



Final Technical Review (CESIR)

1.4 MW PV Generating Station

**Frey Rd
Macedon, NY 14502**

File # 13185

Prepared By: (LaBella)
Reviewed By: MAC
Date: July 23, 2018



Introduction

This Final Technical Review describes the interconnection and lists the responsibilities of Delaware River Solar, LLC and RGE, and provides a cost estimate.

I. Project Description

Delaware River Solar, LLC is applying to interconnect a 1.4 MW photovoltaic generating station to be located at Frey Rd in Macedon. The contact for the project is Pete Dolgos of Delaware River Solar, LLC, 646-998-6495, peter.dolgos@xzertaenergy.com.

Because this interconnection is 1.4 MW capacity, its interconnection requirements are governed by the *New York State Standardized Interconnection Requirements and Application Process for New Distributed Generators 5 MW or Less Connected in Parallel with Utility Distribution Systems* (SIRs) and IEEE Std. 1547, *IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems* (IEEE 1547).

II. Planning

Distribution Planning performed studies to determine if the Project can be interconnected to existing 12.47 kV RGE distribution feeder #5163 out of substation 230 to comply with the requirements contained in IEEE 1547, *Standard for Interconnecting Distributed Resources with Electric Power Systems*.

Distribution Planning Requirements and Conclusions:

1. Each individual PCC location must have the ability to trip offline within 2.0 seconds for the loss of voltage on any one individual phase in order to electrically isolate the IPP from the utility at the generator interconnection and must be verified at checkout.
2. Any circuit tap, substation, or distribution line regulators, and substation LTC/regulator controls must be either already equipped with or changed out to retrofitted microprocessor controls that will handle reverse power flow and co-generation functionality. Based preliminary studies, the substation regulators should be set to 'co-generation' mode if it is a Siemen MJXL or MJ4A control. If it is an older M-2001C Beckwith control, it should be upgraded to an M-2001D unit and the 'DG' or 'auto determination' mode set. These include:
 - a. The station transformer is an LTC type.
3. Transmission Planning does not have any concerns with the installation of this proposed generation at this location on the transmission system.

4. If the IPP cannot comply with the voltage regulation threshold criteria, install new line regulators on the utility-side of the PCC location. The new line circuit regulators shall be equipped with reverse power flow & co-generation functionality (Beckwith M2001-D).
5. Install a new microprocessor-controlled line recloser equipped with directionality on the utility-side of the Primary Metered Service at the PCC.
6. Any potential manual or automatic switching schemes with other distribution circuits will require the customer to disconnect from the distribution circuit at the customer's PCC.
7. Protection & coordination is based on only the system-normal circuit configuration, and is not applicable for switching scenarios and ties with other distribution circuits.
8. The existing transmission circuit relaying will need to be reviewed and verified by System Engineering in order to properly coordinate with the proposed downstream distribution protective devices.
9. For Primary Metered Service, inrush compensation may need to be enabled by the division.
10. Set LTC of transformer 1T to 121V base.
11. Install a 219A Voltage regulator at L-275 P-147A, GISID 300246648
12. Primary Distribution Interconnection/Transformer Connection:

Primary Distribution Line Configuration	Interconnection to Primary Distribution Line
<i>Three-phase, three-wire</i>	<i>If a three-phase or single-phase generator, interconnection must be phase-to-phase</i>
<i>Three-phase, four-wire</i>	<i>If a three-phase (effectively grounded) or single-phase generator, interconnection must be line-to-neutral</i>

III. Interconnection Protection

A. Information from the Customer

The Customer provided a three line diagram for the Project which does not include protection settings. The drawings are stamped by a licensed New York State Professional Engineer.

Noted Application and Design Deficiencies:

PV Module cut sheet not submitted

Three-Line Diagram incomplete:

Ratings not provided for system disconnect fuses

Site Plan incomplete:

System Disconnect location not called out

B. Equipment Verification

1. Type Tested and Approved Equipment

The Customer is installing (4) Ingeteam IS 1245TL U B480 1247 kW inverters. The customer provided technical specifications for this equipment. The Ingeteam IS 1245TL U B480 inverter is listed on the New York State Type-Tested and Approved Equipment List.

2. Three Phase Automatic Interrupting Device

Utility Recloser

Main Disconnect cutout fuses

Transformer current limiting fuses

PV System UL 1741 inverters

3. AC Disconnect Switch

The generator AC disconnect switch is labeled on the drawings. The Customer is installing a 15kV 600A load break disconnect switch. The Customer needs to provide specifications for the proposed switch. The AC disconnect must be an "external, manual, visible, gang-operated, load break disconnecting switch" per SIR requirements. The developer must submit the requisite information for the proposed disconnect switch prior to installation.

4. CTs and VTs

No information regarding the installation of CTs or VTs.

5. Transformer

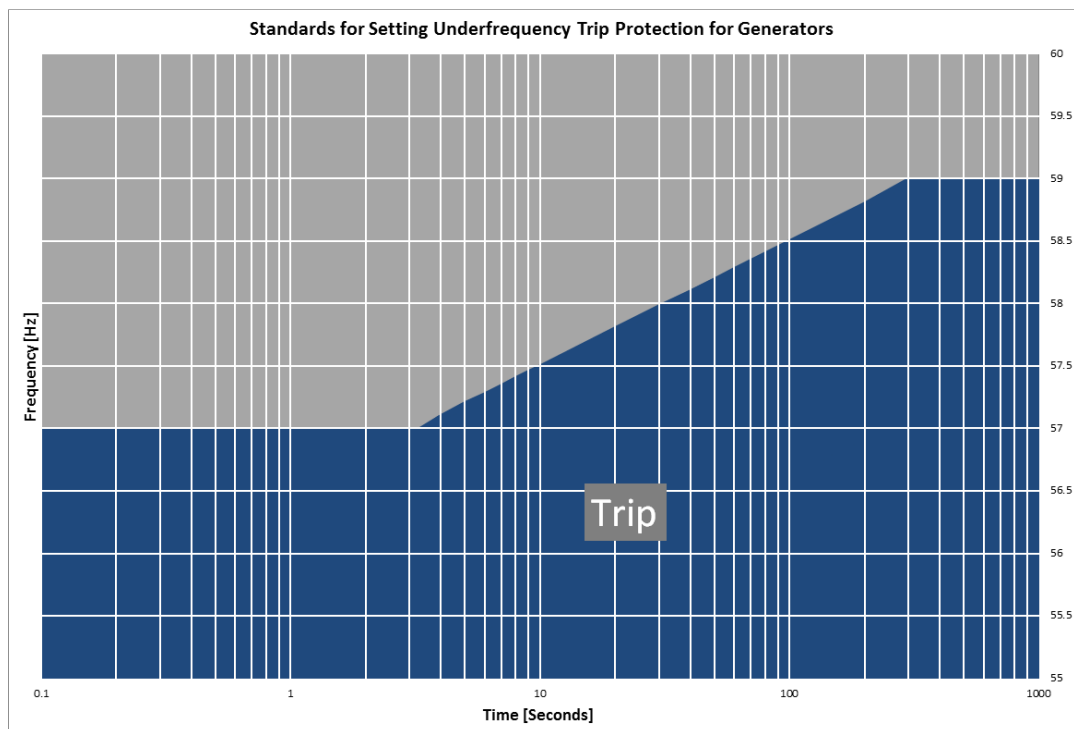
The proposed transformer that is being installed has a 12.47 kV Grounded Wye connection on the high side in order to interconnect with the RGE distribution feeder.

C. Protection Studies

1. Voltage-Frequency

The proposed voltage and frequency settings for the inverters are NOT provided. The settings need to be as follows:

<u>Voltage (% of Rated)</u>	<u>Clearing Time (s)</u>
$V < 50$	0.16
$50 \leq V < 88$	2.00
$110 \leq V < 120$	1.00
$V \geq 120$	0.16



The Customer will need to provide these to RGE for review and approval.

2. Automatic Reclosing of the New Generation

The Customer is hereby reminded that any closing of the inverter to the utility system must be delayed by at least 5 minutes following restoration of the utility system to a healthy voltage and frequency.

3. Grounding Studies

The Coefficient of Grounding (COG) for the installation has been calculated to be 0.796. The COG is less than 0.8, so the system is effectively grounded.

4. Short Circuit Studies

As a result of the installation, the short circuit current on the substation 230 12.47 kV bus increases as follows:

	Present System	System with New Generation Added
3ph short circuit current (A)	2075	2150
1ph-gnd short circuit current (A)	1011	1024

No interrupting devices on the RGE electrical system are over duty as a result of the additional source of short circuit current.

5. Protection Coverage

The new generation does not affect protection coverage of the protective relays on the feeder terminal at RGE substation 230.

6. Switching to Other Sources

The new generation must be disconnected from the electrical system if it is switched to the adjacent feeders during maintenance or system emergencies. The electrical parameters of the adjacent feeders (impedance, grounding, system protection) would be different than those of the interconnecting feeder, and the impact of the generation on the adjacent feeders are not known. For these operating scenarios, the generation would be required to be disconnected from the electrical system until the electrical system is returned to normal configuration.

7. Ferroresonance

Ferroresonant over-voltages have not been found to be a problem for inverters of the same technology interconnected to the same distribution feeder.

8. Anti – Islanding

Inverter must be in compliance with UL1741 and the complete system must comply with the National Electric Safety Code, the National Electric Code and the IEEE 1547 standard. Each individual PCC location must have the ability to trip offline within 2.0 seconds for the loss of voltage on any one individual phase in order to electrically isolate the IPP from the utility at the generator interconnection and must be verified at checkout. Anti-islanding to be certified by PE and witness tested by the utility.

No significant risk of unintentional islanding exists, no further study or investigation required. Provided that the customer uses the same manufacturer of inverters as stated in their application, if the manufacturer is changed it must be reviewed to ensure that the new manufacturer complies with the anti-islanding standards.

9. Monitoring Specific Requirements

These values represent the most basic monitoring components that can provide situational awareness at the PCC. Additional monitoring points may be needed per individual utility requirements. Monitoring data shall be accessible remotely by the use of communications technology per the utility's protocols.

The minimum required data values at the point of common coupling (PCC) are as follows:

- Per phase voltage and current
- Three phase values for real (watts) and reactive (VARs) power
- Power factor

Proposed Monitoring and Control Requirements by Size for Solar PV in New York State			
	< 50 kW	Individual or Aggregated 50 kW up to 500 kW	Individual or Aggregated 500 kW and Greater
Monitoring	Monitoring <i>may</i> be required	Monitoring <i>may</i> be required	Monitoring <i>shall</i> be required
Control (PCC Recloser)			PCC Recloser <i>shall</i> be required
Control (RTU)		Basic control <i>may</i> be required	

10. Metering

RGE will install a Primary revenue meter and associated instrument transformers for the customer's Primary service. The estimated cost for the RGE equipment and installation will be included in the estimate section of the report.

IV. Schedule

Distribution system upgrades, engineering, procurement and construction may take 8 to 10 months after receipt of funding.

V. Cost

Project #13185

Scope:

- A. Install Interconnection PCC Recloser with SCADA capability
- C. **Upgrade substation 230 bank LTC controls
- D. Install a 219A Voltage regulator at L-275 P-147A
- E. Primary metering installation
- F. Engineering support

Estimate Detail	cost/unit	unit	total
Install Interconnection PCC Reclose			
Labor	\$1,600	1	\$1,600
Materials	\$47,000	1	\$47,000
Overheads	\$16,000	1	\$16,000
Install 2-10kva xformer for bidirectional sensing for reclosure	\$1,500	1	\$1,500

3 phase pole with buck arms and 3-7.5kv cutouts			
Labor	\$1,600	1	\$1,600
Materials	\$3,000	1	\$3,000
Overheads	\$1,400	1	\$1,400
200 ft new primary/secondary			
Labor	\$300	1	\$300
Materials	\$800	1	\$800
Overheads	\$1,400	1	\$1,400
**Upgrade substation 230 bank LTC controls			
Labor	\$10,000	1	\$10,000
Materials	\$2,500	1	\$2,500
Overheads	\$2,400	1	\$2,400
Install a 219A Voltage regulator at L-275 P-147A	\$60,000	1	\$60,000
Install new primary meter service			
Labor	\$1,600	1	\$1,600
Materials	\$27,500	1	\$27,500
Overheads	\$1,400	1	\$1,400
Engineering support	\$5,000	1	\$5,000
Sub total			\$185,000
Taxes			\$14,400
Total			\$199,400

Notes to Developer: Cost estimates are +- 25%

**** If projects 12513 or 12197 or 12441 or 12535 or 12705 move forward with interconnection than this upgrade will not be required.**

Developer is required to pay all actual costs for system upgrades and interconnection facilities.

VI. RGE Responsibility

RGE will:

- Engineer, design, procure and construct the distribution system upgrades as described in section V cost estimate work scope;
- Install new Recloser with SCADA-ready communications and control capability, and directionality at the point of common coupling;
- Install Primary revenue metering for Primary service on developer provided facilities;



- D. Review the Customer drawings and equipment specifications relevant to the generation and interconnection;
- E. Conduct a site visit for final checkout of the installed equipment and verification of the AC system operation;
- F. Retains the right to witness the commissioning tests;
- G. Install substation bank LTC controls with reverse power capabilities.

VII. Customer Responsibility

The Customer will:

- A. Provide equipment specifications for the inverters and AC disconnect switch;
- B. Install Primary electric service and metering facilities per RG&E specification 'Requirements for Electric Services and Metering.' Install a phone circuit (POTS) line to RG&E revenue meter for MV-90 dial up system.
- C. Provide voltage and frequency settings for the PV inverters to RGE for review and approval;
- D. Design and install the generating facility as reviewed and accepted by RGE;
- E. Complete the Checkout Form for Generation Protected by Type Tested and Approved Equipment and return it to RGE;
- F. Provide a copy of the electrical inspection certificate and a completion letter certifying that the system has been installed and tested in compliance with the NYS PSC SIR, the utility-accepted design, and the equipment manufacturer's instructions;
- G. Coordinate final field checkout with RGE;
- H. Provide a 24/7 contact for Operations;



Division	Rochester - East
Local Utility Substation	RGE substation 230 Circuit 5163
Project Name	Delaware River Solar, LLC (Frey Rd #2) - 13185
Address	Frey Rd Macedon, NY 14502

		Satisfactorily Performed As Required? (√)	Comments
1.	Equipment Name Plate Data is accessible or on the major equipment list.		
2.	Spot check this list where nameplates are visible. If the nameplates are not visible and there is no PE stamp on the list, the equipment must be disassembled for inspection.		
3.	Relay calibration tests - Verify there is a relay test report and that settings in the relay match the check out list.		
4.	Verify output of the multifunction relay trips the main contactor.		
5.	Witness failure of the multifunction relay & loss of DC each trip the main contactor		
6.	Verify the generator disconnect switch has provisions for a lock (dual lock if developer requires their lock) & proper signage. Verify the disc. switch has a visible break.		
7.	Open the generator disconnect switch with the generator running and make certain that the generator trips within 2 seconds and doesn't reconnect for 5 minutes after power is restored.		
8.	Once the generation is on line, verify the meter readings in multifunction are reasonable and in the correct direction.		

Verified By:		Review By:		Accepted By:	
Date:		Date:		Date:	

Please email a scanned copy of the completed forms to the DG inbox at: distributedgenerationadmin@avangrid.com

INSPECTION FORM

Verify that the following data is consistent with equipment installed by the Developer by a checkmark, otherwise supply correct data.

NOTE: N/A means not applicable.

Verification of Developer's Equipment Nameplate Data and Location

1. Generator(s)/Prime Mover(s)

Number of Units	4
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Generator Data	Unit #1	√	Unit #2	√	Unit #3	√	Comments
Type of Generator							
Manufacturer							
Firmware Version No.							
Rated Output (kVA)							
Rated Output (kW)							
Rated Voltage							
Rated Current							
Rated Frequency (Hz)							
Rated Speed (RPM)							
Power Factor (%)							
Phase (1 or 3)							
Connection							
Type of Grounding							
Grounding Ohms							

Prime Mover

	Unit #1	√	Unit #2	√	Unit #3	√	Comments
Type of Prime Mover							
Rated Output (HP)							
Rated Speed (RPM)							

PV Array (If Applicable)

	Unit #1	√	Unit #2	√	Unit #3	√	Comments
Type of Panels							
Rated Output (kVA)							
No. of Panels							

2. Transformer(s)

	Interface (GSU)	√	Comments
Owner			
Manufacturer			
Rated (kVA)			
Rated Primary Voltage			
Rated Secondary Voltage			
Connection – Primary			
Connection – Secondary			
Phase			
% Impedance			
Primary Fuse			
No. of Transformers			
Type of Grounding			
Grounding Ohms			
Location – See One Line			

3. Capacitor Bank

		√	Comments
Rated kVAR			No Capacitor Bank Required / Installed
Phase			
Connection			
Location – See One Line			

4. Fault Interrupting Device(s)

	Main	√	Unit #1	√	Unit #2	√	Unit #3	√	Comments
Manufacturer									
Type									
Rated Voltage									
Rated Current									
Interrupting Current									
Operating Time									
Location – See One Line									

5. Generator AC Disconnect Switch

		√	Comments
Owner	Customer		
Manufacturer			
Type			
Rated Horsepower			
Rated Voltage			
Interrupting Current			
Location – See One Line			



6. Fault and Isolation Protection – (For Reference Only – Do Not Check)

Isolation Protection								
	√		√		√		√	Comments
Function	27		59		81U		81O	
Trip Interrupt. Dev.								
Manufacturer								
Type								
VT/CT Ratio								
Tap (Pick-up)								
Time Dial								
Set Point								
Location – See One Line								

7. Metering

POTS Line Installed? Yes _____ No _____

Phone Number _____

POTS Line Connected To Meter? Yes _____ No _____

Metering Option	
Meter Number	
Meter Read	



8. Signage

Generator AC Disconnect Switch Labeled?

Yes _____ No _____

Location of Generator AC Disconnect Switch provided at meter? (If not readily visible from meter location)

Yes _____ No _____

Emergency Contact Information provided at meter?

Yes _____ No _____

