



**Generation Interconnection
Feasibility Study Report
for
Queue Project AF2-116
MCCONNELLSBURG 138 KV
13.3 MW Capacity / 20 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 West Penn Power (APS Zone).

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 an uprate to a planned/existing Solar generating facility located in Fulton, Pennsylvania. This project is an increase to the Interconnection Customer's AD2-009 project, which will share the same point of interconnection. The AF2-116 queue position is a 20 MW uprate (13.3 MW Capacity uprate) to the previous project. The total installed facilities will have a capability of 90 MW with 61.4 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this uprate project is March 01, 2022. This study does not imply a TO commitment to this in-service date.

Queue Number	AF2-116
Project Name	MCCONNELLSBURG 138 KV
State	Pennsylvania
County	Fulton
Transmission Owner	West Penn Power (APS Zone)
MFO	90
MWE	20
MWC	13.3
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

The AF2-116 project is an uprate to the proposed AD2-009 project and the Point of Interconnection will remain unchanged. The IC will not incur any connection facility upgrade costs for this project as long as both projects are constructed concurrently.

Attachment 1 shows a one-line diagram of the proposed primary Direct Connection facilities for the AF2-116 generation project to connect to the FirstEnergy (“FE”) Transmission System. The IC will be responsible for constructing the facilities on its side of the POI, including the Attachment Facilities which connect the generator to the FE Transmission System’s Direct Connection facilities.

5 Cost Summary

The AF2-116 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	\$ 0

Description	Total Cost
Total Transmission Owner Analysis Impacts (<100 kV/Non-BES)	\$ 3,600,000 ¹
Total System Network Upgrade Costs	\$ 0
Total Costs	\$ 3,600,000

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 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.

6 Transmission Owner Scope of Work

No Transmission Owner scope of work required.

7 Schedule

The project is an upgrade to the proposed AD2-009 project and the point of interconnection will remain unchanged. There is no Attachment Facilities or Direct and/or Non-Direct Connection facilities scope of work.

If the customer is ultimately responsible for any network upgrades, then the schedule for those upgrades will be refined in future study phases. The customer would need to wait for those upgrades to be completed prior to commercial operation unless determined deliverable by an interim deliverability study.

8 Transmission Owner Analysis

FE performed an analysis of its underlying transmission <100 kV system. At the Primary POI, the AF2-116 project contributes to overloads on the FE Transmission <100 kV System as shown below. The estimated cost of system reinforcements necessary to mitigate these overloads may be allocated to AF2-116 if previous queue projects withdraw.

These Transmission Owner identified overloads will be reviewed by PJM and FirstEnergy in the Impact Study phase to determine whether the queue customer has a cost responsibility to these overloads.

¹ The transmission owner identified overloads will be reviewed by PJM and FirstEnergy in the Impact Study phase to determine whether the queue customer has a cost responsibility to these overloads.

Contingency Description	Overloaded Element	Rating (MVA)	[QUEUE] MW Contrib.	FE Comments/Reinforcements	Cost
Texas Eastern 6 - AE1-101 138 kV line	Warfordsburg - Hancock 34.5 kV line	22	1.16	Reconductor 4.8 miles of the Warfordsburg - Hancock 34.5 kV line. Project Type: FAC Time Estimate: 18 months Overload Contributors: AF1-131 - 5.76 MW AF1-136 - 5.6 MW AF2-116 - 1.16 MW Note: AF1-131 is currently responsible for the full cost of this project. AF2-116 may be responsible for costs if AF1-131 withdraws.	\$2,880,000
Guilford #1 138/34.5 kV transformer or the loss of the Guilford #2 138/69 kV transformer	Route 16 - Milnor 34.5 kV line	36	2.06	Reconductor 1.2 miles on the Milnor - Route 16 34.5 kV line Project Type: FAC Time Estimate: 12 months Overload Contributors: AE1-101 - 15.43 MW AE1-132 - 8.74 MW AE1-188 - 1.19 MW AE2-054 - 5.82 MW AF1-166 - 1.44 MW AF1-209 - 1.43 MW AF1-224 - 0.71 MW AF2-116 - 2.06 MW Note: AE1-101 is currently responsible for the full cost of this project. AF2-116 may be responsible for costs if AE1-101 withdraws.	\$720,000

9 Interconnection Customer Requirements

9.1 System Protection

The IC must design its Customer Facilities in accordance with all applicable standards, including the standards in FE's "Requirements for Transmission Connected Facilities" document located at:

<http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx>.

Preliminary Protection requirements will be provided as part of the Facilities Study. Detailed Protection Requirements will be provided once the project enters the construction phase.

9.2 Compliance Issues and Interconnection Customer Requirements

The proposed Customer Facilities must be designed in accordance with FE's "Requirements for Transmission Connected Facilities" document located at: <http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx>. In particular, the IC is responsible for the following:

1. The purchase and installation of a fully rated 138 kV circuit breaker to protect the AF2-116 generator lead line. A single circuit breaker must be used to protect this line; if the project has several GSU transformers, the individual GSU transformer breakers cannot be used to protect this line.
2. The purchase and installation of the minimum required FE generation interconnection relaying and control facilities. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.
3. The purchase and installation of supervisory control and data acquisition (“SCADA”) equipment to provide information in a compatible format to the FE Transmission System Control Center.
4. Compliance with the FE and PJM generator power factor and voltage control requirements.
5. The execution of a back-up service agreement to serve the customer load supplied from the AF2-116 generation project metering point when the units are out-of-service. This assumes the intent of the IC is to net the generation with the load.

The IC will also be required to meet all PJM, ReliabilityFirst, and NERC reliability criteria and operating procedures for standards compliance. For example, the IC will need to properly locate and report the over and under voltage and over and under frequency system protection elements for its units as well as the submission of the generator model and protection data required to satisfy the PJM and ReliabilityFirst audits. Failure to comply with these requirements may result in a disconnection of service if the violation is found to compromise the reliability of the FE Transmission System.

9.3 Power Factor Requirements

The IC shall design its non-synchronous Customer Facility with the ability to maintain a power factor of at least 0.95 leading (absorbing VARs) to 0.95 lagging (supplying VARs) measured at the high-side of the facility substation transformer(s) connected to the FE Transmission System.

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 Meteorological Data Reporting Requirements

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

- Back panel temperature (Fahrenheit)
- Irradiance (Watts/meter²)
- Ambient air temperature (Fahrenheit) - (Accepted, not required)
- Wind speed (meters/second) – (Accepted, not required)
- Wind direction (decimal degrees from true north) – (Accepted, not required)

10.3 Interconnected Transmission Owner Requirements

The IC will be required to comply with all FE revenue metering requirements for generation interconnection customers which can be found in FE’s “Requirements for Transmission Connected Facilities” document located at: <http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx>.

11 Summer Peak - Load Flow Analysis

The Queue Project AF2-116 was evaluated as a 20.0 MW (Capacity 13.3 MW) uprate to AD2-009 at the McConnellsburg 138 kV substation in the APS area. Project AF2-116 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-116 was studied with a commercial probability of 100.0 %. 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
100536952	235189	01GUILFD	138.0	AP	235187	01GRANDP	138.0	AP	1	AP-P1-2-WP-138-109	operation	228.0	109.75	113.43	DC	8.39
100536932	235453	01CHERYR	138.0	AP	235517	01HARMNY	138.0	AP	1	AP-P1-3-WP-138-056	operation	229.0	118.56	123.72	DC	11.82

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

None

11.6 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

11.7 Contingency Descriptions

Contingency Name	Contingency Definition
AP-P1-3-WP-138-056	CONTINGENCY 'AP-P1-3-WP-138-056' /* GUILFORD #1 138/34.5KV AND #2 138/69KV XFMR DISCONNECT BRANCH FROM BUS 235189 TO BUS 237333 CKT 2 /* 01GUILFD 138 01GUILFORD 69 DISCONNECT BRANCH FROM BUS 235189 TO BUS 237421 CKT 1 /* 01GUILFD 138 01GUILFORD 35 DISCONNECT BRANCH FROM BUS 235189 TO BUS 237010 CKT ZB /* 01GUILFD 138 01GUILFD CAP138 DISCONNECT BRANCH FROM BUS 235189 TO BUS 235725 CKT 1 /* 01GUILFD 138 01GLFNUG 138 DISCONNECT BRANCH FROM BUS 235189 TO BUS 235285 CKT 1 /* 01GUILFD 138 01TEX E6 138 DISCONNECT BRANCH FROM BUS 235189 TO BUS 235136 CKT 1 /* 01GUILFD 138 01ANTRIM 138 REDUCE BUS 237010 SHUNT BY 100 PERCENT /* 01GUILFD CAP138 DISCONNECT BUS 237010 /* 01GUILFD CAP138 DISCONNECT BUS 235723 /* 01GUILF1 14 DISCONNECT BUS 235724 /* 01GUILF2 14 DISCONNECT BRANCH FROM BUS 235189 TO BUS 235187 CKT 1 /* 01GUILFD 138 01GRANDP 138 END
AP-P1-2-WP-138-109	CONTINGENCY 'AP-P1-2-WP-138-109' /* GUILFORD - REID 138KV DISCONNECT BRANCH FROM BUS 235189 TO BUS 235136 CKT 1 /* 01GUILFD 138 01ANTRIM 138 DISCONNECT BRANCH FROM BUS 235136 TO BUS 235503 CKT 1 /* 01ANTRIM 138 01REID 138 REMOVE LOAD 1 FROM BUS 235136 /* 01ANTRIM 138 END

12 Short Circuit Analysis

Short circuit analysis will be provided in the System Impact Study report.

13 Affected Systems

13.1 NYISO

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

14 Attachment 1: One Line Diagram