Generation Interconnection

Feasibility Study Report

for

Queue Project AF2-378

CAMBRIDGE 12 KV

1.1 MW Capacity / 2.65 MW Energy

July 2020

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

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

3 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Dorchester County, Maryland. The installed facilities will have a total capability of 2.65 MW with 1.1 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is February 28, 2022. This study does not imply a TO commitment to this in-service date.

Queue Number	AF2-378
Project Name	CAMBRIDGE 12 KV
State	Maryland
County	Dorchester
Transmission Owner	DPL
MFO	2.65
MWE	2.65
MWC	1.1
Fuel	Solar
Basecase Study Year	2023

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

4 Point of Interconnection

AF2-378 will interconnect with the DPL distribution system via a 12 kV distribution circuit out of the Cambridge substation.

5 Cost Summary

The AF2-378 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 AF2-378 project. DPL reserves the right to reassess issues presented in this document and, upon appropriate justification, submit additional costs related to the AF2-378 project.

This study does not included costs associated with connection to the DPL distribution system. The project is required to apply to for interconnection to the distribution system through the Maryland State Interconnection Process for the distribution interconnection scope of work.

6 Transmission Owner Scope of Work

No transmission level work required to facilitate the interconnection of this facility. This study only evaluates impacts to the transmission system. Distribution level scope of work will be captured in a state-level study which is provided through the Maryland State Interconnection Process.

7 Schedule

Distribution level scope of work and schedule will be captured in a state-level study which is provided through the Maryland State Interconnection Process.

8 Transmission Owner Analysis

None

9 Interconnection Customer Requirements

9.1 Required Relaying and Communications

No transmission scope identified. Any additional work required on distribution facilities will be captured in a state-level study which is provided through the Maryland State Interconnection process.

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.

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/

DPL will provide, own, operate and maintain, at the Interconnection Customers expense, the meters, instrument transformers, associated wiring equipment, test switch and other meter related devices. The revenue metering equipment shall comply with requirements specified in PJM Manuals M-01 and M-14D

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.

A detail metering scope will be provided through the Maryland State Interconnection Process.

11 Summer Peak - Load Flow Analysis

The Queue Project AF2-378 was evaluated as a 2.65 MW (Capacity 1.1 MW) injection at the Cambridge 12 kV substation in the DPL area. Project AF2-378 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-378 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

11.1 Generation Deliverability

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

None

11.2 Multiple Facility Contingency

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

None

11.3 Contribution to Previously Identified Overloads

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

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
10202814 9	23223 9	SHARPTW N	69. 0	DP&L	23224 9	LAUREL	69. 0	DP& L	1	DPL_P1_2_C KT 6708	operatio n	42.0	167.45	168.55	DC	0.46
10202810 2	23224 1	VIENN_69	69. 0	DP&L	23223 9	SHARPTW N	69. 0	DP& L	1	DPL_P1_2_C KT 6708	operatio n	42.0	179.6	180.69	DC	0.46
10202814 3	23224 2	VIENNALC	69. 0	DP&L	23224 1	VIENN_69	69. 0	DP& L	1	DPL_P1_2_C KT 6715	operatio n	95.0	166.34	169.13	DC	2.65
10202814 8	23224 2	VIENNALC	69. 0	DP&L	23224 1	VIENN_69	69. 0	DP& L	1	Base Case	operatio n	95.0	106.85	108.21	DC	1.29
10202835 9	92483 0	AB2-136 TAP	69. 0	DP&L	23223 8	WCAMBRD G	69. 0	DP& L	1	DPL_P1_2_C KT 6715	operatio n	72.0	104.31	107.99	DC	2.65

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
10202813 0	960670	AF2-358 TAP	69.0	DP&L	232242	VIENNALC	69.0	DP&L	1	DPL_P1_2_CKT 6715	operation	95.0	167.71	170.5	DC	2.65
10202813 5	960670	AF2-358 TAP	69.0	DP&L	232242	VIENNALC	69.0	DP&L	1	Base Case	operation	95.0	108.22	109.58	DC	1.29

11.5 System Reinforcements

None

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".

None

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.

None

11.8 Contingency Descriptions

Contingency Name	Contingency Definition
Base Case	
DPL_P1_2_CKT 6708	CONTINGENCY 'DPL_P1_2_CKT 6708' DISCONNECT BUS 232270 / MARDELA - HEBRON 69 & HEBRON XFMR DISCONNECT BUS 232838 / VIENNA - MARDELA 69 DISCONNECT BUS 232644 / HEBRON 1 12 DISCONNECT BUS 232653 / HEBRON 2 12 DISCONNECT BUS 232291 / ROCKAWALKIN - NORTH SALISBURY 69 END
DPL_P1_2_CKT 6715	CONTINGENCY 'DPL_P1_2_CKT 6715' DISCONNECT BUS 232817 / TODD - EAST NEW MARKET REA - EAST NEW MARKET 69 END

12 Short Circuit Analysis

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

13 Affected Systems

None