Generation Interconnection

Feasibility Study Report

for

Queue Project AG1-483

DICKERSON 230 KV

542.5 MW Capacity / 542.5 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 PEPCO.

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.

An Interconnection Customer 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.

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 and Battery Storage generating facility located in Montgomery County, Maryland. The installed facilities will have a total capability of 542.5 MW with 542.5 MW of this output being recognized by PJM as Capacity. AG1-483 is claiming 542.5 MW Capacity Interconnection Rights from the deactivated Dickerson Generating Facility Units 1, Units 2 and Unit 3. The proposed in-service date for this project is June 01, 2024. This study does not imply a TO commitment to this in-service date.

Queue Number	AG1-483
Project Name	DICKERSON 230 KV
State	Maryland
County	Montgomery
Transmission Owner	PEPCO
MFO	542.5
MWE	542.5
MWC	542.5
Fuel	Solar; Storage
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

AG1-483 will interconnect with the PEPCO transmission system at the Dickerson 230 kV substation.

5 Cost Summary

The AG1-483 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$600,000
Total System Network Upgrade Costs	$5,000,000
Total Costs	$5,600,000

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
Add the breaker, disconnect switches and associated equipment to the Dickerson Substation	$600,000
Total Physical Interconnection Costs	$600,000

7 Schedule

The estimated schedule to complete the outline scope of work is 12-24 months from the execution of an Interconnection Construction Service Agreement.

8 Revenue Metering and SCADA Requirements

8.1 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.

8.2 Meteorological Data Reporting Requirements

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

- 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)

8.3 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/

9 Summer Peak - Load Flow Analysis

The Queue Project AG1-483 (MFO: 542.5 MW, Capacity: 542.5 MW) was evaluated as a 0 MW (Capacity 0.0 MW) injection at the Dickerson 230 kV substation in the PEPCO area, since the project is claiming CIRs from the deactivated Dickerson Units 1, 2 and 3. Project AG1-483 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-483 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

9.1 Generation Deliverability

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

None

9.2 Multiple Facility Contingency[1]

(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
165427291	223938	DICKH230	230.0	PEPCO	223937	DICK 230	230.0	PEPCO	2	PP7	bus	680.0	95.65	154.33	DC	398.84

9.3 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

9.4 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.

[1] The Multiple Facility Contingency violation identified is as a result of modelling the battery withdrawal (charging) portion of the facility.

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
167745679	223938	DICKH230	230.0	PEPCO	223937	DICK 230	230.0	PEPCO	2	PEPCO_P1_PP1	operation	680.0	106.16	146.66	DC	267.38
167745682	223938	DICKH230	230.0	PEPCO	223937	DICK 230	230.0	PEPCO	1	PEPCO_P1_PP2	operation	680.0	106.16	146.66	DC	267.38

9.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Index	Facility	Upgrade Description	Cost
165427291	1	**DICKH230 230.0 kV - DICK 230 230.0 kV Ckt 2**	PEPCO: **Description:** **Reconductor/bundle circuit 23103 from Dickerson to Station H. This would raise the thermal rating to approximately 1200 MVA. To achieve this rating the 2 breakers and 4 disconnect switches connected to this circuit would also have to be upgraded along with any other associated terminal equipment.** **Project Type : FAC** **Cost : $5,000,000** **Time Estimate : 36 Months** Note: The impact of the withdrawal of the battery portion of the facility caused the overloads. This cost estimate is high level from PEPCO and will be refined during the System Impact Study phase.	$5,000,000
			TOTAL COST	**$5,000,000**

9.6 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".

9.6.1 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
165427291	223938	DICKH230	PEPCO	223937	DICK 230	PEPCO	2	PP7	bus	680.0	95.65	154.33	DC	398.84

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
223967	METZ E69	-1.7267	Adder	-2.03
224054	DICKHCT1	5.0318	50/50	5.0318
224055	DICKHCT2	5.0318	50/50	5.0318
224056	MCTRSH1G	1.7799	50/50	1.7799
224244	NIH23MW	-4.2169	Adder	-4.96
226704	AOCX4-046 E	-0.9040	Adder	-1.06
226895	WOAKV2-037 E	-0.3237	Adder	-0.38
226896	D-009	-0.5615	Adder	-0.66
235002	**AC1-039 C (Suspended)**	**0.7000**	**Adder**	**0.82**
901952	W1-116E	0.5948	Adder	0.7
918902	AA1-109 E	0.3029	Adder	0.36
923202	**AB1-124 C (Suspended)**	**0.5410**	**Adder**	**0.64**
923203	**AB1-124 E (Suspended)**	**0.8827**	**Adder**	**1.04**
923212	**AB1-125 C OP (Suspended)**	**0.4058**	**Adder**	**0.48**
923213	**AB1-125 E OP (Suspended)**	**0.6620**	**Adder**	**0.78**
924771	**AB2-129 C OP (Suspended)**	**3.6532**	**50/50**	**3.6532**
924772	**AB2-129 E OP (Suspended)**	**5.9604**	**50/50**	**5.9604**
925642	**AC1-039 E (Suspended)**	**0.6462**	**Adder**	**0.76**
930522	AB1-096 E	0.4349	Adder	0.51
933252	AC2-136 E	0.2775	Adder	0.33
938091	AE1-012 C	-0.0106	Adder	-0.01
958631	AF2-154	1.0848	50/50	1.0848
962183	AG1-063 BAT	0.0836	Merchant Transmission	0.0836
962553	AG1-104 BAT	10.0265	Merchant Transmission	10.0265
964293	AG1-290 BAT	0.5845	Merchant Transmission	0.5845
966011	AG1-470 C O1	0.5527	Adder	1.23
966012	AG1-470 E O1	0.8290	Adder	1.84
966143	AG1-483 BAT	398.8427	50/50	398.8427
WEC	WEC	0.2967	Confirmed LTF	0.2967
LGEE	LGEE	0.5919	Confirmed LTF	0.5919
CPLE	CPLE	0.4825	Confirmed LTF	0.4825
CBM-W2	CBM-W2	8.1357	Confirmed LTF	8.1357
NY	NY	0.4606	Confirmed LTF	0.4606
TVA	TVA	1.2404	Confirmed LTF	1.2404
O-066	O-066	8.7423	Confirmed LTF	8.7423
SIGE	SIGE	0.2348	Confirmed LTF	0.2348
CBM-S2	CBM-S2	8.0388	Confirmed LTF	8.0388
CBM-S1	CBM-S1	0.3405	Confirmed LTF	0.3405

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
G-007	G-007	1.4049	Confirmed LTF	1.4049
MEC	MEC	1.4778	Confirmed LTF	1.4778
LAGN	LAGN	1.5523	Confirmed LTF	1.5523
CBM-W1	CBM-W1	13.1928	Confirmed LTF	13.1928

9.7 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
AA1-109	Cotoctin-Troutville Junction 34.5kV	In Service
AB1-096	Carroll-Mt. Airy 34.5kV	Engineering and Procurement
AB1-124	Carroll-Monocacy 34.5kV	Suspended
AB1-125	Carroll-Monocacy 34.5kV	Suspended
AB2-129	Doubs 230kV	Suspended
AC1-039	Catoctin 34kV	Suspended
AC2-136	East Hagerstown 12kV	Engineering and Procurement
AE1-012	64th St. 13 kV	Engineering and Procurement
AF2-154	Dickerson H2 CT 230 kV	Active
AG1-063	Fairhaven 13,8 kV	Active
AG1-104	Waugh Chapel 230 kV	Active
AG1-290	Wagner 115 kV	Active
AG1-470	Ringgold 69 kV	Active
AG1-483	Dickerson 230 kV	Active
V2-037	White Oak	In Service
W1-116	Emmitsburg 34kV	In Service
X4-046	E Street (Sub 18) 13kV	In Service

9.8 Contingency Descriptions

Contingency Name	Contingency Definition
PEPCO_P1_PP1	CONTINGENCY 'PEPCO_P1_PP1' OPEN BRANCH FROM BUS 223937 TO BUS 223938 CKT 1 / 223937 DICK 230 230 223938 DICKH230 230 1 END
PEPCO_P1_PP2	CONTINGENCY 'PEPCO_P1_PP2' OPEN BRANCH FROM BUS 223937 TO BUS 223938 CKT 2 / 223937 DICK 230 230 223938 DICKH230 230 2 END
PP7	CONTINGENCY 'PP7' /* DICKERSON DISCONNECT BRANCH FROM BUS 223937 TO BUS 314290 CKT 1 /* DICKERSN 8EDFERRY 230 230 DISCONNECT BRANCH FROM BUS 223937 TO BUS 223938 CKT 1 /* DICKERSN STATIONH 230 230 END

10 Short Circuit Analysis

The following Breakers are overdutied:

None

10.1 System Reinforcements - Short Circuit

None

11 Affected Systems

None