



# **Generation Interconnection**

## **Feasibility Study Report**

**for**

### **Queue Project AG1-258**

**MADISONBURG JCT-MILLHEIM 46 KV**

**8.3 MW Capacity / 19.9 MW Energy**

January 2021

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## 1 Introduction

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

## 2 Preface

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

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

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

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 an uprate to a planned Solar generating facility located in Centre, Pennsylvania. This project is an increase to the Interconnection Customer's AG1-257 project, which will share the same point of interconnection. The AG1-258 queue position is a 19.9 MW uprate (8.3 MW Capacity uprate) to the previous project. The total installed facilities will have a capability of 39.8 MW with 16.6 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this uprate project is August 01, 2023. This study does not imply a TO commitment to this in-service date.

<b>Queue Number</b>	<b>AG1-258</b>
<b>Project Name</b>	MADISONBURG JCT-MILLHEIM 46 KV
<b>State</b>	Pennsylvania
<b>County</b>	Centre
<b>Transmission Owner</b>	APS
<b>MFO</b>	39.8
<b>MWE</b>	19.9
<b>MWC</b>	8.3
<b>Fuel</b>	Solar
<b>Basecase Study Year</b>	2024

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

## **4 Point of Interconnection**

### **4.1 Primary Point of Interconnection**

AG1-258 will interconnect with the FirstEnergy, West Penn Power system. This project is an increase to the Interconnection Customer's AG1-257 project, which will share the same point of interconnection. The interconnection of the project will be accomplished by converting the proposed AG1-257 three-switch tap into a new interconnection substation with three 46 kV breakers arranged in a ring bus configuration. The new substation will be located approximately 2.8 miles from Madisonburg Junction and 1.6 miles from the Millheim substation. The IC will be responsible for acquiring all easements, properties, and permits that may be required to construct both the new interconnection station and the associated Attachment facilities. The IC will also be responsible for the rough grade of the property and an access road to the proposed site. The project will also require non-direct connection upgrades at Centre Hall and Pleasant Gap substations.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AG1-258 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.

### **4.2 Secondary Point of Interconnection**

There is no secondary point of interconnection specified for AG1-258.

## 5 Cost Summary

The AG1-258 project will be responsible for the following costs:

Description	Total Cost
<b>Total Physical Interconnection Costs</b>	\$10,517,000
<b>Total System Network Upgrade Costs (TO identified)</b>	\$455,884 <sup>1</sup>
<b>Total System Network Upgrade Costs (PJM identified)</b>	\$63,236,612 <sup>2</sup>
<b>Total Costs</b>	<b>\$74,209,496</b>

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

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

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<sup>1</sup> This project currently causes and contributes to overloads of the TO system (see Transmission Owner Analysis section below) and therefore has potential to have cost allocation for the system reinforcements listed in the report. This will be re-evaluated in the System Impact phase. The results may vary with queue customers withdrawing from the queue and other generators deactivating over time. If a customer is the first to cause the need for a project (causes loading to exceed 100% of rating), then the customer is responsible. If a customer contributes to a facility that is already overloaded by a prior queue, then they may receive cost allocation.

<sup>2</sup> This project currently causes and/or contributes to overloads of the Transmission System (see Summer Peak Load Flow Analysis section below) and therefore has potential to have cost allocation for the system reinforcements listed in the report. This will be re-evaluated in the System Impact phase. The results may vary with queue customers withdrawing from the queue and other generators deactivating over time. If a customer is the first to cause the need for a project (causes loading to exceed 100% of rating), then the customer is responsible. If a customer contributes to a facility that is already overloaded by a prior queue, then they may receive cost allocation.

## 6 Transmission Owner Scope of Work

AG1-258 will interconnect with the FirstEnergy (APS) system. This project is an increase to the Interconnection Customer's AG1-257 project, which will share the same point of interconnection. The interconnection of the project will be accomplished by converting the proposed AG1-257 three-switch tap into a new interconnection substation with three 46 kV breakers arranged in a ring bus configuration. The new substation will be located approximately 2.8 miles from Madisonburg Junction and 1.6 miles from the Millheim substation. The IC will be responsible for acquiring all easements, properties, and permits that may be required to construct both the new interconnection station and the associated Attachment facilities. The IC will also be responsible for the rough grade of the property and an access road to the proposed site. The project will also require non-direct connection upgrades at Centre Hall and Pleasant Gap substations.

The total physical interconnection costs are given in the table below:

Description	Total Cost
Install disconnect switch, dead-end structure, and associated facilities for generator lead line exit at interconnection substation.	\$300,000
Convert the 3-switch tap from AG1-257 into a 46 kV three breaker ring bus interconnection substation with SCADA control.	\$5,700,000
Loop the Centre Hall - Pleasant Gap 46 kV line between Madisonburg Junction and Millheim into the new substation.	\$590,000
Install 2.8 miles of OPGW to Madisonburg Jct.	\$1,824,000
Install 1.6 miles of OPGW to Millheim substation.	\$1,043,000
Upgrade relaying at Centre Hall substation.	\$530,000
Upgrade relaying at Pleasant Gap substation.	\$530,000
<b>Total Physical Interconnection Costs</b>	<b>\$10,517,000</b>

## 7 Schedule

Based on the scope of work for the Attachment Facilities and the Direct and/or Non-Direct Connection facilities, it is expected to take a minimum of 24 months after the signing of an Interconnection Construction Service Agreement to complete the installation. This includes the requirement for the IC to make a preliminary payment that compensates FE for the first three months of the engineering design work that is related to the Attachment Facilities. Full initial payment is required for Non-Direct Connection work. This assumes that there will be no environmental issues with any of the new properties associated with this project, that there will be no delays in acquiring the necessary permits for implementing the defined interconnection work and network upgrades, and that all transmission system outages will be allowed when requested.

If the customer is ultimately responsible for network upgrades, then the schedule for those upgrades will be refined in future study phases. The customer would need to wait for those upgrades to be completed prior to commercial operation unless determined deliverable by an interim deliverability study. The elapsed time to complete any network upgrades is provided in the System Reinforcements table of this report.

## 8 Transmission Owner Analysis<sup>3</sup>

### 8.1 Transmission Owner Identified Network Impacts to Distribution Facilities

Potential TO identified network impacts to Transmission Owner distribution facilities were as follows:

Idx	Overloaded Element	Contingency	Rating [MVA]	Loading Before %	Loading After %	Contribution [MW]
90A	940680 AE2-055 TAP 46.0 236711 01SHINGLTN 46.0 1	Base Case	57	89.00%	101.00%	6.84
90B	940680 AE2-055 TAP 46.0 236711 01SHINGLTN 46.0 1	CONTINGENCY 'AP-P1-2-WP-230-006A' DISCONNECT BRANCH FROM BUS 235970 TO BUS 235248 CKT 1 /* 01DALE 230 01SHINGL 230 END	67	95.00%	106.00%	7.1817
90C	940680 AE2-055 TAP 46.0 236711 01SHINGLTN 46.0 1	CONTINGENCY 'AP-P1-2-WP-230-006B' DISCONNECT BRANCH FROM BUS 235219 TO BUS 235970 CKT 1 /* 01MILES B 230 01DALE 230 END	67	95.00%	106.00%	6.9358

### 8.2 Transmission Owner Identified Network Impacts to Sub-Regional Facilities

Potential TO identified network impacts to Transmission Owner Sub-Regional facilities were as follows:

None

<sup>3</sup> For TO Distribution Facilities that need upgrades, the TO has applied their cost allocation rules. For TO Sub-Regional Facilities in need of upgrades, PJM Cost Allocation Criteria has been applied.

### 8.3 System Reinforcements on Distribution Facilities

Idx	Facility	Upgrade ID	Upgrade Description	Cost
90A, 90B, 90C	940680 AE2-055 TAP 46.0 236711 01SHINGLTN 46.0 1	WP-AG1-F-0043	<u>APS</u> Replace 46 kV line side and bus side disconnect switches and substation conductor at Shingletown substation. Adjust line relaying as necessary at Shingletown.  Time Estimate: 12 Cost: \$455,884	\$455,884
			<b>TOTAL COST</b>	<b>\$455,884</b>

### 8.4 System Reinforcements on Sub-Regional Facilities

None

## 9 Interconnection Customer Requirements

### 9.1 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.

### 9.2 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 46 kV circuit breaker to protect the AG1-258 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 AG1-258 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 Transmission System.

### **9.3 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.

## **10 Revenue Metering and SCADA Requirements**

### **10.1 PJM Requirements**

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Section 8 of Attachment O.

### **10.2 Meteorological Data Reporting Requirements**

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

- Back Panel temperature (Fahrenheit) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Irradiance (Watts/meter<sup>2</sup>) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Ambient air temperature (Fahrenheit) - (Accepted, not required)
- Wind speed (meters/second) - (Accepted, not required)
- Wind direction (decimal degrees from true north) - (Accepted, not required)

### **10.3 Interconnected Transmission Owner Requirements**

The IC will be required to comply with all Interconnected Transmission Owner's revenue metering requirements for generation interconnection customers located at the following link:

<http://www.pjm.com/planning/design-engineering/to-tech-standards/>

## 11 Summer Peak - Load Flow Analysis

The Queue Project AG1-258 was evaluated as a 19.9 MW (Capacity 8.3 MW) injection as an uprate to AG1-257 which is tapping the Madisonburg to Millhelm 46 kV line in the APS area. Project AG1-258 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-258 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

### 11.1 Generation Deliverability

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

None

### 11.2 Multiple Facility Contingency

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

None

### 11.3 Contribution to Previously Identified Overloads

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	ACID C	MW IMPACT
1657689 64	20052 2	26SHADE GP	115. 0	PENEL EC	93838 0	AE1-071-POI	115. 0	PENEL EC	1	PL:10:P24:100 548	bus	160. 0	199.38	200.9	DC	2.43
1659583 83	20052 2	26SHADE GP	115. 0	PENEL EC	93838 0	AE1-071-POI	115. 0	PENEL EC	1	PL:10:P45:102 437	break er	160. 0	199.38	200.9	DC	2.43
1659583 84	20052 2	26SHADE GP	115. 0	PENEL EC	93838 0	AE1-071-POI	115. 0	PENEL EC	1	PN-P2_3-PN- 230-0347-16- DRT-029	break er	160. 0	194.43	195.94	DC	2.42
1644485 85	23517 5	01ELKO	230. 0	AP	23597 1	01SQUABHL LW	230. 0	AP	1	PN-P2-2-PN- 230-007T	bus	621. 0	110.1	111.25	DC	7.16
1644487 90	23517 5	01ELKO	230. 0	AP	23597 1	01SQUABHL LW	230. 0	AP	1	PN-P2-3-PN- 230-14CT	break er	621. 0	110.12	111.27	DC	7.16
1644487 91	23517 5	01ELKO	230. 0	AP	23597 1	01SQUABHL LW	230. 0	AP	1	PN-P2-3-PN- 230-14BT	break er	621. 0	110.08	111.24	DC	7.16
1644487 92	23517 5	01ELKO	230. 0	AP	23597 1	01SQUABHL LW	230. 0	AP	1	PN-P2_3-PN- 230-0347-12- DRT-025	break er	621. 0	109.28	110.43	DC	7.14
1657689 59	93838 0	AE1-071- POI	115. 0	PENEL EC	20052 0	26ROXBURY	115. 0	PENEL EC	1	PL:10:P24:100 548	bus	160. 0	232.24	233.76	DC	2.43
1659583 73	93838 0	AE1-071- POI	115. 0	PENEL EC	20052 0	26ROXBURY	115. 0	PENEL EC	1	PN-P2_3-PN- 230-0347-16- DRT-029	break er	160. 0	234.56	236.07	DC	2.42
1659583 74	93838 0	AE1-071- POI	115. 0	PENEL EC	20052 0	26ROXBURY	115. 0	PENEL EC	1	PL:10:P45:102 437	break er	160. 0	232.24	233.76	DC	2.43
1657690 63	99932 7	26SHAW VL 1	1.0	PENEL EC	20071 4	26SHAWVL 1	115. 0	PENEL EC	1A	AP-P2-2-WP- 230-001T	bus	126. 0	129.27	129.84	DC	1.59
1659584 87	99932 7	26SHAW VL 1	1.0	PENEL EC	20071 4	26SHAWVL 1	115. 0	PENEL EC	1A	AP-P2-3-WP- 230-446T	break er	126. 0	129.35	129.92	DC	1.59
1659584 88	99932 7	26SHAW VL 1	1.0	PENEL EC	20071 4	26SHAWVL 1	115. 0	PENEL EC	1A	AP-P2-3-WP- 230-443T *	break er	126. 0	129.27	129.84	DC	1.59

### 11.4 Potential Congestion due to Local Energy Deliverability

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

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC/D C	MW IMPACT
167649904	200513	26LEWISTWN	230.0	PENEL EC	208005	JUNI BU2	230.0	PPL	1	Base Case	operation	493.0	184.43	185.77	DC	6.61
167649905	200513	26LEWISTWN	230.0	PENEL EC	208005	JUNI BU2	230.0	PPL	1	PN-P1-2-PN-115-094_NON	operation	618.0	161.69	162.87	DC	7.29
166198078	200522	26SHADEGP	115.0	PENEL EC	938380	AE1-071-POI	115.0	PENEL EC	1	PL:10:P13:100618	operation	160.0	193.87	195.39	DC	2.43
166198174	200714	26SHAWVL1	115.0	PENEL EC	200872	26BIOEN TP	115.0	PENEL EC	1	AP-P1-3-WP-230-326T-B	operation	185.0	135.53	136.67	DC	2.1
166198322	200727	26SHAW. 2	115.0	PENEL EC	964450	AG1-308 TAP	115.0	PENEL EC	1	AP-P1-3-WP-230-326T-B	operation	202.0	106.34	107.36	DC	2.05
167905647	235157	01CARB	138.0	AP	235159	01CARB J	138.0	AP	1	AP-P1-3-WP-230-001	operation	299.0	112.31	113.33	DC	3.04
167905586	235159	01CARB J	138.0	AP	235174	01ELKO	138.0	AP	1	AP-P1-3-WP-230-001	operation	192.0	122.97	124.18	DC	2.31
164449133	235175	01ELKO	230.0	AP	235971	01SQUABHL LW	230.0	AP	1	AP-P1-3-WP-230-326T-B	operation	621.0	109.2	110.35	DC	7.14
164448972	235248	01SHINGL	230.0	AP	966040	AG1-473 TAP	230.0	AP	1	PL:03:P12:000193	operation	621.0	183.51	185.13	DC	10.06
164448974	235248	01SHINGL	230.0	AP	966040	AG1-473 TAP	230.0	AP	1	Base Case	operation	520.0	180.29	182.19	DC	9.85
164448992	235970	01DALE	230.0	AP	235248	01SHINGL	230.0	AP	1	AP-P1-3-WP-230-325T	operation	554.0	143.09	144.1	DC	5.61
164448999	235970	01DALE	230.0	AP	235248	01SHINGL	230.0	AP	1	Base Case	operation	489.0	101.09	102.35	DC	6.13
166198066	938380	AE1-071-POI	115.0	PENEL EC	200520	26ROXBURY	115.0	PENEL EC	1	PL:10:P13:100618	operation	160.0	230.21	231.72	DC	2.43
166198221	964450	AG1-308 TAP	115.0	PENEL EC	200716	26PHILIPSB	115.0	PENEL EC	1	AP-P1-3-WP-230-326T-B	operation	202.0	125.23	126.25	DC	2.05
164448962	966040	AG1-473 TAP	230.0	AP	200513	26LEWISTWN	230.0	PENEL EC	1	PL:03:P12:000193	operation	621.0	183.42	185.04	DC	10.06
164448964	966040	AG1-473 TAP	230.0	AP	200513	26LEWISTWN	230.0	PENEL EC	1	Base Case	operation	520.0	180.19	182.09	DC	9.85
166198253	999327	26SHAWVL1	1.0	PENEL EC	200714	26SHAWVL1	115.0	PENEL EC	1A	AP-P1-3-WP-230-326T-B	operation	126.0	124.35	124.97	DC	1.74

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

ID	Idx	Facility	Upgrade Description	Cost
165958383,165768964,165958384	1	26SHADE GP 115.0 kV - AE1-071 TAP 115.0 kV Ckt 1	<p><b>PENELEC</b>  <b>PN-AF2-F-0015A (1424) : Reconductor 6.4 miles of line.</b>                      Project Type : FAC                      Cost : \$19,600,000                      Time Estimate : 30.0 Months</p> <p><b>PN-AF2-F-0015B (1425) : Replace line trap at Shade Gap</b>                      Project Type : FAC                      Cost : \$200,000                      Time Estimate : 12.0 Months</p> <p><b>PN-AF2-F-0015C (1426) : Replace transmission line drop at Shade Gap</b>                      Project Type : FAC                      Cost : \$200,000                      Time Estimate : 12.0 Months</p> <p><b>PN-AF2-F-0015D (1427) : Replace adjust CTs at Shade Gap</b>                      Project Type : FAC                      Cost : \$800,000                      Time Estimate : 12.0 Months</p> <p><b>PN-AF2-F-0015E (1428) : Replace substation conductor (bus taps) at Shade Gap</b>                      Project Type : FAC                      Cost : \$200,000                      Time Estimate : 12.0 Months</p> <p><b>PN-AG1-F-0016F (1429) : Replace breaker at Shade Gap</b>                      Project Type : FAC                      Cost : \$900,000                      Time Estimate : 12.0 Months</p> <p><b>Note: It should be noted that some of the contingencies taken in the analysis may not be valid due to system condition changes that were not captured in the model. This will be re-evaluated for validity in the System Impact phase, though the worst case contingency driving the reinforcements listed above is valid.</b></p>	\$21,900,000

ID	Idx	Facility	Upgrade Description	Cost
165958373,165768959,165958374	3	AE1-071 TAP 115.0 kV - 26ROXBURY 115.0 kV Ckt 1	<p><b>PENELEC</b>  <b>PN-AF2-F-0014A (1435) : Reconductor 6.4 miles of line.</b>  <b>Project Type : FAC</b>  <b>Cost : \$15,700,000</b>  <b>Time Estimate : 36.0 Months</b></p> <p><b>PN-AF2-F-0014B (1436) : Replace substation conductor (including bus, risers, line trap leads, and breaker leads) at Roxbury</b>  <b>Project Type : FAC</b>  <b>Cost : \$175,000</b>  <b>Time Estimate : 12.0 Months</b></p> <p><b>PN-AF2-F-0014C (1437) : Replace transmission line drop at Roxbury</b>  <b>Project Type : FAC</b>  <b>Cost : \$175,000</b>  <b>Time Estimate : 12.0 Months</b></p> <p><b>PN-AF2-F-0014D (1438) : Replace circuit breaker and CTs at Roxbury</b>  <b>Project Type : FAC</b>  <b>Cost : \$800,000</b>  <b>Time Estimate : 12.0 Months</b></p> <p><b>Note: It should be noted that some of the contingencies taken in the analysis may not be valid due to system condition changes that were not captured in the model. This will be re-evaluated for validity in the System Impact phase.</b></p>	\$16,850,000

ID	Idx	Facility	Upgrade Description	Cost
164448585,164 448792,164448 790,164448791	2	01ELKO 230.0 kV - 01SQUABHLLW 230.0 kV Ckt 1	<p><u>APS</u>  <b>WP-AG1-F-0004A (1181) : Replace 1033.5 ACSR &amp; 1272 ACSR bus conductor at Elko substation.</b>  Project Type : FAC  Cost : <b>\$162,816</b>  Time Estimate : <b>12.0 Months</b></p> <p><b>WP-AG1-F-0004B (1182) : Replace 1033.5 ACSR bus conductor at Squab Hollow.</b>  Project Type : FAC  Cost : <b>\$162,816</b>  Time Estimate : <b>12.0 Months</b></p> <p><b>WP-AG1-F-0004C (1183) : Replace 1033.5 ACSR line riser at Elko substation.</b>  Project Type : FAC  Cost : <b>\$162,816</b>  Time Estimate : <b>12.0 Months</b></p> <p><b>WP-AG1-F-0004D (1184) : Replace 1033.5 ACSR line riser at Squab Hollow substation.</b>  Project Type : FAC  Cost : <b>\$162,816</b>  Time Estimate : <b>12.0 Months</b></p> <p><b>WP-AG1-F-0004E (1185) : Reconductor 4.03 miles of 1033.5 ACSR from Elko to Squab Hollow 230 kV (35 spans).</b>  Project Type : FAC  Cost : <b>\$18,235,350</b>  Time Estimate : <b>36.0 Months</b></p>	\$18,886,612
165769063,165 958487,165958 488	4	26SHAWVL 1 1.0 kV - 26SHAWVL 1 115.0 kV Ckt 1A	<p><u>PENELEC</u>  <b>PN-AF2-F-0021 (1423) : Replace 230/115-17.2 kV transformer with a larger unit.</b>  Project Type : FAC  Cost : <b>\$5,600,000</b>  Time Estimate : <b>30.0 Months</b></p>	\$5,600,000
<b>TOTAL COST</b>			<b>\$63,236,612</b>	

## 11.6 Flow Gate Details

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

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### 11.6.1 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
165958383	200522	26SHADE GP	PENELEC	938380	AE1-071-POI	PENELEC	1	PL:10:P45:102437	breaker	160.0	199.38	200.9	DC	2.43

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
200812	26ALY HYDR	0.4042	50/50	0.4042
200852	26WARR RDG	0.2636	50/50	0.2636
200883	Q-053 E	2.1510	Adder	2.53
235003	AC1-025 E	0.1866	50/50	0.1866
236828	01GRAYMONT	0.4801	50/50	0.4801
290086	Q-036 E	2.3338	Adder	2.75
293301	N-039 E	3.6448	Adder	4.29
294515	O38_P22	3.1892	Adder	3.75
921642	AA2-000	25.8759	Adder	30.44
930511	AB2-092	0.9501	Adder	1.12
936421	AD2-055	1.9561	Adder	2.3
936991	AD2-133 C	1.0502	Adder	1.24
936992	AD2-133 E	4.8035	Adder	5.65
939171	AE1-147 C	1.4321	50/50	1.4321
939172	AE1-147 E	0.9547	50/50	0.9547
939591	AE1-188 C	-0.6881	Adder	-0.81
940201	AE2-001 C	1.4368	50/50	1.4368
940202	AE2-001 E	0.9578	50/50	0.9578
940681	AE2-055 C (Suspended)	1.5077	50/50	1.5077
940682	AE2-055 E (Suspended)	1.0051	50/50	1.0051
941191	AE2-113 C	2.6637	Adder	3.13
941192	AE2-113 E	2.8679	Adder	3.37
941231	AE2-117 C	1.2276	50/50	1.2276
941232	AE2-117 E	0.8184	50/50	0.8184
941241	AE2-118 C	0.9922	Adder	1.17
941242	AE2-118 E	0.6614	Adder	0.78
941261	AE2-120 C	1.4393	50/50	1.4393
941262	AE2-120 E	0.9595	50/50	0.9595
941271	AE2-121 C	0.7571	50/50	0.7571
941272	AE2-121 E	0.5055	50/50	0.5055
941321	AE2-126 C	0.6973	Adder	0.82
941322	AE2-126 E	0.4648	Adder	0.55
941331	AE2-129 C	0.7311	Adder	0.86
941332	AE2-129 E	0.4874	Adder	0.57
941351	AE2-131 C (Suspended)	0.7311	Adder	0.86
941352	AE2-131 E (Suspended)	0.4874	Adder	0.57
942121	AE2-224 C	2.9733	Adder	3.5
942122	AE2-224 E	1.9822	Adder	2.33
942351	AE2-248 C	1.1824	50/50	1.1824
942352	AE2-248 E	0.7883	50/50	0.7883
942491	AE2-262 C	4.2394	Adder	4.99

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
942492	AE2-262 E	2.8489	Adder	3.35
942501	AE2-263 C	3.9850	Adder	4.69
942502	AE2-263 E	2.6606	Adder	3.13
942511	AE2-264 C	5.1197	50/50	5.1197
942512	AE2-264 E	3.4131	50/50	3.4131
942961	AE2-316 C	1.7575	Adder	2.07
942962	AE2-316 E	2.5061	Adder	2.95
943751	AF1-043	5.8682	Adder	6.9
944001	AF1-068 C O1 (Withdrawn : 12/15/2020)	1.5860	50/50	1.5860
944002	AF1-068 E O1 (Withdrawn : 12/15/2020)	0.8922	50/50	0.8922
944311	AF1-099 C	6.4354	Adder	7.57
944312	AF1-099 E	4.2902	Adder	5.05
944321	AF1-100 C	10.9204	Adder	12.85
944322	AF1-100 E	7.2802	Adder	8.56
944471	AF1-112 C	1.4704	50/50	1.4704
944472	AF1-112 E	0.9802	50/50	0.9802
944671	AF1-132 C O1 (Withdrawn : 12/15/2020)	1.4920	50/50	1.4920
944672	AF1-132 E O1 (Withdrawn : 12/15/2020)	0.9946	50/50	0.9946
944691	AF1-134 C	0.5955	Adder	0.7
944692	AF1-134 E	0.3970	Adder	0.47
944771	AF1-142 C	10.2966	Adder	12.11
944772	AF1-142 E	6.8644	Adder	8.08
944881	AF1-153 C O1	0.6625	Adder	0.78
944882	AF1-153 E O1	0.4417	Adder	0.52
944901	AF1-155 C	0.6586	Adder	0.77
944902	AF1-155 E	0.4391	Adder	0.52
945011	AF1-166 C	-0.5622	Adder	-0.66
945491	AF1-214 C (Withdrawn : 12/03/2020)	1.4392	50/50	1.4392
945492	AF1-214 E (Withdrawn : 12/03/2020)	0.9594	50/50	0.9594
945591	AF1-224 C	-0.4314	Adder	-0.51
946381	AF1-302 C	0.7674	Adder	0.9
946382	AF1-302 E	1.0233	Adder	1.2
946421	AF1-306 C	2.8738	Adder	3.38
946422	AF1-306 E	11.4954	Adder	13.52
957451	AF2-039 C	0.5188	Adder	0.61
957452	AF2-039 E	0.3459	Adder	0.41
957561	AF2-050 C	1.4867	Adder	1.75
957562	AF2-050 E	0.9911	Adder	1.17
957931	AF2-087 C (Suspended)	0.1915	Adder	0.23
957932	AF2-087 E (Suspended)	0.2638	Adder	0.31
957941	AF2-088 C	0.2498	Adder	0.29
957942	AF2-088 E	0.1665	Adder	0.2
958071	AF2-101 C	-0.0937	Adder	-0.11
958271	AF2-121 C	0.7311	Adder	0.86
958272	AF2-121 E	0.4874	Adder	0.57

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
958551	AF2-146 C	5.3006	50/50	5.3006
958552	AF2-146 E	3.5338	50/50	3.5338
958571	AF2-148 C	4.3049	50/50	4.3049
958572	AF2-148 E	2.8699	50/50	2.8699
958601	AF2-151 C	-0.0925	Adder	-0.11
959241	AF2-215 C	-0.1576	Adder	-0.19
959802	AF2-271 E	0.2368	Adder	0.28
959843	AF2-275 BAT	0.1034	Merchant Transmission	0.1034
959853	AF2-276 BAT	0.1034	Merchant Transmission	0.1034
960022	AF2-293 E	0.1389	50/50	0.1389
960041	AF2-295 C	0.6586	Adder	0.77
960042	AF2-295 E	0.4391	Adder	0.52
960051	AF2-296 C	0.5955	Adder	0.7
960052	AF2-296 E	0.3970	Adder	0.47
962411	AG1-090 C O1	1.9375	Adder	4.3
962412	AG1-090 E O1	1.2917	Adder	2.87
962951	AG1-144 C	0.3875	Adder	0.86
962952	AG1-144 E	0.2583	Adder	0.57
963571	AG1-206 C	0.1950	Adder	0.43
963572	AG1-206 E	0.1050	Adder	0.23
963891	AG1-242 C	0.1710	Adder	0.38
963892	AG1-242 E	0.0921	Adder	0.2
964031	AG1-257 C	1.0126	50/50	1.0126
964032	AG1-257 E	1.4152	50/50	1.4152
964041	AG1-258 C	1.0126	50/50	1.0126
964042	AG1-258 E	1.4152	50/50	1.4152
964191	AG1-280 C	0.3056	Adder	0.68
964192	AG1-280 E	0.2037	Adder	0.45
964201	AG1-281 C	0.3074	Adder	0.68
964202	AG1-281 E	0.2049	Adder	0.45
964391	AG1-301 C	1.2653	50/50	1.2653
964392	AG1-301 E	0.8435	50/50	0.8435
964451	AG1-308 C O1	0.2722	Adder	0.6
964452	AG1-308 E O1	0.3805	Adder	0.84
965121	AG1-377 C O1	0.3875	Adder	0.86
965122	AG1-377 E O1	0.2583	Adder	0.57
965131	AG1-378 C O1	0.3875	Adder	0.86
965132	AG1-378 E O1	0.2583	Adder	0.57
965201	AG1-385 C	0.4515	Adder	1.0
965202	AG1-385 E	0.1337	Adder	0.3
965301	AG1-395 C	0.4979	Adder	1.11
965302	AG1-395 E	0.1479	Adder	0.33
966041	AG1-473 C	5.0062	50/50	5.0062
966042	AG1-473 E	3.3375	50/50	3.3375
966152	AG1-484 BAT	0.7123	Merchant Transmission	0.7123
966463	AG1-515 BAT	0.4172	Merchant Transmission	0.4172
966891	AG1-560 BAT	13.9988	50/50	13.9988
966901	AG1-561 BAT	6.0982	50/50	6.0982
WEC	WEC	0.0460	Confirmed LTF	0.0460
LGEE	LGEE	0.0767	Confirmed LTF	0.0767
CALDERWOOD	CALDERWOOD	0.0045	Confirmed LTF	0.0045
CBM-W2	CBM-W2	0.6630	Confirmed LTF	0.6630

<b>Bus #</b>	<b>Bus</b>	<b>Gendeliv MW Impact</b>	<b>Type</b>	<b>Full MW Impact</b>
<b>TVA</b>	TVA	0.0420	Confirmed LTF	0.0420
<b>O-066</b>	O-066	1.9786	Confirmed LTF	1.9786
<b>SIGE</b>	SIGE	0.0434	Confirmed LTF	0.0434
<b>CHEOAH</b>	CHEOAH	0.0060	Confirmed LTF	0.0060
<b>CBM-S1</b>	CBM-S1	0.0179	Confirmed LTF	0.0179
<b>G-007</b>	G-007	0.3423	Confirmed LTF	0.3423
<b>HAMLET</b>	HAMLET	0.0982	Confirmed LTF	0.0982
<b>MEC</b>	MEC	0.1907	Confirmed LTF	0.1907
<b>LAGN</b>	LAGN	0.0683	Confirmed LTF	0.0683
<b>CATAWBA</b>	CATAWBA	0.0413	Confirmed LTF	0.0413
<b>CBM-W1</b>	CBM-W1	2.4535	Confirmed LTF	2.4535

## 11.6.2 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
164448791	235175	01ELKO	AP	235971	01SQUABHLLW	AP	1	PN-P2-3-PN-230-14BT	breaker	621.0	110.08	111.24	DC	7.16

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
200665	26SHAWVL 3	9.6307	50/50	9.6307
200666	26SHAWVL 4	9.4768	50/50	9.4768
200715	26SHAWVL 1	5.4583	50/50	5.4583
200722	26SHAWVL 2	5.5813	50/50	5.5813
200894	26K02	9.2098	50/50	9.2098
200905	26Q36	0.1562	50/50	0.1562
200913	26SHAW-D	0.1993	50/50	0.1993
235003	AC1-025 E	0.5392	50/50	0.5392
236828	01GRAYMONT	1.4401	50/50	1.4401
290086	Q-036 E	4.7704	50/50	4.7704
921642	AA2-000	121.0699	50/50	121.0699
930511	AB2-092	4.4453	50/50	4.4453
936421	AD2-055	9.1521	50/50	9.1521
936991	AD2-133 C	2.1467	50/50	2.1467
936992	AD2-133 E	9.8187	50/50	9.8187
939171	AE1-147 C	4.3214	50/50	4.3214
939172	AE1-147 E	2.8810	50/50	2.8810
940201	AE2-001 C	4.3208	50/50	4.3208
940202	AE2-001 E	2.8806	50/50	2.8806
940681	AE2-055 C (Suspended)	4.3114	50/50	4.3114
940682	AE2-055 E (Suspended)	2.8742	50/50	2.8742
941261	AE2-120 C	4.3205	50/50	4.3205
941262	AE2-120 E	2.8803	50/50	2.8803
941271	AE2-121 C	2.2981	50/50	2.2981
941272	AE2-121 E	1.5345	50/50	1.5345
941331	AE2-129 C	1.9278	50/50	1.9278
941332	AE2-129 E	1.2852	50/50	1.2852
941351	AE2-131 C (Suspended)	1.9278	50/50	1.9278
941352	AE2-131 E (Suspended)	1.2852	50/50	1.2852
942351	AE2-248 C	3.4523	50/50	3.4523
942352	AE2-248 E	2.3015	50/50	2.3015
942491	AE2-262 C	18.1380	50/50	18.1380
942492	AE2-262 E	12.1887	50/50	12.1887
942501	AE2-263 C	17.0497	50/50	17.0497
942502	AE2-263 E	11.3834	50/50	11.3834
943751	AF1-043	27.4564	50/50	27.4564
944001	AF1-068 C O1 (Withdrawn : 12/15/2020)	4.6017	50/50	4.6017
944002	AF1-068 E O1 (Withdrawn : 12/15/2020)	2.5885	50/50	2.5885

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
944311	AF1-099 C	27.5335	50/50	27.5335
944312	AF1-099 E	18.3557	50/50	18.3557
944321	AF1-100 C	53.1015	50/50	53.1015
944322	AF1-100 E	35.4010	50/50	35.4010
944382	AF1-103 BAT	3.1934	50/50	3.1934
944471	AF1-112 C	4.3163	50/50	4.3163
944472	AF1-112 E	2.8775	50/50	2.8775
944671	AF1-132 C O1 (Withdrawn : 12/15/2020)	4.3134	50/50	4.3134
944672	AF1-132 E O1 (Withdrawn : 12/15/2020)	2.8756	50/50	2.8756
944691	AF1-134 C	1.6358	50/50	1.6358
944692	AF1-134 E	1.0906	50/50	1.0906
944771	AF1-142 C	44.0536	50/50	44.0536
944772	AF1-142 E	29.3690	50/50	29.3690
944881	AF1-153 C O1	2.8615	50/50	2.8615
944882	AF1-153 E O1	1.9077	50/50	1.9077
944901	AF1-155 C	2.7005	50/50	2.7005
944902	AF1-155 E	1.8003	50/50	1.8003
945161	AF1-181	0.0442	50/50	0.0442
945171	AF1-182	0.2217	50/50	0.2217
945181	AF1-183	0.0447	50/50	0.0447
945491	AF1-214 C (Withdrawn : 12/03/2020)	4.3205	50/50	4.3205
945492	AF1-214 E (Withdrawn : 12/03/2020)	2.8803	50/50	2.8803
946423	AF1-306 BAT	109.4041	50/50	109.4041
957451	AF2-039 C	1.7066	50/50	1.7066
957452	AF2-039 E	1.1377	50/50	1.1377
957941	AF2-088 C	0.8217	50/50	0.8217
957942	AF2-088 E	0.5478	50/50	0.5478
958271	AF2-121 C	1.9278	50/50	1.9278
958272	AF2-121 E	1.2852	50/50	1.2852
960022	AF2-293 E	0.4199	50/50	0.4199
960041	AF2-295 C	2.7005	50/50	2.7005
960042	AF2-295 E	1.8003	50/50	1.8003
960051	AF2-296 C	1.6358	50/50	1.6358
960052	AF2-296 E	1.0906	50/50	1.0906
962411	AG1-090 C O1	9.6390	50/50	9.6390
962412	AG1-090 E O1	6.4260	50/50	6.4260
962951	AG1-144 C	1.9278	50/50	1.9278
962952	AG1-144 E	1.2852	50/50	1.2852
963891	AG1-242 C	0.8861	50/50	0.8861
963892	AG1-242 E	0.4771	50/50	0.4771
964031	AG1-257 C	2.9860	50/50	2.9860
964032	AG1-257 E	4.1732	50/50	4.1732
964041	AG1-258 C	2.9860	50/50	2.9860
964042	AG1-258 E	4.1732	50/50	4.1732
964451	AG1-308 C O1	1.4617	50/50	1.4617
964452	AG1-308 E O1	2.0429	50/50	2.0429
965121	AG1-377 C O1	1.9278	50/50	1.9278
965122	AG1-377 E O1	1.2852	50/50	1.2852

<b>Bus #</b>	<b>Bus</b>	<b>Gendeliv MW Impact</b>	<b>Type</b>	<b>Full MW Impact</b>
965131	AG1-378 C O1	1.9278	50/50	1.9278
965132	AG1-378 E O1	1.2852	50/50	1.2852
965201	AG1-385 C	3.6794	50/50	3.6794
965202	AG1-385 E	1.0898	50/50	1.0898
965301	AG1-395 C	2.4772	50/50	2.4772
965302	AG1-395 E	0.7358	50/50	0.7358
966041	AG1-473 C	11.6198	50/50	11.6198
966042	AG1-473 E	7.7465	50/50	7.7465
966122	AG1-481 BAT	2.4430	50/50	2.4430
G-007A	G-007A	1.4984	Confirmed LTF	1.4984
VFT	VFT	4.1925	Confirmed LTF	4.1925
CALDERWOOD	CALDERWOOD	0.1730	Confirmed LTF	0.1730
PRAIRIE	PRAIRIE	1.0771	Confirmed LTF	1.0771
CHEOAH	CHEOAH	0.1732	Confirmed LTF	0.1732
CBM-N	CBM-N	0.8616	Confirmed LTF	0.8616
COTTONWOOD	COTTONWOOD	0.7959	Confirmed LTF	0.7959
HAMLET	HAMLET	0.1502	Confirmed LTF	0.1502
GIBSON	GIBSON	0.2359	Confirmed LTF	0.2359
BLUEG	BLUEG	0.7413	Confirmed LTF	0.7413
TRIMBLE	TRIMBLE	0.2376	Confirmed LTF	0.2376
CATAWBA	CATAWBA	0.1004	Confirmed LTF	0.1004

### 11.6.3 Index 3

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
165958373	938380	AE1-071-POI	PENELEC	200520	26ROXBURY	PENELEC	1	PN-P2_3-PN-230-0347-16-DRT-029	breaker	160.0	234.56	236.07	DC	2.42

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
200812	26ALY HYDR	0.4036	50/50	0.4036
200852	26WARR RDG	0.2631	50/50	0.2631
200883	Q-053 E	2.1432	Adder	2.52
235003	AC1-025 E	0.1863	50/50	0.1863
236828	01GRAYMONT	0.4794	50/50	0.4794
290086	Q-036 E	2.3276	Adder	2.74
293301	N-039 E	3.6339	Adder	4.28
294515	O38_P22	3.1797	Adder	3.74
921642	AA2-000	25.8051	Adder	30.36
930511	AB2-092	0.9475	Adder	1.11
936421	AD2-055	1.9507	Adder	2.29
936991	AD2-133 C	1.0474	Adder	1.23
936992	AD2-133 E	4.7909	Adder	5.64
938384	AE1-071-C	40.3905	50/50	40.3905
938385	AE1-071-E	24.7156	50/50	24.7156
939171	AE1-147 C	1.4302	50/50	1.4302
939172	AE1-147 E	0.9534	50/50	0.9534
939591	AE1-188 C	-0.6863	Adder	-0.81
940201	AE2-001 C	1.4348	50/50	1.4348
940202	AE2-001 E	0.9566	50/50	0.9566
940681	AE2-055 C (Suspended)	1.5056	50/50	1.5056
940682	AE2-055 E (Suspended)	1.0038	50/50	1.0038
941231	AE2-117 C	1.2254	50/50	1.2254
941232	AE2-117 E	0.8170	50/50	0.8170
941241	AE2-118 C	0.9903	Adder	1.17
941242	AE2-118 E	0.6602	Adder	0.78
941261	AE2-120 C	1.4374	50/50	1.4374
941262	AE2-120 E	0.9582	50/50	0.9582
941271	AE2-121 C	0.7560	50/50	0.7560
941272	AE2-121 E	0.5048	50/50	0.5048
941321	AE2-126 C	0.6954	Adder	0.82
941322	AE2-126 E	0.4636	Adder	0.55
941331	AE2-129 C	0.7293	Adder	0.86
941332	AE2-129 E	0.4862	Adder	0.57
941351	AE2-131 C (Suspended)	0.7293	Adder	0.86
941352	AE2-131 E (Suspended)	0.4862	Adder	0.57
942121	AE2-224 C	2.9631	Adder	3.49
942122	AE2-224 E	1.9754	Adder	2.32
942351	AE2-248 C	1.1809	50/50	1.1809

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
942352	AE2-248 E	0.7873	50/50	0.7873
942491	AE2-262 C	4.2321	Adder	4.98
942492	AE2-262 E	2.8440	Adder	3.35
942501	AE2-263 C	3.9782	Adder	4.68
942502	AE2-263 E	2.6561	Adder	3.12
942511	AE2-264 C	5.1106	50/50	5.1106
942512	AE2-264 E	3.4070	50/50	3.4070
943751	AF1-043	5.8521	Adder	6.88
944001	AF1-068 C O1 (Withdrawn : 12/15/2020)	1.5840	50/50	1.5840
944002	AF1-068 E O1 (Withdrawn : 12/15/2020)	0.8910	50/50	0.8910
944311	AF1-099 C	6.4244	Adder	7.56
944312	AF1-099 E	4.2829	Adder	5.04
944321	AF1-100 C	10.8987	Adder	12.82
944322	AF1-100 E	7.2658	Adder	8.55
944471	AF1-112 C	1.4683	50/50	1.4683
944472	AF1-112 E	0.9789	50/50	0.9789
944671	AF1-132 C O1 (Withdrawn : 12/15/2020)	1.4900	50/50	1.4900
944672	AF1-132 E O1 (Withdrawn : 12/15/2020)	0.9934	50/50	0.9934
944691	AF1-134 C	0.5935	Adder	0.7
944692	AF1-134 E	0.3957	Adder	0.47
944771	AF1-142 C	10.2790	Adder	12.09
944772	AF1-142 E	6.8527	Adder	8.06
944881	AF1-153 C O1	0.6607	Adder	0.78
944882	AF1-153 E O1	0.4404	Adder	0.52
944901	AF1-155 C	0.6569	Adder	0.77
944902	AF1-155 E	0.4379	Adder	0.52
945011	AF1-166 C	-0.5608	Adder	-0.66
945491	AF1-214 C (Withdrawn : 12/03/2020)	1.4371	50/50	1.4371
945492	AF1-214 E (Withdrawn : 12/03/2020)	0.9581	50/50	0.9581
945591	AF1-224 C	-0.4303	Adder	-0.51
946421	AF1-306 C	2.8667	Adder	3.37
946422	AF1-306 E	11.4669	Adder	13.49
957451	AF2-039 C	0.5175	Adder	0.61
957452	AF2-039 E	0.3450	Adder	0.41
957561	AF2-050 C	1.4816	Adder	1.74
957562	AF2-050 E	0.9877	Adder	1.16
957931	AF2-087 C (Suspended)	0.1910	Adder	0.22
957932	AF2-087 E (Suspended)	0.2631	Adder	0.31
957941	AF2-088 C	0.2492	Adder	0.29
957942	AF2-088 E	0.1661	Adder	0.2
958071	AF2-101 C	-0.0921	Adder	-0.11
958271	AF2-121 C	0.7293	Adder	0.86
958272	AF2-121 E	0.4862	Adder	0.57
958551	AF2-146 C	5.3162	50/50	5.3162
958552	AF2-146 E	3.5442	50/50	3.5442

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
958571	AF2-148 C	4.3078	50/50	4.3078
958572	AF2-148 E	2.8719	50/50	2.8719
958601	AF2-151 C	-0.0909	Adder	-0.11
959241	AF2-215 C	-0.1572	Adder	-0.18
959802	AF2-271 E	0.2363	Adder	0.28
959843	AF2-275 BAT	0.1031	Merchant Transmission	0.1031
959853	AF2-276 BAT	0.1031	Merchant Transmission	0.1031
960022	AF2-293 E	0.1387	50/50	0.1387
960041	AF2-295 C	0.6569	Adder	0.77
960042	AF2-295 E	0.4379	Adder	0.52
960051	AF2-296 C	0.5935	Adder	0.7
960052	AF2-296 E	0.3957	Adder	0.47
962411	AG1-090 C O1	1.9326	Adder	4.29
962412	AG1-090 E O1	1.2884	Adder	2.86
962951	AG1-144 C	0.3865	Adder	0.86
962952	AG1-144 E	0.2577	Adder	0.57
963571	AG1-206 C	0.1945	Adder	0.43
963572	AG1-206 E	0.1047	Adder	0.23
963891	AG1-242 C	0.1704	Adder	0.38
963892	AG1-242 E	0.0918	Adder	0.2
964031	AG1-257 C	1.0113	50/50	1.0113
964032	AG1-257 E	1.4133	50/50	1.4133
964041	AG1-258 C	1.0113	50/50	1.0113
964042	AG1-258 E	1.4133	50/50	1.4133
964191	AG1-280 C	0.3046	Adder	0.68
964192	AG1-280 E	0.2030	Adder	0.45
964201	AG1-281 C	0.3064	Adder	0.68
964202	AG1-281 E	0.2042	Adder	0.45
964391	AG1-301 C	1.2631	50/50	1.2631
964392	AG1-301 E	0.8421	50/50	0.8421
964451	AG1-308 C O1	0.2716	Adder	0.6
964452	AG1-308 E O1	0.3795	Adder	0.84
965121	AG1-377 C O1	0.3865	Adder	0.86
965122	AG1-377 E O1	0.2577	Adder	0.57
965131	AG1-378 C O1	0.3865	Adder	0.86
965132	AG1-378 E O1	0.2577	Adder	0.57
965201	AG1-385 C	0.4502	Adder	1.0
965202	AG1-385 E	0.1333	Adder	0.3
965301	AG1-395 C	0.4967	Adder	1.1
965302	AG1-395 E	0.1475	Adder	0.33
966041	AG1-473 C	5.0011	50/50	5.0011
966042	AG1-473 E	3.3340	50/50	3.3340
966152	AG1-484 BAT	0.7022	Merchant Transmission	0.7022
966463	AG1-515 BAT	0.4163	Merchant Transmission	0.4163
966901	AG1-561 BAT	6.0877	50/50	6.0877
WEC	WEC	0.0441	Confirmed LTF	0.0441
LGEE	LGEE	0.0729	Confirmed LTF	0.0729
CALDERWOOD	CALDERWOOD	0.0060	Confirmed LTF	0.0060
CBM-W2	CBM-W2	0.6182	Confirmed LTF	0.6182
TVA	TVA	0.0364	Confirmed LTF	0.0364
O-066	O-066	1.9719	Confirmed LTF	1.9719
SIGE	SIGE	0.0427	Confirmed LTF	0.0427

<b>Bus #</b>	<b>Bus</b>	<b>Gendeliv MW Impact</b>	<b>Type</b>	<b>Full MW Impact</b>
<b>CHEOAH</b>	CHEOAH	0.0080	Confirmed LTF	0.0080
<b>CBM-S1</b>	CBM-S1	0.0163	Confirmed LTF	0.0163
<b>G-007</b>	G-007	0.3402	Confirmed LTF	0.3402
<b>HAMLET</b>	HAMLET	0.0982	Confirmed LTF	0.0982
<b>MEC</b>	MEC	0.1827	Confirmed LTF	0.1827
<b>LAGN</b>	LAGN	0.0595	Confirmed LTF	0.0595
<b>CATAWBA</b>	CATAWBA	0.0416	Confirmed LTF	0.0416
<b>CBM-W1</b>	CBM-W1	2.3694	Confirmed LTF	2.3694

11.6.4 Index 4

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
165958488	999327	26SHAWVL 1	PENELEC	200714	26SHAWVL 1	PENELEC	1A	AP-P2-3-WP-230-443T *	breaker	126.0	129.27	129.84	DC	1.59

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
200665	26SHAWVL 3	3.3420	50/50	3.3420
200666	26SHAWVL 4	3.1659	50/50	3.1659
235003	AC1-025 E	0.0997	Adder	0.12
236828	O1GRAYMONT	0.2754	Adder	0.32
921642	AA2-000	29.6264	Adder	34.85
930511	AB2-092	1.0878	Adder	1.28
936421	AD2-055	2.2396	Adder	2.63
939171	AE1-147 C	0.8308	Adder	0.98
939172	AE1-147 E	0.5539	Adder	0.65
940201	AE2-001 C	0.8282	Adder	0.97
940202	AE2-001 E	0.5522	Adder	0.65
940681	AE2-055 C (Suspended)	0.7895	Adder	0.93
940682	AE2-055 E (Suspended)	0.5263	Adder	0.62
941261	AE2-120 C	0.8268	Adder	0.97
941262	AE2-120 E	0.5512	Adder	0.65
941271	AE2-121 C	0.4440	Adder	0.52
941272	AE2-121 E	0.2965	Adder	0.35
941351	AE2-131 C (Suspended)	-1.3743	Adder	-1.62
942351	AE2-248 C	0.6446	Adder	0.76
942352	AE2-248 E	0.4297	Adder	0.51
942491	AE2-262 C	3.9967	Adder	4.7
942492	AE2-262 E	2.6858	Adder	3.16
942501	AE2-263 C	3.7569	Adder	4.42
942502	AE2-263 E	2.5083	Adder	2.95
943751	AF1-043	6.7187	Adder	7.9
944001	AF1-068 C O1 (Withdrawn : 12/15/2020)	0.8542	Adder	1.0
944002	AF1-068 E O1 (Withdrawn : 12/15/2020)	0.4805	Adder	0.57
944311	AF1-099 C	6.0670	Adder	7.14
944312	AF1-099 E	4.0447	Adder	4.76
944321	AF1-100 C	17.5710	50/50	17.5710
944322	AF1-100 E	11.7140	50/50	11.7140
944471	AF1-112 C	0.8099	Adder	0.95
944472	AF1-112 E	0.5399	Adder	0.64
944671	AF1-132 C O1 (Withdrawn : 12/15/2020)	0.7980	Adder	0.94
944672	AF1-132 E O1 (Withdrawn : 12/15/2020)	0.5320	Adder	0.63

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
944771	AF1-142 C	9.7072	Adder	11.42
944772	AF1-142 E	6.4715	Adder	7.61
945161	AF1-181	0.0153	50/50	0.0153
945171	AF1-182	0.0741	50/50	0.0741
945491	AF1-214 C (Withdrawn : 12/03/2020)	0.8269	Adder	0.97
945492	AF1-214 E (Withdrawn : 12/03/2020)	0.5513	Adder	0.65
960022	AF2-293 E	0.0808	Adder	0.1
964031	AG1-257 C	0.2982	Adder	0.66
964032	AG1-257 E	0.4167	Adder	0.92
964041	AG1-258 C	0.2982	Adder	0.66
964042	AG1-258 E	0.4167	Adder	0.92
965303	AG1-395 BAT	1.1547	50/50	1.1547
966041	AG1-473 C	0.7914	Adder	1.76
966042	AG1-473 E	0.5276	Adder	1.17
G-007A	G-007A	1.0357	Confirmed LTF	1.0357
VFT	VFT	2.8445	Confirmed LTF	2.8445
CALDERWOOD	CALDERWOOD	0.0924	Confirmed LTF	0.0924
PRAIRIE	PRAIRIE	0.5605	Confirmed LTF	0.5605
CHEOAH	CHEOAH	0.0926	Confirmed LTF	0.0926
CBM-N	CBM-N	0.5568	Confirmed LTF	0.5568
COTTONWOOD	COTTONWOOD	0.4200	Confirmed LTF	0.4200
HAMLET	HAMLET	0.0820	Confirmed LTF	0.0820
GIBSON	GIBSON	0.1223	Confirmed LTF	0.1223
BLUEG	BLUEG	0.3871	Confirmed LTF	0.3871
TRIMBLE	TRIMBLE	0.1247	Confirmed LTF	0.1247
CATAWBA	CATAWBA	0.0546	Confirmed LTF	0.0546

## 11.7 Queue Dependencies

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

Queue Number	Project Name	Status
AA2-000	N/A	N/A
AB2-092	Bergen 138kV	Partially in Service - Under Construction
AC1-025	Dale Summit	In Service
AD2-055	Moshannon-East Towanda 230 kV	Active
AD2-133	Eagle Valley 115kV	Active
AE1-071	Shade Gap-Roxbury 115 kV	Active
AE1-147	Bellefonte 46 kV	Engineering and Procurement
AE1-188	Fayetteville 34.5 kV	Engineering and Procurement
AE2-001	Nittany-Zion 46 kV	Active
AE2-055	Shingletown-Boalsburg 46 kV	Suspended
AE2-113	Farmers Valley-Ridgeway 115 kV	Active
AE2-117	ABW Tap-Alexandria 46 kV	Active
AE2-118	ABW Tap-Williamsburg 46 kV	Active
AE2-120	Graymont-Zion 46 kV	Active
AE2-121	Milesburg-Tanney Junction 46 kV	Active
AE2-126	Dubois-Curwensville 34.5 kV	Engineering and Procurement
AE2-129	Philipsburg-Clarence 34.5 kV	Engineering and Procurement
AE2-131	Philipsburg-Karthus 34.5	Suspended
AE2-224	Bearrock-Johnstown 230 kV	Active
AE2-248	Fillmore-Thompson Farm 46 kV	Active
AE2-262	Moshannon-Milesburg 230 kV	Active
AE2-263	Moshannon-Milesburg 230 kV	Active
AE2-264	Altoona-Raystown 230 kV	Active
AE2-316	Brookville-Squab Hollow 138 kV	Active
AF1-043	Moshannon-East Towanda 230 kV	Active
AF1-068	Boalsburg-Centre Hall 46 kV	Withdrawn
AF1-099	Moshannon-Milesburg 230 kV	Active
AF1-100	Shawville-Moshannon 230 kV	Active
AF1-103	Warren 34.5 kV	Active
AF1-112	Centre Hall-Boalsburg 46 kV	Active
AF1-132	Shingletown-Boalsburg 46 kV	Withdrawn
AF1-134	Philipsburg-Madera 34.5 kV	Active
AF1-142	Moshannon-Milesburg 230 kV	Active
AF1-153	Motion-Ridgeway 46 kV	Active
AF1-155	Paper City-Wilcox 46 kV	Engineering and Procurement
AF1-166	Target-Chambers No.5 34.5 kV	Engineering and Procurement
AF1-181	Shawville 3 230 kV	Partially in Service - Under Construction
AF1-182	Shawville 4 230 kV	Partially in Service - Under Construction
AF1-183	Shawville 1 230 kV	Partially in Service - Under Construction

Queue Number	Project Name	Status
AF1-214	Nittany-Zion 46 kV	Withdrawn
AF1-224	Fayetteville 34.5 kV	Engineering and Procurement
AF1-302	Brookville-Squab Hollow 138 kV	Active
AF1-306	Squab Hollow 230 kV	Active
AF2-039	Shawville-Clearfield 34.5 kV	Active
AF2-050	Bearrock-Johnstown 230 kV	Active
AF2-087	East Altoona-Pinecroft 12.47 kV	Suspended
AF2-088	Shawville-Clearfield 34.5 kV II	Active
AF2-101	Allen 13.2 kV	Engineering and Procurement
AF2-121	Philipsburg-Shawville 34.5 kV	Active
AF2-146	Hill Valley-Valley REC 46 kV	Active
AF2-148	Shade Gap-Three Springs KTS 23 kV	Active
AF2-151	Dillsburg 13.2 kV	Engineering and Procurement
AF2-215	Saint Thomas-LeMasters Junction 34.5 kV	Engineering and Procurement
AF2-271	Pemberton-Sinking Valley 12.47 kV	Engineering and Procurement
AF2-275	Guilford 12.47 kV	Active
AF2-276	Guilford 12.47 kV	Active
AF2-293	Beech Creek 12.47 kV	Active
AF2-295	Wilcox-Paper City 46 kV	Active
AF2-296	Madera 34.5 kV	Active
AG1-090	Philipsburg 115 kV	Active
AG1-144	Phillipsburg 34.5 kV	Active
AG1-206	Snyder Twp 34.5 kV	Active
AG1-242	Beccaria 34.5 kV	Active
AG1-257	Madisonburg Jct-Millheim 46 kV	Active
AG1-258	Madisonburg Jct-Millheim 46 kV	Active
AG1-280	Claysburg-Puzzletown 46 kV	Active
AG1-281	Claysburg-HCR Tap 46 kV	Active
AG1-301	Miller REC-Warrior Ridge 46 kV	Active
AG1-308	Shawville-Philipsburg 115 kV	Active
AG1-377	Philipsburg 115 kV	Active
AG1-378	Philipsburg 115 kV	Active
AG1-385	Motion-Ridgeway 46 kV	Active
AG1-395	Philipsburg-Karthaus 34.5 kV 2	Active
AG1-473	Shinglestown-Lewistown 230 kV	Active
AG1-481	Warren 34.5 kV	Active
AG1-484	Mountain 115 kV	Active
AG1-515	Guilford 138 kV	Active
AG1-560	Shade Gap-Roxbury 115 kV II	Active
AG1-561	Roxbury-Greene 138 kV II	Active

## 11.8 Contingency Descriptions

Contingency Name	Contingency Definition
<b>AP-P1-3-WP-230-001</b>	CONTINGENCY 'AP-P1-3-WP-230-001' /* ELKO #1 230/138KV XFMR DISCONNECT BRANCH FROM BUS 235174 TO BUS 235175 CKT 1 /* 01ELKO 138 01ELKO 230 DISCONNECT BRANCH FROM BUS 235175 TO BUS 235971 CKT 1 /* 01ELKO 230 01SQUABHLLW 230 END
<b>PN-P2_3-PN-230-0347-16-DRT-029</b>	CONTINGENCY 'PN-P2_3-PN-230-0347-16-DRT-029' /* 26LEWISTOWN-26RAYSTOWN 230 AND B5 FAULT DISCONNECT BRANCH FROM BUS 200513 TO BUS 208005 CKT 1 /* 26LEWISTOWN-08JUNITA 230 AND B89 FAULT OPEN BUS 200531 /* 26LEWISTOWN 230 BUS 2 END
<b>AP-P1-3-WP-230-326T-B</b>	CONTINGENCY 'AP-P1-3-WP-230-326T-B' /* SHINGLETOWN #82 230/46KV XFMR DISCONNECT BRANCH FROM BUS 966040 TO BUS 200513 CKT 1 /* AG1-473 TAP 230 26LEWISTWN 230 END
<b>AP-P2-3-WP-230-443T *</b>	CONTINGENCY 'AP-P2-3-WP-230-443T *' / UPDATED CON AJK 3-31-16 DISCONNECT BRANCH FROM BUS 200726 TO BUS 235175 CKT 1 DISCONNECT BRANCH FROM BUS 235175 TO BUS 235236 CKT 1 DISCONNECT BUS 235158 END
<b>AP-P1-3-WP-230-325T</b>	CONTINGENCY 'AP-P1-3-WP-230-325T' /* SHINGLETOWN #81 230/46KV XFMR DISCONNECT BRANCH FROM BUS 235248 TO BUS 236711 CKT 81 /* 01SHINGL 230 01SHINGLTN 46 DISCONNECT BRANCH FROM BUS 235248 TO BUS 200726 CKT 1 /* 01SHINGL 230 26SHAWVL 2 230 END
<b>PL:10:P45:102437</b>	CONTINGENCY 'PL:10:P45:102437' /* JUNI BU2 230KV BUS; BUS_SEC_1-2 CB @ JUNI 230KV DISCONNECT BUS 208004 /* JUNI BU1 230 DISCONNECT BUS 208005 /* JUNI BU2 230 END

Contingency Name	Contingency Definition
<b>PN-P1-2-PN-115-094_NON</b>	CONTINGENCY 'PN-P1-2-PN-115-094_NON' /* ROXBURY - AE1-071 - SHADE GAP 115KV DISCONNECT BRANCH FROM BUS 200520 TO BUS 938380 CKT 1 /* 26ROXBURY 115 26AE1-071-POI 115 DISCONNECT BRANCH FROM BUS 200522 TO BUS 938380 CKT 1 /* 26SHADE GP 115 26AE1-071-POI 115 END
<b>PL:10:P13:100618</b>	CONTINGENCY 'PL:10:P13:100618' /* JUNIATA 230/69KV TR4 OUT" DISCONNECT BRANCH FROM BUS 208005 TO BUS 209997 CKT 4 /* DISCONNECT BRANCH FROM BUS 208005 TO BUS 207955 CKT 1 /* DISCONNECT BRANCH FROM BUS 208005 TO BUS 200009 CKT 2 /* REMOVE SHUNT 1 FROM BUS 208004 /* DISCONNECT BRANCH FROM BUS 208005 TO BUS 208004 CKT 1 /* DISCONNECT BRANCH FROM BUS 208005 TO BUS 200513 CKT 1 /* END
<b>AP-P2-2-WP-230-001T</b>	CONTINGENCY 'AP-P2-2-WP-230-001T' /* ELKO #2 230KV BUS DISCONNECT BRANCH FROM BUS 235175 TO BUS 235158 CKT 1 /* 01ELKO 230 01CARB 230 DISCONNECT BRANCH FROM BUS 235175 TO BUS 235236 CKT 1 /* 01ELKO 230 01QUEHAN 230 DISCONNECT BRANCH FROM BUS 235175 TO BUS 200726 CKT 1 /* 01ELKO 230 26SHAWVL 2 230 END
<b>PL:10:P24:100548</b>	CONTINGENCY 'PL:10:P24:100548' /* JUNI 230KV BUS_SEC_1-2 CB DISCONNECT BUS 208005 /* JUNI BU2 230 DISCONNECT BUS 208004 /* JUNI BU1 230 /* JUNI BU1 230 END
<b>PL:03:P12:000193</b>	CONTINGENCY 'PL:03:P12:000193' /* NMES-LACK 230KV LINE DISCONNECT BRANCH FROM BUS 200706 TO BUS 200677 CKT 4 /* DISCONNECT BUS 200708 /* OXBOW 230KV BUS END
<b>PN-P2-2-PN-230-007T</b>	CONTINGENCY 'PN-P2-2-PN-230-007T' /* LEWISTOWN #2 230KV BUS DISCONNECT BRANCH FROM BUS 200513 TO BUS 200531 CKT 2 /* 26LEWISTWN 230 26YEAGRTWN 230 DISCONNECT BRANCH FROM BUS 200513 TO BUS 966040 CKT 1 /* 26LEWISTWN 230 AG1-473 TAP 230 DISCONNECT BRANCH FROM BUS 200513 TO BUS 200517 CKT 1 /* 26LEWISTWN 230 26RAYSTOWN 230 END

Contingency Name	Contingency Definition
<b>PN-P2-3-PN-230-14CT</b>	CONTINGENCY 'PN-P2-3-PN-230-14CT' /* LEWISTOWN STUCK 230KV BREAKER - SHINGLETOWN DISCONNECT BRANCH FROM BUS 200513 TO BUS 200517 CKT 1 /* 26LEWISTWN 230 26RAYSTOWN 230 DISCONNECT BRANCH FROM BUS 200513 TO BUS 966040 CKT 1 /* 26LEWISTWN 230 AG1-473 TAP 230 DISCONNECT BRANCH FROM BUS 200513 TO BUS 200531 CKT 2 /* 26LEWISTWN 230 26YEAGRTWN 230 DISCONNECT BRANCH FROM BUS 200513 TO BUS 200548 CKT 2 /* 26LEWISTWN 230 26LEWISTWN 46.00 DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 CKT 3 /* 26LEWISTWN 230 26LEWISTWN 115 END
<b>PN-P2-3-PN-230-14BT</b>	CONTINGENCY 'PN-P2-3-PN-230-14BT' /* LEWISTOWN STUCK 230KV BREAKER B5 (RAYSTOWN) DISCONNECT BRANCH FROM BUS 200513 TO BUS 200517 CKT 1 /* 26LEWISTWN 230 26RAYSTOWN 230 DISCONNECT BRANCH FROM BUS 200517 TO BUS 200539 CKT 1 /* 26RAYSTOWN 230 26RAYSTOWN 46 DISCONNECT BRANCH FROM BUS 200513 TO BUS 966040 CKT 1 /* 26LEWISTWN 230 AG1-473 TAP 230 DISCONNECT BRANCH FROM BUS 200513 TO BUS 200531 CKT 2 /* 26LEWISTWN 230 26YEAGRTWN 230 DISCONNECT BRANCH FROM BUS 200513 TO BUS 200548 CKT 1 /* 26LEWISTWN 230 26LEWISTWN 46.00 END
<b>Base Case</b>	
<b>PN-P2_3-PN-230-0347-12-DRT-025</b>	CONTINGENCY 'PN-P2_3-PN-230-0347-12-DRT-025' /* 26LEWISTOWN- 26RAYSTOWN 230 AND B5 FAULT DISCONNECT BRANCH FROM BUS 200513 TO BUS 966040 CKT 1 /* 26LEWISTOWN-AG1- 473 TAP 230 AND B57 FAULT OPEN BUS 200531 /* 26LEWISTOWN 230 BUS 2 END
<b>AP-P2-3-WP-230-446T</b>	CONTINGENCY 'AP-P2-3-WP-230-446T' DISCONNECT BRANCH FROM BUS 200726 TO BUS 235175 CKT 1 DISCONNECT BRANCH FROM BUS 235158 TO BUS 235175 CKT 1 DISCONNECT BRANCH FROM BUS 235175 TO BUS 235236 CKT 1 DISCONNECT BRANCH FROM BUS 235220 TO BUS 235236 CKT 1 DISCONNECT BRANCH FROM BUS 235236 TO BUS 236732 CKT 81 OPEN BUS 235158 END

## **12 Short Circuit Analysis**

The following Breakers are overdutied:

None.

### **12.1 System Reinforcements - Short Circuit**

None.

## 13 Affected Systems

### 13.1 NYISO

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

## 14 Attachment 1: One Line Diagram