



Final Technical Review

2MW PV Generating Station

**11581 Walden Ave.
Alden, New York 14004**

File # 7999

Prepared By: LaBella
Reviewed By: Mijanur Rahman
Date: July 25, 2016



Introduction

This Final Technical Review describes the interconnection and lists the responsibilities of Greenskies Renewable Energy LLC, County of Erie, and RG&E, and provides a cost estimate.

I. Project Description

Greenskies Renewable Energy LLC is applying to interconnect a 2 MW photovoltaic generating station, to be built along 11581 Walden Ave, Alden, New York 14004. The contact for the project is Eric Oberg of Greenskies Renewable Energy LLC, (860) 398-5408, pmg4@greenskies.com.

Because this interconnection is 2 MW capacity, its interconnection requirements are governed by the *New York State Standardized Interconnection Requirements and Application Process for New Distributed Generators 2 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 NYSEG distribution feeder #443 out of the Wende Rd Substation 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 on 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.
3. 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).



4. The proposed IPP output is greater than or equal to 250kW/250kVA, per IEEE-1547 requirements, the PCC location “shall have provisions for monitoring its connection status, real power output, reactive power output, and the voltage at the PCC.”
5. 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.
6. Protection & coordination is based on only the system-normal circuit configuration, and is not applicable for switching scenarios and ties with other distribution circuits.
7. Install a new three-phase line recloser equipped with directionality & at the PCC.
8. 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 NOT stamped by a licensed New York State Professional Engineer.

The drawings detail that the Customer is installing a 480V 3000A load break disconnect switch, (66) SMA-AMERICA 30000TL-US 30kW inverters and (1) SMA-AMERICA 20000TL-US 20kW inverter. The customer provided technical specifications for this equipment.

The generator AC disconnect switch is labeled on the drawings. The AC disconnect must be an “external, manual, visible, gang-operated, load break disconnecting switch” per SIR requirements. The developer must note the switch on the drawings and submit the requisite information for the proposed disconnect switch prior to installation.

B. Equipment Verification

1. Type Tested and Approved Equipment



The) SMA-AMERICA 20000TL-US and 30000TL-US inverters are listed on the New York State Type-Tested and Approved Equipment List. The inverter(s) are UL 1741 compliant.

2. Three Phase Automatic Interrupting Device

PV System UL 1741 inverters.

3. AC Disconnect Switch

The Customer is installing a 480V 3000A load break disconnect switch. The disconnect switch must be clearly labeled on the drawings and the Customer needs to provide specifications for the proposed switch.

4. CTs and VTs

(3) 14400/120V PT'S

5. Transformer

The proposed transformer that is being installed is a 12.47kVA Wye-Grounded connection on the high side in order to interconnect with the NYSEG 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

<u>Frequency Range (Hz)</u>	<u>Clearing Time (s)</u>
$f \leq 57.0$	0.16



57.0 < f ≤ 59.8 (Adjustable Set point)	Adjustable 0.16 to 300
f ≥ 60.5	0.16

The Customer will need to provide these to NYSEG 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 0.54. 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 NYSEG Wende Rd. Substation 12.47 kV bus increases as follows:

	Present System	System with New Generation Added
3φ short circuit current (A)	1862	1933
1φ-g short circuit current (A)	2036	2508

No interrupting devices on the NYSEG 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 the NYSEG Wende Rd Substation.

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.

9. Metering

NYSEG will install the revenue meter and associated instrument transformers. For primary meter installations, developer is to procure and install meter pole. The estimated cost for the NYSEG equipment and installation will be included in the estimate section of the report.

IV. Schedule

Distribution system upgrades, engineering, procurement and construction may take 6 to 10 months after receipt of funding.



V. Cost

Cost Estimate County of Erie

Scope:

- A. Install Interconnection PCC Recloser with SCADA capability
- C. Upgrade existing substation regulators, line 443 regulator controls that will handle reverse power flow and co-generation functionality
- D. Primary metering installation
- E. Engineering support

Estimate Detail	cost/unit	unit	total
Install Interconnection PCC Recloser	\$65,000	1	\$65,000
Upgrade existing 3-418A line regulators controls	\$34,000	1	\$34,000
Install new primary meter service	\$27,500	1	\$27,500
Engineering support	\$5,000	1	\$5,000
Sub total			\$131,500
Total			\$131,500

BY E.C., LL
BY
CONSENSUS

Notes to Developer: Cost estimates are +- 25%

VI. NYSEG Responsibility

NYSEG will:

- A. Engineer, design, procure and construct the distribution system upgrades as described in section V cost estimate work scope;
- B. Install new Recloser with SCADA-ready communications and control capability, and directionality at the point of common coupling;
- C. Install revenue metering on developer provided pole;
- D. Review the Customer drawings and equipment specifications relevant to the generation and interconnection;
- E. NYSEG retains the right to witness the commissioning tests;
- F. Conduct a site visit for final checkout of the installed equipment and verification of the AC system operation;



VII. Customer Responsibility

The Customer will:

- A. Provide equipment specifications for the inverters and AC disconnect switch;
- B. Install metering pole for primary metering installation and phone circuit (POTS) line to NYSEG revenue meter for MV-90 dial up system;
- C. Provide voltage and frequency settings for the PV inverters to NYSEG for review and approval;
- D. Design and install the generating facility as reviewed and accepted by NYSEG;
- E. Complete the Checkout Form for Generation Protected by Type Tested and Approved Equipment and return it to NYSEG;
- F. Notify NYSEG at least two weeks in advance of commissioning;
- G. Provide certified test reports prior to commissioning (if required);
- H. Provide a 24/7 contact for Operations;

Division	Lancaster
Local Utility Substation	NYSEG Wende Rd Substation Circuit #443
Project Name	County of Erie - 7999
Address	11581 Walden Ave Alden, New York 14004

		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 or loss of DC trips the main contactor		
6.	Verify the generator disconnect switch has a double lock and proper signage. Verify the generator disconnect switch has a visible break.		
7.	Open the generator disconnect switch with the generator running and make certain that the generator trips.		
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 return a copy of this completed form to Richard Kauffman in Binghamton.

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	(66) 30kW (1) 20kW
------------------------	-----------------------

Generator Data	Unit #1	√	Unit #2	√	Unit #3	√	Comments
Type of Generator	PV		/		/		
Manufacturer	SMA- America		/		/		
Firmware Version No.			/		/		
Rated Output (kVA)	(66) 30 (1) 20		/		/		
Rated Output (kW)	(66) 30 (1) 20		/		/		
Rated Voltage	480V		/		/		
Rated Current	(66) 36.2 (1) 24		/		/		
Rated Frequency (Hz)	60		/		/		
Rated Speed (RPM)	N/A		/		/		
Power Factor (%)	100		/		/		
Phase (1 or 3)	3		/		/		



Connection	Wye					
Type of Grounding						
Grounding Ohms						

Prime Mover

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

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	Owner		
Manufacturer			
Rated (kVA)	2000 kVA		
Rated Primary Voltage	12.47kV		
Rated Secondary Voltage	480V		
Connection – Primary	Wye – Ground		
Connection – Secondary	Wye		
Phase	3		
% Impedance			
Primary Fuse			
No. of Transformers	1		
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	Pad Mounted Fused Disconnect		/		/		/		
Rated Voltage	480V		/		/		/		
Rated Current	3000A		/		/		/		
Interrupting Current			/		/		/		
Operating Time			/		/		/		
Location – See One Line			/		/		/		

5. Generator AC Disconnect Switch

		√	Comments
Owner	Customer		The system AC Disconnect is also the Fault Interrupting Device. Refer to Item 4 for details.
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

Metering Option	Primary
Meter Number	
Meter Read	

PUBLIC WORKS

2016 OCT 12 P 4: 01