# *Generation Interconnection Feasibility Study Report*

# *For*

# *PJM Generation Interconnection Request Queue Position AB2-155*

# *Richland-Stryker 115kV*

**August 2016**

# 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. 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.

# General

The Interconnection Customer (IC), has proposed an uprate to an existing natural gas generating facility located in Defiance, Ohio. This projects requests an increase to the install capability of 25 MW with 25 MW of this output being recognized by PJM as capacity. The installed facilities will have a total capability of 379 MW with 379 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is June 1, 2017. **This study does not imply a ATSI commitment to this in-service date.**

## Point of Interconnection

AB2-155 will interconnect with the ATSI transmission system at the Richland 115kV substation.

## Cost Summary

The AB2-155 project will be responsible for the following costs:

| Description | Total Cost |
|---|---|
| Attachment Facilities | $ 0 |
| Direct Connection Network Upgrades | $ 0 |
| Non Direct Connection Network Upgrades | $ 0 |
| **Total Costs** | **$ 0** |

In addition, the AB2-155 project may be responsible for a contribution to the following costs:

| Description | Total Cost |
|---|---|
| New System Upgrades | $ 18,826,700 |
| Previously Identified Upgrades | $ 0 |
| **Total Costs** | **$ 18,826,700** |

Cost allocations for these upgrades will be provided in the System Impact Study Report.

## Attachment Facilities

No Attachment Facilities are required to support this interconnection request.

## Direct Connection Cost Estimate

No Direct Connection Facilities are required to support this interconnection request.

## Non-Direct Connection Cost Estimate

No Non-Direct Connection Facilities are required to support this interconnection request.

## Transmission Owner Scope of Work

There are no direct connection requirements for this interconnection since the AB2-155 project only deals with a capacity increase with no modification of the transmission connection. First Energy (FE), however, identified network reinforcements that are necessary to be completed before the customer generation is to be delivered.

FE is proposing network reinforcements to mitigate the identified overloads; the costs for the reinforcement is provided in Attachment 5b. The reinforcement will take 18 months to complete from the date of receipt of a signed CSA; therefore, the Interconnection Customer's proposed in-service date of June 1, 2017 may not be achievable.

## Interconnection Customer Requirements

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 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.

2. The Interconnection Customer may be required to install and/or pay for metering as necessary to properly track real time output of the facility as well as installing metering which shall be used for billing purposes. See Section 8 of Appendix 2 to the Interconnection Service Agreement as well as Section 4 of PJM Manual 14D for additional information.

# Revenue Metering and SCADA Requirements

## 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 Sections 24.1 and 24.2.

## First Energy Requirements

The Interconnection Customer will be required to comply with all FE Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "FirstEnergy Requirements for Transmission Connected Facilities" document located at the following links:

http://www.firstenergycorp.com/feconnect
http://www.pjm.com/planning/design-engineering/to-tech-standards.aspx

# Network Impacts

The Queue Project AB2-155 was evaluated as a 25.0 MW (Capacity 25.0 MW) uprate to the Richland substation in the ATSI area. Project AB2-155 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AB2-155 was studied with a commercial probability of 53%. Potential network impacts were as follows:

## ‘Summer Peak Analysis - 2020

### Contingency Descriptions

The following contingencies resulted in overloads:

| Contingency Name | Description |
|---|---|
| C1-TE-138-003 | CONTINGENCY 'C2-TE-138-003' /* RICHLAND 13245 BREAKER (NAOMI)<br><br>DISCONNECT BUS 239064 /* 02RICHG1 13<br>DISCONNECT BUS 240893 /* 02RCHLN 34 35<br>DISCONNECT BUS 240868 /* 02HLGATE34 35<br>DISCONNECT BUS 240878 /* 02MAROE 34 35<br>DISCONNECT BUS 239067 /* 02RICHG4 14<br>DISCONNECT BUS 239068 /* 02RICHG5 14<br>DISCONNECT BUS 239069 /* 02RICHG6 14<br>/* DISCONNECT BUS 238785 /* 02JOHNMAN-2 138<br>/* DISCONNECT BUS 238516 /* 02JOHNMANDEF138<br>/* DISCONNECT BUS 238659 /* 02DEFISW 138<br>DISCONNECT BUS 238512 /* 02GMC-K 138<br>DISCONNECT BUS 239070 /* 02RICHLD 138<br>DISCONNECT BUS 238521 /* 02NAOMI 138<br>END |
| C2-TE-138-002 | CONTINGENCY 'C2-TE-138-002' /* RICHLAND 13249 BREAKER (LJ TIE)<br><br>DISCONNECT BUS 239065 /* 02RICHG2&3 13<br>DISCONNECT BUS 238522 /* 02RCHLN 69<br>/* DISCONNECT BUS 238556 /* 02AYERSV 138<br>DISCONNECT BUS 238511 /* 02GMC-J 138<br>DISCONNECT BRANCH FROM BUS 239269 TO BUS 239070 CKT ZB /* 02RICHLJ 138 02RICHLD 138<br>/* DISCONNECT BUS 242993 /* 05E.LPSC 138<br>DISCONNECT BUS 239269 /* 02RICHLJ 138<br>END |

| Contingency Name | Description |
|---|---|
| C2-TE-138-005 | CONTINGENCY 'C2-TE-138-005' /* RICHLAND 13246 BREAKER (RIDGEVILLE)<br><br>DISCONNECT BUS 239061 /* 02RDGVL+ 138<br>REDUCE BUS 239269 SHUNT BY 100 PERCENT /* 02RICHLJ 138<br>DISCONNECT BUS 239065 /* 02RICHG2&3 13<br>DISCONNECT BUS 238522 /* 02RCHLN 69<br>DISCONNECT BUS 239060 /* 02RDGVL 138<br>DISCONNECT BRANCH FROM BUS 239269 TO BUS 242993 CKT 1 /* 02RICHLJ 138 05E.LPSC 138<br>DISCONNECT BRANCH FROM BUS 239269 TO BUS 238511 CKT 1 /* 02RICHLJ 138 02GMC-J 138<br>DISCONNECT BUS 238511 /* 02GMC-J 138<br>/* DISCONNECT BUS 238556 /* 02AYERSV 138<br>DISCONNECT BUS 239269 /* 02RICHLJ 138<br>END |

## Generator Deliverability

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

None.

## Multiple Facility Contingency

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

| | Contingency | | Affected | | Bus | | | Power | Loading % | | Rating | | MW | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | Type | Name | Area | Facility Description | From | To | Circuit | Flow | Initial | Final | Type | MVA | Contribution | Ref |
| 1 | LFFB | C2-TE-138-002 | FE | 02RICHLD-02NAOMI 138 kV line | 239070 | 238521 | 1 | DC | 98.48 | 105.48 | ER | 194 | 13.58 | 1 |
| 2 | BUS | C1-TE-138-003 | FE | 02RICHLD-02NAOMI 138 kV line | 239070 | 238521 | 1 | DC | 98.22 | 105.22 | ER | 194 | 13.58 | |
| 3 | LFFB | C2-TE-138-005 | FE | 02RICHLD-02NAOMI 138 kV line | 239070 | 238521 | 1 | DC | 93.94 | 100.94 | ER | 194 | 13.58 | |

*Note: Please see Attachment 3 for projects providing impacts to flowgate violations. The values in the Reference column correspond to the proper table in the Attachment.*

## 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.

## Short Circuit

*(Summary of impacted circuit breakers)*

None.

## 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.*

None.

## New System Reinforcements

*(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)*

| Violation # | Overloaded Facility | Upgrade Description | Network Upgrade Number | Upgrade Cost |
|---|---|---|---|---|
| #1, 2, 3 | | In order to mitigate the overloads of facilities above, the following reinforcements are required:<br>• Reinforcement: Reconductor Richland-Naomi Junction line segment (Richland Substation to Structure 215 of Richland-Midway-Wauseon 138 kV line) with 336.4 ACSS 26/7 conductor from existing 336.4 ACSR 30/7 conductor.<br>The estimated cost is $18,826,700, and it will take 18 months to complete. | To be provided in the Impact Study | $ 18,826,700 |
| | | | **Total New Network Upgrades** | **$ 18,826,700** |

## Contribution to Previously Identified System Reinforcements

*(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)*

None.

## Attachment 1. Flowgate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact.

It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

# Appendix 1

(FE - FE) The 02RICHLD-02NAOMI 138 kV line (from bus 239070 to bus 238521 ckt 1) loads from 98.48% to 105.48% (**DC power flow**) of its emergency rating (194 MVA) for the line fault with failed breaker contingency outage of 'C2-TE-138-002'. This project contributes approximately 13.58 MW to the thermal violation.

| Bus Number | Bus Name | Full Contribution |
|---|---|---|
| 239064 | 02RICHG1 | 1.17 |
| 239067 | 02RICHG4 | 12.59 |
| 239068 | 02RICHG5 | 12.59 |

| Bus Number | Bus Name | Full Contribution |
|---|---|---|
| 239069 | 02RICHG6 | 12.59 |
| 247928 | R-048 E | 3.54 |
| 924991 | AB2-155 | 13.58 |