Generation Interconnection

Feasibility Study Report

for

Queue Project AF2-249

EDGEWOOD 12 KV II

0.6 MW Capacity / 3 MW Energy

July 2020

Table of Contents

1 Introduction

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

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 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 Storage generating facility located in Wicomico County, Maryland. The installed facilities will have a total capability of 3 MW with 0.6 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is June 01, 2020. This study does not imply a TO commitment to this in-service date.

Queue Number	AF2-249
Project Name	EDGEWOOD 12 KV II
State	Maryland
County	Wicomico
Transmission Owner	DPL
MFO	3
MWE	3
MWC	0.6
Fuel	Storage
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

AF2-249 will interconnect with the DPL transmission system behind the 69/12 kV transformer at Choptank Electric Cooperative's (CEC) Edgewood substation.

5 Cost Summary

The AF2-249 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$0
Total System Network Upgrade Costs	$0
Total Costs	$0

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.

5.1 DPL Costs

Cost estimates will further be refined as a part of the Impact Study and Facilities Study for this project. The Interconnection Customer will be responsible for all costs incurred by DPL in connection with the AF2-249 project. DPL reserves the right to reassess issues presented in this document and, upon appropriate justification, submit additional costs related to the AF2-249 project.

6 Transmission Owner Scope of Work

There is no Delmarva Power & Light attachment facility or direct connection work scope. Attachment facilities and local upgrades (if required) along with terms and conditions to interconnect AF2-249 will be specified in a separate two party Interconnection Agreement (IA) between Choptank Electric Cooperative (CEC) and the Interconnection Customer as this project is considered FERC non-jurisdictional per the PJM Open Access Transmission Tariff (OATT). The Interconnection Customer is responsible for contacting the Choptank Electric Cooperative (CEC) directly for attachment facilities work scope.

7 Schedule

The Interconnection Customer is responsible for contacting Choptank Electric Cooperative (CEC) directly for schedule to construct the physical interconnection for the AF2-249 project.

8 Transmission Owner Analysis

None

9 Interconnection Customer Requirements

9.1 Required Relaying and Communications

DPL will require over voltage relay protection on the high side of the Edgewood 69/12 kV transformer. Interconnection Customer will coordinate with Choptank to facilitate this interconnection.

9.2 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.

9.3 Additional Interconnection Customer Responsibilities

The Interconnection Customer is responsible for contacting Choptank Electric Cooperative (CEC) for any additional Interconnection Customer requirements.

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 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/

Metering for this project will be installed behind the CEC transformer. DPL will require the following:
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.

11 Summer Peak - Load Flow Analysis

The Queue Project AF2-249 was evaluated as a 3.0 MW (Capacity 0.6 MW) injection at the Edgewood 69 kV substation in the DPL area. Project AF2-249 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-249 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)

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
10184391 5	23283 8	MARDEL A	69. 0	DP&L	23227 0	HEBRO N	69. 0	DP&L	1	DPL_P4 - 2_DP56	breake r	64.0	99.61	100.22	DC	0.39

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)

None

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
1001509 58	23200 6	INDRI V 4	230. 0	DP&L	23200 1	COOLSP RS	230. 0	DP& L	1	Base Case	operatio n	650.0	99.97	100.01	DC	0.53
1018444 50	23224 9	LAURE L	69.0	DP&L	23282 8	SHORT 1	69.0	DP& L	1	DPL_P1_3_NELS ON AT1	operatio n	57.0	110.3	112.17	DC	1.07

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
101843915	1	MARDELA 69.0 kV - HEBRON 69.0 kV Ckt 1	DPL s0835 (1029) : Rebuild the 6708 line from Vienna - Hebron (N. Salisbury to Hebron Section already completed) with new poles, conductor, foundations, insulators and OPGW Project Type : CON Cost : $15,000,000 Time Estimate : 36-48 Months	$0
			TOTAL COST	$0

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
101843915	232838	MARDELA	DP&L	232270	HEBRON	DP&L	1	DPL_P4-2_DP56	breaker	64.0	99.61	100.22	DC	0.39

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
232417	X3-008 C	0.1889	50/50	0.1889
232418	X3-008 E	1.7872	50/50	1.7872
232426	Y1-080 FULL	0.0384	50/50	0.0384
232427	Y1-080 E	0.3652	50/50	0.3652
232919	VN10	0.3322	50/50	0.3322
924831	AB2-136 C	4.0942	50/50	4.0942
924832	AB2-136 E	4.3419	50/50	4.3419
925151	AB2-172 C OP	2.7385	50/50	2.7385
925152	AB2-172 E OP	4.4680	50/50	4.4680
927031	AC1-190 C	5.1726	50/50	5.1726
927032	AC1-190 E	2.2169	50/50	2.2169
938651	AE1-087 C	2.3061	50/50	2.3061
938652	AE1-087 E	0.5765	50/50	0.5765
939152	AE1-145 BAT	1.9916	Merchant Transmission	1.9916
945663	AF1-231 BAT	1.9002	50/50	1.9002
945782	AF1-243 BAT	0.5014	50/50	0.5014
945792	AF1-244 BAT	0.9508	50/50	0.9508
946041	**AF1-269 (Withdrawn : 05/12/2020)**	**1.9129**	**50/50**	**1.9129**
957613	AF2-055 BAT	3.0081	50/50	3.0081
957662	AF2-060 BAT	0.4750	Merchant Transmission	0.4750
957672	AF2-061 BAT	2.1111	Merchant Transmission	2.1111
959163	AF2-207 BAT	2.2740	Merchant Transmission	2.2740
959583	AF2-249 BAT	0.3913	50/50	0.3913
960341	AF2-325 C	0.6624	50/50	0.6624
960342	AF2-325 E	0.9147	50/50	0.9147
960671	AF2-358 C O1	10.6278	50/50	10.6278
960672	AF2-358 E O1	7.0852	50/50	7.0852
960871	AF2-378 C	0.1795	50/50	0.1795
960872	AF2-378 E	0.2490	50/50	0.2490
961181	AF2-409 O1	2.3120	Adder	5.13
WEC	WEC	0.0095	Confirmed LTF	0.0095
LGEE	LGEE	0.0171	Confirmed LTF	0.0171
CPLE	CPLE	0.0198	Confirmed LTF	0.0198
G-007A	G-007A	0.0527	Confirmed LTF	0.0527
VFT	VFT	0.1548	Confirmed LTF	0.1548
CBM-W2	CBM-W2	0.2457	Confirmed LTF	0.2457
CBM-W1	CBM-W1	0.3753	Confirmed LTF	0.3753
TVA	TVA	0.0420	Confirmed LTF	0.0420
CBM-S2	CBM-S2	0.1734	Confirmed LTF	0.1734
CBM-S1	CBM-S1	0.2556	Confirmed LTF	0.2556
MEC	MEC	0.0477	Confirmed LTF	0.0477

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
AB2-136	West Cambridge-Vienna 69kV	Active
AB2-172	Todd 69kV	Active
AC1-190	East New Market 69kV	Active
AE1-087	Todd 69 kV	Active
AE1-145	Wallops Island 69 kV	Active
AF1-231	New Church 138 kV	Active
AF1-243	Tasley 25 kV	Active
AF1-244	Kingston 25 kV	Active
AF1-269	Airey-Golden Hill 69 kV	Withdrawn
AF2-055	Plantation 69 kV	Active
AF2-060	Wattsville 12 kV	Active
AF2-061	Wattsville 69kV	Active
AF2-207	Nelson 69 kV	Active
AF2-249	Edgewood 12 kV II	Active
AF2-325	Jacktown 12 kV	Active
AF2-358	Airey-Vienna 69 kV	Active
AF2-378	Cambridge 12 kV	Active
AF2-409	Vienna 138 kV	Active
X3-008	Todd 69kV	Under Construction
Y1-080	Dorchester 12kV	In Service

11.8 Contingency Descriptions

Contingency Name	Contingency Definition
Base Case	
DPL_P4-2_DP56	CONTINGENCY 'DPL_P4-2_DP56' /*LORETTO BUS BREAKER DISCONNECT BRANCH FROM BUS 232127 TO BUS 232117 CKT 1 /*LORETTO VIENNA 138 1380 DISCONNECT BRANCH FROM BUS 232127 TO BUS 232128 CKT 1 /*LORETTO PINEY GROVE 138 138 END
DPL_P1_3_NELSON AT1	CONTINGENCY 'DPL_P1_3_NELSON AT1' OPEN LINE FROM BUS 232119 TO BUS 232250 CIRCUIT 1 /NELSON AT1 138/69 DISCONNECT BUS 230905 / NELSON 69 CAP END

12 Short Circuit Analysis

Short circuit will be studied in the System Impact Study phase.

13 Affected Systems

None