AVANGRID	**Coordinated Electric System Interconnected Review**	DER #17215
	Distributed Energy Resources - NYSSIR	Revision 0 12/17/2021

For

Interconnection Customer: Delaware River Solar, LLC

Applicant: Delaware River Solar, LLC

1502 kVA PV Generator System

35 Route 38

Interconnection to NYSEG

Ithaca Division

4304201 Substation Circuit

34.5kV Feeder

Table of Contents

AVANGRID	Coordinated Electric System Interconnected Review	DER #17215
	Distributed Energy Resources - NYSSIR	Revision 0 12/17/2021

1.0 INTRODUCTION

This report presents the analysis results of the NYSEG interconnection study based on the proposed interconnection and design submittal from the Interconnection Customer in accordance with the Company Bulletin 86-01. The intent of this report is to assess this project's feasibility, determine its impact to the existing electric power system (EPS), determine interconnection scope and installation requirements, and determine costs associated with interconnecting the Interconnection Customer's generation to the Company's Electric Power System (EPS). This Coordinated Electric System Impact Review (CESIR) study; according to the New York State Standardized Interconnection Requirements (NYSSIR) Section I.C Step 6; identifies the scope, schedule, and costs specific to this Interconnection Customer's installation requirements.

2.0 EXECUTIVE SUMMARY

The total estimated planning grade cost of the work associated with the interconnection of the Interconnection Customer is $652,317*.

The interconnection was found to be feasible by Distribution Planning with modifications to the existing Company EPS and operating conditions, which are described in detail in the body of this Study.

***Transmission Planning cannot recommend the installation of this proposed generation at this location unless mitigating actions are taken to prevent voltage violations. Please see section 6 for mitigation options.**

The ability to generate is contingent on this facility being served by the interconnecting circuit during normal Utility operating conditions. Therefore, if the interconnecting circuit is out of service, or if abnormal Utility operating conditions of the area EPS are in effect, NYSEG reserves the right to disengage the facility.

No future increase in generation output beyond that which specified herein for this interconnection has been studied. Any increase in system size and/or design change is subject to the requirements of the NYSSIR.

3.0 COMPANY EPS PARAMETERS

Substation	Harford
Transformer Name	N/A
Transformer Peak Load (kVA)	N/A
Contingency Condition Load, N-1 Criteria (kW)	N/A
Minimum Daytime Load (kVA)	N/A
Generation: Total/Connected/Queued (kVA)	9981 / 5 / 9976
Contingency Condition Generation: T/C/Q (kVA)	N/A
Supply Voltage (kV)	34.5
Transformer Maximum Nameplate Rating (kVA)	N/A
Distribution Bus Voltage Regulation	Yes
Transmission GFOV Status	N/A
Bus Tie	none
Number of Feeders Served from this Bus	N/A

Connecting Feeder/Line	4304201
Peak Load on Feeder (kVA)	600
Minimum Daytime Load on Feeder (kVA)	90
Feeder Primary Voltage at POI (kV)	34.50
Line Phasing at POI	Three-Phase
Circuit distance from POI to substation	0.022 miles
Distance to nearest 3-Phase (if applicable)	N/A
Line Regulation	Yes
Line/Source Grounding Configuration at POI	Effective
Other Generation: Total/Connected/Queued (kVA)	9981 / 5 / 9976

System Fault Characteristics without Interconnection Customer DG at POI with System Upgrades described in Section 6	
Interconnection Customer POI Location	L-297, P-1A
I 3-Phase (3LLL)	1612 Amps
I Line to Ground (3I0)	944 Amps
Z1 (100 MVA Base)	0.2463 + j1.1513 PU
Z0 (100 MVA Base)	0.8993 + j2.9765 PU

4.0 INTERCONNECTION CUSTOMER SITE

The Interconnection Customer is proposing a new Primary Metered Service connection.

This location is presently served via Three-Phase 34.5kV.

The proposed generating system consists of :

One (1) Ingeteam IS 1500TL U B578 inverter rated at 1502 kVA, and one (1) 2.00 MVA pad-mounted 34.5/0.578kV Yg/Y transformer.

5.0 SYSTEM IMPACT ANALYSIS

Category	Criteria	Limit	Result
Voltage	Overvoltage	<105% (ANSI C84.1)	FAIL
With the addition of the subject generator, the maximum voltage as modeled on the Feeder is 105.96% of nominal, and is impacted by the proposed DER. Remediation is required.			
Voltage	Undervoltage	>95% (ANSI C84.1)	PASS
With the addition of the subject generator, the minimum voltage as modeled on the Feeder is 94.35% of nominal, and is not impacted by the proposed DER. No remediation is required.			
Voltage	Source Regulation for Reverse Power	<15% minimum load criteria	N/A
Distribution Planning cannot provide - Transmission Source			
Voltage	Line Regulation for Reverse Power	Minimum load to generation criteria	FAIL
The total generation downstream of line regulator #1 is 11.483 MVA. The minimum load on the regulator is 0.182 MVA. Therefore, the generation to load ratio is 6309%.			
Voltage	Fluctuation	<3% steady state from proposed generation on feeder	PASS
The greatest steady-state voltage fluctuation on the circuit is 0% due to the proposed generation and 0% on the substation bus due to the aggregate generation.			
Voltage	Fluctuation	<5% steady state from aggregate DER on substation bus	PASS
The greatest steady-state voltage fluctuation on the substation bus due to aggregate generation is 0%.			
Voltage	Regulator Variation	Regulator tap movement >1 position	PASS
The greatest voltage fluctuation seen at the voltage regulation on the feeder is 0.001V due to the proposed generation, and 0V on the source regulation due to the aggregate generation.			
Voltage	Flicker	Screen H Flicker	PASS
With an X/R ratio of 4.674, the Pst for the location with the greatest voltage fluctuation is 0.221 and the emissions limit is 0.350			
Equipment Ratings	Thermal (Cont. Current)	Thermal limits (assuming no load)	PASS
No issues.			
Equipment Ratings	Withstand (Fault Current)	<90% withstand limits (Distribution Equip.)	PASS
No distribution issues.			
Equipment Ratings	Withstand (Fault Current)	<90% withstand limits (Substation Equip.)	PASS
The additional fault current contribution from the generation does not contribute to interrupting ratings in excess of existing EPS equipment.			

AVANGRID	Coordinated Electric System Interconnected Review	DER #17215
	Distributed Energy Resources - NYSSIR	Revision 0 12/17/2021

Protection	Unintentional Islanding	Unintentional Islanding Document & Company Guidelines	PASS
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.			
Protection	Protective Device Coordination	Company Guidelines (Dist. Line Fusing)	PASS
There are no existing protective devices between the Source and proposed PCC.			
Protection	Protective Device Coordination	Company Guidelines (Reclosers and Breakers)	Fail
Due to the amount of reverse power flow, the line recloser on Circuit 524, Line 298, Pole 1 must be set directionally.			
Protection	Fault Sensitivity	Rated capabilities of EPS equipment	PASS
The additional fault current contribution from the generation does not contribute to interrupting ratings in excess of existing EPS equipment.			
Protection	Ground Fault Detection	Reduction of reach >100%	Pass
The Interconnection customer is not a ground source to the distribution circuit			
Protection	Overvoltage - Transmission System Fault	Company 3V0 criteria	Pass
The proposed interconnection does not pose an issue.			
Protection	Overvoltage - Distribution System Fault	<125% voltage rise	FAIL
With subject generator interconnected the modeled voltage rise on the unfaulted phases of the system is 176%. See section 6 point 12.			
Protection	Effective Grounding	[individual utility specifications]	FAIL
With the subject generator interconnected the modeled R0/X1 is 0.00297 PU and the X0/X1 is -184.27 PU. See section 6 point 12.			
SCADA	Required EMS Visibility for Generation Sources	Monitoring & Control Requirements	Needed
The 1.502 MVA subject generator triggers the requirement for SCADA reporting to the utility.			

AVANGRID	**Coordinated Electric System Interconnected Review**	DER #17215
	Distributed Energy Resources - NYSSIR	Revision 0 12/17/2021

Existing Equipment Rating Analysis Table:

EQUIPMENT	VOLTAGE (kV)	LINE	POLE	PASS/FAIL
NONE				

6.0 MITIGATIONS FOR SYSTEM IMPACT ANALYSIS FAILURES

Detail below is intended to provide sufficient information and clarity to give the Interconnection Customer an understanding to the relationship of costs and scope associated with the DER interconnection and the system modifications due to the DER impact. This included any required EPS equipment upgrades. Where scope items are identified, associated labor, equipment rentals and indirect project support functions (such as engineering and project management) are intended and implied.

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 DER from the utility at the generator interconnection and must be verified at checkout.
2. The Interconnection Customer is required to comply with the utility's voltage threshold criteria while operating the generating system. If, after interconnection, the Interconnection Customer cannot meet this requirement the Company reserves the right to disconnect the generation and install voltage regulators on the utility side of the Point Of Common Coupling at the Interconnection Customer's expense.
3. 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.
4. Protection & coordination is based on only the system-normal circuit configuration, and is not applicable for switching scenarios and ties with other distribution circuits.
5. **Transmission Planning cannot recommend the installation of this proposed generation at this location unless mitigating actions are taken to prevent voltage violations. In the event that Harford Mills Substation is being fed from Binghamton instead of Dryden Substation there is a potential for high voltages on the transmission system. Options to mitigate this violation include:**
    a. **Operation at a fixed power factor may be possible depending on the mitigation selected by generation ahead in the queue (CESIR #17023 and CESIR #17214).**
    b. **Reactive support installed on the transmission system – equipment that would allow for a reactive power absorption in the range of 0-1 MVAr in response to transmission system voltages. *(If this option is chosen then the cost estimate in section 7.0 would be updated.)***
    c. **Complex transmission system upgrade – initial reviews did not identify any additional simple solutions, so a more in-depth study would be required to determine the scope of an upgrade that would support the full generation capacity proposed at this site. *(Additional funding and time would be required to perform this more in-depth study.)***
6. Install a new microprocessor-controlled line recloser equipped with directionality on the utility-side of the primary-metered service at the PCC.
7. 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. These include:

    Control is REQUIRED for the Line Regulation:

    a. Proposed 3P regulator at the circuit tap at or about L-297 P-1 on circuit 4304201

8. | **Failure(s) Addressed:** | DP: Overvoltage |
|---|---|

Install a new 3P_335A line regulators at or about L-297 P-1 on Circuit 4304201. (123.0V Set, 3.0V bandwidth, No R&X compensation, 30 sec time delay, Co-generation/Auto-Determination mode). *(Note: Previously recommended for file #17214)*

9. | **Failure(s) Addressed:** | DP: Overvoltage |
|---|---|

Install new 1P_100A line regulator at or about L-2319 P-14 on Circuit 4304201. (123.0V Set, 3.0V bandwidth, No R&X compensation, 60 sec time delay, Co-generation/Auto-Determination mode). *(Note: Previously recommended for file #17214)*

10. | **Failure(s) Addressed:** | DP: Other |
|---|---|

Install new Pole before L-297 P-1 and move the 10kVA transformer and recloser back one span to allow the three-phase 34.5 kV line extension along Route 38. *(Note: Previously recommended for file #17023 and file #17214)*

11. | **Failure(s) Addressed:** | DP: Other |
|---|---|

Reconductor existing conductors to 34.5 kV distribution level 477AL from L-297 P-1 to the proposed PCC (approx 0.06 mi). *(Note: Previously recommended for file #17023 and file #17214)*

12. | **Failure(s) Addressed:** | **SPC: Overvoltage – Distribution** |
|---|---|

Due to the installation failing the Overvoltage-Distribution System Fault and Effective Grounding Screens the project must be revised such that if the generation site is islanded from the utility the system from the Point Of Interconnection into and through the generation equipment is maintained as effectively grounded. The interconnection is required to meet the grounding requirements as identified in NYSEG/RGE Bulletin 86-01 section 6.2.2.2 Grounding. A PE stamped revised 3 Line will be required to be submitted to the Distributedgenerationadmin@avangrid.com mailbox clearly identifying the revision(s) made to meet the effective grounding requirements. It is vital that the proposed interconnection maintain an effectively grounded system such that during any case of islanding (intentional or not), the circuit (and load) remains effectively grounded. Therefore, verification by the utility of the system meeting the effective grounding requirements is necessary in order to energize the generation site.

13. | **Failure(s) Addressed:** | SPC: Protective Device Coordination |
|---|---|

Due to the amount of reverse power flow, the line recloser on Circuit 524, L-298 P-1 must be set for directionality. This will require a new line recloser to be installed.

7.0 CONCEPTUAL COST ESTIMATE

The following items are a good faith estimate for the scope and work required to interconnect the project estimated under rates and schedules in effect at the time of this study in accordance with the most recent version of the NYSSIR.

Planning Grade Estimate

Project #17215

Scope:

A. Install Interconnection PCC Recloser with SCADA capability
B. **Install a new 3P_335A line regulators at or about L-297 P-1
C. **Install new 1P_100A line regulator at or about L-2319 P-14
D. ***Install new pole before L-297 P-1 and move the 10kVA transformer & recloser back one span
E. ***Reconduct conductors to 34.5 kV 477AL from L-297 P-1 to the PCC (approx. 0.06 miles)
F. Install new line recloser at L-298 P-1
G. Primary metering installation
H. Engineering support
I. Project Administration

Estimate Detail	cost/unit	unit	total
Install Interconnection PCC Recloser			
Labor	$30,000	1	$30,000
Materials	$37,000	1	$37,000
Overheads	$18,000	1	$18,000
3ph line construction from mainline to site			
Labor	$20,000	1	$20,000
Materials	$10,000	1	$10,000
Overheads	$5,000	1	$5,000
****Install a new 3P_335A line regulators at or about L-297 P-1**			
Labor	$23,758	1	$23,758
Materials	$94,893	1	$94,893
Overheads	$40,755	1	$40,755
****Install new 1P_100A line regulator at or about L-2319 P-14**			
Labor	$5,878	1	$5,878
Materials	$15,779	1	$15,779
Overheads	$6,044	1	$6,044
*****Install pole & move 10kVA transformer & recloser**			
Labor	$14,336	1	$14,336
Materials	$31,437	1	$31,437
Overheads	$16,696	1	$16,696
*****Reconduct conductors to 34.5 kV 477AL (approx. 0.06 miles)**			
Labor	$8,512	1	$8,512

Materials	$4,439	1	$4,439
Overheads	$3,654	1	$3,654
Install new line recloser at L-298 P-1			
Labor	$30,000	1	$30,000
Materials	$37,000	1	$37,000
Overheads	$18,000	1	$18,000
Install new primary meter service			
Labor	$15,000	1	$15,000
Materials	$20,000	1	$20,000
Overheads	$5,000	1	$5,000
Engineering support	$5,000	1	$5,000
Project Administration	$10,000	1	$10,000
Subtotal			$526,181
15% Contingency			$78,927
Taxes			$47,209
Total			**$652,317**

Notes to Developer:

****If project #17214 moves forward with interconnection and installs these upgrades then these upgrades are not required for this project.**

*****If project #17023 or #17214 moves forward with interconnection and installs these upgrades then these upgrades are not required for this project.**

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

Notes:

1.) These estimated costs are based upon the results of this study and are subject to change. All costs anticipated to be incurred by the Company are listed.

2.) The Company will reconcile actual charges upon project completion and the Interconnection Customer will be responsible for all final charges, which may be higher or lower than estimated according to the NYSSIR I.C step 11.

3.) This estimate does not include the following:

- additional interconnection study costs, or study work
- additional application fees,
- applicable surcharges,
- property taxes,
- future operation and maintenance costs,
- adverse field conditions such as weather and Interconnection Customer equipment obstructions,
- extended construction hours to minimize outage time or Company's public duty to serve,
- the cost of any temporary construction service, or

- any required permits.

4.) Cost adders estimated for overtime would be based on 1.5 and 2 times labor rates if required for work beyond normal business hours. Per Diems are also extra costs potentially incurred for overtime labor.

8.0 REVISION HISTORY

Revision	Date	Description
0.0	12/17/2021	Original