# *Generation Interconnection System Impact Study Report*

# *For*

# *PJM Generation Interconnection Request Queue Position AC2-088*

# *South Bethel-Brown 69 kV*

***March 2017***

# Preface

The intent of the System Impact Study is to determine a plan, with approximate cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications (on PJM web site) for the appropriate transmission owner.

In some instances an Interconnection Customer may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection or merchant transmission upgrade, 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 System Impact Study is performed.

The System Impact 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

Lendlease Energy Development, LLC ("Interconnection Customer") has proposed a 70 MW solar photovoltaic generating facility located near Leonard Road, Brown County, Ohio. For the AC2-088 project, PJM recognizes 38.4 MW as Capacity Interconnection Rights. The proposed in-service date for this project is May 31, 2019. **This study does not imply a Duke Energy ("Transmission Owner") commitment to this in-service date.**

# Point of Interconnection

AC2-088 will interconnect with the Duke Energy sub-transmission system by tapping the South Bethel-Brown 69 kV line via a new 69 kV switching substation configured as a three breaker ring bus and is located adjacent to the 69 kV line. Please refer to Appendix 2 for a one-line diagram of the interconnection.

## Costs Summary and Transmission Owner Scope of Work

Duke Energy facilities and network upgrades required to support the AC2-088 project are:

(a) Attachment Facilities: .....$82,785

Duke Energy will install a revenue metering package, a take-off structure, and overhead conductors from the new substation to the Interconnection Customer's pole mounted switch.

(b) Direct Connection Network Upgrades: .....$4,381,692

Duke Energy will build a new 69 kV substation on Interconnection Customer supplied land. The substation will include, but is not limited to, a three breaker ring bus configuration, three 69 kV breakers, nine disconnect switches, relaying, metering, control building, two take-off structures, lighting, fencing, gravel, and foundations as necessary to form a complete substation installation. Duke Energy will install overhead conductors from the new substation to the Interconnect Customer's pole mounted switch.

Duke Energy will reconfigure the South Bethel to Brown 69 kV feeder to loop though the new substation and rework the distribution underbuild on that feeder path to allow for the new substation.

(c) Non-Direct Connection Network Upgrades: $ 0.0

(d) Direct Connection Local Upgrades: $ 0.0

(e) Non-Direct Connection Local Upgrades: $ 0.0

(f) Option to Build Upgrades: $ 0.0

***Estimated Total Costs (a) to (f):*** .....***$ 4,464,477***

NOTE: CIAC Tax Gross Up charges will be added to above costs if the project does not meet the eligibility requirements of IRS Notice 88-129.

# Interconnection Customer Requirements

Interconnection Customer will be required to procure and provide land for the new substation. The land will be ceded to Duke Energy prior to construction of the new substation. The land must be near the South Bethel - Brown 69 kV feeder path and have direct access to publically maintained roadway. The land shall be environmentally permitted, graded and ready for construction. The area required is approximately 310 feet by 210 feet. Final size and location is to be approved by Duke Energy.

Interconnection Customer will be required to engineer, procure, and construct the connecting circuit from the Interconnection Customer's substation to the Point of Interconnection. This includes, but is not limited to, a pole and switch to be installed approximately 25 feet outside the new substation fence.

Interconnection Customer will be responsible for meeting all criteria as specified in the applicable sections of the Duke Energy "Requirements for Connection of Facilities to the Duke Energy MIDWEST Transmission System" document, Version 6, effective January 31, 2014, which can be found under this link:

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

# 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.

## Duke Energy 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 "Requirements for Connection of Facilities to the Duke Energy MIDWEST Transmission System" document, Version 6, effective January 31, 2014.

# Network Impacts

The Queue Project AC2-088 was evaluated as a 70.0 MW (Capacity 38.4 MW) injection into a tap of the South Bethel – T58631 69 kV segment (part of the South Bethel – Brown 69 kV line) in the DEOK area. Project AC2-088 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AC2-088 was studied with a commercial probability of 100%. Potential network impacts were as follows:

## Summer Peak Analysis - 2020

**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)*

None

**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

**Steady-State Voltage Requirements**

None

**Short Circuit**

None

**Delivery of Energy Portion of Interconnection Request**

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.
Only the most severely overloaded conditions are listed. 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 will study all overload conditions associated with the overloaded element(s) identified.

None

## Light Load Analysis - 2020

Light Load Studies to be conducted during later study phases (as required by PJM Manual 14B).

## System Reinforcements

### Short Circuit

None

### Stability and Reactive Power Requirement

None

## Summer Peak Load Flow Analysis Reinforcements

### New System Reinforcements

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

None

### 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

## Light Load Load Flow Analysis Reinforcements

### New System Reinforcements

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

None

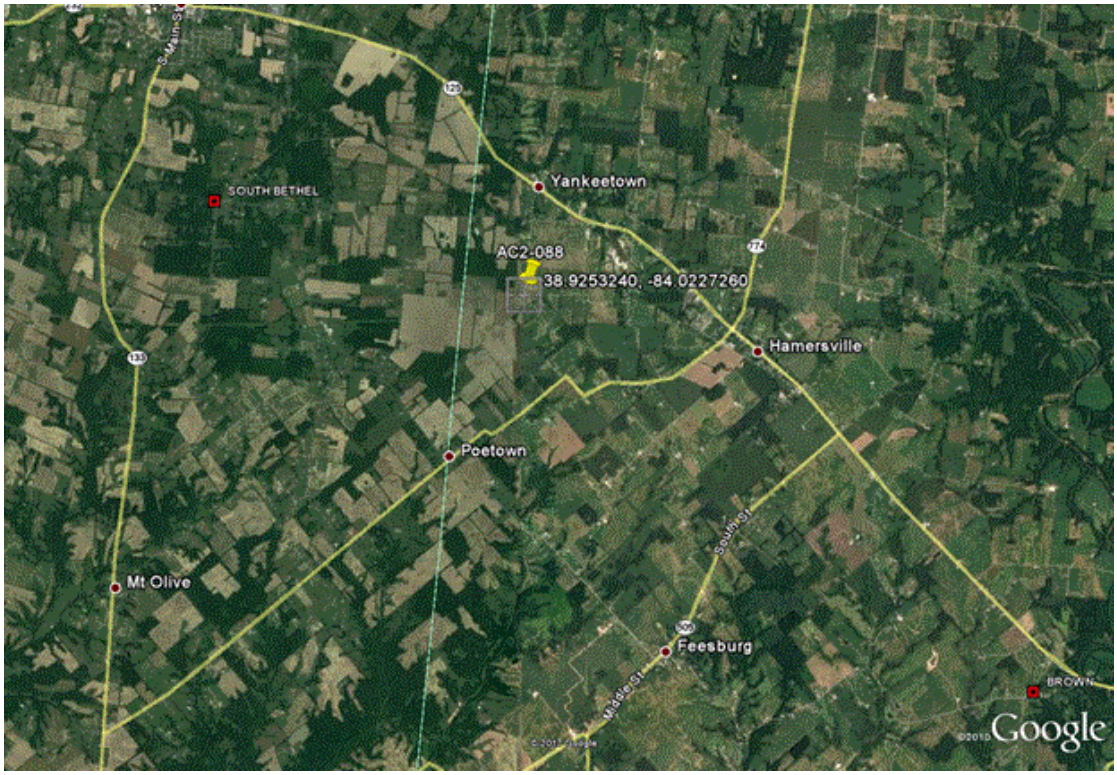
### Contribution to Previously Identified System Reinforcements

*(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

# Appendix 1

## Facility Location
## PJM Queue Position: AC2-088



# Appendix 2

Interconnection One-Line Diagram
PJM Queue Position: AC2-088