

***PJM Generator Interconnection
V4-027 Quarryville 5 MW
Feasibility / Impact Study***

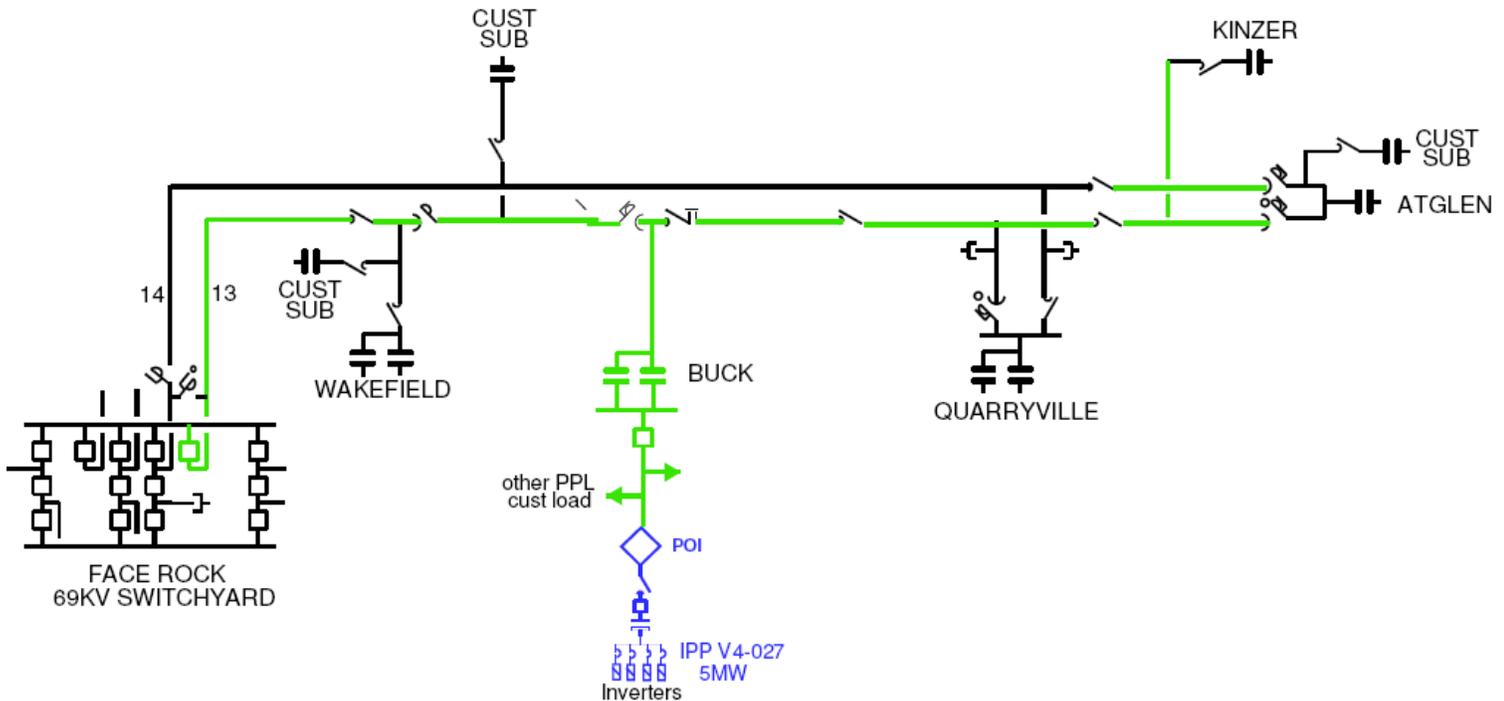
April 2010
Docs #590792

General

Queue V4-027 is a Community Energy Inc. / Lancaster Solar LLC request to interconnect a 5 MW Energy (1.9 MW Capacity) Resource consisting of a 5 MW ground array of photovoltaic panels. The new generation will be located at 1067 Lancaster Pike, Lancaster County, Quarryville Pennsylvania. Queue V4-027 has requested a December 1, 2010 in-service date. **This study does not imply a PPL EU commitment to this in-service date.**

Direct Connection

Queue V4-027 generation can be connected to the Buck 12 kV line #08-2 as shown on the single line diagrams below and Attachment 1.



POI = Point of Interconnection

The total estimated cost for PPL EU to construct the Queue V4-027 Direct Connection facilities is **\$228,000.00** and the estimated construction time is **9 months**.

V4-027 Interconnection Customer (Community Energy / Lancaster Solar LLC) Scope of Work

Queue V4-027 Interconnection Customer is responsible for design, construction and costs for all facilities associated with V4-027 on the Interconnection Customer side of the POI (Point of Interconnection) shown on the single line diagram of the previous page.

Protection Equipment:

The Interconnection Customer is required to install suitable protection and control equipment based on PPL EU's Applicable Standards for interconnection of parallel generation. This includes both Intertie Protective Relaying (IPR) and Point of Contact (POC) relaying. The PPL EU web site links for the IPR and POC requirements are shown below.

IPR Requirements:

<http://www.pplelectric.com/Business+Partners/Tools+and+Reference+Center/Customer-Owned+Generation/>

POC Requirements:

[http://www.pplelectric.com/NR/rdonlyres/B0937C7E-B6E9-40AD-AE8C-ED3C9558E528/0/point of contact r1.pdf](http://www.pplelectric.com/NR/rdonlyres/B0937C7E-B6E9-40AD-AE8C-ED3C9558E528/0/point%20of%20contact%20r1.pdf)

Direct Transfer Trip

Direct Transfer Trip (DTT) protection will be required for the proposed Queue V4-027 interconnection. Queue V4-027 generation will be tripped from Buck 69-12 kV substation for any condition that would cause the Buck 08-2 12kV line breaker to open or for loss of the 69 kV source to Buck 69/12 kV substation.

Queue V4-027 Interconnection Customer will be required to install radio or fiber based Direct Transfer Trip equipment (matching PPL Electric Utilities equipment) to Buck substation.

If the need arises to transfer V4-027 to an alternate source, for maintenance, restoration of service, or any other reason, V4-027 will be required to isolate from PPL's system temporarily. This is required since only the Buck 08-2 12 kV breaker is being modified to accept V4-027 generation.

SCADA Requirements:

PPL EU will require the installation of a PPL EU approved SCADA equipment that will connect to its existing SCADA system. PPL Electric Utilities will supply suitable drawings and a material list for the generator to provide this equipment. The current PPL Electric Utilities design uses commercially available PLC equipment, with the software provided by PPL Electric Utilities.

Metering and Telemetering Requirements for PJM:

The Interconnection Customer will be required to install the equipment necessary to provide revenue metering (KWH and KVARH hourly data sent once per day) and real time data (telemetry) for the Interconnection Customer's generating resource in compliance with PJM Manuals M-01 and M-14B, and the PJM Tariff. **Real time data (telemetry) is only required if Queue V4-027 is a Capacity Resource.**

For additional information regarding PJM metering requirements and the PJM internet-based telemetry alternative (Arcom Director) contact Ryan Nice at 610-666-4777 or nicer@pjm.com

Metering and telemetering requirements for PPL EU:

New metering equipment is required, it will be provided by PPL EU at no cost to the Interconnection Customer (Community Energy Inc. / Lancaster Solar LLC).

Isolation Breaker Requirement:

V4-027 Interconnection Customer will have its own isolation breaker that is capable of separating the V4-027 generation from the PPL EU system. This breaker will be operated by the PPL EU Controlled POC and/or IPR relaying. The Interconnection Customer may also operate this breaker by its own protection and control equipment. As per PPL EU design requirements, sharing of IPR/POC equipment within the IPR cabinet with the Interconnection Customer is not allowed.

Interconnected Transmission Owner (PPL EU) Direct Connection
Scope of Work (estimated \$228,000)

The following distribution modifications will be required on the Buck #08-2, 12 kV line in order to accommodate the generation:

1. 12 kV line tap (Estimated cost = Cost To Be Determined)

Construct a 12 kV line from a tap point on #08-2 12 kV line, to the V4-027 Point of Interconnection, at Community Energy Inc. / Lancaster Solar LLC Interconnection Customer facility.

- V4-027 must submit a request for electric service for the service extension. V4-027 can contact PPL's ICS department at 1-888-220-9991 or:
<http://www.pplelectric.com/Commercial+and+Industrial/Service+Center/Building+or+Renovating/>
- The cost for the extension will be engineered and direct billed separate to this feasibility/impact study and is not included in the PPL scope of work.

Queue V4-027 generation will be interconnected to the PPL EU 12 kV distribution system as shown in Figures 1 and 2. No reinforcement of the 12 kV distribution system is required for Queue V4-027.

2. Relay and control modifications need to be made at Buck Substation. Upgrades at Buck Substation are required to detect a local island condition for loss of 69 kV source to Buck Substation (e.g. operation of the 69 kV fuses). Estimated cost = \$50,000
3. Modifications at Buck substation to include installation of DTT equipment, Voltage check capability on 08-2 12kV line breaker, associated wiring, cables and conduit. Cost for radio/fiber based DTT, installed in conjunction with other work at Buck Substation is estimated to be \$178,000.

Network Impacts

The queue V4-027 project was studied as a 5 MW injection (1.9 MW of which was capacity) into PPL's system at the Buck 69kV substation. The project was studied on a combined feasibility-impact basis which utilizes an AC analysis, and incorporates all contingency types. Project V4-027 was evaluated for compliance with reliability criteria for summer peak conditions in 2014. Potential network impacts were as follows:

Generator Deliverability

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

No problems identified.

Multiple Facility Contingency

(Double Circuit Tower Line, Stuck breaker and Bus Fault contingencies for the full energy output)

No problems identified.

Short Circuit

Not required because of generation technology used.

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 problems identified.

New System Reinforcements

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

None required.

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 required.

ATTACHMENT #1

V4-027 Interconnection Single Line Diagram

Face Rock – Kinzer #13 69 kV Line

