PJM Generator Interconnection
Y1-057 Barbadoes 2 MW
Feasibility / Impact Study

March 18, 2013

Docs 742836v1

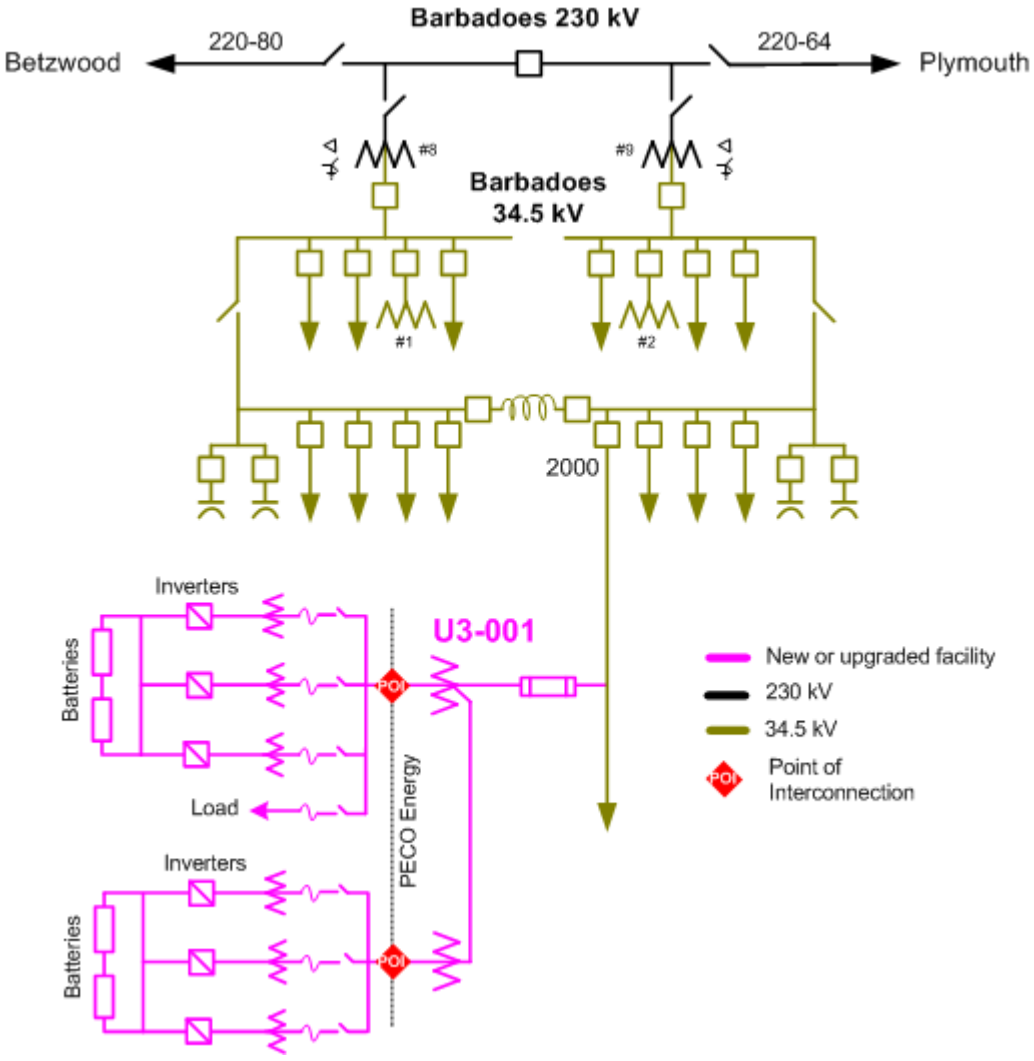
Confidential

General

Queue Y1-057 is an AES Energy Storage, LLC ("Interconnection Customer" or "IC") 2 MW generating facility located in the PJM Service Center Parking Lot at 2750 Monroe Blvd, Norristown, Pennsylvania. Queue Y1-057 proposed an in-service date of June, 2013.

Direct Connection

The Y1-057 generation project can be interconnected to the Barbadoes 34 kV circuit #2000 as shown on the one line diagram below.



Interconnection Customer (IC) Scope of Direct Connection Work

IC is responsible for construction of all facilities on its side of the POI (Point of Interconnection). IC proposes to build the interconnection facilities as shown on the one line diagram above.

The IC shall install PECO approved 35 kV cable from the designate service or terminal pole to the 1,500 kVA transformer. [The IC shall leave sufficient slack at the base of the designated service pole for PECO to extend up the pole, terminate the cable and connect to the existing open wire 34 kV conductors on the pole.]

The IC will be responsible to terminate the cables at the transformers using PECO approved 35 kV elbows and connecting the cables to the transformers.

The IC shall install PECO approved 35 kV cable from the 1,500 kVA transformer to the 1,000 kVA transformer

The IC shall install PECO approved 35 kV elbows on all primary cables at the transformers and connecting the cables to the transformers

The IC shall install all secondary cables from the transformers to the customer's equipment and connecting them at both ends

Interconnected Transmission Owner (PECO Energy) Scope of Direct Connection Work

The batteries and auxiliary load serving the battery/inverter installation will be connected to the PECO system through a temporary Rate GS, 3-phase, 4-wire, 480/277 volt service.

PECO will be provide two padmounted transformers [one 1,500 kVA and one 1,000 kVA]. Metering and other associated equipment along with 1.0 MW of batteries/inverters will be connected to each transformer.

The 1,500 kVA transformer will also serve a maximum of 200 kVA of non-continuous auxiliary load.

There will be no connections between the transformers on the low voltage side.

PECO will terminate the IC supplied cable on the pole and connect it to the PECO system.

The IC is responsible for the cost of all PECO work associated with the installation and removal of the temporary service as well as the energy used by the battery/inverter installations and auxiliary equipment.

The IC agrees that the temporary service is authorized and approved for duration not to exceed 2 years from the date of service.

The IC further acknowledges its responsibility to advise PECO of its intent to terminate service within the two year period and PECO shall have no obligation to continue service beyond the two year maximum duration.

The IC must meet the service requirements listed in PECO's Electric Service Requirements and PECO's 'Gray Book' [Interconnection Requirements for Parallel Operation for generation greater than 50kW].

Based on the IC supplied drawing, 12524 E-1, dated 11/18/12, the inverters will be connected to the secondary side of PECO's grounded-wye/grounded-wye transformers through grounded-wye/delta isolation transformers.

Notes:
Although not shown on the drawing, **a neutral conductor shall be extended from the grounded-wye connection of each isolation transformer to the PECO supplied transformers**.

PECO will provide one 1,500 kVA and 1,000 kVA transformer rather than the two 1,500 kVA transformers shown in the drawing.

It is **recommended** that the IC consider installing circuit breakers rather than fuses for over current protection on the secondary side of the PECO transformer to minimize the impact of over current device operation in response to phase-to-ground faults on the PECO system.

Based on PECO's understanding that the inverters being installed on this project are not IEEE 1547/UL 1741 certified, PECO's Gray Book requirements related to over/under voltage and over/under frequency protection must be met. The over/under voltage settings and time delays and over/under frequency settings [typically 60.5/59.5 Hz] for the SEL-351A relay shown in drawing, identified above, must be provided. Also **confirmation as to whether the relay will trip the CBs ahead of the inverters or the inverter contactors is required**.

Cost estimate for PECO Energy Direct Connection work:

Work	**Cost**
PECO Labor	$4800
Transformer Charge	$3200
Metering	$1600
Materials	$2500
Total	**$12,100**

Construction time estimate: PECO has estimated 3 to 6 months to design, schedule and complete work after an Interconnection Service Agreement is executed.

Network Impacts

The Y1-057 project was studied as a 2 MW Energy-only injection into a tap on the Barbadoes 34.5 kV circuit #2000. Project Y1-057 was evaluated for compliance with reliability criteria for summer peak conditions in 2015. Potential network impacts were as follows:

NETWORK IMPACTS

Generator Deliverability

(Normal system, all facilities in-service ,and Single or N-1 contingencies for the Capacity portion of the interconnection only)

No problems were identified

Multiple Facility Contingency

(Double circuit towerline, stuck breaker and bus fault contingencies for the energy portion of the interconnection)

No problems were identified.

Short Circuit Analysis

No problems were identified.

Stability Analysis

Not required.

Contribution to Previously Identified Overloads

(Queue Y1-057 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.

NETWORK UPGRADE REQUIREMENTS

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e."Network Impacts", initially caused by the addition of Queue R53 generation)

one required

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by Queue Y1-057)

None required.