Generation Interconnection

Feasibility Study Report

for

Queue Project AF1-157

PEPPER 69 KV

15 MW Capacity / 25 MW Energy

January, 2020

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1 Preface

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

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

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

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

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

2 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Sussex, Maryland. The installed facilities will have a total capability of 25 MW with 15 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is December 31, 2022. This study does not imply a TO commitment to this in-service date. The IC has requested that queue project AF1-157 be studied at both a Primary and Secondary Point of Interconnection.

Queue Number	AF1-157
Project Name	Laurel-Sussex 69 KV
State	Delaware
County	Sussex
Transmission Owner	DPL
MFO	25
MWE	25
MWC	15
Fuel	Solar
Basecase Study Year	2023

2.1 Primary Point of Interconnection

Queue Position AF1-157, a 25 MW solar facility, proposed to interconnect with the Delmarva Power & Light transmission system tapping the circuit Laurel to Sussex 69 kV.

2.2 Cost Summary

The AF1-157 project will be responsible for the following costs associated with the physical interconnection of the project:

Description	Total Cost
Attachment Facilities	$460,000
Direct Connection Network Upgrade	$3,680,000
Non Direct Connection Network Upgrades	$460,000
Total Costs	**$4,600,000**

DPL reserves the right to reassess issues presented in this document and, upon appropriate justification, submit additional costs related to the AF1-007 project.

In addition, the AF1-157 project may be responsible for a contribution to the following costs associated with network upgrades (see Section 16 System Reinforcements):

Description	Total Cost
System Upgrades	**$20,756,000**

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

3 Transmission Owner Scope of Work

3.1 Interconnection Customer Scope of Direct Connection 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 DPL'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.

3.2 DPL Interconnection Customer Scope of Direct Connection Work Requirements:

DPL requires that an IC circuit breaker is located within 500 feet of the DPL substation to facilitate the relay protection scheme between DPL and the IC at the Point of Interconnection (POI).

4 Attachment Facilities

The AF1-157 generator lead would interconnect to a new 69 kV 3 breaker ring bus substation.

The total preliminary cost estimate for the Attachment work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Construct infrastructure from POI to new substation	$460,000
Total Attachment Facility Costs	**$460,000**

5 Direct Connection Cost Estimate

Design and construct a new 3-breaker ring bus substation. Two terminals will be designed for the Laurel-Sussex 69 kV line, with the third terminal being designated for the interconnecting generator.

The total preliminary cost estimate for the Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Design and construct a new 3-breaker ring bus substation	$3,680,000
Total Direct Connection Facility Costs	**$3,680,000**

6 Non-Direct Connection Cost Estimate

The total preliminary cost estimate for the Non-Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Cut in existing line and loop into new 69 kV substation	$460,000
Total Non-Direct Connection Facility Costs	**$460,000**

7 Schedule

DPL would take approximately 36-48 months design and construct a new 3-breaker ring bus station.

8 Transmission Owner Analysis

None

9 Interconnection Customer Requirements

9.1 Special Operating Requirements

1. DPL will require the capability to remotely disconnect the generator from the grid by communication from its System Operations facility. Such disconnection may be facilitated by a generator breaker, or other method depending upon the specific circumstances and the evaluation by DPL.

2. DPL reserves the right to charge the Interconnection Customer operation and maintenance expenses to maintain the Interconnection Customer attachment facilities, including metering and telecommunications facilities, owned by DPL.

3. Interconnection Customer shall design its non-synchronous generation facility with the ability to maintain a power factor between 0.95 leading and 0.95 lagging measured at the generator terminals.

9.2 Additional Interconnection Customer Responsibilities:

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

2. The Interconnection Customer may be required to install and/or pay for metering as necessary to properly track real time output of the facility as well as installing metering which shall be used for billing purposes. See Section 8 of Appendix 2 to the Interconnection Service Agreement as well as Section 4 of PJM Manual 14D for additional information.

3. The Interconnection Customer seeking to interconnect a wind generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per item 5.IV of Schedule H to the Interconnection Service Agreement.

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 DPL Requirements

10.2.1 Required Relaying and Communications

Front line and back-up line protection will be required. One relay panel for each terminal will be required for front line and back-up protection.

A breaker control relay on a breaker control panel will be required for the control and operation of each new 69 kV circuit breaker.

10.2.2 Metering

A three phase 69 kV revenue metering point will need to be established within the Interconnection Customer Facilities at the Point of Interconnection. The Interconnection Customer will purchase and install all metering instrument transformers as well as construct a metering structure per the DPL's specifications. The secondary wiring connections at the instrument transformers will be completed by the Interconnection Customer and inspected by DPL, while the connections at the metering enclosure will be completed by the DPL. The

metering control cable and meter cabinets will be supplied by the DPL and installed by the Interconnection Customer. The Interconnection Customer will install conduit for the control cable between the instrument transformers and the metering enclosure. The location of the metering enclosure will be determined during construction. The Interconnection Customer will provide 120V power to the meter cabinet. The DPL will provide, program, install, and own the primary & backup solid state multi-function meters for the new metering position.

Each meter will be equipped with load profile, telemetry, and DNP outputs. The Interconnection Customer will be provided with one-meter DNP output for each meter. DPL will supply a wireless modem for MV90 interrogation. In the event that a wireless modem is unable to reliably communicate, the IC will be required to make provisions for a POTS (Plain Old Telephone Service) line or equivalent technology approved by DPL within approximately three feet of the DPL metering position to facilitate remote interrogation and data collection. It is the Interconnection Customer's responsibility to send the data that PJM and DPL require directly to PJM. The Interconnection Customer will grant permission for PJM to send DPL the following telemetry that the Interconnection Customer sends to PJM: real time MW, MVAR, volts, amperes, generator status, and interval MWH and MVARH.

DPL's revenue meters will be the official meters and must be the source for reporting generation output to PJM. The Interconnection Customer is responsible for installing telemetry equipment necessary to obtain the revenue meter data and submitting the data to PJM.

11 Network Impacts

The Queue Project AF1-157 was evaluated as a 25.0 MW (Capacity 15.0 MW) injection tapping the Mumford to Pepper 69 kV line in the DPL area. Project AF1-157 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-157 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

Summer Peak Load Flow

12 Generation Deliverability

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

None

13 Multiple Facility Contingency

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

None

14 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
41004414	232100	CHURCH	138.0	DP&L	232107	TOWNSEND	138.0	DP&L	1	DPL_P7_1_DBL_1NCB_FSA	tower	348.0	111.99	112.6	DC	4.82
41004445	232106	MIDLTNTP	138.0	DP&L	232104	MT PLSNT	138.0	DP&L	1	DPL_P7_1_DBL_1NCB_FSA	tower	348.0	108.09	108.7	DC	4.82
41004373	232107	TOWNSEND	138.0	DP&L	232106	MIDLTNTP	138.0	DP&L	1	DPL_P7_1_DBL_1NCB_FSA	tower	348.0	117.4	118.01	DC	4.82
41573277	232215	KENT	69.0	DP&L	232812	NMEREDTH	69.0	DP&L	1	DPL_P4-2_DP11	breaker	93.0	103.1	103.85	DC	1.53
41572611	232233	PRESTON	69.0	DP&L	232821	TANYARD	69.0	DP&L	1	DPL_P4-2_DP11	breaker	93.0	172.95	174.03	DC	2.57
41572612	232233	PRESTON	69.0	DP&L	232821	TANYARD	69.0	DP&L	1	DPL_P4-2_DP12	breaker	93.0	100.83	101.72	DC	1.84
41572606	232234	TODD	69.0	DP&L	232233	PRESTON	69.0	DP&L	1	DPL_P4-2_DP11	breaker	93.0	178.0	179.08	DC	2.57
41572607	232234	TODD	69.0	DP&L	232233	PRESTON	69.0	DP&L	1	DPL_P4-2_DP12	breaker	93.0	105.89	106.78	DC	1.84
41572931	924820	AB2-135 TAP	69.0	DP&L	232203	CHURC_69	69.0	DP&L	1	DPL_P4-2_DP11	breaker	93.0	129.17	129.91	DC	1.53

15 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
4124439 2	23200 2	CEDAR CK	230. 0	DP&L	23201 3	SILVER RUN	230. 0	PJM	1	CKT 23032B	operatio n	679.0	111.73	112.43	DC	10.4
4124449 7	23200 3	CARTANZ A	230. 0	DP&L	23201 3	SILVER RUN	230. 0	PJM	1	CKT 23030B	operatio n	790.0	111.1	112.24	DC	8.94
4247718 6	23200 4	MILF_230	230. 0	DP&L	23200 0	STEELE	230. 0	DP& L	1	CKT 23032B	operatio n	550.0	108.84	110.04	DC	7.05
4124467 3	23223 3	PRESTON	69.0	DP&L	23282 1	TANYAR D	69.0	DP& L	1	DPL_P1_2_230 85 &13710	operatio n	93.0	100.07	100.96	DC	1.84
4124458 6	23223 4	TODD	69.0	DP&L	23223 3	PRESTO N	69.0	DP& L	1	DPL_P1_2_230 85 &13710	operatio n	93.0	105.02	105.91	DC	1.84

16 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
41572612,41572611	5	PRESTON 69.0 kV - TANYARD 69.0 kV Ckt 1	b2946 (16) : PJM baseline upgrade b2946 conversion of Preston station to a Ring Bus Project Type : CON Cost : $6,000,000 Time Estimate : 30-36 Months	$0
41004445	2	MIDLTNTP 138.0 kV - MT PLSNT 138.0 kV Ckt 1	dt13808r0002 (14) : Partial reconductor of 13808 line between Mt. Pleasant and Middletown Tap Project Type : FAC Cost : $250,000 Time Estimate : 18-24 Months	$250,000
41004373	3	TOWNSEND 138.0 kV - MIDLTNTP 138.0 kV Ckt 1	dt13808r0001 (12) : To mitigate the (DP&L) TOWNSEND to MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) overload, it will require increasing the emergency rating of the Townsend to Middletown Tap 138 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. It will also require substation reinforcements at Townsend & Middletown Tap Substation. Project Type : FAC Cost : $700,000 Time Estimate : 36-48 Months ds13808r0001 (13) : To mitigate the (DP&L) TOWNSEND to MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) overload, it will require increasing the emergency rating of the Townsend to Middletown Tap 138 kV line by rebuilding the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. It will also require substation reinforcements at Townsend & Middletown Tap Substation. Project Type : FAC Cost : $100,000 Time Estimate : 12.0 Months	$800,000
41004414	1	CHURCH 138.0 kV - TOWNSEND 138.0 kV Ckt 1	ds13833r0001 (10) : To mitigate the (DP&L) CHURCH to TOWNSEND 138 kV line (from bus 232100 to bus 232107 ckt 1) overload will require substation reinforcements at Church Substation. Project Type : FAC Cost : $500,000 Time Estimate : 24-36 Months ds13833r0002 (11) : To mitigate the (DP&L) CHURCH to TOWNSEND 138 kV line (from bus 232100 to bus 232107 ckt 1) overload will require substation reinforcements (on top of ds13833r001) at Church Substation. Project Type : FAC Cost : $200,000 Time Estimate : 24.0 Months	$700,000

ID	Index	Facility	Upgrade Description	Cost
41572607,41572606	6	TODD 69.0 kV - PRESTON 69.0 kV Ckt 1	ds6716r0001 (4) : Previously identified in AB2-172, To mitigate the (DP&L) TODD to PRESTON 69 kV line (from bus 232234 to bus 232233 ckt 1) overload will require substation reinforcements at Preston Substation and Todd Substation. Replace 600A Disconnect Switch at each substation. Project Type : FAC Cost : $67,000 Time Estimate : 12.0 Months ds6716r0002 (5) : Previously identified in AE1-188, To mitigate the (DP&L) TODD toPRESTON 69 kV line (from bus 232234 to bus 232233 ckt 1) overload will require substation reinforcements at Preston Substation and Todd Substation. Project Type : FAC Cost : $39,000 Time Estimate : 12.0 Months	$106,000
41572931	7	AB2-135 TAP 69.0 kV - CHURC_69 69.0 kV Ckt 1	n5444 (6) : Replace disconnect switch, rebuild line 6704-1 from Church 69 to NMeredth & replace conductor on 6701-1 line Project Type : CON Cost : $11,300,000 Time Estimate : 0.0 Months	$11,300,000
41573277	4	KENT 69.0 kV - NMEREDTH 69.0 kV Ckt 1	dt6704r0001 : Rebuild 6704-2 Line from Kent to N. Meredith Tap. Upgrade disconnect switch @ N Meredith Project Type : FAC Cost : $ 7,600,000 Time Estimate : 36-48 Months	$7,600,000
			TOTAL COST	**$20,756,000**

17 Flow Gate Details

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

17.1 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
41004414	232100	CHURCH	DP&L	232107	TOWNSEND	DP&L	1	DPL_P7_1_DBL_1NCB_FSA	tower	348.0	111.99	112.6	DC	4.82

Bus #	Bus	MW Impact
232404	W1-003 C	0.4366
232405	W1-003 E	0.9087
232406	W1-004 FULL	0.4366
232407	W1-004 E	0.9087
232408	W1-005 C	0.4366
232409	W1-005 E	0.9087
232410	W1-006 C	0.4366
232411	W1-006 E	0.9087
232412	X1-032 E	0.8189
232417	X3-008 C	0.2675
232418	X3-008 E	3.1267
232422	X3-066 FULL	0.1337
232423	X3-066 E	1.5629
232424	Y1-079 C	0.1971
232425	Y1-079 E	2.3034
232426	Y1-080 FULL	0.0420
232427	Y1-080 E	0.4931
232428	Y3-058 C	0.1681
232429	Y3-058 E	1.9648
232433	Z2-076 E	0.3207
232435	Z2-077 E	0.3207
232436	AB1-176 C	1.4285
232813	VAUGHN	0.0935
232902	EASTMUNI	2.9988
232907	VN8	4.8246
232910	NRG_G1	1.4723
232911	NRG_G2	1.4723
232915	OH NUG4	0.9330
232916	OH NUG5	0.9330
232919	VN10	0.3351
232922	**MR3 (Deativation : 06/01/21)**	**9.0792**
232926	CRISFLD1	0.2867
293670	O-025 C	0.1725
917082	Z2-012 E	2.1255
918831	AA1-102	1.0753
919831	AA2-069	40.1444
923282	AB1-137 C	0.6588
923283	AB1-137 E	0.2823
923322	AB1-141 C OP	5.7556
923323	AB1-141 E OP	2.6859
923332	AB1-142 C OP	5.7556
923603	AB1-176 E	2.3528
923921	AB2-032 C	5.7982

Bus #	Bus	MW Impact
923922	AB2-032 E	2.7286
923951	AB2-036 C	12.6900
923952	AB2-036 E	20.7621
924681	AB2-120 C OP	6.5068
924682	AB2-120 E OP	10.6164
924781	AB2-130 C OP	5.4743
924782	AB2-130 E OP	8.9317
924801	AB2-133 C OP	11.5576
924802	AB2-133 E OP	14.6584
924821	AB2-135 C	12.3167
924822	AB2-135 E	14.0468
924831	AB2-136 C	5.9503
924832	AB2-136 E	6.3102
924971	AB2-153 C	3.2402
924972	AB2-153 E	5.2866
925151	AB2-172 C OP	4.7908
925152	AB2-172 E OP	7.8166
925261	AB2-180 C	2.9578
925262	AB2-180 E	1.2676
925271	AB2-185 C OP	5.2011
925272	AB2-185 E OP	2.2291
926131	AC1-091 C	0.6411
926132	AC1-091 E	1.0515
926141	AC1-092 C	0.6411
926142	AC1-092 E	1.0515
926151	AC1-093 C	0.6069
926152	AC1-093 E	1.0002
926161	AC1-094 C	0.5129
926162	AC1-094 E	0.8463
926171	AC1-095 C	0.3248
926172	AC1-095 E	0.5215
927031	AC1-190 C	8.7507
927032	AC1-190 E	3.7503
927191	AC1-213 C	0.6593
927192	AC1-213 E	0.4327
930201	AB1-056 C	9.9397
930202	AB1-056 E	28.3065
930881	AB1-137 C	0.6588
930882	AB1-137 E	0.2823
930932	AB1-142 E OP	2.6859
932161	AC2-023 C	5.6964
932162	AC2-023 E	4.1487
933631	AC2-185 C	1.2994
933632	AC2-185 E	2.1200
933641	AC2-186 C	3.1346
933642	AC2-186 E	5.1143
936611	AD2-076 C O1	8.1859
936612	AD2-076 E O1	13.3560
936691	AD2-088 C	3.7888
936692	AD2-088 E	2.5259
938651	AE1-087 C	4.0344
938652	AE1-087 E	1.0086

Bus #	Bus	MW Impact
938891	AE1-117 C O1	6.5111
938892	AE1-117 E O1	17.3367
938901	AE1-118 C O1	6.5160
938902	AE1-118 E O1	17.3498
939151	AE1-145	3.4241
939361	AE1-167 C O1	1.0272
939362	AE1-167 E O1	0.8560
939621	AE1-192 C O1	8.0563
939622	AE1-192 E O1	3.9425
941021	AE2-093 C	5.9724
941022	AE2-093 E	9.4892
941181	AE2-112 C	2.8400
941182	AE2-112 E	4.6337
941971	AE2-209 C	7.7484
941972	AE2-209 E	5.4004
942441	AE2-257 C	5.1643
942442	AE2-257 E	13.6149
942821	AE2-301 C	0.4519
942822	AE2-301 E	1.6024
943361	AF1-007 C	0.1554
943362	AF1-007 E	0.4417
943441	AF1-015 C	1.9100
943442	AF1-015 E	2.6376
943651	AF1-036 C	3.6929
943652	AF1-036 E	5.0997
943761	AF1-044 C	6.8159
943762	AF1-044 E	9.4124
944921	AF1-157 C O1	1.3016
944922	AF1-157 E O1	0.8677
945661	AF1-231 C	0.6906
945662	AF1-231 E	1.0359
945781	AF1-243	0.4542
945791	AF1-244	1.6434
945931	AF1-258	0.6761
945941	AF1-259	0.3361
946041	AF1-269	2.5828
DUCKCREEK	DUCKCREEK	0.2061
NEWTON	NEWTON	0.1923
FARMERCITY	FARMERCITY	0.0100
NY	NY	0.0647
PRAIRIE	PRAIRIE	0.4624
O-066	O-066	0.5914
COFFEEN	COFFEEN	0.0946
EDWARDS	EDWARDS	0.0627
CHEOAH	CHEOAH	0.0901
TILTON	TILTON	0.1128
G-007	G-007	0.0645
GIBSON	GIBSON	0.0977
CALDERWOOD	CALDERWOOD	0.0895
BLUEG	BLUEG	0.3107
TRIMBLE	TRIMBLE	0.0996
CATAWBA	CATAWBA	0.0637

17.2 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
41004445	232106	MIDLTNTP	DP&L	232104	MT PLSNT	DP&L	1	DPL_P7_1_DBL_1NCB_FSA	tower	348.0	108.09	108.7	DC	4.82

Bus #	Bus	MW Impact
232404	W1-003 C	0.4366
232405	W1-003 E	0.9087
232406	W1-004 FULL	0.4366
232407	W1-004 E	0.9087
232408	W1-005 C	0.4366
232409	W1-005 E	0.9087
232410	W1-006 C	0.4366
232411	W1-006 E	0.9087
232412	X1-032 E	0.8189
232417	X3-008 C	0.2675
232418	X3-008 E	3.1267
232422	X3-066 FULL	0.1337
232423	X3-066 E	1.5629
232424	Y1-079 C	0.1971
232425	Y1-079 E	2.3034
232426	Y1-080 FULL	0.0420
232427	Y1-080 E	0.4931
232428	Y3-058 C	0.1681
232429	Y3-058 E	1.9648
232433	Z2-076 E	0.3207
232435	Z2-077 E	0.3207
232436	AB1-176 C	1.4285
232813	VAUGHN	0.0935
232902	EASTMUNI	2.9988
232907	VN8	4.8246
232910	NRG_G1	1.4723
232911	NRG_G2	1.4723
232915	OH NUG4	0.9330
232916	OH NUG5	0.9330
232919	VN10	0.3351
232922	**MR3 (Deativation : 06/01/21)**	**9.0792**
232926	CRISFLD1	0.2867
293670	O-025 C	0.1725
917082	Z2-012 E	2.1255
918831	AA1-102	1.0753
919831	AA2-069	40.1444
923282	AB1-137 C	0.6588
923283	AB1-137 E	0.2823
923322	AB1-141 C OP	5.7556
923323	AB1-141 E OP	2.6859
923332	AB1-142 C OP	5.7556
923603	AB1-176 E	2.3528

Bus #	Bus	MW Impact
923921	AB2-032 C	5.7982
923922	AB2-032 E	2.7286
923951	AB2-036 C	12.6900
923952	AB2-036 E	20.7621
924681	AB2-120 C OP	6.5068
924682	AB2-120 E OP	10.6164
924781	AB2-130 C OP	5.4743
924782	AB2-130 E OP	8.9317
924801	AB2-133 C OP	11.5576
924802	AB2-133 E OP	14.6584
924821	AB2-135 C	12.3167
924822	AB2-135 E	14.0468
924831	AB2-136 C	5.9503
924832	AB2-136 E	6.3102
924971	AB2-153 C	3.2402
924972	AB2-153 E	5.2866
925151	AB2-172 C OP	4.7908
925152	AB2-172 E OP	7.8166
925251	AB2-179 C OP	26.8562
925252	AB2-179 E OP	8.8568
925261	AB2-180 C	2.9578
925262	AB2-180 E	1.2676
925271	AB2-185 C OP	5.2011
925272	AB2-185 E OP	2.2291
926131	AC1-091 C	0.6411
926132	AC1-091 E	1.0515
926141	AC1-092 C	0.6411
926142	AC1-092 E	1.0515
926151	AC1-093 C	0.6069
926152	AC1-093 E	1.0002
926161	AC1-094 C	0.5129
926162	AC1-094 E	0.8463
926171	AC1-095 C	0.3248
926172	AC1-095 E	0.5215
927031	AC1-190 C	8.7507
927032	AC1-190 E	3.7503
927191	AC1-213 C	0.6593
927192	AC1-213 E	0.4327
930201	AB1-056 C	9.9397
930202	AB1-056 E	28.3065
930881	AB1-137 C	0.6588
930882	AB1-137 E	0.2823
930932	AB1-142 E OP	2.6859
932161	AC2-023 C	5.6964
932162	AC2-023 E	4.1487
933631	AC2-185 C	1.2994
933632	AC2-185 E	2.1200
933641	AC2-186 C	3.1346
933642	AC2-186 E	5.1143
936611	AD2-076 C O1	8.1859
936612	AD2-076 E O1	13.3560
936691	AD2-088 C	3.7888

Bus #	Bus	MW Impact
936692	AD2-088 E	2.5259
938651	AE1-087 C	4.0344
938652	AE1-087 E	1.0086
938891	AE1-117 C O1	6.5111
938892	AE1-117 E O1	17.3367
938901	AE1-118 C O1	6.5160
938902	AE1-118 E O1	17.3498
939151	AE1-145	3.4241
939361	AE1-167 C O1	1.0272
939362	AE1-167 E O1	0.8560
939621	AE1-192 C O1	8.0563
939622	AE1-192 E O1	3.9425
941021	AE2-093 C	5.9724
941022	AE2-093 E	9.4892
941181	AE2-112 C	2.8400
941182	AE2-112 E	4.6337
941971	AE2-209 C	7.7484
941972	AE2-209 E	5.4004
942441	AE2-257 C	5.1643
942442	AE2-257 E	13.6149
942821	AE2-301 C	0.4519
942822	AE2-301 E	1.6024
943361	AF1-007 C	0.1554
943362	AF1-007 E	0.4417
943441	AF1-015 C	1.9100
943442	AF1-015 E	2.6376
943651	AF1-036 C	3.6929
943652	AF1-036 E	5.0997
943761	AF1-044 C	6.8159
943762	AF1-044 E	9.4124
944921	AF1-157 C O1	1.3016
944922	AF1-157 E O1	0.8677
945661	AF1-231 C	0.6906
945662	AF1-231 E	1.0359
945781	AF1-243	0.4542
945791	AF1-244	1.6434
945931	AF1-258	0.6761
945941	AF1-259	0.3361
946041	AF1-269	2.5828
DUCKCREEK	DUCKCREEK	0.2061
NEWTON	NEWTON	0.1923
FARMERCITY	FARMERCITY	0.0100
NY	NY	0.0647
PRAIRIE	PRAIRIE	0.4624
O-066	O-066	0.5914
COFFEEN	COFFEEN	0.0946
EDWARDS	EDWARDS	0.0627
CHEOAH	CHEOAH	0.0901
TILTON	TILTON	0.1128
G-007	G-007	0.0645
GIBSON	GIBSON	0.0977
CALDERWOOD	CALDERWOOD	0.0895

Bus #	Bus	MW Impact
BLUEG	BLUEG	0.3107
TRIMBLE	TRIMBLE	0.0996
CATAWBA	CATAWBA	0.0637

17.3 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
4100437 3	232107	TOWNSEND	DP&L	232106	MIDLTNTP	DP&L	1	DPL_P7_1_DBL_1NCB_FSA	tower	348.0	117.4	118.01	DC	4.82

Bus #	Bus	MW Impact
232404	W1-003 C	0.4366
232405	W1-003 E	0.9087
232406	W1-004 FULL	0.4366
232407	W1-004 E	0.9087
232408	W1-005 C	0.4366
232409	W1-005 E	0.9087
232410	W1-006 C	0.4366
232411	W1-006 E	0.9087
232412	X1-032 E	0.8189
232417	X3-008 C	0.2675
232418	X3-008 E	3.1267
232422	X3-066 FULL	0.1337
232423	X3-066 E	1.5629
232424	Y1-079 C	0.1971
232425	Y1-079 E	2.3034
232426	Y1-080 FULL	0.0420
232427	Y1-080 E	0.4931
232428	Y3-058 C	0.1681
232429	Y3-058 E	1.9648
232433	Z2-076 E	0.3207
232435	Z2-077 E	0.3207
232436	AB1-176 C	1.4285
232813	VAUGHN	0.0935
232902	EASTMUNI	2.9988
232907	VN8	4.8246
232910	NRG_G1	1.4723
232911	NRG_G2	1.4723
232915	OH NUG4	0.9330
232916	OH NUG5	0.9330
232919	VN10	0.3351
232922	**MR3 (Deativation : 06/01/21)**	**9.0792**
232926	CRISFLD1	0.2867
293670	O-025 C	0.1725
917082	Z2-012 E	2.1255
918831	AA1-102	1.0753
919831	AA2-069	40.1444
923282	AB1-137 C	0.6588
923283	AB1-137 E	0.2823
923322	AB1-141 C OP	5.7556
923323	AB1-141 E OP	2.6859
923332	AB1-142 C OP	5.7556
923603	AB1-176 E	2.3528

Bus #	Bus	MW Impact
923921	AB2-032 C	5.7982
923922	AB2-032 E	2.7286
923951	AB2-036 C	12.6900
923952	AB2-036 E	20.7621
924681	AB2-120 C OP	6.5068
924682	AB2-120 E OP	10.6164
924781	AB2-130 C OP	5.4743
924782	AB2-130 E OP	8.9317
924801	AB2-133 C OP	11.5576
924802	AB2-133 E OP	14.6584
924821	AB2-135 C	12.3167
924822	AB2-135 E	14.0468
924831	AB2-136 C	5.9503
924832	AB2-136 E	6.3102
924971	AB2-153 C	3.2402
924972	AB2-153 E	5.2866
925151	AB2-172 C OP	4.7908
925152	AB2-172 E OP	7.8166
925251	AB2-179 C OP	26.8562
925252	AB2-179 E OP	8.8568
925261	AB2-180 C	2.9578
925262	AB2-180 E	1.2676
925271	AB2-185 C OP	5.2011
925272	AB2-185 E OP	2.2291
926131	AC1-091 C	0.6411
926132	AC1-091 E	1.0515
926141	AC1-092 C	0.6411
926142	AC1-092 E	1.0515
926151	AC1-093 C	0.6069
926152	AC1-093 E	1.0002
926161	AC1-094 C	0.5129
926162	AC1-094 E	0.8463
926171	AC1-095 C	0.3248
926172	AC1-095 E	0.5215
927031	AC1-190 C	8.7507
927032	AC1-190 E	3.7503
927191	AC1-213 C	0.6593
927192	AC1-213 E	0.4327
930201	AB1-056 C	9.9397
930202	AB1-056 E	28.3065
930881	AB1-137 C	0.6588
930882	AB1-137 E	0.2823
930932	AB1-142 E OP	2.6859
932161	AC2-023 C	5.6964
932162	AC2-023 E	4.1487
933631	AC2-185 C	1.2994
933632	AC2-185 E	2.1200
933641	AC2-186 C	3.1346
933642	AC2-186 E	5.1143
936611	AD2-076 C O1	8.1859
936612	AD2-076 E O1	13.3560
936691	AD2-088 C	3.7888

Bus #	Bus	MW Impact
936692	AD2-088 E	2.5259
938651	AE1-087 C	4.0344
938652	AE1-087 E	1.0086
938891	AE1-117 C O1	6.5111
938892	AE1-117 E O1	17.3367
938901	AE1-118 C O1	6.5160
938902	AE1-118 E O1	17.3498
939151	AE1-145	3.4241
939361	AE1-167 C O1	1.0272
939362	AE1-167 E O1	0.8560
939621	AE1-192 C O1	8.0563
939622	AE1-192 E O1	3.9425
941021	AE2-093 C	5.9724
941022	AE2-093 E	9.4892
941181	AE2-112 C	2.8400
941182	AE2-112 E	4.6337
941971	AE2-209 C	7.7484
941972	AE2-209 E	5.4004
942441	AE2-257 C	5.1643
942442	AE2-257 E	13.6149
942821	AE2-301 C	0.4519
942822	AE2-301 E	1.6024
943361	AF1-007 C	0.1554
943362	AF1-007 E	0.4417
943441	AF1-015 C	1.9100
943442	AF1-015 E	2.6376
943651	AF1-036 C	3.6929
943652	AF1-036 E	5.0997
943761	AF1-044 C	6.8159
943762	AF1-044 E	9.4124
944921	AF1-157 C O1	1.3016
944922	AF1-157 E O1	0.8677
945661	AF1-231 C	0.6906
945662	AF1-231 E	1.0359
945781	AF1-243	0.4542
945791	AF1-244	1.6434
945931	AF1-258	0.6761
945941	AF1-259	0.3361
946041	AF1-269	2.5828
DUCKCREEK	DUCKCREEK	0.2061
NEWTON	NEWTON	0.1923
FARMERCITY	FARMERCITY	0.0100
NY	NY	0.0647
PRAIRIE	PRAIRIE	0.4624
O-066	O-066	0.5914
COFFEEN	COFFEEN	0.0946
EDWARDS	EDWARDS	0.0627
CHEOAH	CHEOAH	0.0901
TILTON	TILTON	0.1128
G-007	G-007	0.0645
GIBSON	GIBSON	0.0977
CALDERWOOD	CALDERWOOD	0.0895

Bus #	Bus	MW Impact
BLUEG	BLUEG	0.3107
TRIMBLE	TRIMBLE	0.0996
CATAWBA	CATAWBA	0.0637

17.4 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
41573277	232215	KENT	DP&L	232812	NMEREDTH	DP&L	1	DPL_P4-2_DP11	breaker	93.0	103.1	103.85	DC	1.53

Bus #	Bus	MW Impact
232405	W1-003 E	0.2066
232407	W1-004 E	0.2066
232409	W1-005 E	0.2066
232411	W1-006 E	0.2066
232412	X1-032 E	0.1822
232429	Y3-058 E	0.4015
232433	Z2-076 E	0.0982
232435	Z2-077 E	0.0982
232813	VAUGHN	0.1035
232899	W1-062	0.7550
232900	DEMECSMY	0.7550
232910	NRG_G1	1.8684
232911	NRG_G2	1.8684
917082	Z2-012 E	0.5694
923282	AB1-137 C	0.2078
923283	AB1-137 E	0.0890
924681	AB2-120 C OP	1.7458
924682	AB2-120 E OP	2.8484
924781	AB2-130 C OP	1.7500
924782	AB2-130 E OP	2.8552
925261	AB2-180 C	0.6044
925262	AB2-180 E	0.2590
926131	AC1-091 C	0.4455
926132	AC1-091 E	0.7307
926141	AC1-092 C	0.4455
926142	AC1-092 E	0.7307
926151	AC1-093 C	0.4218
926152	AC1-093 E	0.6951
926161	AC1-094 C	0.3564
926162	AC1-094 E	0.5881
926171	AC1-095 C	0.2257
926172	AC1-095 E	0.3624
927191	AC1-213 C	0.1455
927192	AC1-213 E	0.0955
930201	AB1-056 C	3.1054
930202	AB1-056 E	8.8436
930881	AB1-137 C	0.2078
930882	AB1-137 E	0.0890
933631	AC2-185 C	0.9030
933632	AC2-185 E	1.4733
933641	AC2-186 C	2.7808
933642	AC2-186 E	4.5372

Bus #	Bus	MW Impact
936691	AD2-088 C	0.8465
936692	AD2-088 E	0.5644
938891	AE1-117 C O1	2.0505
938892	AE1-117 E O1	5.4599
938901	AE1-118 C O1	2.0498
938902	AE1-118 E O1	5.4580
939151	AE1-145	0.9190
939361	AE1-167 C O1	0.2757
939362	AE1-167 E O1	0.2298
939621	AE1-192 C O1	2.1581
939622	AE1-192 E O1	1.0561
942441	AE2-257 C	1.6280
942442	AE2-257 E	4.2921
942821	AE2-301 C	0.0530
942822	AE2-301 E	0.1880
943361	AF1-007 C	0.0486
943362	AF1-007 E	0.1380
944921	AF1-157 C O1	0.4141
944922	AF1-157 E O1	0.2761
945661	AF1-231 C	0.1850
945662	AF1-231 E	0.2774
945781	AF1-243	0.1217
945791	AF1-244	0.1929
945931	AF1-258	0.0732
DUCKCREEK	DUCKCREEK	0.0737
NEWTON	NEWTON	0.0688
FARMERCITY	FARMERCITY	0.0036
NY	NY	0.0199
PRAIRIE	PRAIRIE	0.1653
O-066	O-066	0.1680
COFFEEN	COFFEEN	0.0338
EDWARDS	EDWARDS	0.0221
CHEOAH	CHEOAH	0.0320
TILTON	TILTON	0.0397
G-007	G-007	0.0156
GIBSON	GIBSON	0.0349
CALDERWOOD	CALDERWOOD	0.0318
BLUEG	BLUEG	0.1111
TRIMBLE	TRIMBLE	0.0356
CATAWBA	CATAWBA	0.0228

17.5 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
41572611	232233	PRESTON	DP&L	232821	TANYARD	DP&L	1	DPL_P4-2_DP11	breaker	93.0	172.95	174.03	DC	2.57

Bus #	Bus	MW Impact
232404	W1-003 C	0.2456
232405	W1-003 E	0.5111
232406	W1-004 FULL	0.2456
232407	W1-004 E	0.5111
232408	W1-005 C	0.2456
232409	W1-005 E	0.5111
232410	W1-006 C	0.2456
232411	W1-006 E	0.5111
232412	X1-032 E	0.4731
232417	X3-008 C	0.4194
232418	X3-008 E	4.9020
232426	Y1-080 FULL	0.0484
232427	Y1-080 E	0.5687
232428	Y3-058 C	0.1230
232429	Y3-058 E	1.4381
232433	Z2-076 E	0.1512
232435	Z2-077 E	0.1512
232905	BAYVIEW1	0.1977
232907	VN8	3.1919
232915	OH NUG4	0.5240
232916	OH NUG5	0.5240
232919	VN10	0.3257
232921	TASLEY2G	0.3517
232926	CRISFLD1	0.1667
293670	O-025 C	0.1119
917081	Z2-012 C	0.1202
917082	Z2-012 E	1.4048
918831	AA1-102	0.6251
923282	AB1-137 C	0.2878
923283	AB1-137 E	0.1233
924681	AB2-120 C OP	3.6451
924682	AB2-120 E OP	5.9472
924781	AB2-130 C OP	3.8502
924782	AB2-130 E OP	6.2818
924831	AB2-136 C	7.6295
924832	AB2-136 E	8.0909
925151	AB2-172 C OP	7.5111
925152	AB2-172 E OP	12.2549
925261	AB2-180 C	2.1648
925262	AB2-180 E	0.9278
927031	AC1-190 C	13.3000
927032	AC1-190 E	5.7000

Bus #	Bus	MW Impact
927191	AC1-213 C	0.4276
927192	AC1-213 E	0.2806
930201	AB1-056 C	4.1148
930202	AB1-056 E	11.7183
930881	AB1-137 C	0.2878
930882	AB1-137 E	0.1233
932161	AC2-023 C	4.4904
932162	AC2-023 E	3.2704
933641	AC2-186 C	0.8249
933642	AC2-186 E	1.3460
936691	AD2-088 C	2.8620
936692	AD2-088 E	1.9080
938651	AE1-087 C	6.3251
938652	AE1-087 E	1.5813
938891	AE1-117 C O1	2.8509
938892	AE1-117 E O1	7.5910
938901	AE1-118 C O1	2.8629
938902	AE1-118 E O1	7.6230
939151	AE1-145	1.9205
939361	AE1-167 C O1	0.5761
939362	AE1-167 E O1	0.4801
939621	AE1-192 C O1	5.3246
939622	AE1-192 E O1	2.6057
941971	AE2-209 C	8.9367
941972	AE2-209 E	6.2286
942441	AE2-257 C	2.2443
942442	AE2-257 E	5.9167
942821	AE2-301 C	0.2627
942822	AE2-301 E	0.9316
943361	AF1-007 C	0.0643
943362	AF1-007 E	0.1829
944921	AF1-157 C O1	0.6949
944922	AF1-157 E O1	0.4633
945661	AF1-231 C	0.3878
945662	AF1-231 E	0.5818
945781	AF1-243	0.5664
945791	AF1-244	0.9554
945931	AF1-258	0.4948
946041	AF1-269	2.9789
DUCKCREEK	DUCKCREEK	0.0829
NEWTON	NEWTON	0.0774
FARMERCITY	FARMERCITY	0.0040
NY	NY	0.0304
PRAIRIE	PRAIRIE	0.1860
O-066	O-066	0.3091
COFFEEN	COFFEEN	0.0381
EDWARDS	EDWARDS	0.0252
CHEOAH	CHEOAH	0.0360
TILTON	TILTON	0.0454
G-007	G-007	0.0416
GIBSON	GIBSON	0.0393
CALDERWOOD	CALDERWOOD	0.0358

Bus #	Bus	MW Impact
BLUEG	BLUEG	0.1250
TRIMBLE	TRIMBLE	0.0401
CATAWBA	CATAWBA	0.0252

17.6 Index 6

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
41572606	232234	TODD	DP&L	232233	PRESTON	DP&L	1	DPL_P4-2_DP11	breaker	93.0	178.0	179.08	DC	2.57

Bus #	Bus	MW Impact
232404	W1-003 C	0.2456
232405	W1-003 E	0.5111
232406	W1-004 FULL	0.2456
232407	W1-004 E	0.5111
232408	W1-005 C	0.2456
232409	W1-005 E	0.5111
232410	W1-006 C	0.2456
232411	W1-006 E	0.5111
232412	X1-032 E	0.4731
232417	X3-008 C	0.4194
232418	X3-008 E	4.9020
232426	Y1-080 FULL	0.0484
232427	Y1-080 E	0.5687
232428	Y3-058 C	0.1230
232429	Y3-058 E	1.4381
232433	Z2-076 E	0.1512
232435	Z2-077 E	0.1512
232905	BAYVIEW1	0.1977
232907	VN8	3.1919
232915	OH NUG4	0.5240
232916	OH NUG5	0.5240
232919	VN10	0.3257
232921	TASLEY2G	0.3517
232926	CRISFLD1	0.1667
293670	O-025 C	0.1119
917081	Z2-012 C	0.1202
917082	Z2-012 E	1.4048
918831	AA1-102	0.6251
923282	AB1-137 C	0.2878
923283	AB1-137 E	0.1233
924681	AB2-120 C OP	3.6451
924682	AB2-120 E OP	5.9472
924781	AB2-130 C OP	3.8502
924782	AB2-130 E OP	6.2818
924831	AB2-136 C	7.6295
924832	AB2-136 E	8.0909
925151	AB2-172 C OP	7.5111
925152	AB2-172 E OP	12.2549
925261	AB2-180 C	2.1648
925262	AB2-180 E	0.9278
927031	AC1-190 C	13.3000
927032	AC1-190 E	5.7000

Bus #	Bus	MW Impact
927191	AC1-213 C	0.4276
927192	AC1-213 E	0.2806
930201	AB1-056 C	4.1148
930202	AB1-056 E	11.7183
930881	AB1-137 C	0.2878
930882	AB1-137 E	0.1233
932161	AC2-023 C	4.4904
932162	AC2-023 E	3.2704
933641	AC2-186 C	0.8249
933642	AC2-186 E	1.3460
936691	AD2-088 C	2.8620
936692	AD2-088 E	1.9080
938651	AE1-087 C	6.3251
938652	AE1-087 E	1.5813
938891	AE1-117 C O1	2.8509
938892	AE1-117 E O1	7.5910
938901	AE1-118 C O1	2.8629
938902	AE1-118 E O1	7.6230
939151	AE1-145	1.9205
939361	AE1-167 C O1	0.5761
939362	AE1-167 E O1	0.4801
939621	AE1-192 C O1	5.3246
939622	AE1-192 E O1	2.6057
941971	AE2-209 C	8.9367
941972	AE2-209 E	6.2286
942441	AE2-257 C	2.2443
942442	AE2-257 E	5.9167
942821	AE2-301 C	0.2627
942822	AE2-301 E	0.9316
943361	AF1-007 C	0.0643
943362	AF1-007 E	0.1829
944921	AF1-157 C O1	0.6949
944922	AF1-157 E O1	0.4633
945661	AF1-231 C	0.3878
945662	AF1-231 E	0.5818
945781	AF1-243	0.5664
945791	AF1-244	0.9554
945931	AF1-258	0.4948
946041	AF1-269	2.9789
DUCKCREEK	DUCKCREEK	0.0829
NEWTON	NEWTON	0.0774
FARMERCITY	FARMERCITY	0.0040
NY	NY	0.0304
PRAIRIE	PRAIRIE	0.1860
O-066	O-066	0.3091
COFFEEN	COFFEEN	0.0381
EDWARDS	EDWARDS	0.0252
CHEOAH	CHEOAH	0.0360
TILTON	TILTON	0.0454
G-007	G-007	0.0416
GIBSON	GIBSON	0.0393
CALDERWOOD	CALDERWOOD	0.0358

Bus #	Bus	MW Impact
BLUEG	BLUEG	0.1250
TRIMBLE	TRIMBLE	0.0401
CATAWBA	CATAWBA	0.0252

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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
41572931	924820	AB2-135 TAP	DP&L	232203	CHURC_69	DP&L	1	DPL_P4-2_DP11	breaker	93.0	129.17	129.91	DC	1.53

Bus #	Bus	MW Impact
232405	W1-003 E	0.2066
232407	W1-004 E	0.2066
232409	W1-005 E	0.2066
232411	W1-006 E	0.2066
232412	X1-032 E	0.1822
232429	Y3-058 E	0.4015
232433	Z2-076 E	0.0982
232435	Z2-077 E	0.0982
232813	VAUGHN	0.1035
232899	W1-062	0.7550
232900	DEMECSMY	0.7550
232910	NRG_G1	1.8684
232911	NRG_G2	1.8684
917082	Z2-012 E	0.5694
923282	AB1-137 C	0.2078
923283	AB1-137 E	0.0890
924681	AB2-120 C OP	1.7458
924682	AB2-120 E OP	2.8484
924781	AB2-130 C OP	1.7500
924782	AB2-130 E OP	2.8552
924821	AB2-135 C	21.0427
924822	AB2-135 E	23.9986
925261	AB2-180 C	0.6044
925262	AB2-180 E	0.2590
926131	AC1-091 C	0.4455
926132	AC1-091 E	0.7307
926141	AC1-092 C	0.4455
926142	AC1-092 E	0.7307
926151	AC1-093 C	0.4218
926152	AC1-093 E	0.6951
926161	AC1-094 C	0.3564
926162	AC1-094 E	0.5881
926171	AC1-095 C	0.2257
926172	AC1-095 E	0.3624
927191	AC1-213 C	0.1455
927192	AC1-213 E	0.0955
930201	AB1-056 C	3.1054
930202	AB1-056 E	8.8436
930881	AB1-137 C	0.2078
930882	AB1-137 E	0.0890
933631	AC2-185 C	0.9030
933632	AC2-185 E	1.4733

Bus #	Bus	MW Impact
933641	AC2-186 C	2.7808
933642	AC2-186 E	4.5372
936691	AD2-088 C	0.8465
936692	AD2-088 E	0.5644
938891	AE1-117 C O1	2.0505
938892	AE1-117 E O1	5.4599
938901	AE1-118 C O1	2.0498
938902	AE1-118 E O1	5.4580
939151	AE1-145	0.9190
939361	AE1-167 C O1	0.2757
939362	AE1-167 E O1	0.2298
939621	AE1-192 C O1	2.1581
939622	AE1-192 E O1	1.0561
942441	AE2-257 C	1.6280
942442	AE2-257 E	4.2921
942821	AE2-301 C	0.0530
942822	AE2-301 E	0.1880
943361	AF1-007 C	0.0486
943362	AF1-007 E	0.1380
944921	AF1-157 C O1	0.4141
944922	AF1-157 E O1	0.2761
945661	AF1-231 C	0.1850
945662	AF1-231 E	0.2774
945781	AF1-243	0.1217
945791	AF1-244	0.1929
945931	AF1-258	0.0732
DUCKCREEK	DUCKCREEK	0.0737
NEWTON	NEWTON	0.0688
FARMERCITY	FARMERCITY	0.0036
NY	NY	0.0199
PRAIRIE	PRAIRIE	0.1653
O-066	O-066	0.1680
COFFEEN	COFFEEN	0.0338
EDWARDS	EDWARDS	0.0221
CHEOAH	CHEOAH	0.0320
TILTON	TILTON	0.0397
G-007	G-007	0.0156
GIBSON	GIBSON	0.0349
CALDERWOOD	CALDERWOOD	0.0318
BLUEG	BLUEG	0.1111
TRIMBLE	TRIMBLE	0.0356
CATAWBA	CATAWBA	0.0228

Contingency Name	Contingency Definition
CKT 23030B	CONTINGENCY 'CKT 23030B' OPEN LINE FROM BUS 232002 TO BUS 232013 CIRCUIT 1 /CEDAR CREEK - SILVER RUN 230 END
DPL_P4-2_DP12	CONTINGENCY 'DPL_P4-2_DP12' /*STEELE BUS BREAKER TO VIENNA DISCONNECT BRANCH FROM BUS 232000 TO BUS 232103 CKT 2 /*STEELE STEELE 230 138 AT21 DISCONNECT BRANCH FROM BUS 232000 TO BUS 232005 CKT 1 /*STEELE VIENNA 230 230 END
DPL_P4-2_DP11	CONTINGENCY 'DPL_P4-2_DP11' /*STEELE BUS BREAKER TO MILFORD DISCONNECT BRANCH FROM BUS 232004 TO BUS 232000 CKT 1 /*MILFORD STEELE 230 230 DISCONNECT BRANCH FROM BUS 232000 TO BUS 232005 CKT 1 /*STEELE VIENNA 230 230 END
DPL_P1_2_23085 &13710	CONTINGENCY 'DPL_P1_2_23085 &13710' DISCONNECT BUS 232005 /STEELE - VIENNA 230 & VIENNA AT20 DISCONNECT BUS 232116 /VIENNA XFMR - VIENNA 138 END
CKT 23032B	CONTINGENCY 'CKT 23032B' OPEN LINE FROM BUS 232013 TO BUS 232003 CIRCUIT 1 /SILVER RUN - CARTANZA 230 END
DPL_P7_1_DBL_1NCB_FSA	CONTINGENCY 'DPL_P7_1_DBL_1NCB_FSA' /* #1 & #2 KEENEY-STEELE 230 OPEN LINE FROM BUS 231003 TO BUS 232000 CKT 1 OPEN LINE FROM BUS 231003 TO BUS 923960 CKT 2 OPEN LINE FROM BUS 232000 TO BUS 923960 CKT 2 DISCONNECT BUS 923961 DISCONNECT BUS 923962 END

Short Circuit

18 Short Circuit

The following Breakers are overduty

None

19 Secondary Point of Interconnection

AF1-157 will interconnect with the DPL transmission system at Choptank Electric Cooperative's (CEC) Pepper 69 kV substation.

Summer Peak Load Flow

20 Generation Deliverability

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

None

21 Multiple Facility Contingency

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

None

22 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
41004414	232100	CHURCH	138.0	DP&L	232107	TOWNSEND	138.0	DP&L	1	DPL_P7_1_DBL_1NCB_FSA	tower	348.0	111.99	112.59	DC	4.74
41004445	232106	MIDLTNTP	138.0	DP&L	232104	MT PLSNT	138.0	DP&L	1	DPL_P7_1_DBL_1NCB_FSA	tower	348.0	108.09	108.69	DC	4.74
41004373	232107	TOWNSEND	138.0	DP&L	232106	MIDLTNTP	138.0	DP&L	1	DPL_P7_1_DBL_1NCB_FSA	tower	348.0	117.4	118.0	DC	4.74
41573277	232215	KENT	69.0	DP&L	232812	NMEREDTH	69.0	DP&L	1	DPL_P4-2_DP11	breaker	93.0	103.1	103.84	DC	1.51
41572921	232232	TRAPPETP	69.0	DP&L	232227	EASTN_69	69.0	DP&L	1	DPL_P4-2_DP11	breaker	110.0	121.67	122.52	DC	2.4
41572611	232233	PRESTON	69.0	DP&L	232821	TANYARD	69.0	DP&L	1	DPL_P4-2_DP11	breaker	93.0	172.95	173.95	DC	2.4
41572612	232233	PRESTON	69.0	DP&L	232821	TANYARD	69.0	DP&L	1	DPL_P4-2_DP12	breaker	93.0	100.83	101.63	DC	1.65
41572606	232234	TODD	69.0	DP&L	232233	PRESTON	69.0	DP&L	1	DPL_P4-2_DP11	breaker	93.0	178.0	179.01	DC	2.4
41572607	232234	TODD	69.0	DP&L	232233	PRESTON	69.0	DP&L	1	DPL_P4-2_DP12	breaker	93.0	105.89	106.69	DC	1.65
41573183	232241	VIENN_69	69.0	DP&L	232234	TODD	69.0	DP&L	1	DPL_P4-2_DP11	breaker	110.0	112.58	113.36	DC	1.91
41572931	924820	AB2-135 TAP	69.0	DP&L	232203	CHURC_69	69.0	DP&L	1	DPL_P4-2_DP11	breaker	93.0	129.17	129.9	DC	1.51

23 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
41244392	232002	CEDAR CK	230.0	DP&L	232013	SILVER RUN	230.0	PJM	1	CKT 23032B	operation	679.0	111.73	112.43	DC	10.48
41244497	232003	CARTANZA	230.0	DP&L	232013	SILVER RUN	230.0	PJM	1	CKT 23030B	operation	790.0	111.1	112.25	DC	9.07
42477186	232004	MILF_230	230.0	DP&L	232000	STEELE	230.0	DP&L	1	CKT 23032B	operation	550.0	108.84	110.12	DC	7.51
41244673	232233	PRESTON	69.0	DP&L	232821	TANYARD	69.0	DP&L	1	DPL_P1_2_23085 &13710	operation	93.0	100.07	100.87	DC	1.65
41244586	232234	TODD	69.0	DP&L	232233	PRESTON	69.0	DP&L	1	DPL_P1_2_23085 &13710	operation	93.0	105.02	105.82	DC	1.65