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March 27, 2015

Ms. Barcy McNeal
Administration/Docketing
Public Utilities Commission of Ohio
180 East Broad Street, 11th Floor
Columbus, OH 43215-3793

Re: Clean Energy Future-Lordstown, LLC,
OPSB Case No. 14-2322-EL-BGN

Dear Ms. McNeal:

Enclosed is an update to the Application of Clean Energy Future-Lordstown, LLC, a limited liability company, for a Certificate of Environmental Compatibility and Public Need for an Electric Generating Facility within the Lordstown Industrial Park, Trumbull County, Ohio, under Chapter 4906-13 of the Ohio Administrative Code (OAC).

Please do not hesitate to contact me with any questions.

Sincerely on behalf of
CLEAN ENERGY FUTURE-LORDSTOWN, LLC

Sally W. Bloomfield

Attachment

Generation Interconnection
System Impact Study Report

For

PJM Generation Interconnection Request Queue
Position Z2-028

Highland – Sammis 345kV
And
Highland – Mansfield 345kV

March 2015

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

The Interconnection Customer (IC), Clean Energy Future-Lordstown, LLC, is proposing to install an 800 MW natural gas facility to be located in Trumbell County, OH and has requested to be studied as an 800 MW Energy (800MW Capacity) resource interconnecting into the ATSI area. The IC has proposed in-service date is for April 29, 2019. **Impacts on the MISO member transmission systems will be done as a part of the Facilities Study phase, which may reveal new upgrades required for this project to be put in service.**

The intent of the System Impact Study is to determine system reinforcements and associated costs and construction time estimates required to facilitate the addition of the new generating plant to the transmission system. The reinforcements include the direct connection of the generator to the system and any network upgrades necessary to maintain the reliability of the transmission system.

Point(s) of Interconnection

Z2-028 will interconnect to two lines simultaneously at Highland – Sammis 345kV and Highland – Mansfield 345kV. It is expected to take a minimum of **48 months** from the date of a fully executed Interconnection Construction Service Agreement to complete all ATSI upgrades for project Z2-028.

The following assumptions were made when making these cost/time estimates:

- Interconnection Customer to provide all right-of-way, permits, easements, etc.
- No environmental issues
- No delays in acquiring necessary permits
- All system outages will be allowed when requested.

Interconnection Facilities

To accommodate this interconnection, a new five breaker ring bus, loops to both Highland – Mansfield and Highland – Sammis 345kV lines from proposed ring bus, installation of fiber from project Z2-028 to Highland substation and remote end relaying work is required. It will cost approximately **$19,538,500** (add **$4,718,800** tax, if applicable, for a total of **$24,257,300**) to complete these upgrades and take approximately **25 months** to complete this work. The single line is shown below in **Figure 1**.

The IC is required to construct all connection facilities in accordance with the ATSI published standards.

Direct Connection/Attachment Facilities Cost Estimate

The total preliminary cost estimate for Direct Connection/Attachment Facilities work is given in the following tables below.

For ATSI building Direct Connection/Attachment Facilities cost estimates:

Table 1. Direct Connect/Attachment Facilities Cost Estimate			
Description	**Total Cost**	**Tax**	**Total with Tax**
Install new 345kV five-breaker ring bus substation to interconnect Z2-028 (PJM Network Upgrade Number n**4387**).	$11,914,300	$2,877,400	$14,791,700
Loop in new five-breaker ring bus substation to Highland – Mansfield and Highland – Sammis 345kV lines: each approximately 900 ft. in length, utilizing steel pole structures (PJM Network Upgrade Number n**4388**).	$7,303,000	$1,763,700	$9,066,700
Total	**$19,217,300**	**$4,641,100**	**$23,858,400**

Non-Direct Connection Cost Estimate

The total preliminary cost estimate for Non-Direct Connection work is given in the following table below:

For ATSI building Non-Direct Connection cost estimates:

Table 2. Non-Direct Connect Cost Estimate			
Description	**Total Cost**	**Tax**	**Total with Tax**
Upgrade Highland 345kV substation line relaying to new Z2-028 interconnection bus (PJM Network Upgrade Number n**4389**).	$213,300	$51,600	$264,900
Install approximately 1.23 miles of fiber from Z2-028 Interconnection substation to Highland 345kV substation (PJM Network Upgrade Number n**4390**).	$107,900	$26,100	$134,000
Total	**$321,200**	**$77,700**	**$398,900**

In addition to the ATSI facilities, Clean Energy Future-Lordstown, LLC will also be responsible for meeting all criteria as specified in the applicable sections of the FE "Requirements for Transmission Connected Facilities" document including:

1. The purchase and installation of fully rated 345 kV circuit breakers to permit tripping of each entire unit.

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. The establishment of dedicated communication circuits for SCADA to the FE Transmission System Control Center.

5. A compliance with the FE and PJM generator power factor and voltage control requirements.

6. The execution of a back-up service agreement to serve the customer load supplied from the Highland-Sammis-Mansfield 345 kV (Z2-028) generation project metering point when the units are out-of-service. This assumes the intent of Clean Energy Future-Lordstown, LLC is to net the generation with the load.

7. Clean Energy Future-Lordstown, LLC is responsible for the cost, engineering, equipment procurement, construction and maintenance of the 0.7 mile 345 kV line from the 5 CB Interconnection Substation to the Generation Substation (shown in Attachment 2).

The above requirements are in addition to any metering or other requirements imposed by PJM.

The following protection requirements are required by ATSI for this project:

Z2-028 345kV Interconnecting Ring Bus Substation

345kV Transmission Line Protection

- Highland #1 line exit
  - Primary relay: SEL-411L relay with line current differential protection over fiber
  - Backup relay: SEL-411L relay with line current differential protection over fiber
  - Fiber-optic cable path with dedicated fibers for use with the SEL-411L primary and backup relaying
    - Planning to determine if dual, independent paths necessary for stability purposes

- Highland #2 line exit
  - Primary relay: SEL-411L relay with line current differential protection over fiber
  - Backup relay: SEL-411L relay with line current differential protection over fiber
  - Fiber-optic cable path with dedicated fibers for use with the SEL-411L primary and backup relaying
    - Planning to determine if dual, independent paths necessary for stability purposes

- Mansfield line exit
  - Primary relay: SEL-421-5 directional comparison blocking line relaying operating over power line carrier (PLC) communications

        - Ametek/Pulsar UPLC on/off carrier set for use with directional comparison blocking line relaying.
        - CCVTs with carrier accessories in one phase and at least two secondary windings, line tuner, and wavetrap for use with PLC relaying
    - Backup relay: SEL-421-5 non-pilot direct tripping backup relay
        - Planning to determine if dual pilot protection is necessary for stability purposes

- Sammis line exit
    - Primary relay: SEL-421-5 directional comparison blocking line relaying operating over power line carrier (PLC) communications
        - Ametek/Pulsar UPLC on/off carrier set for use with directional comparison blocking line relaying.
        - CCVTs with carrier accessories in one phase and at least two secondary windings, line tuner, and wavetrap for use with PLC relaying
    - Backup relay: SEL-421-5 non-pilot direct tripping backup relay
        - Planning to determine if dual pilot protection is necessary for stability purposes

- Z2-028 Generating Station line exit
    - Primary relay: SEL-411L relay with line current differential protection over fiber
    - Backup relay: SEL-411L relay with line current differential protection over fiber
    - Dual, independent fiber-optic cable paths with dedicated fibers for use with the SEL-411L primary and backup relaying

345kV Breaker Failure to Trip Protection

- 345kV Breaker Failure to Trip Relaying
    - SEL-501 breaker failure to trip relaying (1 on each 345kV breakers). The breaker failure to trip relaying on the Z2-028, Highland #1, and Highland #2 line exit breakers shall initiate direct transfer trip via the SEL-411L relays (fiber).

<u>Z2-028 345kV Generating Station</u>

345kV Transmission Line Protection

- Z2-028 Interconnecting Station line exit
    - Primary relay: SEL-411L relay with line current differential protection over fiber
    - Backup relay: SEL-411L relay with line current differential protection over fiber

345kV Breaker Failure to Trip Protection

- 345kV Breaker Failure to Trip Relaying
    - SEL-352-2 breaker failure to trip relaying on each of four 345kV breakers (one line and three Unit). The breaker failure to trip relaying on the Z2-028 Interconnecting Station line exit breaker shall initiate direct transfer trip via the SEL-411L primary and backup line relays (fiber).

345kV Bus & GSU Transformer Protection @ Z2-028 Generating Station (minimum protection to meet FE requirements)

- To be determined in a later study phase.

FE System Modifications

Highland 345kV Substation

345kV Transmission Line Protection

- Z2-028 Interconnecting Station line exit #1
  - Primary relay: SEL-411L relay with line current differential protection over fiber
  - Backup relay: SEL-411L relay with line current differential protection over fiber

- Z2-028 Interconnecting Station line exit #2
  - Primary relay: SEL-411L relay with line current differential protection over fiber
  - Backup relay: SEL-411L relay with line current differential protection over fiber

Sammis 345kV Substation

345kV Transmission Line Protection

- Z2-028 Interconnecting Station line exit
  - Primary relay: SEL-421-5 directional comparison blocking line relaying operating over power line carrier (PLC) communications
  - Backup relay: SEL-421-5 non-pilot direct tripping backup relay

Mansfield 345kV Substation

345kV Circuit Breaker Adequacy

- (11) 345kV circuit breakers have been identified by PJM as overdutied with the addition of Z2-028. This would necessitate replacing the existing 72kA breakers with 80kA breakers.

Revenue Metering and SCADA Requirements

For PJM: IC 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.

For ATSI: 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

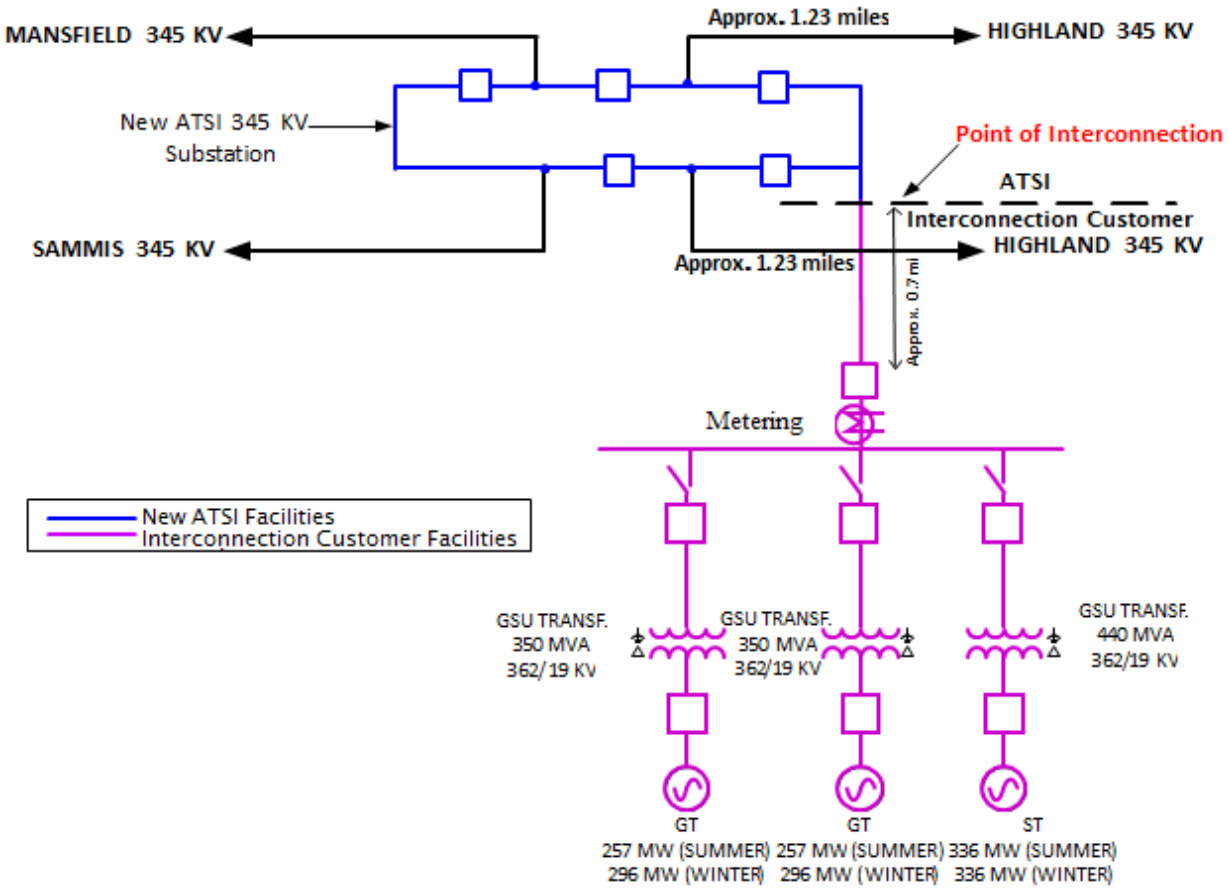

Figure 1. Single Line Diagram

Network Impacts

The Queue Project Z2-028 was studied as an 800.0 MW (800.0 MW Capacity) injection into a dual tap of the Highland – Mansfield 345 kV line and the Highland – Sammis 345 kV line in the ATSI area. Project Z2-028 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project Z2-028 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Summer Peak Analysis – 2018

Generator Deliverability

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

No violations were identified.

Multiple Facility Contingency

(Double Circuit Tower Line(DCTL), Line with Failed Breaker(LFFB) and Bus Fault(Bus) contingencies for the full energy output)

No violations were identified.

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)

No violations were identified.

Short Circuit

(Summary of impacted circuit breakers)

PJM has completed the short circuit analysis of the Z2-028 queue project Highland – Sammis 345kV and Highland – Mansfield 345kV. One option was considered during this study: the primary option was a double tap of the Highland – Sammis 345kV and Highland – Mansfield 345kV lines. PJM analysis found **11 breakers** to be over duty in the ATSI transmission area. The breakers are listed below:

Bus_NO	BUS	BREAKER	Duty % with Z2-028	Duty % without Z2-028	Duty % Difference	Duty Amps With Z2-028	Duty Amps Without Z2-028	Notes
9728	B.MNSFLD 345 345.kV	BVLY1-HOYT :	101.55%	98.63%	2.92%	73117	71012.8	New Overduty
9728	B.MNSFLD 345 345.kV	BVLY2-GEN1 :	101.55%	98.63%	2.92%	73117	71012.8	New Overduty
9728	B.MNSFLD 345 345.kV	CRESENT-S. B	101.55%	98.63%	2.92%	73117	71012.8	New Overduty
9728	B.MNSFLD 345 345.kV	GEN NO 1-N.	101.55%	98.63%	2.92%	73117	71012.8	New Overduty
9728	B.MNSFLD 345 345.kV	GEN NO 2-N.	101.55%	98.63%	2.92%	73117	71012.8	New Overduty
9728	B.MNSFLD 345 345.kV	GEN NO 3-N.	101.55%	98.63%	2.92%	73117	71012.8	New Overduty
9728	B.MNSFLD 345 345.kV	GEN2-CHAMB :	101.55%	98.63%	2.92%	73117	71012.8	New Overduty
9728	B.MNSFLD 345 345.kV	GEN3-S. BUS	101.55%	98.63%	2.92%	73117	71012.8	New Overduty
9728	B.MNSFLD 345 345.kV	HIGH-CRESCEN	101.55%	98.63%	2.92%	73117	71012.8	New Overduty
9728	B.MNSFLD 345 345.kV	HIGH-N. BUS	101.55%	98.63%	2.92%	73117	71012.8	New Overduty
9728	B.MNSFLD 345 345.kV	HOYT-N. BUS	101.55%	98.63%	2.92%	73117	71012.8	New Overduty

It will cost a total of **$10,671,700** (with an extra **$2,577,400** in tax for a total of **$13,249,100** if applicable) and will take approximately **48 months** to complete this work. Please see **Table 3** below for complete cost breakdown.

The following upgrades listed in **Table 3** will mitigate the overdutied breakers listed above:

Table 3. ATSI Breaker Replacement Cost Estimate			
Description	**Total Cost**	**Taxes**	**Total with Tax**
Replace BVLY1-HOYT : 345kV circuit breaker at Bruce Mansfield substation (PJM Network Upgrade Number n**4336.1**).	$969,700	$234,200	$1,203,900
Replace BVLY2-GEN1 : 345kV circuit breaker at Bruce Mansfield substation (PJM Network Upgrade Number n**4336.2**).	$969,700	$234,200	$1,203,900
Replace CRESENT-S. B 345kV circuit breaker at Bruce Mansfield substation (PJM Network Upgrade Number n**4337**).	$969,700	$234,200	$1,203,900
Replace GEN NO 1-N. 345kV circuit breaker at Bruce Mansfield substation (PJM Network Upgrade Number n**4338.1**).	$969,700	$234,200	$1,203,900
Replace GEN NO 2-N. 345kV circuit breaker at Bruce Mansfield substation (PJM Network Upgrade Number n**4338.2**).	$969,700	$234,200	$1,203,900
Replace GEN NO 3-N. 345kV circuit breaker at Bruce Mansfield substation (PJM Network Upgrade Number n**4338.3**).	$969,700	$234,200	$1,203,900
Replace GEN2-CHAMB : 345kV circuit breaker at Bruce Mansfield substation (PJM Network Upgrade Number n**4339.1**).	$969,700	$234,200	$1,203,900
Replace GEN3-S. BUS 345kV circuit breaker at Bruce Mansfield substation (PJM Network Upgrade Number n**4339.2**).	$969,700	$234,200	$1,203,900
Replace HIGH-CRESCEN 345kV circuit breaker at Bruce Mansfield substation (PJM Network Upgrade Number n**4339.3**).	$969,700	$234,200	$1,203,900
Replace HIGH-N. BUS 345kV circuit breaker at Bruce Mansfield substation (PJM Network Upgrade Number n**4340.1**)	$972,200	$234,800	$1,207,000
Replace HOYT-N. BUS 345kV circuit breaker at Bruce Mansfield substation (PJM Network Upgrade Number n**4340.2**)	$972,200	$234,800	$1,207,000
Total	**$10,671,700**	**$2,577,400**	**$13,249,100**

Steady-State Voltage Requirements

(Summary of VAR requirements based upon the results of the steady-state voltage studies)

None.

Light Load Analysis - 2018

(Summary of any reinforcements required to mitigate system reliability issues during light load periods.)

Not required.

Stability and Reactive Power Requirement

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

Stability will be performed as a part of the Facilities Study.

System 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.

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.

As a result of the aggregate energy resources in the area, no violations were identified.

Summary: Application Update to Application electronically filed by Teresa Orahood on behalf of Sally Bloomfield