Generation Interconnection

Feasibility Study Report

for

Queue Project AG1-228

ALTA HAUTE-TUSCARORA 69 KV

12 MW Capacity / 20 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 PPL.

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.

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3 General

The Interconnection Customer (IC) has proposed a Solar generating facility located in Schuylkill County, Pennsylvania. The installed facilities will have a total capability of 20 MW with 12 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is June 01, 2023. This study does not imply a TO commitment to this in-service date.

Queue Number	AG1-228
Project Name	ALTA HAUTE-TUSCARORA 69 KV
State	Pennsylvania
County	Schuylkill
Transmission Owner	PPL
MFO	20
MWE	20
MWC	12
Fuel	Solar
Basecase Study Year	2024

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

4 Point of Interconnection

AG1-228 will interconnect with the PPL Transmission system as an uprate to AG1-227, tapping the 69 kV Frackville - Greenwood Circuit between the Alta Haute bus and Tuscarora Tap bus. AG1-228 will share the same physical interconnection facilities as the prior AF1-227 project.

Note: As part of Supplemental Project s1242, PPL EU is renaming the Hauto – Frackville #1 69 kV line to the Frackville – Greenwood 69 kV line. It is assumed that s1242 will be complete prior to this project's interconnection to the PPL EU Transmission System.

5 Cost Summary

The AG1-228 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$0
Total System Network Upgrade Costs	$151,600,000
Total Costs	$151,600,000

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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.

6 Transmission Owner Scope of Work

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

Description	Total Cost
Total Physical Interconnection Costs	$0

The physical interconnection costs will be borne by the AG1-227 project. There is no additional work required to accommodate the AG1-228 project.

7 Schedule

The schedule for the AG1-227 project will apply.

8 Interconnection Customer Requirements

PPL EU applicable technical standards that address requirements for interconnection of generation, transmission, and end user facilities can be found at the following link:

https://pjm.com/planning/design-engineering/to-tech-standards/private-ppl.aspx

9 Revenue Metering and SCADA Requirements

9.1 PJM Requirements

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

9.2 Meteorological Data Reporting Requirements

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

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

9.3 Interconnected Transmission Owner Requirements

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

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

10 Summer Peak - Load Flow Analysis

The Queue Project AG1-228 was evaluated as a 20.0 MW (Capacity 12.0 MW) injection as an uprate to AG1-277, tapping the 69 kV Frackville - Greenwood Circuit between the Alta Haute bus and Tuscarora Tap Section in the PPL area. Project AG1-228 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-228 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

10.1 Generation Deliverability

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

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
167637640	207964	ELDR	230.0	PPL	208109	SUNB	230.0	PPL	1	208072 SIEG 230 938390 AE1-058_TAP 230 1	single	456.0	99.57	100.77	DC	5.46

10.2 Multiple Facility Contingency

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

None

10.3 Contribution to Previously Identified Overloads

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

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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
164964497	207973	FRAC	230	PPL	938390	AE1-058_TAP	230.0	PPL	1	PL:08:P71:101751	tower	628	114.52	115.63	DC	6.99
164964499	207973	FRAC	230	PPL	938390	AE1-058_TAP	230.0	PPL	1	PL:48:P71:101752	tower	628	112.92	114.03	DC	6.99
164964445	938390	AE1-058_TAP	230	PPL	208072	SIEG	230.0	PPL	1	PL:08:P71:101751	tower	628	141.38	142.49	DC	6.99
164964446	938390	AE1-058_TAP	230	PPL	208072	SIEG	230.0	PPL	1	PL:48:P71:101752	tower	628	139.78	140.89	DC	6.99

10.4 Potential Congestion due to Local Energy Deliverability

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

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
167637638	207964	ELDR	230	PPL	208109	SUNB	230.0	PPL	1	208072 SIEG 230 938390 AE1-058_TAP 230 1	operation	456.0	134.14	136.13	DC	9.1
167637639	207964	ELDR	230	PPL	208109	SUNB	230.0	PPL	1	Base Case	operation	341.0	99.56	101.4	DC	6.28
167637784	207973	FRAC	230	PPL	938390	AE1-058_TAP	230.0	PPL	1	PL:18:P12:000083	operation	628.0	110.19	111.3	DC	6.94
167637785	207973	FRAC	230	PPL	938390	AE1-058_TAP	230.0	PPL	1	Base Case	operation	513.0	109.48	110.7	DC	6.28
169636525	938390	AE1-058_TAP	230	PPL	208072	SIEG	230.0	PPL	1	Base Case	operation	513.0	140.57	141.79	DC	6.28
169636526	938390	AE1-058_TAP	230	PPL	208072	SIEG	230.0	PPL	1	PL:18:P12:000083	operation	628.0	137.18	138.29	DC	6.94

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10.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
167637640	1	ELDR 230.0 kV - SUNB 230.0 kV Ckt 1	R-PL-0015 (2345): Rebuild SUNB-ELDR 230kV line. Project Type : FAC Cost : $61,200,000 Time Estimate : 48.0 Months	$61,200,000
164964446, 164964445	3	AE1-058 TAP 230.0 kV - SIEG 230.0 kV Ckt 1	R-PL-0003C (2338): Rebuild 35.5 miles of the SIEG-FRAC 230kV line from AE1-058 switchyard cut-in to Siegfried substation as 230kV single circuit (ACSS). Project Type : FAC Cost : $78,200,000 Time Estimate : 72.0 Months	$78,200,000
164964499, 164964497	2	FRAC 230.0 kV - AE1-058 TAP 230.0 kV Ckt 1	R-PL-0003B (2337): Rebuild FRAC-AE1-058 yard 230kV line. Project Type : FAC Cost : $12,200,000 Time Estimate : 30.0 Months	$12,200,000
			TOTAL COST	$151,600,000

10.6 Flow Gate Details

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

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10.6.1 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
167637640	207964	ELDR	PPL	208109	SUNB	PPL	1	208072 SIEG 230 938390 AE1-058_TAP 230 1	single	456.0	99.57	100.77	DC	5.46

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
208911	MONT G1	7.8789	80/20	7.8789
208912	**MONT G2 (Deactivation : 18/02/2019)**	**7.8727**	**80/20**	**7.8727**
208941	FISH CT	2.0090	80/20	2.0090
208981	FOWH IPP	4.2251	80/20	4.2251
208982	GLBT IPP	5.8835	80/20	5.8835
209013	SCEN IPP	6.1705	80/20	6.1705
209021	WEST IPP	3.2158	80/20	3.2158
209022	**WHFR IPP (Deactivation : 03/03/2020 WD - 01/03/2020)**	**19.5555**	**80/20**	**19.5555**
209027	LOR2_Q27	0.8180	80/20	0.8180
212099	COLA IPP	0.7916	80/20	0.7916
212174	INGE	0.6036	80/20	0.6036
212266	LOR1	0.2511	80/20	0.2511
212369	PATRIOT 1	3.0342	80/20	3.0342
212370	PATRIOT 2	3.0342	80/20	3.0342
938392	AE1-058_GEN1	118.7520	80/20	118.7520
938393	AE1-058_GEN2	118.7520	80/20	118.7520
941161	AE2-110 C	1.4954	80/20	1.4954
942281	AE2-241 C	1.4954	80/20	1.4954
942561	AE2-271 C	4.0136	80/20	4.0136
942771	AE2-295 C	16.1183	80/20	16.1183
945611	AF1-226 C	2.6169	80/20	2.6169
946471	AF1-311 C O1	3.7529	80/20	3.7529
957621	AF2-056 C	15.0077	80/20	15.0077
957921	AF2-086 C	2.1362	80/20	2.1362
958461	AF2-140	1.5084	80/20	1.5084
959121	AF2-203 C	2.1362	80/20	2.1362
959411	AF2-232 C	4.2725	80/20	4.2725
960401	AF2-331 C	1.9752	80/20	1.9752
960411	AF2-332 C	1.9752	80/20	1.9752
960421	AF2-333 C	0.7901	80/20	0.7901
960431	AF2-334 C	0.7901	80/20	0.7901
961271	AF2-418 C	2.1362	80/20	2.1362
961331	AF2-424 C	7.5260	80/20	7.5260
961341	AF2-425 C	7.5260	80/20	7.5260
961421	AF2-433 C O1	2.1362	80/20	2.1362
961431	AF2-434 C O1	2.1362	80/20	2.1362
961531	AF2-444 C	7.4006	80/20	7.4006

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Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
961541	AF2-445AC	5.3664	80/20	5.3664
962151	AG1-060 C	16.1183	80/20	16.1183
963751	AG1-227 C	5.4574	80/20	5.4574
963761	AG1-228 C	5.4574	80/20	5.4574
G-007A	G-007A	0.1007	Confirmed LTF	0.1007
VFT	VFT	0.4579	Confirmed LTF	0.4579
CALDERWOOD	CALDERWOOD	0.1118	Confirmed LTF	0.1118
PRAIRIE	PRAIRIE	0.5863	Confirmed LTF	0.5863
CHEOAH	CHEOAH	0.1126	Confirmed LTF	0.1126
CBM-N	CBM-N	0.1272	Confirmed LTF	0.1272
COTTONWOOD	COTTONWOOD	0.4746	Confirmed LTF	0.4746
HAMLET	HAMLET	0.1282	Confirmed LTF	0.1282
GIBSON	GIBSON	0.1245	Confirmed LTF	0.1245
BLUEG	BLUEG	0.3958	Confirmed LTF	0.3958
TRIMBLE	TRIMBLE	0.1269	Confirmed LTF	0.1269
CATAWBA	CATAWBA	0.0780	Confirmed LTF	0.0780

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10.6.2 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
164964497	207973	FRAC	PPL	938390	AE1-058_TAP	PPL	1	PL:08:P71:101751	tower	628.0	114.52	115.63	DC	6.99

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
208941	FISH CT	1.5435	50/50	1.5435
208981	FOWH IPP	1.8216	50/50	1.8216
208982	GLBT IPP	4.5202	50/50	4.5202
209013	SCEN IPP	4.7407	50/50	4.7407
209021	WEST IPP	1.3864	50/50	1.3864
209022	**WHFR IPP (Deactivation : 03/03/2020 WD - 01/03/2020)**	**15.0242**	**50/50**	**15.0242**
209027	LOR2_Q27	0.6284	50/50	0.6284
212099	COLA IPP	0.3413	50/50	0.3413
212174	INGE	0.2602	50/50	0.2602
212266	LOR1	0.1929	50/50	0.1929
935083	**AD1-143 BAT1 (Suspended)**	**0.5352**	**Merchant Transmission**	**0.5352**
935103	**AD1-143 BAT2 (Suspended)**	**0.5352**	**Merchant Transmission**	**0.5352**
939891	AE1-225 C O1	0.8792	Adder	1.03
939892	AE1-225 E O1	0.9728	Adder	1.14
940561	AE2-042 C	5.3743	Adder	6.32
940562	AE2-042 E	2.6642	Adder	3.13
940721	AE2-059 C	0.9646	Adder	1.13
940722	AE2-059 E	1.3321	Adder	1.57
940941	AE2-084 C	0.9646	Adder	1.13
940942	AE2-084 E	1.3321	Adder	1.57
941161	AE2-110 C	1.8386	50/50	1.8386
941162	AE2-110 E	2.5390	50/50	2.5390
941171	AE2-111 C	0.7857	Adder	0.92
941172	AE2-111 E	1.0850	Adder	1.28
941371	AE2-133 C	0.7857	Adder	0.92
941372	AE2-133 E	1.0850	Adder	1.28
942281	AE2-241 C	1.8386	50/50	1.8386
942282	AE2-241 E	2.5390	50/50	2.5390
942561	AE2-271 C	8.5693	Adder	10.08
942562	AE2-271 E	5.7129	Adder	6.72
942771	AE2-295 C	6.9490	50/50	6.9490
942772	AE2-295 E	40.3152	50/50	40.3152
943721	AF1-040 C	0.0935	Adder	0.11
943722	AF1-040 E	1.7771	Adder	2.09
945511	AF1-216 C1O1	5.2658	Adder	6.2
945512	AF1-216 E1O1	3.5065	Adder	4.13
945521	AF1-216 C2O1	5.2655	Adder	6.19
945522	AF1-216 E2O1	3.5062	Adder	4.12

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Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
945611	AF1-226 C	3.2175	50/50	3.2175
945612	AF1-226 E	4.4433	50/50	4.4433
946471	AF1-311 C O1	8.0127	Adder	9.43
946472	AF1-311 E O1	13.0733	Adder	15.38
946691	AF1-333 C O1	1.2375	Adder	1.46
946692	AF1-333 E O1	0.8250	Adder	0.97
946731	AF1-337 C	1.2375	Adder	1.46
946732	AF1-337 E	0.8250	Adder	0.97
946741	AF1-338 C	1.2375	Adder	1.46
946742	AF1-338 E	0.8250	Adder	0.97
946751	AF1-339 C O1	1.2375	Adder	1.46
946752	AF1-339 E O1	0.8250	Adder	0.97
946761	AF1-271AC	0.9540	Adder	1.12
946762	AF1-271AE	0.6360	Adder	0.75
957621	AF2-056 C	11.5302	50/50	11.5302
957622	AF2-056 E	5.9398	50/50	5.9398
957881	AF2-082 C	3.0866	Adder	3.63
957882	AF2-082 E	2.0577	Adder	2.42
957921	AF2-086 C	2.6266	50/50	2.6266
957922	AF2-086 E	1.7510	50/50	1.7510
958461	AF2-140	3.9675	Adder	4.67
958511	AF2-145 C1	1.8758	Adder	2.21
958512	AF2-145 E1	1.2506	Adder	1.47
958521	AF2-145 C2	1.8757	Adder	2.21
958522	AF2-145 E2	1.2505	Adder	1.47
959121	AF2-203 C	2.6266	50/50	2.6266
959122	AF2-203 E	1.7510	50/50	1.7510
959411	AF2-232 C	5.2531	50/50	5.2531
959412	AF2-232 E	3.5021	50/50	3.5021
959421	AF2-233 C	1.1224	Adder	1.32
959422	AF2-233 E	0.7483	Adder	0.88
959431	AF2-234 C	2.2448	Adder	2.64
959432	AF2-234 E	1.4965	Adder	1.76
959932	AF2-284 E	0.2616	Adder	0.31
959982	AF2-289 E	0.3923	Adder	0.46
959992	AF2-290 E	0.2297	Adder	0.27
960401	AF2-331 C	4.2172	Adder	4.96
960402	AF2-331 E	2.8115	Adder	3.31
960411	AF2-332 C	4.2172	Adder	4.96
960412	AF2-332 E	2.8115	Adder	3.31
960421	AF2-333 C	1.6869	Adder	1.98
960422	AF2-333 E	1.1246	Adder	1.32
960431	AF2-334 C	1.6869	Adder	1.98
960432	AF2-334 E	1.1246	Adder	1.32
961271	AF2-418 C	2.6266	50/50	2.6266
961272	AF2-418 E	1.7510	50/50	1.7510
961331	AF2-424 C	3.2447	50/50	3.2447
961332	AF2-424 E	2.1631	50/50	2.1631
961341	AF2-425 C	3.2447	50/50	3.2447
961342	AF2-425 E	2.1631	50/50	2.1631
961362	AF2-427 E	0.3923	Adder	0.46
961412	AF2-432 E	0.4378	50/50	0.4378

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Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
961421	AF2-433 C O1	2.6266	50/50	2.6266
961422	AF2-433 E O1	1.7510	50/50	1.7510
961431	AF2-434 C O1	2.6266	50/50	2.6266
961432	AF2-434 E O1	1.7510	50/50	1.7510
961531	AF2-444 C	3.1906	50/50	3.1906
961532	AF2-444 E	2.1631	50/50	2.1631
961541	AF2-445AC	4.1229	50/50	4.1229
961542	AF2-445AE	2.7952	50/50	2.7952
962061	AG1-050	1.2173	Adder	2.7
962151	AG1-060 C	6.9490	50/50	6.9490
962152	AG1-060 E	40.3152	50/50	40.3152
963751	AG1-227 C	4.1928	50/50	4.1928
963752	AG1-227 E	2.7952	50/50	2.7952
963761	AG1-228 C	4.1928	50/50	4.1928
963762	AG1-228 E	2.7952	50/50	2.7952
963911	AG1-244 C	0.3222	Adder	0.72
963912	AG1-244 E	0.1735	Adder	0.39
964051	AG1-259 C	0.4115	Adder	0.91
964052	AG1-259 E	0.5750	Adder	1.28
964061	AG1-260 C	0.4115	Adder	0.91
964062	AG1-260 E	0.5750	Adder	1.28
964671	AG1-330 C	0.2231	Adder	0.5
964672	AG1-330 E	0.0248	Adder	0.06
964731	AG1-336 C	0.1933	Adder	0.43
964732	AG1-336 E	0.0545	Adder	0.12
964741	AG1-337 C	0.1884	Adder	0.42
964742	AG1-337 E	0.0595	Adder	0.13
965311	AG1-396 C	0.1983	Adder	0.44
965312	AG1-396 E	0.1735	Adder	0.39
WEC	WEC	0.0441	Confirmed LTF	0.0441
LGEE	LGEE	0.0854	Confirmed LTF	0.0854
CPLE	CPLE	0.0430	Confirmed LTF	0.0430
CBM-W2	CBM-W2	1.1200	Confirmed LTF	1.1200
NY	NY	0.5923	Confirmed LTF	0.5923
TVA	TVA	0.1624	Confirmed LTF	0.1624
O-066	O-066	14.1667	Confirmed LTF	14.1667
SIGE	SIGE	0.2352	Confirmed LTF	0.2352
CBM-S2	CBM-S2	0.8248	Confirmed LTF	0.8248
CBM-S1	CBM-S1	0.0456	Confirmed LTF	0.0456
G-007	G-007	1.8669	Confirmed LTF	1.8669
MEC	MEC	0.2145	Confirmed LTF	0.2145
LAGN	LAGN	0.2047	Confirmed LTF	0.2047
CBM-W1	CBM-W1	2.0189	Confirmed LTF	2.0189

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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
164964445	938390	AE1-058_TAP	PPL	208072	SIEG	PPL	1	PL:08:P71:101751	tower	628.0	141.38	142.49	DC	6.99

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
208941	FISH CT	1.5435	50/50	1.5435
208981	FOWH IPP	1.8216	50/50	1.8216
208982	GLBT IPP	4.5202	50/50	4.5202
209013	SCEN IPP	4.7407	50/50	4.7407
209022	**WHFR IPP (Deactivation : 03/03/2020 WD - 01/03/2020)**	**15.0242**	**50/50**	**15.0242**
209027	LOR2_Q27	0.6284	50/50	0.6284
212266	LOR1	0.1929	50/50	0.1929
935083	**AD1-143 BAT1 (Suspended)**	**0.5352**	**Merchant Transmission**	**0.5352**
935103	**AD1-143 BAT2 (Suspended)**	**0.5352**	**Merchant Transmission**	**0.5352**
938392	AE1-058_GEN1	109.6648	50/50	109.6648
938393	AE1-058_GEN2	109.6648	50/50	109.6648
939891	AE1-225 C O1	0.8792	Adder	1.03
939892	AE1-225 E O1	0.9728	Adder	1.14
940561	AE2-042 C	5.3743	Adder	6.32
940562	AE2-042 E	2.6642	Adder	3.13
940721	AE2-059 C	0.9646	Adder	1.13
940722	AE2-059 E	1.3321	Adder	1.57
940941	AE2-084 C	0.9646	Adder	1.13
940942	AE2-084 E	1.3321	Adder	1.57
941161	AE2-110 C	1.5628	Adder	1.84
941162	AE2-110 E	2.1582	Adder	2.54
941171	AE2-111 C	0.7857	Adder	0.92
941172	AE2-111 E	1.0850	Adder	1.28
941371	AE2-133 C	0.7857	Adder	0.92
941372	AE2-133 E	1.0850	Adder	1.28
942281	AE2-241 C	1.5628	Adder	1.84
942282	AE2-241 E	2.1582	Adder	2.54
942561	AE2-271 C	8.5693	Adder	10.08
942562	AE2-271 E	5.7129	Adder	6.72
942771	AE2-295 C	5.9067	Adder	6.95
942772	AE2-295 E	34.2679	Adder	40.32
943721	AF1-040 C	0.0935	Adder	0.11
943722	AF1-040 E	1.7771	Adder	2.09
945511	AF1-216 C1O1	5.2658	Adder	6.2
945512	AF1-216 E1O1	3.5065	Adder	4.13
945521	AF1-216 C2O1	5.2655	Adder	6.19
945522	AF1-216 E2O1	3.5062	Adder	4.12
945611	AF1-226 C	2.7349	Adder	3.22

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Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
945612	AF1-226 E	3.7768	Adder	4.44
946471	AF1-311 C O1	8.0127	Adder	9.43
946472	AF1-311 E O1	13.0733	Adder	15.38
946691	AF1-333 C O1	1.2375	Adder	1.46
946692	AF1-333 E O1	0.8250	Adder	0.97
946731	AF1-337 C	1.2375	Adder	1.46
946732	AF1-337 E	0.8250	Adder	0.97
946741	AF1-338 C	1.2375	Adder	1.46
946742	AF1-338 E	0.8250	Adder	0.97
946751	AF1-339 C O1	1.2375	Adder	1.46
946752	AF1-339 E O1	0.8250	Adder	0.97
946761	AF1-271AC	0.9540	Adder	1.12
946762	AF1-271AE	0.6360	Adder	0.75
957621	AF2-056 C	11.5302	50/50	11.5302
957622	AF2-056 E	5.9398	50/50	5.9398
957881	AF2-082 C	3.0866	Adder	3.63
957882	AF2-082 E	2.0577	Adder	2.42
957921	AF2-086 C	2.2326	Adder	2.63
957922	AF2-086 E	1.4884	Adder	1.75
958461	AF2-140	3.9675	Adder	4.67
958511	AF2-145 C1	1.8758	Adder	2.21
958512	AF2-145 E1	1.2506	Adder	1.47
958521	AF2-145 C2	1.8757	Adder	2.21
958522	AF2-145 E2	1.2505	Adder	1.47
959121	AF2-203 C	2.2326	Adder	2.63
959122	AF2-203 E	1.4884	Adder	1.75
959411	AF2-232 C	4.4652	Adder	5.25
959412	AF2-232 E	2.9768	Adder	3.5
959421	AF2-233 C	1.1224	Adder	1.32
959422	AF2-233 E	0.7483	Adder	0.88
959431	AF2-234 C	2.2448	Adder	2.64
959432	AF2-234 E	1.4965	Adder	1.76
959932	AF2-284 E	0.2616	Adder	0.31
959982	AF2-289 E	0.3923	Adder	0.46
959992	AF2-290 E	0.2297	Adder	0.27
960401	AF2-331 C	4.2172	Adder	4.96
960402	AF2-331 E	2.8115	Adder	3.31
960411	AF2-332 C	4.2172	Adder	4.96
960412	AF2-332 E	2.8115	Adder	3.31
960421	AF2-333 C	1.6869	Adder	1.98
960422	AF2-333 E	1.1246	Adder	1.32
960431	AF2-334 C	1.6869	Adder	1.98
960432	AF2-334 E	1.1246	Adder	1.32
961271	AF2-418 C	2.2326	Adder	2.63
961272	AF2-418 E	1.4884	Adder	1.75
961331	AF2-424 C	2.7580	Adder	3.24
961332	AF2-424 E	1.8387	Adder	2.16
961341	AF2-425 C	2.7580	Adder	3.24
961342	AF2-425 E	1.8387	Adder	2.16
961362	AF2-427 E	0.3923	Adder	0.46
961412	AF2-432 E	0.3721	Adder	0.44
961421	AF2-433 C O1	2.2326	Adder	2.63

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Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
961422	AF2-433 E O1	1.4884	Adder	1.75
961431	AF2-434 C O1	2.2326	Adder	2.63
961432	AF2-434 E O1	1.4884	Adder	1.75
961531	AF2-444 C	2.7120	Adder	3.19
961532	AF2-444 E	1.8387	Adder	2.16
961541	AF2-445AC	4.1229	50/50	4.1229
961542	AF2-445AE	2.7952	50/50	2.7952
962061	AG1-050	1.2173	Adder	2.7
962151	AG1-060 C	3.1305	Adder	6.95
962152	AG1-060 E	18.1620	Adder	40.32
963751	AG1-227 C	4.1928	50/50	4.1928
963752	AG1-227 E	2.7952	50/50	2.7952
963761	AG1-228 C	4.1928	50/50	4.1928
963762	AG1-228 E	2.7952	50/50	2.7952
963911	AG1-244 C	0.3222	Adder	0.72
963912	AG1-244 E	0.1735	Adder	0.39
964051	AG1-259 C	0.4115	Adder	0.91
964052	AG1-259 E	0.5750	Adder	1.28
964061	AG1-260 C	0.4115	Adder	0.91
964062	AG1-260 E	0.5750	Adder	1.28
964671	AG1-330 C	0.2231	Adder	0.5
964672	AG1-330 E	0.0248	Adder	0.06
964731	AG1-336 C	0.1933	Adder	0.43
964732	AG1-336 E	0.0545	Adder	0.12
964741	AG1-337 C	0.1884	Adder	0.42
964742	AG1-337 E	0.0595	Adder	0.13
965311	AG1-396 C	0.1983	Adder	0.44
965312	AG1-396 E	0.1735	Adder	0.39
WEC	WEC	0.0441	Confirmed LTF	0.0441
LGEE	LGEE	0.0854	Confirmed LTF	0.0854
CPLE	CPLE	0.0430	Confirmed LTF	0.0430
CBM-W2	CBM-W2	1.1200	Confirmed LTF	1.1200
NY	NY	0.5923	Confirmed LTF	0.5923
TVA	TVA	0.1624	Confirmed LTF	0.1624
O-066	O-066	14.1667	Confirmed LTF	14.1667
SIGE	SIGE	0.2352	Confirmed LTF	0.2352
CBM-S2	CBM-S2	0.8248	Confirmed LTF	0.8248
CBM-S1	CBM-S1	0.0456	Confirmed LTF	0.0456
G-007	G-007	1.8669	Confirmed LTF	1.8669
MEC	MEC	0.2145	Confirmed LTF	0.2145
LAGN	LAGN	0.2047	Confirmed LTF	0.2047
CBM-W1	CBM-W1	2.0189	Confirmed LTF	2.0189

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10.7 Queue Dependencies

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

Queue Number	Project Name	Status
AD1-143	Hauto-Siegfried 69 kV	Suspended
AE1-058	Frackville-Siegfried 230 kV	Active
AE1-225	Columbia-Sunbury 69 kV	Active
AE2-042	Milton 69 kV	Active
AE2-059	Derry Tap-Derry Bus 69 kV	Active
AE2-084	Derry Tap-Derry Bus 69 kV	Active
AE2-110	Columbia-West Bloomsburg 69 kV	Active
AE2-111	Beavertown Tap-Beavertown Weaving Tap 69kV	Active
AE2-133	Penns Tap-Richfield Tie 69 kV	Active
AE2-241	Bloomsburg-Columbia 69 kV	Active
AE2-271	Montour 230 kV	Active
AE2-295	Eldred 230 kV	Active
AF1-040	Gratz Tap 69 kV	Active
AF1-216	Lycoming-Lock Haven 69 kV	Active
AF1-226	Bowmans Mill-Scott 69 kV	Active
AF1-271A	Gratz 69 kV	Active
AF1-311	Montour 230 kV	Active
AF1-333	Laurelton-Mifflinburg 69 kV	Active
AF1-337	Laurelton-Mifflinburg 69 kV	Active
AF1-338	Laurelton-Mifflinburg 69 kV	Active
AF1-339	Laurelton-Mifflinburg 69 kV	Active
AF2-056	Shenandoah Tap 1– Mahanoy Tap 2 69 kV	Active
AF2-082	Dauphin PG Tie–Dauphin Juniata Tie 69 k	Active
AF2-086	Scott Tap-Bowmans Mill Tap 69 kV	Active
AF2-140	Saegers 230 kV	Active
AF2-145	Lycoming-Lock Haven 69 kV	Active
AF2-203	Rohrsburg 12.5 kV	Active
AF2-232	Bowmanns Mill Tap-Scott 69 kV	Active
AF2-233	Penns-Richfield Tie #1 69 kV	Active
AF2-234	Sunbury Yard #1-Richfield Tie #2 69 kV	Active
AF2-284	Watson 12.47 kV	Engineering and Procurement
AF2-289	Watson 12.47 kV	Engineering and Procurement
AF2-290	Derry 12.47 kV	Engineering and Procurement
AF2-331	Montour 230 kV	Active
AF2-332	Montour 230 kV	Active
AF2-333	Montour 230 kV	Active
AF2-334	Montour 230 kV	Active
AF2-418	Millville Tap 69 kV	Active

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Queue Number	Project Name	Status
AF2-424	Reed-Reed Tap #1 69 kV	Active
AF2-425	Sunbury-Eldred #2 69 kV	Active
AF2-427	Watson 12.47 kV	Engineering and Procurement
AF2-432	University 12.47 kV	Engineering and Procurement
AF2-433	Columbia-Geisinger Tap #1 69 kV	Active
AF2-434	Columbia-Geisinger Tap #1 69 kV	Active
AF2-444	Reed-Fairview Tap #2 69 kV	Active
AF2-445A	Fishbach-Port Carbon 69 kV	Active
AG1-050	Milton 69 kV	Active
AG1-060	Eldred 69 kV	Active
AG1-227	Altamont-Tuscarora 69 kV	Active
AG1-228	Alta Haute-Tuscarora 69 kV	Active
AG1-244	Middleburg 12.47 kV	Active
AG1-259	Sunbury-Dalmatia 69 kV	Active
AG1-260	Sunbury-Dalmatia 69 kV	Active
AG1-330	Beavertown 12.47 kV	Active
AG1-336	Hunter 12.47 kV	Active
AG1-337	Elizabethville 12.47 kV	Active
AG1-396	Dauphin-Pine Grove 69 kV	Active

10.8 Contingency Descriptions

Contingency Name	Contingency Definition
Base Case	
PL:18:P12:000083	CONTINGENCY 'PL:18:P12:000083' /* JUNI-SUNB 500KV LINE DISCONNECT BRANCH FROM BUS 200009 TO BUS 200021 CKT 1 /* JUNIATA-SUNBURY END
PL:08:P71:101751	CONTINGENCY 'PL:08:P71:101751' /* MONT-BETA 1 & 2 230KV DISCONNECT BRANCH FROM BUS 207915 TO BUS 208040 CKT 1 /* MONT-BETA 1 DISCONNECT BRANCH FROM BUS 207915 TO BUS 208040 CKT 2 /* MONT-BETA 2 END
PL:48:P71:101752	CONTINGENCY 'PL:48:P71:101752' /* BETA-SUSQ 230KV & BETA-SU10 230KV DISCONNECT BRANCH FROM BUS 207915 TO BUS 208113 CKT 1 /* BETA-SUSQ DISCONNECT BRANCH FROM BUS 207915 TO BUS 208120 CKT 1 /* BETA-SU10 END
208072 SIEG 230 938390 AE1-058_TAP 230 1	CONTINGENCY '208072 SIEG 230 938390 AE1-058_TAP 230 1' OPEN BRANCH FROM BUS 208072 TO BUS 938390 CKT 1 END

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11 Short Circuit Analysis

The following Breakers are overdutied:

None

11.1 System Reinforcements - Short Circuit

None

12 Affected Systems

12.1 NYISO

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

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