



**Generation Interconnection
Feasibility Study Report
for
Queue Project AF2-033
MIAMI FORT 138 KV
8 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 DEOK.

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.

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 an uprate to a planned/existing Storage generating facility located in Hamilton, Ohio. This project is an increase to the Interconnection Customer's NQ143 project. The AF2-033 queue position is a 20 MW uprate (8 MW Capacity uprate) to the previous project. The proposed in-service date for this uprate project is June 01, 2021. This study does not imply a TO commitment to this in-service date.

Project AF2-033 is a request by the Interconnection Customer that proposes a 20 MW battery storage to be built near the Miami Fort GT substation. The IC will be responsible to build the generator lead from this site to the IC owned side of disconnect 823 in the Miami Fort GT yard. The Interconnection Customer proposed in-service date for this project is June 01, 2021. **This study does not imply a Duke Energy commitment to this in-service date.**

| | |
|----------------------------|-------------------|
| Queue Number | AF2-033 |
| Project Name | MIAMI FORT 138 KV |
| State | Ohio |
| County | Hamilton |
| Transmission Owner | DEOK |
| MFO | 1076 |
| MWE | 20 |
| MWC | 8 |
| 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

AF2-033 will interconnect with the Duke Energy transmission system via the existing interconnection point that the Interconnection Customer currently owns at the Miami Fort GT 138 kV station. As such, no new points of interconnection will be made upon energization of the AF2-033 generator.

5 Cost Summary

The AF2-033 project will be responsible for the following costs:

Duke Energy facilities and network upgrades costs required to support the AF2-033 project are listed below. Please note this is a class 5 estimate, with a band range of (-50% to +100 %). It is also assumed there will be no issues obtaining Transmission Line easement for station power.

| Description | Total Cost |
|---|-------------------|
| Total Physical Interconnection Costs | \$ 252,235 |
| Total System Network Upgrade Costs | \$ 0 |
| Total Costs | \$ 252,235 |

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

The total physical interconnection costs is given in the tables below:

6.1 Attachment Facilities

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 |
|--|-------------------|
| The attachment facilities will include but are not limited to 3 new metering grade CT's, 2 CT junction boxes, required control cables from the IC's breaker and the two transformers at Miami Fort GT, and the necessary conduit for the control cables. | \$ 252,235 |
| Total Attachment Facility Costs | \$ 252,235 |

6.2 Direct Connection Cost Estimate

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 |
|---|------------|
| None | \$0 |
| Total Direct Connection Facility Costs | \$0 |

6.3 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 |
|---|------------|
| None | \$0 |
| Total Non-Direct Connection Facility Costs | \$0 |

7 Transmission Owner Analysis

A Summer Peak 2024 load flow study was performed evaluating AF2-033 for compliance with applicable reliability planning criteria (NERC, NERC Regional Reliability Council, and Transmission Owner). AF2-033 was studied as a 20 MW injection onto the Miami Fort GT 138 kV bus. No underlying impacts were found during this phase of the generator interconnect process.

8 Schedule

The estimated time to complete this work is approximately 15 months from a signed ISA and ICSA. This assumes no issues getting right of way, a PJM outage on the line or adjacent line on tower, and no major interruptions for weather.

9 Interconnection Customer Requirements

Interconnection Customer will be required to engineer, procure, and construct the connecting circuit from the Interconnection Customer's substation to the Point of Interconnection (POI) that the Interconnection Customer currently has with Duke Energy.

Any connecting circuit path that is on Duke Energy property is first to be reviewed and approved by Duke Energy.

Interconnection Customer will be responsible for meeting all criteria as specified in the applicable sections of the "Duke Energy Midwest transmission systems Facility Connection Requirements" document, Version 7, effective October 31, 2018, which can be found under this link:

<http://www.pjm.com/~media/planning/plan-standards/deok/deok-facility-connection-requirements.ashx>.

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 DEOK Requirements

The Interconnection Customer will be required to comply with all Duke Energy revenue metering requirements for generation interconnection customers. The revenue metering requirements may be found within the "Duke Energy Midwest transmission systems Facility Connection Requirements" document, Version 7, effective October 31, 2018.

10.3 Meteorological Data Reporting Requirements

Solar generation facilities 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)

10.4 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/>

11 Summer Peak - Load Flow Analysis

The Queue Project AF2-033 was evaluated as a 20.1 MW (Capacity 8.0 MW) injection as an uprate to NQ143 at the Miami Fort 138 kV substation in the DEOK area. Project AF2-033 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-033 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.

None

11.5 System Reinforcements - Summer Peak Load Flow

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".

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

None

12 Light Load Analysis

Light Load Studies (As applicable)

To be determined during later study phases.

13 Short Circuit Analysis

The following Breakers are overdutied:

To be determined during later study phases.

14 Stability and Reactive Power Assessment

(Summary of the VAR requirements based upon the results of the dynamic studies)

To be determined during later study phases.

15 Affected Systems

15.1 MISO

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

15.2 LG&E

LG&E Impacts to be determined during later study phases (as applicable).