235158 TO BUS 235175 CKT 1 /* 01CARB 230 01ELKO 230<br>DISCONNECT BRANCH FROM BUS 235175 TO BUS 235236 CKT 1 /* 01ELKO 230 01QUEHAN 230<br>DISCONNECT BRANCH FROM BUS 235220 TO BUS 235236 CKT 1 /* 01MOSHAN 230 01QUEHAN 230<br>DISCONNECT BRANCH FROM BUS 235236 TO BUS 236732 CKT 81 /* 01QUEHAN 230 01QUEHANNA 46<br>END |
| **PN-P1-3-PN-230-003A** | CONTINGENCY 'PN-P1-3-PN-230-003A' /* HOMER CITY NORTH 345/230KV XFMR<br>DISCONNECT BRANCH FROM BUS 200769 TO BUS 200767 TO BUS 202640 CKT N/* 26HOMER CY 345 26HOMER CT 230 26HOMERCITYN 23.00<br>END |
| **PL_P12_100618** | CONTINGENCY 'PL_P12_100618' /* JUNIATA 230/69KV TR4 OUT"<br>DISCONNECT BRANCH FROM BUS 208005 TO BUS 209997 CKT 4 /*<br>DISCONNECT BRANCH FROM BUS 208005 TO BUS 207955 CKT 1 /*<br>DISCONNECT BRANCH FROM BUS 208005 TO BUS 200009 CKT 2 /*<br>DISCONNECT BRANCH FROM BUS 208005 TO BUS 208006 CKT 1 /*<br>DISCONNECT BRANCH FROM BUS 208005 TO BUS 208004 CKT 1 /*<br>DISCONNECT BRANCH FROM BUS 208005 TO BUS 200513 CKT 1 /*<br>END |
| **ATSI-P7-1-CEI-345-012** | CONTINGENCY 'ATSI-P7-1-CEI-345-012' /* PERRY-EASTLAKE AND PERRY-NORTHFIELD 345KV LINE OUTAGES<br>DISCONNECT BRANCH FROM BUS 238684 TO BUS 239036 CKT 1 /* 02EASTLK 345 02PERRY 345<br>DISCONNECT BRANCH FROM BUS 239358 TO BUS 239036 CKT 1 /* 02NFIELD 345 02PERRY 345<br>END |
| **PN-P1-2-PN-230-101T** | CONTINGENCY 'PN-P1-2-PN-230-101T' /* EAST TOWANDA - HILLSIDE 230KV<br>DISCONNECT BRANCH FROM BUS 200675 TO BUS 130763 CKT 1 /* 26E.TWANDA 230 HILSD230 230<br>END |
| **ATSI-P1-1-CEI-345-711** | CONTINGENCY 'ATSI-P1-1-CEI-345-711' /* GEN 02PERRG1 22.0 UNIT 1<br>REMOVE MACHINE 1 FROM BUS 239035 /* 02PERRG1 22<br>END |

| Contingency Name | Contingency Definition |
|---|---|
| **PN-P1-3-PN-230-001T** | CONTINGENCY 'PN-P1-3-PN-230-001T' /* CONEMAUGH #1 500/230KV XFMR<br>DISCONNECT BRANCH FROM BUS 200005 TO BUS 200912 CKT 3 /* CONEM-GH 500 26CONEMAGH 230<br>END |

# Short Circuit

## 13.29 Short Circuit

The following Breakers are overduty:

None.

# 14 Attachment 1 – One Line