Generation Interconnection

Feasibility Study Report

for

Queue Project AF2-172

NEWPORT 12 KV

3.8 MW Capacity / 10 MW Energy

Revised 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 AEC.

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 a Solar generating facility located in Cumberland County, New Jersey. The installed facilities will have a total capability of 10 MW with 3.8 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is June 01, 2022. This study does not imply a TO commitment to this in-service date.

Queue Number	AF2-172
Project Name	NEWPORT 12 KV
State	New Jersey
County	Cumberland
Transmission Owner	AEC
MFO	10
MWE	10
MWC	3.8
Fuel	Solar
Basecase Study Year	2023

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

AF2-172 will interconnect with the AEC distribution system at the Newport 12 kV substation.

5 Cost Summary

The AF2-172 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$11,432,666
Total System Network Upgrade Costs	$23,920,000
Total Costs	$35,352,666

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

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

6 Transmission Owner Scope of Work

Direct Connection Requirements

Criteria Limits for Distributed Energy Resource (DER) Connections to the ACE Distribution System (less than 69 kV)

1. Single Phase Limit

The largest capacity single phase generator or DER (battery) operating in parallel with the gird is 100kW. Above that size, a balanced 3 phase system is required. If 3 phase is available, balanced 3 phase shall be used.

2. Voltage Limits

DERs are permitted to cause up to 3% (primary) or 5% (secondary) voltage fluctuation at the Point of Interconnection and ½ the band width of any voltage regulator or ½ the net dead band of a capacitor bank. DERs in maximum output, are permitted to raise feeder voltage to the ANSI or state limit whichever is more conservative. An absorbing PF may be required to mitigate voltage rise or fluctuation impact.

3. Existing Distribution Circuit Capacity Limits

The aggregate limit of "large" generators running in parallel with a single, existing distribution circuit is:

Circuit Voltage	Aggregate Limit	Large DER Size
4 kV	1 MW	250 kW
12 – 13.8 kV	3 MW	250 kW
23 – 25 kV	6 MW	500 kW
33.26 – 34.5 kV	10 MW	1 MW

4. Express Circuit Capacity Limits

Distributed generation installations which exceed the limit for an existing circuit require an express circuit.

The maximum generator size for express circuits shall be:

Circuit Voltage	DER Limit
4 kV	1 MW
12 – 13.8 kV	10 MW
23 – 25 kV	10 MW
33.26 – 34.5 kV	20 MW

Note: Maximum Demand Loss and Annual Energy Loss both must be less than 3% for the express feeder

5. Telemetry requirements

On radial circuits that have or can incorporate Distribution Automation, telemetry is required on all systems 250kW and greater.

6. Distribution Power Transformer Limit

The aggregate of "large" DER will be limited to 50% of the substation transformer normal rating. In the case of transformers paralleled on the low side, the limit is 50% of the sum of the transformer normal ratings. This

usually ensures that the LTC does not operate excessively. Note that small systems (less than the large system size for the circuits' voltage class), may continue to be interconnected when these distribution transformer limits are reached.

The absolute net reverse power limit is 40% of the transformer normal rating. This ensures that locations with transfer capability can operate safely where one transformer load automatically transfers to the remaining transformer upon outage of one transformer.

7. Express Circuit Length Limit
The maximum circuit length is limited to 5 miles for 12/13 kV, 7 miles for 25 kV, and 10 miles for 34 kV.

Note: For ACE and Pepco, no 34 kV Express Circuits will be built as that voltage level is being retired. 4 kV Express Circuits will not be built in any PHI jurisdiction.

If there is no more injection capacity or space for an additional transformer at the closest substation, the next closest substation will be considered.

8. When a New Substation is Required
If a distribution express circuit can't be built from an existing substation for a project, it will be necessary to construct a new distribution substation with a standard ring bus design. It will be supplied by extending existing transmission lines. In NJ, it is the developer's responsibility to verify eligibility of this configuration for solar renewable energy certificates with New Jersey's Clean Energy Program if desired.

All limits, given above in MWs, are subject to more detailed study to ensure feasibility.

Transmission Owner (T.O.) Scope of Direct Connection Work
Transmission Owner scope of work required to accommodate 2.6 MW of generation via feeder NJ0572 to Newport T1 Substation:

1. Rebuilt approximately 3000ft existing two/single phase to three phase distribution primary.
2. Install a utility operated recloser equipped with the proper relaying and communication.
3. Install utility grade primary metering.
4. Replace fixed capacitor banks to switched capacitor bank of same size.
5. Remove a fixed capacitor bank of 600kVar.
6. Install a new switched capacitor bank.
7. Replace fuse to accommodate the current due to solar.
8. The existing 12kV -1200Amps OCB, needs to be upgraded to VCB.
9. The transformer LTC will need to be retrofitted.
10. Generation telemetry and remote trip capability will be provided to the control center.
11. A detailed, time based study may be performer during later study phases.
12. Direct transfer trip will be required. Approximately 5.5 miles of 96SM ADSS fiber optic cable was estimated for this report to provide the communication channel from Newport Substation to the PV site (note: *this may require secondary zone tree trimming*).

High Level Estimates			
Newport T1			
Distribution Feeder Upgrade	0.5	mi.	$500,000
Capcitor Banks and Fuse			$88,000
Substation Feeder Terminal & Relay			$1,411,766
Telecommunication			$595,200
Recloser & Metering			$92,000
SCADA Integration into EMS			$11,500
Miscellaneous Engineering Costs			$69,000
Approximate Total Cost			$2,767,466

The estimated time to complete this work is 18-24 months after receipt of a fully executed interconnection agreement.

Transmission Owner (T.O.) Scope of Direct Connection Work

Transmission Owner scope of work required to accommodate 7.4 MW of generation via Express Feeder from Newport T1 Substation:

1. Underground feeder getaway from substation.
2. Install approximately 500ft of parallel three phase 1000Al cable in concrete encased duct bank from Newport Substation.
3. Build approximately 3000ft of three phase distribution primary.
4. Rebuild approximately 4.5 miles of existing three phase distribution pole line to include a second deck of three phase distribution primary.
5. Rebuild approximately 3000ft existing two/single phase pole line to include a top deck of three phase distribution primary.
6. Install a utility operated recloser equipped with the proper relaying and communications.
7. Install utility grade primary metering.
8. Generation telemetry and remote trip capability will be provided to the control center.
9. A detailed, time-based study may be performed during later study phases.
10. Direct transfer trip will be required. Approximately 5.5 miles of 96SM ADSS fiber optic cable was estimated for this report to provide the communication channel from Newport Substation to the PV site (note: *this may require secondary zone tree trimming*).

High Level Estimates			
Newport T1			
Express Feeder	5.5	mi.	$6,000,000
Substation Feeder Terminal & Relay			$1,897,500
Telecommunication			$595,200
Recloser & Metering			$92,000
SCADA Integration into EMS			$11,500
Miscellaneous Engineering Costs			$69,000
Approximate Total Cost			$8,665,200

The estimated time to complete this work is 18-24 months after receipt of a fully executed interconnection agreement.

Assumption:

1. The express feeder can be built only after the ACE Newport substation expansion project has been completed.

7 Schedule

The estimated time to complete this work is 18-24 months after receipt of a fully executed interconnection agreement.

8 Transmission Owner Analysis

None

9 Interconnection Customer Requirements

Interconnection Customer Scope of Work

The IC is responsible for all design and construction related to activities on their side of the Point of Interconnection. Site preparation, including grading and an access road, as necessary, is assumed to be by the IC. Route selection, line design, and right-of-way acquisition of the direct connect facilities is not included in this report and is the responsibility of the IC.

Protective relaying and metering design and installation must comply with ACE's applicable standards. The IC is also required to provide revenue metering and real-time telemetering data to PJM in conformance with the requirements contained in PJM Manuals M-01 and M-14 and the PJM Tariff.

The IC will purchase and install all metering instrument transformers as well as construct a metering structure per ACE's specifications. The secondary wiring connections at the instrument transformers will be completed by the IC's contractors and inspected by ACE, while the secondary wiring work at the metering enclosure will be

completed by ACE's Meter technicians. The metering control cable and meter cabinets will be supplied by ACE and installed by the IC's contractors. ACE's meter technicians will program and install two solid state multi-function meters (Primary & Backup) for the new metering position. Each meter will be equipped with load profile, telemetry, and form-c pulse outputs. The ownership of metering equipment purchased or installed by the IC shall be transferred to the Transmission Owner at Commercial Operation, unless the IC asserts its right to install, own and operate the metering system.

Power Factor Requirement

The generators used for this project shall be capable of operating at a power factor (or schedule) specified by ACE in the range of 0.95 leading to 0.95 lagging. It is the responsibility of the developer/customer to obtain equipment that can operate with these requirements while also meeting all applicable requirements of IEEE and UL standards such as, but not limited to, IEEE 1547 and UL 1741.

For this project, operate inverters at absorbing power factor of (**0.98**) not impacting volt-ampere reactive ("VAR") continuously.

Inverter Requirements (if applicable):

The inverter at the DG location shall have the following capabilities:

- Voltage flicker reduction through dynamic VAR or fixed PF response
- Ramp rate control
- SCADA communications
- Curtailment or other mitigation ability if high voltage were to occur
- Disturbance Ride through for both Voltage and Frequency
- Ability to receive and respond to a transfer trip signal
- Ability to adjust PF or VARs based on utility signal
- Ability to Adjust Real Power Output based on utility signal
- Ability to operate on a Volt/VAR schedule
- Ability to maintain a voltage schedule

The inverter(s) shall operate in accordance with both the IEEE 1547 and UL 1741 series of standards that have been approved and use default settings except when specified otherwise by ACE. While inverters should be capable of voltage stabilization through dynamic VAR response and capable of low voltage and system disturbance ride through, neither of these capabilities will be implemented until such time that the IEEE 1547 series of standards are revised and approved to include standards for these capabilities. At such time as these revised standards become available, the generation owner/operator shall cooperate with ACE to implement these capabilities with settings acceptable to ACE. Until such time, the inverters shall operate with a fixed power factor value between 0.95 lead and 0.95 lag as specified by ACE.

Security Requirements

It is the responsibility of the owner to secure the generator or inverter from any unauthorized access (including physical and remote access) which could alter settings or adversely affect its ability to operate as required. Security measures should include utilizing secure password settings and/or physical locks on cabinet doors.

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:

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

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 AF2-172 was evaluated as a 10.0 MW (Capacity 3.8 MW) injection at the Newport 12 kV substation in the AEC area. Project AF2-172 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-172 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	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
10173343 9	22821 8	LAURE L	69. 0	AE	22836 0	WOODTWN 2	69. 0	AE	1	AE_P4-2 AE47	breake r	107.0	103.69	105.95	DC	2.54
10173450 1	22821 8	LAURE L	69. 0	AE	22836 0	WOODTWN 2	69. 0	AE	1	AE_P7-1 AE7TOWE R	tower	107.0	106.55	108.71	DC	2.3
10173450 2	22821 8	LAURE L	69. 0	AE	22836 0	WOODTWN 2	69. 0	AE	1	AE_P7-1 AE2TOWE R	tower	107.0	103.91	106.25	DC	2.65
10173335 5	22850 4	SHLDL Y T	69. 0	AE	22851 1	LANDIS T	69. 0	AE	1	AE_P4-2 AE23	breake r	158.0	115.81	117.25	DC	2.31
10173447 3	22850 4	SHLDL Y T	69. 0	AE	22851 1	LANDIS T	69. 0	AE	1	AE_P7-1 AE7TOWE R	tower	158.0	120.93	122.1	DC	1.88
10173335 8	22851 1	LANDI S T	69. 0	AE	22840 9	MONROE#3	69. 0	AE	1	AE_P4-2 AE23	breake r	158.0	115.81	117.25	DC	2.31
10173335 9	22851 1	LANDI S T	69. 0	AE	22840 9	MONROE#3	69. 0	AE	1	AE_P4-2 AE22	breake r	158.0	115.78	117.23	DC	2.34
10173447 1	22851 1	LANDI S T	69. 0	AE	22840 9	MONROE#3	69. 0	AE	1	AE_P7-1 AE7TOWE R	tower	158.0	120.87	122.04	DC	1.88
10173330 3	22871 4	CNTRL N	69. 0	AE	22850 4	SHLDLY T	69. 0	AE	1	AE_P4-2 AE23	breake r	143.0	127.96	129.55	DC	2.31
10173443 9	22871 4	CNTRL N	69. 0	AE	22850 4	SHLDLY T	69. 0	AE	1	AE_P7-1 AE7TOWE R	tower	143.0	133.62	134.91	DC	1.88
10173322 0	94000 0	AE1-240 TAP	69. 0	AE	22822 6	SHRMAN#2	69. 0	AE	1	AE_P4-2 AE46	breake r	93.0	155.74	156.89	DC	1.08

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|DC	MW IMPACT
10173385 5	22821 8	LAURE L	69. 0	AE	22836 0	WOODTWN 2	69. 0	AE	1	AE_P1-2 ORCH-CUMB	operatio n	107.0	102.48	104.76	DC	2.56
10173379 7	22850 4	SHLDL Y T	69. 0	AE	22851 1	LANDIS T	69. 0	AE	1	AE_P1-2 ORCH-CUMB	operatio n	158.0	115.82	117.25	DC	2.29

10173379 9	22851 1	LANDI S T	69. 0	AE	22840 9	MONROE#3	69. 0	AE	1	AE_P1-2 ORCH-CUMB	operatio n	158.0	115.76	117.18	DC	2.29
10173385 2	22870 3	BUTLE R	69. 0	AE	22871 3	VCLP TP	69. 0	AE	1	AE_P1-2 SHERM-W VINE-A	operatio n	132.0	105.49	106.72	DC	1.63
10173385 6	22871 3	VCLP TP	69. 0	AE	22870 4	CENTRAL	69. 0	AE	1	AE_P1-2 SHERM-W VINE-A	operatio n	132.0	103.44	104.68	DC	1.63
10173374 7	22871 4	CNTRL N	69. 0	AE	22850 4	SHLDLY T	69. 0	AE	1	AE_P1-2 ORCH-CUMB	operatio n	143.0	127.97	129.55	DC	2.29
10173380 4	93950 0	AE1-179 TAP	69. 0	AE	22822 8	SO MVLLE	69. 0	AE	1	228226 SHRMAN# 2 69.0 940000 AE1-240 TAP 69.0 1	operatio n	89.0	109.86	116.56	DC	5.96
10173368 1	94000 0	AE1-240 TAP	69. 0	AE	22822 6	SHRMAN#2	69. 0	AE	1	Base Case	operatio n	82.0	118.28	119.8	DC	1.25

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
101733303,101734439	4	CNTRL N 69.0 kV - SHLDLY T 69.0 kV Ckt 1	**ACE:** **as0711r0001 (21)** : To mitigate the (ACE) Sheildalloy Tap Central Tap 69 kV line (from bus 228504 to bus 228714 ckt 1) overload, terminal reinforcement is required at Central North (Vineland). **Project Type** : FAC **Cost** : $200,000 **Time Estimate** : 24-36 Months **as0711r0006 (26)** : To mitigate the (ACE) Sheildalloy Tap Central Tap 69 kV line (from bus 228504 to bus 228714 ckt 1) overload, terminal reinforcement is required at Central North (Vineland). **Project Type** : FAC **Cost** : $400,000 **Time Estimate** : 12-24 Months **at0711r0001 (100)** : To mitigate the (ACE) Sheildalloy Tap Central Tap 69 kV line (from bus 228504 to bus 228714 ckt 1) overload, it will require increasing the emergency rating of the Sheildalloy Tap to Central North (Vineland) 230 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. **Project Type** : FAC **Cost** : $1,300,000 **Time Estimate** : 24-48 Months **at0711r0004 (103)** : To mitigate the (ACE) Sheildalloy Tap Central Tap 69 kV line (from bus 228504 to bus 228714 ckt 1) overload, it will require increasing the emergency rating of the Sheildalloy Tap to Central North (Vineland) 230 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. Also, upgrades to the terminal equipment at Central North Substation will be required. **Project Type** : FAC **Cost** : $4,600,000 **Time Estimate** : 24-48 Months **City of Vineland:** **20-094**: Line Upgrade – CN- Metering POI, including the installation of new poles, circuit breaker, relaying, foundations, insulators, and conductor. **Project Type** : FAC **Cost** : $4,000,000 **Time Estimate** : 18 Months	$10,500,000

101733439,101734502,101734501	1	**LAUREL 69.0 kV - WOODTWN2 69.0 kV Ckt 1**	**ACE:** **as0740r0001_af1f (30) : To mitigate the (ACE) Laurel to Woodstown 69 kV line (from bus 228218 to bus 228360 ckt 1) overload, it will require reinforcement of terminal equipment at Woodstown #2 substation.** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12-24 Months** **as0740r0002_af1f (31) : To mitigate the (ACE) Laurel to Woodstown 69 kV line (from bus 228218 to bus 228360 ckt 1) overload, it will require reinforcement of terminal equipment at Woodstown #2 substation.** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12-24 Months**	$200,000
101734471,101733358,101733359	3	**LANDIS T 69.0 kV - MONROE#3 69.0 kV Ckt 1**	**ACE:** **as0711r0002 (22) : To mitigate the (ACE) Landis Tap - Monroe 69 kV line (from bus 228511 to bus 228409 ckt 1) overload, terminal reinforcement is required at Monroe#3 substation.** **Project Type : FAC** **Cost : $200,000** **Time Estimate : 12-24 Months** **as0711r0003 (23) : To mitigate the (ACE) Landis Tap - Monroe 69 kV line (from bus 228511 to bus 228409 ckt 1) overload, terminal reinforcement is required at Monroe#3 substation.** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12-24 Months** **at0711r0002 (101) : To mitigate the (ACE) Landis Tap - Monroe 69 kV line (from bus 228511 to bus 228409 ckt 1) overload, it will require increasing the emergency rating of the Sheildalloy Tap to Central North (Vineland) 230 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor.** **Project Type : FAC** **Cost : $11,300,000** **Time Estimate : 36-48 Months**	$11,600,000
101733220	5	**AE1-240 TAP 69.0 kV - SHRMAN#2 69.0 kV Ckt 1**	**ACE:** **ACECCShermr01 (12) : To mitigate the AE1-240 tap to Sherman 69 kV line section oveload a 600 amp disc switch must be upgraded at Sherman** **Project Type : FAC** **Cost : $20,000** **Time Estimate : 6 to 14 Months**	$20,000
101733355,101734473	2	**SHLDLY T 69.0 kV - LANDIS T 69.0 kV Ckt 1**	**ACE:** **at0711r0003 (102) : To mitigate the (ACE) Sheildalloy Tap - Landis Tap 69 kV line (from bus 228504 to bus 228511 ckt 1) overload, it will require increasing the emergency rating of the Sheildalloy Tap to Landis Tap 69 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor.** **Project Type : FAC** **Cost : $1,600,000** **Time Estimate : 24-48 Months**	$1,600,000
			TOTAL COST	**$23,920,000**

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".

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
101734501	228218	LAUREL	AE	228360	WOODTWN2	AE	1	AE_P7-1 AE7TOWER	tower	107.0	106.55	108.71	DC	2.3

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
228102	BLE#2 ST (Deactivation : 30/04/2019)	7.1948	Adder	8.46
228200	CARL#1CT	1.4208	50/50	1.4208
228201	CARL#2CT	1.5039	50/50	1.5039
228251	CARLLS#4	0.1608	50/50	0.1608
228260	V4-054C	0.3890	50/50	0.3890
228261	V4-054E	1.8399	50/50	1.8399
228334	MANNMILG	-0.9530	Adder	-1.12
228343	QUINTN#1 (Deactivation : 26/04/2020)	0.2333	50/50	0.2333
228702	WEST CT	0.4708	50/50	0.4708
228712	V2-041E	0.1738	Adder	0.2
228717	S121	1.1032	50/50	1.1032
228727	W2-039G	1.4033	50/50	1.4033
924531	AB2-102 C	9.7346	Adder	11.45
924532	AB2-102 E	0.2163	Adder	0.25
938781	AE1-104 C O1	5.8075	Adder	6.83
938782	AE1-104 E O1	14.8585	Adder	17.48
939501	AE1-179 C O1	6.1201	50/50	6.1201
939502	AE1-179 E O1	4.3190	50/50	4.3190
940001	AE1-240 C O1	5.3145	50/50	5.3145
940002	AE1-240 E O1	3.7935	50/50	3.7935
945431	AF1-208 C O1	7.4631	50/50	7.4631
945432	AF1-208 E O1	4.9754	50/50	4.9754
945731	AF1-238 C	6.0410	50/50	6.0410
945732	AF1-238 E	9.0614	50/50	9.0614
945741	AF1-239 C	1.4214	50/50	1.4214
945742	AF1-239 E	2.1321	50/50	2.1321
957251	AF2-019 C	0.3976	Adder	0.88
957252	AF2-019 E	0.5964	Adder	1.32
957261	AF2-020 C	2.4162	50/50	2.4162
957262	AF2-020 E	3.6242	50/50	3.6242
957281	AF2-022 C	0.6245	Adder	1.39
957282	AF2-022 E	0.9367	Adder	2.08
957321	AF2-026 C	0.5102	Adder	1.13
957322	AF2-026 E	0.7653	Adder	1.7
957641	AF2-058	0.7419	50/50	0.7419
958781	AF2-169 C O1 (Withdrawn : 06/09/2020)	0.1166	Adder	0.26
958782	AF2-169 E O1 (Withdrawn : 06/09/2020)	13.8789	Adder	30.81
958811	AF2-172 C	0.8745	50/50	0.8745

958812	AF2-172 E	1.4267	50/50	1.4267
959111	AF2-202 C	0.3428	50/50	0.3428
959112	AF2-202 E	0.4691	50/50	0.4691
NEWTON	NEWTON	0.0290	Confirmed LTF	0.0290
FARMERCITY	FARMERCITY	0.0015	Confirmed LTF	0.0015
CALDERWOOD	CALDERWOOD	0.0134	Confirmed LTF	0.0134
NY	NY	0.0182	Confirmed LTF	0.0182
PRAIRIE	PRAIRIE	0.0697	Confirmed LTF	0.0697
O-066	O-066	0.2083	Confirmed LTF	0.2083
CHEOAH	CHEOAH	0.0135	Confirmed LTF	0.0135
EDWARDS	EDWARDS	0.0094	Confirmed LTF	0.0094
TILTON	TILTON	0.0170	Confirmed LTF	0.0170
G-007	G-007	0.0114	Confirmed LTF	0.0114
GIBSON	GIBSON	0.0147	Confirmed LTF	0.0147
BLUEG	BLUEG	0.0469	Confirmed LTF	0.0469
TRIMBLE	TRIMBLE	0.0150	Confirmed LTF	0.0150
CATAWBA	CATAWBA	0.0094	Confirmed LTF	0.0094

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
101734473	228504	SHLDLY T	AE	228511	LANDIS T	AE	1	AE_P7-1 AE7TOWER	tower	158.0	120.93	122.1	DC	1.88

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
228102	BLE#2 ST (Deactivation : 30/04/2019)	13.6865	Adder	16.1
228201	CARL#2CT	0.7659	50/50	0.7659
228206	SHRMN CT	1.8223	50/50	1.8223
228251	CARLLS#4	0.0825	50/50	0.0825
228260	V4-054C	0.2069	50/50	0.2069
228261	V4-054E	0.9785	50/50	0.9785
228343	QUINTN#1 (Deactivation : 26/04/2020)	0.1124	Adder	0.13
228702	WEST CT	1.2680	50/50	1.2680
228712	V2-041E	0.3227	Adder	0.38
228717	S121	3.2895	50/50	3.2895
228727	W2-039G	2.6662	50/50	2.6662
924531	AB2-102 C	18.8458	Adder	22.17
924532	AB2-102 E	0.4188	Adder	0.49
938781	AE1-104 C O1	11.0475	Adder	13.0
938782	AE1-104 E O1	28.2649	Adder	33.25
939501	AE1-179 C O1	7.4858	50/50	7.4858
939502	AE1-179 E O1	5.2828	50/50	5.2828
940001	AE1-240 C O1	5.8203	50/50	5.8203
940002	AE1-240 E O1	4.1545	50/50	4.1545
945431	AF1-208 C O1	2.8022	Adder	3.3
945432	AF1-208 E O1	1.8681	Adder	2.2
945731	AF1-238 C	13.2243	50/50	13.2243
945732	AF1-238 E	19.8364	50/50	19.8364
945741	AF1-239 C	3.1116	50/50	3.1116
945742	AF1-239 E	4.6674	50/50	4.6674
957251	AF2-019 C	0.7566	Adder	1.68
957252	AF2-019 E	1.1349	Adder	2.52
957261	AF2-020 C	0.5543	Adder	1.23
957262	AF2-020 E	0.8315	Adder	1.85
957281	AF2-022 C	1.1738	Adder	2.61
957282	AF2-022 E	1.7607	Adder	3.91
957321	AF2-026 C	2.0844	50/50	2.0844
957322	AF2-026 E	3.1266	50/50	3.1266
957641	AF2-058	0.3946	50/50	0.3946
958781	AF2-169 C O1 (Withdrawn : 06/09/2020)	0.2219	Adder	0.49
958782	AF2-169 E O1 (Withdrawn : 06/09/2020)	26.4014	Adder	58.6
958811	AF2-172 C	0.7162	50/50	0.7162
958812	AF2-172 E	1.1685	50/50	1.1685

959111	AF2-202 C	0.1759	50/50	0.1759
959112	AF2-202 E	0.2408	50/50	0.2408
NEWTON	NEWTON	0.0527	Confirmed LTF	0.0527
FARMERCITY	FARMERCITY	0.0027	Confirmed LTF	0.0027
CALDERWOOD	CALDERWOOD	0.0244	Confirmed LTF	0.0244
NY	NY	0.0426	Confirmed LTF	0.0426
PRAIRIE	PRAIRIE	0.1266	Confirmed LTF	0.1266
O-066	O-066	0.5779	Confirmed LTF	0.5779
CHEOAH	CHEOAH	0.0245	Confirmed LTF	0.0245
EDWARDS	EDWARDS	0.0172	Confirmed LTF	0.0172
TILTON	TILTON	0.0309	Confirmed LTF	0.0309
G-007	G-007	0.0666	Confirmed LTF	0.0666
MADISON	MADISON	0.0020	Confirmed LTF	0.0020
GIBSON	GIBSON	0.0268	Confirmed LTF	0.0268
BLUEG	BLUEG	0.0851	Confirmed LTF	0.0851
TRIMBLE	TRIMBLE	0.0273	Confirmed LTF	0.0273
CATAWBA	CATAWBA	0.0168	Confirmed LTF	0.0168

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
101734471	228511	LANDIS T	AE	228409	MONROE#3	AE	1	AE_P7-1 AE7TOWER	tower	158.0	120.87	122.04	DC	1.88

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
228102	BLE#2 ST (Deactivation : 30/04/2019)	13.6865	Adder	16.1
228201	CARL#2CT	0.7659	50/50	0.7659
228206	SHRMN CT	1.8223	50/50	1.8223
228251	CARLLS#4	0.0825	50/50	0.0825
228260	V4-054C	0.2069	50/50	0.2069
228261	V4-054E	0.9785	50/50	0.9785
228343	QUINTN#1 (Deactivation : 26/04/2020)	0.1124	Adder	0.13
228702	WEST CT	1.2680	50/50	1.2680
228712	V2-041E	0.3227	Adder	0.38
228717	S121	3.2895	50/50	3.2895
228727	W2-039G	2.6662	50/50	2.6662
924531	AB2-102 C	18.8458	Adder	22.17
924532	AB2-102 E	0.4188	Adder	0.49
938781	AE1-104 C O1	11.0475	Adder	13.0
938782	AE1-104 E O1	28.2649	Adder	33.25
939501	AE1-179 C O1	7.4858	50/50	7.4858
939502	AE1-179 E O1	5.2828	50/50	5.2828
940001	AE1-240 C O1	5.8203	50/50	5.8203
940002	AE1-240 E O1	4.1545	50/50	4.1545
945431	AF1-208 C O1	2.8022	Adder	3.3
945432	AF1-208 E O1	1.8681	Adder	2.2
945731	AF1-238 C	13.2243	50/50	13.2243
945732	AF1-238 E	19.8364	50/50	19.8364
945741	AF1-239 C	3.1116	50/50	3.1116
945742	AF1-239 E	4.6674	50/50	4.6674
957251	AF2-019 C	0.7566	Adder	1.68
957252	AF2-019 E	1.1349	Adder	2.52
957261	AF2-020 C	0.5543	Adder	1.23
957262	AF2-020 E	0.8315	Adder	1.85
957281	AF2-022 C	1.1738	Adder	2.61
957282	AF2-022 E	1.7607	Adder	3.91
957321	AF2-026 C	2.0844	50/50	2.0844
957322	AF2-026 E	3.1266	50/50	3.1266
957641	AF2-058	0.3946	50/50	0.3946
958781	AF2-169 C O1 (Withdrawn : 06/09/2020)	0.2219	Adder	0.49
958782	AF2-169 E O1 (Withdrawn : 06/09/2020)	26.4014	Adder	58.6
958811	AF2-172 C	0.7162	50/50	0.7162
958812	AF2-172 E	1.1685	50/50	1.1685

959111	AF2-202 C	0.1759	50/50	0.1759
959112	AF2-202 E	0.2408	50/50	0.2408
NEWTON	NEWTON	0.0527	Confirmed LTF	0.0527
FARMERCITY	FARMERCITY	0.0027	Confirmed LTF	0.0027
CALDERWOOD	CALDERWOOD	0.0244	Confirmed LTF	0.0244
NY	NY	0.0426	Confirmed LTF	0.0426
PRAIRIE	PRAIRIE	0.1266	Confirmed LTF	0.1266
O-066	O-066	0.5779	Confirmed LTF	0.5779
CHEOAH	CHEOAH	0.0245	Confirmed LTF	0.0245
EDWARDS	EDWARDS	0.0172	Confirmed LTF	0.0172
TILTON	TILTON	0.0309	Confirmed LTF	0.0309
G-007	G-007	0.0666	Confirmed LTF	0.0666
MADISON	MADISON	0.0020	Confirmed LTF	0.0020
GIBSON	GIBSON	0.0268	Confirmed LTF	0.0268
BLUEG	BLUEG	0.0851	Confirmed LTF	0.0851
TRIMBLE	TRIMBLE	0.0273	Confirmed LTF	0.0273
CATAWBA	CATAWBA	0.0168	Confirmed LTF	0.0168

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
101734439	228714	CNTRL N	AE	228504	SHLDLY T	AE	1	AE_P7-1 AE7TOWER	tower	143.0	133.62	134.91	DC	1.88

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
228102	BLE#2 ST (Deactivation : 30/04/2019)	13.6865	Adder	16.1
228201	CARL#2CT	0.7659	50/50	0.7659
228206	SHRMN CT	1.8223	50/50	1.8223
228251	CARLLS#4	0.0825	50/50	0.0825
228260	V4-054C	0.2069	50/50	0.2069
228261	V4-054E	0.9785	50/50	0.9785
228343	QUINTN#1 (Deactivation : 26/04/2020)	0.1124	Adder	0.13
228702	WEST CT	1.2680	50/50	1.2680
228712	V2-041E	0.3227	Adder	0.38
228717	S121	3.2895	50/50	3.2895
228727	W2-039G	2.6662	50/50	2.6662
924531	AB2-102 C	18.8458	Adder	22.17
924532	AB2-102 E	0.4188	Adder	0.49
938781	AE1-104 C O1	11.0475	Adder	13.0
938782	AE1-104 E O1	28.2649	Adder	33.25
939501	AE1-179 C O1	7.4858	50/50	7.4858
939502	AE1-179 E O1	5.2828	50/50	5.2828
940001	AE1-240 C O1	5.8203	50/50	5.8203
940002	AE1-240 E O1	4.1545	50/50	4.1545
945431	AF1-208 C O1	2.8022	Adder	3.3
945432	AF1-208 E O1	1.8681	Adder	2.2
945731	AF1-238 C	13.2243	50/50	13.2243
945732	AF1-238 E	19.8364	50/50	19.8364
945741	AF1-239 C	3.1116	50/50	3.1116
945742	AF1-239 E	4.6674	50/50	4.6674
957251	AF2-019 C	0.7566	Adder	1.68
957252	AF2-019 E	1.1349	Adder	2.52
957261	AF2-020 C	0.5543	Adder	1.23
957262	AF2-020 E	0.8315	Adder	1.85
957281	AF2-022 C	1.1738	Adder	2.61
957282	AF2-022 E	1.7607	Adder	3.91
957321	AF2-026 C	2.0844	50/50	2.0844
957322	AF2-026 E	3.1266	50/50	3.1266
957641	AF2-058	0.3946	50/50	0.3946
958781	AF2-169 C O1 (Withdrawn : 06/09/2020)	0.2219	Adder	0.49
958782	AF2-169 E O1 (Withdrawn : 06/09/2020)	26.4014	Adder	58.6
958811	AF2-172 C	0.7162	50/50	0.7162
958812	AF2-172 E	1.1685	50/50	1.1685

959111	AF2-202 C	0.1759	50/50	0.1759
959112	AF2-202 E	0.2408	50/50	0.2408
NEWTON	NEWTON	0.0527	Confirmed LTF	0.0527
FARMERCITY	FARMERCITY	0.0027	Confirmed LTF	0.0027
CALDERWOOD	CALDERWOOD	0.0244	Confirmed LTF	0.0244
NY	NY	0.0426	Confirmed LTF	0.0426
PRAIRIE	PRAIRIE	0.1266	Confirmed LTF	0.1266
O-066	O-066	0.5779	Confirmed LTF	0.5779
CHEOAH	CHEOAH	0.0245	Confirmed LTF	0.0245
EDWARDS	EDWARDS	0.0172	Confirmed LTF	0.0172
TILTON	TILTON	0.0309	Confirmed LTF	0.0309
G-007	G-007	0.0666	Confirmed LTF	0.0666
MADISON	MADISON	0.0020	Confirmed LTF	0.0020
GIBSON	GIBSON	0.0268	Confirmed LTF	0.0268
BLUEG	BLUEG	0.0851	Confirmed LTF	0.0851
TRIMBLE	TRIMBLE	0.0273	Confirmed LTF	0.0273
CATAWBA	CATAWBA	0.0168	Confirmed LTF	0.0168

11.6.5 Index 5

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
101733220	940000	AE1-240 TAP	AE	228226	SHRMAN#2	AE	1	AE_P4-2 AE46	breaker	93.0	155.74	156.89	DC	1.08

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
228200	CARL#1CT	2.0154	50/50	2.0154
228201	CARL#2CT	2.1333	50/50	2.1333
228251	CARLLS#4	0.2308	50/50	0.2308
228260	V4-054C	0.3406	50/50	0.3406
228261	V4-054E	1.6109	50/50	1.6109
228334	MANNMILG	0.6930	Adder	0.82
228343	**QUINTN#1 (Deactivation : 26/04/2020)**	**0.3260**	**50/50**	**0.3260**
228351	V2-046C	0.1285	50/50	0.1285
228357	V2-046E	1.3727	50/50	1.3727
938871	AE1-115 C	0.5038	Adder	0.59
938872	AE1-115 E	0.5038	Adder	0.59
940001	AE1-240 C O1	20.6996	50/50	20.6996
940002	AE1-240 E O1	14.7752	50/50	14.7752
942571	AE2-272	0.0147	50/50	0.0147
945431	AF1-208 C O1	8.1116	50/50	8.1116
945432	AF1-208 E O1	5.4077	50/50	5.4077
945733	AF1-238 BAT	17.1921	50/50	17.1921
945743	AF1-239 BAT	4.0452	50/50	4.0452
957223	AF2-016 BAT	5.4696	Merchant Transmission	5.4696
957253	AF2-019 BAT	1.4149	Merchant Transmission	1.4149
957261	AF2-020 C	3.4272	50/50	3.4272
957262	AF2-020 E	5.1408	50/50	5.1408
957283	AF2-022 BAT	2.4595	Merchant Transmission	2.4595
957291	AF2-023 C O1	0.5365	Adder	1.19
957292	AF2-023 E O1	0.8048	Adder	1.79
957323	AF2-026 BAT	3.4767	50/50	3.4767
957641	AF2-058	0.6496	50/50	0.6496
958811	AF2-172 C	0.4088	50/50	0.4088
958812	AF2-172 E	0.6669	50/50	0.6669
959111	AF2-202 C	0.4920	50/50	0.4920
959112	AF2-202 E	0.6733	50/50	0.6733
NEWTON	NEWTON	0.0054	Confirmed LTF	0.0054
FARMERCITY	FARMERCITY	0.0003	Confirmed LTF	0.0003
CALDERWOOD	CALDERWOOD	0.0025	Confirmed LTF	0.0025
NY	NY	0.0310	Confirmed LTF	0.0310
PRAIRIE	PRAIRIE	0.0129	Confirmed LTF	0.0129
O-066	O-066	0.5510	Confirmed LTF	0.5510
CHEOAH	CHEOAH	0.0025	Confirmed LTF	0.0025
EDWARDS	EDWARDS	0.0017	Confirmed LTF	0.0017
TILTON	TILTON	0.0031	Confirmed LTF	0.0031
G-007	G-007	0.2049	Confirmed LTF	0.2049

GIBSON	GIBSON	0.0027	Confirmed LTF	0.0027
BLUEG	BLUEG	0.0087	Confirmed LTF	0.0087
TRIMBLE	TRIMBLE	0.0028	Confirmed LTF	0.0028
CATAWBA	CATAWBA	0.0017	Confirmed LTF	0.0017

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
AB2-102	Cumberland 230kV	Active
AE1-104	BL England 138 kV	Active
AE1-115	Churchtown 69 kV	Active
AE1-179	South Millville-Newport 69 kV	Active
AE1-240	Carlls Corner-Sherman Avenue 69 kV	Active
AE2-272	Woodstown 12 kV	In Service
AF1-208	Quinton-Roadstown 69 kV	Active
AF1-238	Sherman Ave. 69 kV	Active
AF1-239	Sherman Ave-Vineland 69 kV	Active
AF2-016	Lewis 138 kV	Active
AF2-019	Rio Grande 69 kV	Active
AF2-020	Carll's Corner 69 kV	Active
AF2-022	Cumberland 138 kV	Active
AF2-023	Churchtown 69 kV	Active
AF2-026	Sherman Ave 138 kV	Active
AF2-058	Fairton 12 kV	Active
AF2-169	BL England 138 kV	Withdrawn
AF2-172	Whibco 12 kV	Active
AF2-202	Landis 12 V	Active
V2-041	Clayville 12kV	In Service
V2-046	Pilesgrove Township 12kV	In Service
V4-054	Fairfield Township 12kV	In Service
W2-039	Clayville 69kV	In Service

11.8 Contingency Descriptions

Contingency Name	Contingency Definition
AE_P1-2 SHERM-W VINE-A	CONTINGENCY 'AE_P1-2 SHERM-W VINE-A' OPEN LINE FROM BUS 228256 TO BUS 945730 CIRCUIT 1 / END
228226 SHRMAN#2 69.0 940000 AE1-240 TAP 69.0 1	CONTINGENCY '228226 SHRMAN#2 69.0 940000 AE1-240 TAP 69.0 1' OPEN BRANCH FROM BUS 228226 TO BUS 940000 CKT 1 END
AE_P7-1 AE7TOWER	CONTINGENCY 'AE_P7-1 AE7TOWER' DISCONNECT BUS 227905 /* #1 BLE TO SCULL TO MILL 138 KV DISCONNECT BUS 227929 /* #1 SCULL 12 KV DISCONNECT BUS 227906 /* #2 BLE TO SCULL TO MILL 138 KV DISCONNECT BUS 227930 /* #2 SCULL 12 KV DISCONNECT BUS 227903 /* #1 MILL TO LEWIS 138 KV DISCONNECT BUS 227904 /* #2 MILL TO LEWIS 138 KV END
AE_P1-2 ORCH-CUMB	CONTINGENCY 'AE_P1-2 ORCH-CUMB' OPEN LINE FROM BUS 228002 TO BUS 228207 CIRCUIT 1 / END
AE_P4-2 AE22	CONTINGENCY 'AE_P4-2 AE22' /* CUMBERLAND TO ORCHARD BREAKER A DISCONNECT BRANCH FROM BUS 228002 TO BUS 228207 CKT 1 /* ORCHARD CUMBERLAND 230 230 DISCONNECT BRANCH FROM BUS 228207 TO BUS 228262 CKT 2 /* CUMB 230 138 T3 END
AE_P4-2 AE23	CONTINGENCY 'AE_P4-2 AE23' /* CUMBERLAND TO ORCHARD BREAKER B DISCONNECT BRANCH FROM BUS 228002 TO BUS 228207 CKT 1 /* ORCHARD CUMBERLAND 230 230 DISCONNECT BRANCH FROM BUS 228207 TO BUS 228262 CKT 1 /* CUMB 230 138 T2 END
AE_P7-1 AE2TOWER	CONTINGENCY 'AE_P7-1 AE2TOWER' / PJM FIXED DISCONNECT BRANCH FROM BUS 228262 TO BUS 228253 CKT 1 /* SHERMAN TO CUMBERLAND 138 KV DISCONNECT BRANCH FROM BUS 228207 TO BUS 228002 CKT 1 /* ORCHARD TO CUMBERLAND 230 KV END

AE_P4-2 AE46	CONTINGENCY 'AE_P4-2 AE46' /*ORCHARD 230 BUS BREAKER D DISCONNECT BRANCH FROM BUS 228002 TO BUS 228310 CKT 1 /* ORCHARD TO CHURCHTOWN 230 230 DISCONNECT BRANCH FROM BUS 200063 TO BUS 228002 CKT 1 /*ORCHARD ORCHARD 500 230 T1 END
AE_P4-2 AE47	CONTINGENCY 'AE_P4-2 AE47' /*ORCHARD 230 BUS BREAKER NEW2 DISCONNECT BRANCH FROM BUS 228002 TO BUS 228310 CKT 1 /* ORCHARD TO CHURCHTOWN 230 230 DISCONNECT BRANCH FROM BUS 228002 TO BUS 228207 CKT 1 /* ORCHARD TO CUMBERLAND 230 230 END
Base Case	

12 Short Circuit Analysis

The following Breakers are overdutied

None

13 Affected Systems

None

14 Attachment 1: One Line Diagram