November 7, 2024

Distributed Sun
1425 K St. NW
Washington, DC 20005

Dear Addressee,

This is an invoice for the $401,402.00 Cost Share Payment for your project located at:

1036 76 Road
Caroline, NY 13736

This invoice is due 11/19/2024. The Cost Share payment is non-refundable, per the New York State SIR.
Payments can be made by ACH/Wire to the following account:

ABA: 021000089
Account: 00040387

Please indicate your file number on the payment which is File # 20274
Invoice # 20274CS

**Please note – This invoice was adjusted due to fact it shares cost with project 20273 being handled by same developer - Distributed Sun. If IPP20273 is cancelled and/or Distributed Sun is no longer developer of record for 20273, 20274 & 20275 projects, this invoice is null and void.*

If you have any questions regarding this invoice or your project you may send them to the Distributed Generation Administration mailbox distributedgenerationadmin@avangrid.com

NYSEG

New York Energy Services

October 29, 2024

Distributed Sun
1425 K St. NW
Washington, DC 20005

Dear Addressee,

This is an invoice for the $290,018.00 25% Construction Payment for your project located at:

1 76 Rd
Caroline, NY 13736

This invoice is due 11/19/2024.
Payments can be made by ACH/Wire to the following account:

ABA: 021000089
Account: 00040387

Please indicate your file number on the payment which is File # 20272
Invoice # 20272CP1

If you have any questions regarding this invoice or your project you may send them to the Distributed Generation Administration mailbox distributedgenerationadmin@avangrid.com

NYSEG

New York Energy Services

February 27, 2025

Puresky Holdco Inc.
518 17th StreetSuite 950
Denver, CO 8020

Dear Addressee,

This is an invoice for the $870,053.00 75% Construction Payment for your project located at:

1 76 Rd
Caroline, NY 13736

This invoice is due 05/14//2025.
Payments can be made by ACH/Wire to the following account:

ABA: 021000089
Account: 00040387

Please indicate your file number on the payment which is File # 20272
Invoice # 20272CP2

If you have any questions regarding this invoice or your project you may send them to the Distributed Generation Administration mailbox distributedgenerationadmin@avangrid.com

October 29, 2024

Distributed Sun
1425 K St. NW
Washington, DC 20005

Dear Addressee,

This is an invoice for the $401,401.00 Cost Share Payment for your project located at:

1 76 Rd
Caroline, NY 13736

This invoice is due 11/19/2024.
Payments can be made by ACH/Wire to the following account:

ABA: 021000089
Account: 00040387

Please indicate your file number on the payment which is File # 20272
Invoice # 20272CP1

If you have any questions regarding this invoice or your project you may send them to the Distributed Generation Administration mailbox distributedgenerationadmin@avangrid.com

October 29, 2024

Distributed Sun
1425 K St. NW
Washington, DC 20005

Dear Addressee,

This is an invoice for the $2,078,101.00 Cost Share Payment for your project located at:

1 76 Road
Caroline, NY 13736

This invoice is due 11/19/2024.
Payments can be made by ACH/Wire to the following account:

ABA: 021000089
Account: 00040387

Please indicate your file number on the payment which is File # 20273
Invoice # 20273CP1

If you have any questions regarding this invoice or your project you may send them to the Distributed Generation Administration mailbox distributedgenerationadmin@avangrid.com

NYSEG

New York Energy Services

October 29, 2024

Distributed Sun
1425 K St. NW
Washington, DC 20005

Dear Addressee,

This is an invoice for the $429,743.00 25% Construction Payment for your project located at:

1 76 Road
Caroline, NY 13736

This invoice is due 11/19/2024.
Payments can be made by ACH/Wire to the following account:

ABA: 021000089
Account: 00040387

Please indicate your file number on the payment which is File # 20273
Invoice # 20273CP1

If you have any questions regarding this invoice or your project you may send them to the Distributed Generation Administration mailbox distributedgenerationadmin@avangrid.com

NYSEG

New York Energy Services

February 27, 2025

Puresky Holdco Inc.
518 17th StreetSuite 950
Denver, CO 8020

Dear Addressee,

This is an invoice for the $198,473.00 ($376,358 – $177,885 overpayment on IPP20274) 75% Construction Payment for your project located at:

1 76 Road
Caroline, NY 13736

This invoice is due 05/14/2025.
Payments can be made by ACH/Wire to the following account:

ABA: 021000089
Account: 00040387

Please indicate your file number on the payment which is File # 20273
Invoice # 20273CP2

If you have any questions regarding this invoice or your project you may send them to the Distributed Generation Administration mailbox distributedgenerationadmin@avangrid.com

NYSEG

New York Energy Services

October 29, 2024

Distributed Sun
1425 K St. NW
Washington, DC 20005

Dear Addressee,

This is an invoice for the $725,164.00 Cost Share Payment for your project located at:

1036 76 Road
Caroline, NY 13736

This invoice is due 11/19/2024. The Cost Share payment is non-refundable, per the New York State SIR.
Payments can be made by ACH/Wire to the following account:

ABA: 021000089
Account: 00040387

Please indicate your file number on the payment which is File # 20274
Invoice # 20274CS

**Please note – This invoice was adjusted due to fact it shares cost with project 20273 being handled by same developer - Distributed Sun. If IPP20273 is cancelled and/or Distributed Sun is no longer developer of record for 20273, 20274 & 20275 projects, this invoice is null and void.*

If you have any questions regarding this invoice or your project you may send them to the Distributed Generation Administration mailbox distributedgenerationadmin@avangrid.com

New York Energy Services

January 25, 2024

Distributed Sun
1425 K St. NW
Washington, DC 20005

Dear Addressee,

This is an invoice for the $999,699.00 25% Construction Payment for your project located at:

1036 76 Road
Caroline, NY 13736

This invoice is due 02/02/2024.
Payments can be made by ACH/Wire to the following account:

ABA: 021000089
Account: 00040387

Please indicate your file number on the payment which is File # 20275
Invoice # 20275CP1

If you have any questions regarding this invoice or your project you may send them to the Distributed Generation Administration mailbox distributedgenerationadmin@avangrid.com

NYSEG

New York Energy Services

February 27, 2025

Puresky Holdco Inc.
518 17th StreetSuite 950
Denver, CO 8020

Dear Addressee,

This is an invoice for the $160,560.00 75% Construction Payment for your project located at:

1036 76 Road
Caroline, NY 13736

This invoice is due 05/14/2025.
Payments can be made by ACH/Wire to the following account:

ABA: 021000089
Account: 00040387

Please indicate your file number on the payment which is File # 20275
Invoice # 20275CP2

If you have any questions regarding this invoice or your project you may send them to the Distributed Generation Administration mailbox distributedgenerationadmin@avangrid.com

NYSEG

New York Energy Services

January 25, 2024

Distributed Sun
1425 K St. NW
Washington, DC 20005

Dear Addressee,

This is an invoice for the $621,000 25% Construction Payment for your project located at:

1036 76 Road
Caroline, NY 13736

This invoice is due 02/02/2024.
Payments can be made by ACH/Wire to the following account:

ABA: 021000089
Account: 00040387

Please indicate your file number on the payment which is File # 20275
Invoice # 20275CSP1

If you have any questions regarding this invoice or your project you may send them to the Distributed Generation Administration mailbox distributedgenerationadmin@avangrid.com

AVANGRID	Coordinated Electric System Interconnect Review	DER #20272
	Distributed Energy Resources - NYSSIR	Version 4 7/12/2024

For

Interconnection Customer: Pichel 1

Applicant: Distributed Sun

5000 kVA PV Generator System

1 76 Rd

Interconnection to NYSEG

Ithaca Division

4301101 Tap Circuit

34.5kV Feeder

Table of Contents

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 $1,561,471.

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 does not have any concerns with the installation of this proposed generation at this location when running at a 0.97 power factor.

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 a new study and costs associated shall be borne by the Interconnection Customer. An increase in system size may also forfeit the Interconnection Customer's existing queue position.

3.0 COMPANY EPS PARAMETERS

Substation	Brooktondale Tap
Transformer Name	N/A
Transformer Peak Load (kVA)	N/A
Contingency Condition Load, N-1 Criteria (kVA)	N/A
Minimum Daytime Load (kVA)	N/A
Generation: Total/Connected/Queued (kVA)	1363.81 / 1363.81 / 0
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	4301101
Peak Load on Feeder (kVA)	3,310
Minimum Daytime Load on Feeder (kVA)	497
Feeder Primary Voltage at POI (kV)	34.50
Line Phasing at POI	Three-Phase
Circuit distance from POI to substation	8.69 miles
Distance to nearest 3-Phase (if applicable)	N/A
Line Regulation	Yes
Line/Source Grounding Configuration at POI	Non-Effective
Other Generation: Total/Connected/Queued (kVA)	1363.81 / 1363.81 / 0

System Fault Characteristics without Interconnection Customer DG at POI with System Upgrades described in Section 6	
Interconnection Customer POI Location	L-802, P-233
I 3-Phase (3LLL)	1364 Amps
I Line to Ground (3I0)	1020 Amps
Z1 (100 MVA Base)	0.7185 + j1.0062 PU
Z0 (100 MVA Base)	0.9399 + j2.3641 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 4.8kV.

The proposed generating system consists of :

Thirty four(34) SMA-SHP-150-US inverters, six(6) inverters will be curtailed to 133.333 kVA each.

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 105.82% 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 83.49% of nominal, and is not impacted by the proposed DER. No remediation is required.			
Voltage	Source Regulation for Reverse Power	<15% minimum load criteria	FAIL
The total generation downstream of the source regulation is 6.364MVA. The total minimum load on this source is 0.497MVA. Therefore, the generation to load ratio is 1282%.			
Voltage	Line Regulation for Reverse Power	Minimum load to generation criteria	FAIL
The total generation downstream of line regulator #1 is 5.42 MVA. The minimum load on the regulator is 2.7 MVA. Therefore, the generation to load ratio is 201%.			
The total generation downstream of line regulator #2 is 5.243 MVA. The minimum load on the regulator is 2.769 MVA. Therefore, the generation to load ratio is 189%.			
Voltage	Fluctuation	<3% steady state from proposed generation on feeder	PASS
The greatest steady-state voltage fluctuation on the circuit is 0.82% 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 0.93V 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 1.4, the Pst for the location with the greatest voltage fluctuation is 0.131 and the emissions limit is 0.350.			
Voltage	Flicker	Aggregate Flicker	PASS
The Pst for the location with the greatest aggregate voltage fluctuation is 0.131 and the emissions limit is 0.900.			
Equipment Ratings	Thermal (Cont. Current)	Thermal limits (assuming no load)	FAIL
The proposed generation exceeds an existing equipment thermal capability. (see failed equipment chart below)			
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.			
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)	FAIL
There are 6 existing protective devices between the Source and PCC. Distribution line Protection and Coordination must be reviewed, any changes or upgrades will be included in the Section 6 below.			
Protection	Protective Device Coordination	Company Guidelines (Reclosers and Breakers)	FAIL
Due to the amount of generation back feed, the SCADA SWITCH @ L-802 P-130 and the SCADA SWITCH SW# 531AX6 @ L-802 P-99A 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 has proposed a Grounding Bank with an impedance of 0.12 ohms and X/R ratio of 3.2. The Grounding Bank is within Company Guidelines. The Interconnection Customer will contribute approximately 84 A of 3I0 current to remote bolted line to ground faults and 84 A to faults at the PCC.			
Protection	Overvoltage - Transmission System Fault	Company 3V0 criteria	Pass
Due to the substation configuration Transmission Ground Fault Overvoltage's are not a concern			
Protection	Overvoltage - Distribution System Fault	<125% voltage rise	Pass
With subject generator interconnected the modeled voltage rise on the unfaulted phases of the system is 118%			
Protection	Effective Grounding	[individual utility specifications]	PASS
With the subject generator interconnected the modeled R0/X1 is 0.48175 PU and the X0/X1 is 1.5452 PU			
SCADA	Required EMS Visibility for Generation Sources	Monitoring & Control Requirements	Needed
The 5 MVA subject generator triggers the requirement for SCADA reporting to the Utility			

Existing Equipment Rating Analysis Table:

EQUIPMENT	VOLTAGE (kV)	LINE or GISID	POLE	PASS/FAIL
3P_FUSE	4.8	802	211	FAIL
SOLID_BLADE	4.8	802	204	FAIL
GROUP_OP	4.8	802	203	FAIL
3P_REGULATOR	4.8	802	196	FAIL
SOLID_BLADE	4.8	802	183	FAIL
GROUP_OP	4.8	802	182	FAIL
3P_2AC	4.8	802	182	FAIL
3P_2AC	4.8	802	182	FAIL
OH-167-19.9YG/4.8D	34.5	802	182	FAIL
3P_FUSE	34.5	802	181	FAIL
3P_REGULATOR	34.5	SUB	SUB	FAIL

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. The requirements for Remote Crediting, or Community Distributed Generation billing are that an hourly interval MV-90 meter be installed which has remote access via a dial-up telephone circuit known as a land line. The installation of the land line is the responsibility of the customer, and the installation of the meter is the responsibility of the utility.
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 Source Regulation:

   a. Circuit 4301101 Source Line Regulator at or about L-801, P-21

   Control is REQUIRED for the Line Regulation:

   b. Proposed 3P regulator at or about L-802 P-122 on circuit 4301101

   Control is REQUIRED for the Line Regulation:

   c. Existing 3P regulator at or about L-802 P-196 on circuit 4301101

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

   Relocate 34.5/4.8 kV transformer and related fuses from L-802 P-180 to L-802 P-240 on circuit 4301101

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

   Replace 3P recloser at L-802 P-50 with 3P recloser 34.5 kV, 12.5 kA interrupting rating on circuit 4301101. A microprocessor control is needed with source side PT sensing on all three phases. The directionality feature will need to be enabled.

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

Replace 3P recloser at L-802 P-99A with 3P recloser 34.5 kV, 12.5 kA interrupting rating on circuit 4301101. A microprocessor control is needed with source side PT sensing on all three phases. The directionality feature will need to be enabled.

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

Replace 3P recloser at L-802 P-130 with 3P recloser 34.5 kV, 12.5 kA interrupting rating on circuit 4301101. A microprocessor control is needed with source side PT sensing on all three phases. The directionality feature will need to be enabled.

12. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Replace 3P fuse at L-802 P-211 with 3P recloser 34.5 kV, 12.5 kA interrupting rating on circuit 4301101. A microprocessor control is needed with source side PT sensing on all three phases. The directionality feature will need to be enabled.

13. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Upgrade 3P_100 Line regulator at L-801 P-21 from 100A to 418A. (123.0V Set, 3.0V bandwidth, No R&X compensation, 30 sec time delay, Co-generation/Auto-Determination mode).

14. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Upgrade 3P_100 Line regulator at L-802 P-196 from 100A to 418A. (123.0V Set, 3.0V bandwidth, No R&X compensation, 60 sec time delay, Co-generation/Auto-Determination mode).

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

Install a new 3P_418A line regulators at L-802 P-122 on Circuit 4301101. (123.0V Set, 3.0V bandwidth, No R&X compensation, 45 sec time delay, Co-generation/Auto-Determination mode)

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

Install a new 1P_219A line regulators at L-308 P-190 on Circuit 4301101. (123.0V Set, 3.0V bandwidth, No R&X compensation, 45 sec time delay, Co-generation/Auto-Determination mode).

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

The customer's inverter will be set to generate power in the power factor mode (not voltage regulation mode) at 97% power factor (absorbing).

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

Due to the amount of generation back feed, the SCADA SWITCH @ L-802 P-130 and the SCADA SWITCH SW# 531AX6 @ L-802 P-99A must be set directionally.

7.0 Smart Inverter Settings

The following provides Smart Inverter Settings - JUDefault22

Inverter Mode: Vars precedence over Watts

Inverter Ratings

KVA rating:	5000
KW rating:	4848
KVAR rating:	5000
De-Rating Required?	YES

Inverter profiles

Reactive Power Profile	SA22
Real Power Profile	Watt22_1
Bulk System Settings	JUDefault22

Bulk Power System Settings

Performance Category	III

Frequency Distrubance Trip Settings

OF2 Frequency	62
OF2 Clearing Time	0.16
OF1 Frequency	61.2
OF1 Clearing Time	300
UF2 Frequency	56.5
UF2 Clearing Time	0.16
UF1 Frequency	58.5
UF1 Clearing Time	300

Voltage Disturbance Trip Settings

OV2 Voltage	1.2
OV2 Clearing Time	0.16
OV1 Voltage	1.1
OV1 Clearing Time	2
UV2 Voltage	0.5
UV2 Clearing Time	1.1
UV1 Voltage	0.88
UV1 Clearing Time	3

Enter Service Criteria

Frequency Minimum (Hz)	59.5
Frequency Maximum (Hz)	60.1
Voltage Minimum (p.u.)	0.917
Voltage Maximum (p.u.)	1.05
Delay Before Export (s)	300
Ramp Time (s)	300
Ramp Characteristics	Linear
Enter Service Exceptions	Linear Ramp Required for Systems >50 kVA

Fixed Power Factor

Constant PF Active	Yes
Power Factor	0.97
Power Factor Excitation	0

Volt-VAR Settings

Volt-VAR Profile:	No
Vref	1
V1 - [PU]	N/A
Q1 - %Nameplate Apparent Power Rating	N/A
V2- [PU]	N/A
Q2 - %Nameplate Apparent Power Rating	N/A
V3 - [PU]	N/A
Q3 - %Nameplate Apparent Power Rating	N/A
V4 - [PU]	N/A
Q4 - %Nameplate Apparent Power Rating	N/A

Volt-Watt Active

Volt-Watt Profile:	No
Pmin	20%
V1 - [PU]	1.07
P1	100%
V2 - [PU]	1.1
P2	20%

8.0 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 #20272

Scope:

A . Install Interconnection PCC Recloser with SCADA capability
B . 3ph line construction from mainline to site
C . Relocate 34.5/4.8 kV transformer from L-802 P-180 to L-802 P-240
C . Replace 3P recloser at L-802 P-50 with 3P recloser 34.5 kV
D . Replace 3P recloser at L-802 P-99A with 3P recloser 34.5 kV
E . Replace 3P recloser at L-802 P-130 with 3P recloser 34.5 kV
F . Replace 3P fuse at L-802 P-211 with 3P recloser 34.5 kV
G . Upgrade 3P_100 Line regulator at L-802 P-196 from 100A to 418A
H . Install new 3P_418A line regulators at L-802, P-122
I . Install new 1P_219A line regulators at L-308 P-190
J . Set SCADA switchs directionally @ L-802 P-130 & L-802 P-99A
K . Power Quality Monitor/Meter
L . Primary metering installation
M . Engineering support
N . 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
Relocate 34.5/4.8 kV transformer			
Labor	$41,250	1	$41,250
Materials	$68,750	1	$68,750
Overheads	$15,000	1	$15,000
Replace 3P recloser with 3P recloser 34.5 kV			
Labor	$29,700	3	$89,100
Materials	$49,500	3	$148,500
Overheads	$10,800	3	$32,400

Replace 3P fuse with 3P recloser 34.5 kV			
Labor	$30,000	1	$30,000
Materials	$37,000	1	$37,000
Overheads	$18,000	1	$18,000
Upgrade 3P_100 Line regulator from 100A to 418A			
Labor	$33,000	1	$33,000
Materials	$55,000	1	$55,000
Overheads	$12,000	1	$12,000
Install new 3P_418A line regulator			
Labor	$33,000	1	$33,000
Materials	$55,000	1	$55,000
Overheads	$12,000	1	$12,000
Install 1P_219A line regulators			
Labor	$19,250	1	$19,250
Materials	$11,550	1	$11,550
Overheads	$4,200	1	$4,200
Set SCADA switchs directionally @ L-802 P-130 & L-802 P-99A			
Labor	$3,300	2	$6,600
Materials	$5,500	2	$11,000
Overheads	$1,200	2	$2,400
Power Quality Monitor/Meter			
Labor	$420	1	$420
Materials	$24,400	1	$24,400
Overheads	$180	1	$180
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			$935,000
15% Contingency			$140,250
Taxes			$84,820
Total			**$1,160,070**

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

AVANGRID	Coordinated Electric System Interconnect Review	DER #20272
	Distributed Energy Resources - NYSSIR	Version 4 7/12/2024

Project #20272

Scope:

A . Upgrade 3P_100 Source Line regulator at L-801 P-21 from 100A to 418A

B . Engineering support

Estimate Detail	cost/unit	unit	total
Upgrade 3P_100 Source Line regulator from 100A to 418A			
Labor	$105,929	1	$105,929
Materials	$159,198	1	$159,198
Overheads	$24,870	1	$24,870
Engineering support - Source Line Regulator	$35,477	1	$35,477
Subtotal			$325,475
15% Contingency			$48,821
Taxes			$27,105
Total			**$401,401**

Notes to Developer:
This item is eligible for cost sharing per Appendix E of the SIR Standardized Contract. The cost shown above is the pro-rata share of the Qualifying Upgrade Cost which this project is responsible for under the Cost Sharing 2.0 PSC Order. This upgrade will result in an incremental hosting capacity amount of 15.16 MW and the total cost is $1,490,162. Please note that under the Cost Sharing 2.0 process, the mobilization threshold for substation Transformer Bank upgrades is upon payment of 75% of the Qualifying Upgrade Cost by the Triggering Project and Sharing Project(s). For other Qualifying Substation Upgrades, the mobilization threshold is 25% of the Qualifying Upgrade Cost. Any remaining reconciliation for Qualifying Upgrade Cost will occur pursuant to Section I-C of the SIR. Qualifying Upgrade Costs are non-refundable until another Sharing Project provides payment such that the utility has received payments equal to the pro-rata share of the Qualifying Upgrade. Triggering amount is $372,541
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 rework
- 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.

9.0 REVISION HISTORY

Version	Date	Description
0.0	6/8/2023	Original
1.0	9/25/2023	Revised to reflect developer selected mitigation - section 6
2.0	1/18/2024	Updated narrative in section 2 and section 6.6
3.0	6/28/2024	Inverters operating at 0.97 power factor
4.0	7/12/2024	Updated Sections 2 & 8 cost

AVANGRID	**Coordinated Electric System Interconnect Review**	DER #20273
	Distributed Energy Resources - NYSSIR	Version 4 7/12/2024

For

Interconnection Customer: Pichel 2

Applicant: Distributed Sun

5000 kVA PV Generator System

1 76 Rd

Interconnection to NYSEG

Ithaca Division

4301101 Tap Circuit

34.5kV Feeder

Table of Contents

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 $3,797,071.

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 does not have any concerns with the installation of this proposed generation at this location when running at a 0.97 power factor.

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 a new study and costs associated shall be borne by the Interconnection Customer. An increase in system size may also forfeit the Interconnection Customer's existing queue position.

Triggering amount for the reconductoring is $1,676,700.

3.0 COMPANY EPS PARAMETERS

Substation	Brooktondale Tap
Transformer Name	N/A
Transformer Peak Load (kVA)	N/A
Contingency Condition Load, N-1 Criteria (kVA)	N/A
Minimum Daytime Load (kVA)	N/A
Generation: Total/Connected/Queued (kVA)	6363.81 / 1363.81 / 5000
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	4301101
Peak Load on Feeder (kVA)	3,310
Minimum Daytime Load on Feeder (kVA)	497
Feeder Primary Voltage at POI (kV)	34.50
Line Phasing at POI	Three-Phase
Circuit distance from POI to substation	8.69 miles
Distance to nearest 3-Phase (if applicable)	N/A
Line Regulation	Yes
Line/Source Grounding Configuration at POI	Non-Effective
Other Generation: Total/Connected/Queued (kVA)	6363.81 / 1363.81 / 5000

System Fault Characteristics without Interconnection Customer DG at POI with System Upgrades described in Section 6	
Interconnection Customer POI Location	L-802, P-233
I 3-Phase (3LLL)	1692 Amps
I Line to Ground (3I0)	1131 Amps
Z1 (100 MVA Base)	0.3978 + j0.9768 PU
Z0 (100 MVA Base)	0.6374 + j2.3678 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 4.8kV.

The proposed generating system consists of :

Thirty four(34) SMA-SHP-150-US inverters, six(6) inverters will be curtailed to 133.333 kVA each.

5.0 SYSTEM IMPACT ANALYSIS

Category	Criteria	Limit	Result
Voltage	Overvoltage	<105% (ANSI C84.1)	PASS
With the addition of the subject generator, the maximum voltage as modeled on the Feeder is 105.67% of nominal, and is not impacted by the proposed DER. No 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 83.38% of nominal, and is not impacted by the proposed DER. No remediation is required.			
Voltage	Source Regulation for Reverse Power	<15% minimum load criteria	FAIL
The total generation downstream of the source regulation is 11.364MVA. The total minimum load on this source is 0.497MVA. Therefore, the generation to load ratio is 2289%.			
Voltage	Line Regulation for Reverse Power	Minimum load to generation criteria	FAIL
The total generation downstream of line regulator #1 is 10.42 MVA. The minimum load on the regulator is 2.7 MVA. Therefore, the generation to load ratio is 386%.			
The total generation downstream of line regulator #2 is 10.243 MVA. The minimum load on the regulator is 2.769 MVA. Therefore, the generation to load ratio is 370%.			
Voltage	Fluctuation	<3% steady state from proposed generation on feeder	PASS
The greatest steady-state voltage fluctuation on the circuit is 0.31% 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 0.26V 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 2.46, the Pst for the location with the greatest voltage fluctuation is 0.072 and the emissions limit is 0.350.			
Voltage	Flicker	Aggregate Flicker	PASS
The Pst for the location with the greatest aggregate voltage fluctuation is 0.126 and the emissions limit is 0.900.			
Equipment Ratings	Thermal (Cont. Current)	Thermal limits (assuming no load)	FAIL
The proposed generation exceeds an existing equipment thermal capability. (see failed equipment chart below)			
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.			
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)	FAIL
There are 6 existing protective devices between the Source and PCC. Distribution line Protection and Coordination must be reviewed, any changes or upgrades will be included in the Section 6 below.			
Protection	Protective Device Coordination	Company Guidelines (Reclosers and Breakers)	FAIL
Due to the amount of generation back feed, the SCADA SWITCH @ L-802 P-130, SCADA SWITCH SW# 531AX6 @ L-802 P-99A, SCADA SWITCH SW# 531-S3 @ L-802 P-50 and SCADA SWITCH @ L-803 P-11-1 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 has proposed a Grounding Bank with an impedance of 0.12 ohms and X/R ratio of 3.2. The Grounding Bank is within Company Guidelines. The Interconnection Customer will contribute approximately 164 A of 3I0 current to remote bolted line to ground faults and 164 A to faults at the PCC.			
Protection	Overvoltage - Transmission System Fault	Company 3V0 criteria	PASS
Due to the system configuration Transmission Ground Fault Overvoltage's are not a concern.			
Protection	Overvoltage - Distribution System Fault	<125% voltage rise	PASS
With subject generator interconnected the modeled voltage rise on the unfaulted phases of the system is 99%			
Protection	Effective Grounding	[individual utility specifications]	PASS
With the subject generator interconnected the modeled R0/X1 is 0.10685 PU and the X0/X1 is 0.73285 PU			
SCADA	Required EMS Visibility for Generation Sources	Monitoring & Control Requirements	Needed
The 5 MVA subject generator triggers the requirement for SCADA reporting to the Utility			

Existing Equipment Rating Analysis Table:

EQUIPMENT	VOLTAGE (kV)	LINE or GISID	POLE	PASS/FAIL
3P_FUSE	4.8	802	211	FAIL
SOLID_BLADE	4.8	802	204	FAIL
GROUP_OP	4.8	802	203	FAIL
3P_REGULATOR	4.8	802	196	FAIL
SOLID_BLADE	4.8	802	183	FAIL
SOLID_BLADE	4.8	802	182	FAIL
3P_2AC	4.8	802	182	FAIL
3P_2AC	4.8	802	182	FAIL
OH-167-19.9YG/4.8D	34.5	802	182	FAIL
3P_FUSE	34.5	802	181	FAIL
3P_2AC	34.5	802	149	FAIL
3P_2AC	34.5	802	109	FAIL
3P_REGULATOR	34.5	SUB	SUB	FAIL

6.0 MITIGATIONS FOR SYSTEM IMPACT ANALYSIS FAILURES

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. The requirements for Remote Crediting, or Community Distributed Generation billing are that an hourly interval MV-90 meter be installed which has remote access via a dial-up telephone circuit known as a land line. The installation of the land line is the responsibility of the customer, and the installation of the meter is the responsibility of the utility.
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 Source Regulation:

   a. Circuit 4301101 Source Line Regulator at L-801 P-21

   Control is REQUIRED for the Line Regulation:

   b. Proposed 3P regulator at L-802 P-122 on circuit 4301101

   Control is REQUIRED for the Line Regulation:

   c. Existing 3P regulator at L-802 P-196 on circuit 4301101

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

   Relocate 34.5/4.8 kV transformer and related fuses from L-802 P-180 to L-802 P-240 on circuit 4301101 (*Also Required for IPP#20272*)

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

   Replace 3P recloser at L-802 P-50 with 3P recloser 34.5 kV, 12.5 kA interrupting rating on circuit 4301101. A microprocessor control is needed with source side PT sensing on all three phases. The directionality feature will need to be enabled. (*Also Required for IPP#20272*)

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

Replace 3P recloser at L-802 P-99A with 3P recloser 34.5 kV, 12.5 kA interrupting rating on circuit 4301101. A microprocessor control is needed with source side PT sensing on all three phases. The directionality feature will need to be enabled. (*Also Required for IPP#20272*)

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

Replace 3P recloser at L-802 P-130 with 3P recloser 34.5 kV, 12.5 kA interrupting rating on circuit 4301101. A microprocessor control is needed with source side PT sensing on all three phases. The directionality feature will need to be enabled. (*Also Required for IPP#20272*)

12. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Replace 3P fuse at L-802 P-211 with 3P recloser 34.5 kV, 12.5 kA interrupting rating on circuit 4301101. A microprocessor control is needed with source side PT sensing on all three phases. The directionality feature will need to be enabled. (*Also Required for IPP#20272*)

13. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Upgrade 3P_100 Line regulator at L-801 P-21 from 100A to 418A. (123.0V Set, 3.0V bandwidth, No R&X compensation, 30 sec time delay, Co-generation/Auto-Determination mode). (*Also Required for IPP#20272*)

14. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Upgrade 3P_100 Line regulator at L-802 P-196 from 100A to 418A. (123.0V Set, 3.0V bandwidth, No R&X compensation, 60 sec time delay, Co-generation/Auto-Determination mode). (*Also Required for IPP#20272*)

15. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Reconductor 3P_2AC OH conductor from L-802 P-182 to L-802 P-233 with 3P_477AL (2.2 miles) on Circuit 4301101

16. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Reconductor 3P_2AC OH conductor from L-802 P-151 to L-802 P-157 with 3P_477AL (0.4 miles) on Circuit 4301101

17. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Reconductor 3P_2AC OH conductor from L-802 P-110 to L-802 P-121 with 3P_477AL (0.5 miles) on Circuit 4301101

18. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Reconductor 3P_2AC OH conductor from L-802 P-92 to L-802 P-94 with 3P_477AL (0.1 miles) on Circuit 4301101

19. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Remove cutouts and solids at L-802 P-204 and L-802 P-183 and install a new 600A SCADA 3P_SWITCH on circuit 4301101

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

Install a new 3P_418A line regulators at L-802 P-122 on Circuit 4301101. (123.0V Set, 3.0V bandwidth, No R&X compensation, 45 sec time delay, Co-generation/Auto-Determination mode).(*Also Required for IPP#20272*)

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

Install a new 1P_219A line regulators at L-308 P-190 on Circuit 4301101. (123.0V Set, 3.0V bandwidth, No R&X compensation, 45 sec time delay, Co-generation/Auto-Determination mode). (*Also Required for IPP#20272*)

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

The customer's inverter will be set to generate power in the power factor mode (not voltage regulation mode) at 97% power factor (absorbing).

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

Due to the amount of generation back feed the SCADA SWITCH @ L-802 P-130 & SCADA SWITCH SW# 531AX6 @ L-802 P-99A must be set directionally (*Also Required for IPP#20272*)

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

Due to the amount of generation back feed the SCADA SWITCH SW# 531-S3 @ L-802 P-50 & SCADA SWITCH @ L-803 P-11-1 must be set directionally

7.0 Smart Inverter Settings

The following provides Smart Inverter Settings - AVGDFS

Inverter Mode: Vars precedence over Watts

Inverter Ratings

KVA rating:	5000
KW rating:	4848
KVAR rating:	5000
De-Rating Required?	YES

Inverter profiles

Reactive Power Profile	SA22
Real Power Profile	Watt22_1
Bulk System Settings	JUDefault22

Bulk Power System Settings

Performance Category	III

Frequency Distrubance Trip Settings

OF2 Frequency	62
OF2 Clearing Time	0.16
OF1 Frequency	61.2
OF1 Clearing Time	300
UF2 Frequency	56.5
UF2 Clearing Time	0.16
UF1 Frequency	58.5
UF1 Clearing Time	300

Voltage Disturbance Trip Settings

OV2 Voltage	1.2
OV2 Clearing Time	0.16
OV1 Voltage	1.1
OV1 Clearing Time	2
UV2 Voltage	0.5
UV2 Clearing Time	1.1
UV1 Voltage	0.88
UV1 Clearing Time	3

Enter Service Criteria

Frequency Minimum (Hz)	59.5
Frequency Maximum (Hz)	60.1
Voltage Minimum (p.u.)	0.917
Voltage Maximum (p.u.)	1.05
Delay Before Export (s)	300
Ramp Time (s)	300
Ramp Characteristics	Linear
Enter Service Exceptions	Linear Ramp Required for Systems >50 kVA

Fixed Power Factor

Constant PF Active	Yes
Power Factor	0.97
Power Factor Excitation	0

Volt-VAR Settings

Volt-VAR Profile:	No
Vref	1
V1 - [PU]	N/A
Q1 - %Nameplate Apparent Power Rating	N/A
V2- [PU]	N/A
Q2 - %Nameplate Apparent Power Rating	N/A
V3 - [PU]	N/A
Q3 - %Nameplate Apparent Power Rating	N/A
V4 - [PU]	N/A
Q4 - %Nameplate Apparent Power Rating	N/A

Volt-Watt Active

Volt-Watt Profile:	No
Pmin	20%
V1 - [PU]	1.07
P1	100%
V2 - [PU]	1.1
P2	20%

8.0 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 #20273

Scope:

A . Install Interconnection PCC Recloser with SCADA capability
B . 3ph line construction from mainline to site
C . *Relocate 34.5/4.8 kV transformer from L-802 P-180 to L-802 P-240
D . *Replace 3P recloser at L-802 P-50 with 3P recloser 34.5 kV
E . *Replace 3P recloser at L-802 P-99A with 3P recloser 34.5 kV
F . *Replace 3P recloser at L-802 P-130 with 3P recloser 34.5 kV
G . *Replace 3P fuse at L-802 P-211 with 3P recloser 34.5 kV
H . *Upgrade 3P_100 Line regulator at L-802 P-196 from 100A to 418A
I . *Install new 3P_418A line regulators at L-802, P-122
J . *Install new 1P_219A line regulators at L-308 P-190
K . *Set SCADA switchs directionally @ L-802 P-130 & L-802 P-99A
L . Reconductor 3P_2AC OH conductor from L-802 P-151 to L-802 P-157 with 3P_477AL (0.4 miles)
M . Reconductor 3P_2AC OH conductor from L-802 P-92 to L-802 P-94 with 3P_477AL (0.1 miles)
N . Remove cutouts & solids at L-802 P-204 & L-802 P-183 and install 600A SCADA 3P_SWITCH
O . Set SCADA switchs directionally @ L-802 P-50 & L-803 P-11-1
P . Power Quality Monitor/Meter
Q . Primary metering installation
R . Engineering support
S . 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
***Relocate 34.5/4.8 kV transformer**			
Labor	$41,250	1	$41,250
Materials	$68,750	1	$68,750
Overheads	$15,000	1	$15,000

***Replace 3P recloser with 3P recloser 34.5 kV**			
Labor	$29,700	3	$89,100
Materials	$49,500	3	$148,500
Overheads	$10,800	3	$32,400
***Replace 3P fuse with 3P recloser 34.5 kV**			
Labor	$30,000	1	$30,000
Materials	$37,000	1	$37,000
Overheads	$18,000	1	$18,000
***Upgrade 3P_100 Line regulator from 100A to 418A**			
Labor	$33,000	1	$33,000
Materials	$55,000	1	$55,000
Overheads	$12,000	1	$12,000
***Install new 3P_418A line regulators at L-802, P-122**			
Labor	$33,000	1	$33,000
Materials	$55,000	1	$55,000
Overheads	$12,000	1	$12,000
***Install 1P_219A line regulators**			
Labor	$19,250	1	$19,250
Materials	$11,550	1	$11,550
Overheads	$4,200	1	$4,200
***Set SCADA switchs directionally @ L-802 P-130 & L-802 P-99A**			
Labor	$3,300	2	$6,600
Materials	$5,500	2	$11,000
Overheads	$1,200	2	$2,400
Reconductor 3P_2AC OH conductor with 3P_477AL (0.4 miles)			
Labor	$92,000	1	$92,000
Materials	$68,000	1	$68,000
Overheads	$40,000	1	$40,000
Reconductor 3P_2AC OH conductor with 3P_477AL (0.1 miles)			
Labor	$23,000	1	$23,000
Materials	$17,000	1	$17,000
Overheads	$10,000	1	$10,000
Remove cutouts & solids & install 600A SCADA 3P_SWITCH			
Labor	$29,700	2	$59,400
Materials	$49,500	2	$99,000
Overheads	$10,800	2	$21,600
Set SCADA switchs directionally @ L-802 P-50 & L-803 P-11-1			
Labor	$3,300	2	$6,600
Materials	$5,500	2	$11,000
Overheads	$1,200	2	$2,400
Power Quality Monitor/Meter			
Labor	$420	1	$420
Materials	$24,400	1	$24,400
Overheads	$180	1	$180

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			$1,385,000
15% Contingency			$207,750
Taxes			$126,220
Total			**$1,718,970**

Notes to Developer:
***If Project#20272 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.

Project #20273

Scope:

A . **Upgrade 3P_100 Source Line regulator at L-801 P-21 from 100A to 418A
B . *Reconductor 3P_2AC OH conductor from L-802 P-182 to L-802 P-233 with 3P_477AL (2.2 miles)
C . *Reconductor 3P_2AC OH conductor from L-802 P-110 to L-802 P-121 with 3P_477AL (0.5 miles)
D . **Engineering support

Estimate Detail	cost/unit	unit	total
****Upgrade 3P_100 Source Line regulator from 100A to 418A**			
Labor	$105,929	1	$105,929
Materials	$159,198	1	$159,198
Overheads	$24,870	1	$24,870
***Reconductor 3P_2AC OH conductor with 3P_477AL (2.2 miles)**			
Labor	$506,000	1	$506,000
Materials	$374,000	1	$374,000
Overheads	$220,000	1	$220,000
***Reconductor 3P_2AC OH conductor with 3P_477AL (0.5 miles)**			
Labor	$115,000	1	$115,000
Materials	$85,000	1	$85,000
Overheads	$50,000	1	$50,000
**Engineering support - Source Line Regulator	$35,477	1	$35,477

Subtotal			$1,675,475
15% Contingency			$251,321
Taxes			$151,305
Total			**$2,078,101**

Notes to Developer:
***This item is eligible for cost sharing per Appendix E of the SIR Standardized Contract. Since this project is the Triggering Project for this upgrade, this project will be responsible for paying 100% of the Qualifying Upgrade Cost. This upgrade will result in an incremental hosting capacity amount of 25.89 MW. The total cost of item B is $1,366,200 and the total cost of item C is $310,500. Upon receipt of additional payments by Sharing Projects the utility shall reconcile with the Triggering Project based on a calculated estimated pro-rata share. Any remaining reconciliation for Qualifying Upgrade Cost will occur pursuant to Section I-C of the SIR. Qualifying Upgrade Costs are non-refundable for the Triggering Project until a Sharing Project provides payment such that the utility has receipt of 100% of Qualifying Upgrade Cost. Triggering amount of item B is $1,366,200 and item C is $310,500.**
****This item is eligible for cost sharing per Appendix E of the SIR Standardized Contract. The cost shown above is the pro-rata share of the Qualifying Upgrade Cost which this project is responsible for under the Cost Sharing 2.0 PSC Order. This upgrade will result in an incremental hosting capacity amount of 15.16MW. The total cost of is $1,490,162. Please note that under the Cost Sharing 2.0 process, the mobilization threshold for substation Transformer Bank upgrades is upon payment of 75% of the Qualifying Upgrade Cost by the Triggering Project and Sharing Project(s).**
For other Qualifying Substation Upgrades, the mobilization threshold is 25% ($372,541) of the Qualifying Upgrade Cost. Any remaining reconciliation for Qualifying Upgrade Cost will occur pursuant to Section I-C of the SIR. Qualifying Upgrade Costs are non-refundable until another Sharing Project provides payment such that the utility has received payments equal to the pro-rata share of the Qualifying Upgrade.
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 rework
- 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.

9.0 REVISION HISTORY

Version	Date	Description
0.0	6/12/2023	Original
1.0	9/25/2023	Revised to reflect developer selected mitigation - section 6 point b
2.0	1/18/2024	Updated narrative in section 2 and section 6.6
3.0	7/1/2024	inverters operating at 0.97 power factor
4.0	7/12/2024	Updated Sections 2 & 8 cost

AVANGRID	Coordinated Electric System Interconnect Review	DER #20274
	Distributed Energy Resources - NYSSIR	Version 4 7/12/2024

For

Interconnection Customer: Tavelli 1

Applicant: Distributed Sun

5000 kVA PV Generator System

1036 76 Rd

Interconnection to NYSEG

Ithaca Division

4301101 Tap Circuit

34.5kV Feeder

Table of Contents

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 $2,450,344.

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 does not have any concerns with the installation of this proposed generation at this location.

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 a new study and costs associated shall be borne by the Interconnection Customer. An increase in system size may also forfeit the Interconnection Customer's existing queue position.

Triggering amount for the reconductoring is $1,676,700
Triggering amount for the Source Line regulator is $372,541

3.0 COMPANY EPS PARAMETERS

Substation	Brooktondale Tap
Transformer Name	N/A
Transformer Peak Load (kVA)	N/A
Contingency Condition Load, N-1 Criteria (kVA)	N/A
Minimum Daytime Load (kVA)	N/A
Generation: Total/Connected/Queued (kVA)	11363.81 / 1363.81 / 10000
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	4301101
Peak Load on Feeder (kVA)	3,310
Minimum Daytime Load on Feeder (kVA)	497
Feeder Primary Voltage at POI (kV)	34.50
Line Phasing at POI	Three-Phase
Circuit distance from POI to substation	8.69 miles
Distance to nearest 3-Phase (if applicable)	N/A
Line Regulation	Yes
Line/Source Grounding Configuration at POI	Non-Effective
Other Generation: Total/Connected/Queued (kVA)	11363.81 / 1363.81 / 10000

System Fault Characteristics without Interconnection Customer DG at POI with System Upgrades described in Section 6	
Interconnection Customer POI Location	L-802, P-239
I 3-Phase (3LLL)	1720 Amps
I Line to Ground (3I0)	1101 Amps
Z1 (100 MVA Base)	0.4388 + j0.9991 PU
Z0 (100 MVA Base)	0.6865 + j2.4589 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 4.8kV.

The proposed generating system consists of :

Thirty four(34) SMA-SHP-150-US inverters, six(6) inverters will be curtailed to 133.333 kVA each.

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 105.66% of nominal, and is impacted by the proposed DER. Remediation is required.			
Voltage	Undervoltage	>95% (ANSI C84.1)	FAIL
With the addition of the subject generator, the minimum voltage as modeled on the Feeder is 83.31% of nominal, and is impacted by the proposed DER. Remediation is required.			
Voltage	Source Regulation for Reverse Power	<15% minimum load criteria	FAIL
The total generation downstream of the source regulation is 16.364MVA. The total minimum load on this source is 0.497MVA. Therefore, the generation to load ratio is 3296%.			
Voltage	Line Regulation for Reverse Power	Minimum load to generation criteria	FAIL
The total generation downstream of line regulator #1 is 15.42 MVA. The minimum load on the regulator is 2.7 MVA. Therefore, the generation to load ratio is 571%.			
The total generation downstream of line regulator #2 is 15.243 MVA. The minimum load on the regulator is 2.769 MVA. Therefore, the generation to load ratio is 550%.			
Voltage	Fluctuation	<3% steady state from proposed generation on feeder	PASS
The greatest steady-state voltage fluctuation on the circuit is -0.23% 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 0.19V 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 2.28, the Pst for the location with the greatest voltage fluctuation is 0.08 and the emissions limit is 0.350.			
Voltage	Flicker	Aggregate Flicker	PASS
The Pst for the location with the greatest aggregate voltage fluctuation is 0.11 and the emissions limit is 0.900.			
Equipment Ratings	Thermal (Cont. Current)	Thermal limits (assuming no load)	FAIL
The proposed generation exceeds an existing equipment thermal capability. (see failed equipment chart below)			
Equipment Ratings	Withstand (Fault Current)	<90% withstand limits (Distribution Equip.)	PASS
No distribution issues			

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.			
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)	FAIL
There are 6 existing protective devices between the Source and PCC. Distribution line Protection and Coordination must be reviewed, any changes or upgrades will be included in the Section 6 below.			
Protection	Protective Device Coordination	Company Guidelines (Reclosers and Breakers)	FAIL
Due to the amount of generation back feed, BRK 531A12, SCADA SWITCH @ L-802 P-130, SCADA SWITCH SW# 531AX6 @ L-802 P-99A, SCADA SWITCH SW# 531-S3 @ L-802 P-50 and SCADA SWITCH @ L-803 P-11-1 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 has proposed a Grounding Bank with an impedance of 0.12 ohms and X/R ratio of 3.2. The Grounding Bank is within Company Guidelines. The Interconnection Customer will contribute approximately 55 A of 3I0 current to remote bolted line to ground faults and A to faults at the PCC.			
Protection	Overvoltage - Transmission System Fault	Company 3V0 criteria	PASS
Due to the system configuration Transmission Ground Fault Overvoltage's are not a concern.			
Protection	Overvoltage - Distribution System Fault	<125% voltage rise	PASS
With subject generator interconnected the modeled voltage rise on the unfaulted phases of the system is 118%			
Protection	Effective Grounding	[individual utility specifications]	PASS
With the subject generator interconnected the modeled R0/X1 is 0.46782 PU and the X0/X1 is 1.5512 PU			
SCADA	Required EMS Visibility for Generation Sources	Monitoring & Control Requirements	Needed
The 5 MVA subject generator triggers the requirement for SCADA reporting to the Utility			

The 5 MVA subject generator triggers the requirement for SCADA reporting to the Utility

Existing Equipment Rating Analysis Table:

EQUIPMENT	VOLTAGE (kV)	LINE or GISID	POLE	PASS/FAIL
3P_FUSE	4.8	802	211	FAIL
SOLID_BLADE	4.8	802	204	FAIL
GROUP_OP	4.8	802	203	FAIL
3P_REGULATOR	4.8	802	196	FAIL
SOLID_BLADE	4.8	802	183	FAIL
SOLID_BLADE	4.8	802	182	FAIL
3P_2AC	4.8	802	182	FAIL
3P_2AC	4.8	802	182	FAIL
OH-167-19.9YG/4.8D	34.5	802	182	FAIL
3P_FUSE	34.5	802	181	FAIL
3P_1/0AA	34.5	802	181	FAIL
3P_2AC	34.5	802	149	FAIL
3P_2AC	34.5	802	109	FAIL
3P_REGULATOR	34.5	SUB	SUB	FAIL

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. The requirements for Remote Crediting, or Community Distributed Generation billing are that an hourly interval MV-90 meter be installed which has remote access via a dial-up telephone circuit known as a land line. The installation of the land line is the responsibility of the customer, and the installation of the meter is the responsibility of the utility.
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 Source Regulation:

   a. Circuit 4301101 Source Line Regulator at L-801 P-21

   Control is REQUIRED for the Line Regulation:

   b. Proposed 3P regulator at L-802 P-122 on circuit 4301101

   Control is REQUIRED for the Line Regulation:

   c. Existing 3P regulator at L-802 P-196 on circuit 4301101

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

   Relocate 34.5/4.8 kV transformer and related fuses from L-802 P-180 to L-802 P-240 on circuit 4301101 (*Also Required for IPP#20272 & 20273*)

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

   Replace 3P recloser at L-802 P-50 with 3P recloser 34.5 kV, 12.5 kA interrupting rating on circuit 4301101. A microprocessor control is needed with source side PT sensing on all three phases. The directionality feature will need to be enabled. (Also Required for IPP#20272 & 20273)

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

Replace 3P recloser at L-802 P-99A with 3P recloser 34.5 kV, 12.5 kA interrupting rating on circuit 4301101. A microprocessor control is needed with source side PT sensing on all three phases. The directionality feature will need to be enabled. (Also Required for IPP#20272 & 20273)

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

Replace 3P recloser at L-802 P-130 with 3P recloser 34.5 kV, 12.5 kA interrupting rating on circuit 4301101. A microprocessor control is needed with source side PT sensing on all three phases. The directionality feature will need to be enabled. (Also Required for IPP#20272 & 20273)

12. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Replace 3P fuse at L-802 P-211 with 3P recloser 34.5 kV, 12.5 kA interrupting rating on circuit 4301101. A microprocessor control is needed with source side PT sensing on all three phases. The directionality feature will need to be enabled. (Also Required for IPP#20272 & 20273)

13. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Upgrade 3P_100 Line regulator at L-801 P-21 from 100A to 418A. (123.0V Set, 3.0V bandwidth, No R&X compensation, 30 sec time delay, Co-generation/Auto-Determination mode). (Also Required for IPP#20272)

14. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Upgrade 3P_100 Line regulator at L-802 P-196 from 100A to 418A. (123.0V Set, 3.0V bandwidth, No R&X compensation, 60 sec time delay, Co-generation/Auto-Determination mode). (Also Required for IPP#20272)

15. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Reconductor 3P_2AC OH conductor from L-802 P-182 to L-802 P-233 with 3P_477AL (2.2 miles) on Circuit 4301101 (Also Required for IPP#20273)

16. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Reconductor 3P_2AC OH conductor from L-802 P-151 to L-802 P-157 with 3P_477AL (0.4 miles) on Circuit 4301101 (Also Required for IPP#20273)

17. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Reconductor 3P_2AC OH conductor from L-802 P-110 to L-802 P-121 with 3P_477AL (0.5 miles) on Circuit 4301101 (Also Required for IPP#20273)

18. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Reconductor 3P_2AC OH conductor from L-802 P-92 to L-802 P-94 with 3P_477AL (0.1 miles) on Circuit 4301101 (Also Required for IPP#20273)

19. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Remove cutouts and solids at L-802 P-204 and L-802 P-183 and install a new 600A SCADA 3P_SWITCH

on circuit 4301101 (Also Required for IPP#20273)

20. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Reconductor 3P_1/0AA OH conductor from L-802 P-182 to L-802 P-183 with 3P_477AL (0.01 miles) on Circuit 4301101.

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

Install a new 3P_418A line regulators at L-802 P-122 on Circuit 4301101. (123.0V Set, 3.0V bandwidth, No R&X compensation, 45 sec time delay, Co-generation/Auto-Determination mode).(Also Required for IPP#20272 & 20273)

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

Install a new 1P_219A line regulators at or about L-308, P-190 on Circuit 4301101. (123.0V Set, 3.0V bandwidth, No R&X compensation, 45 sec time delay, Co-generation/Auto-Determination mode).(Required for IPP#20272)

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

Due to the amount of generation back feed the SCADA SWITCH @ L-802 P-130 & SCADA SWITCH SW# 531AX6 @ L-802 P-99A must be set directionally (*Also Required for IPP#20272 & 20273)*

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

Due to the amount of generation back feed the SCADA SWITCH SW# 531-S3 @ L-802 P-50 & SCADA SWITCH @ L-803 P-11-1 must be set directionally (Also Required for IPP#20273)

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

The customer's inverter will be set to generate power in the power factor mode (not voltage regulation mode) at 97% power factor (absorbing).

7.0 Smart Inverter Settings

The following provides Smart Inverter Settings - AVGDFS

Inverter Mode: Vars precedence over Watts

Inverter Ratings

KVA rating:	5000
KW rating:	4848
KVAR rating:	5000
De-Rating Required?	YES

Inverter profiles

Reactive Power Profile	SA22
Real Power Profile	Watt22_1
Bulk System Settings	JUDefault22

Bulk Power System Settings

Performance Category	III

Frequency Distrubance Trip Settings

OF2 Frequency	62
OF2 Clearing Time	0.16
OF1 Frequency	61.2
OF1 Clearing Time	300
UF2 Frequency	56.5
UF2 Clearing Time	0.16
UF1 Frequency	58.5
UF1 Clearing Time	300

Voltage Disturbance Trip Settings

OV2 Voltage	1.2
OV2 Clearing Time	0.16
OV1 Voltage	1.1
OV1 Clearing Time	2
UV2 Voltage	0.5
UV2 Clearing Time	1.1
UV1 Voltage	0.88
UV1 Clearing Time	3

Enter Service Criteria

Frequency Minimum (Hz)	59.5
Frequency Maximum (Hz)	60.1
Voltage Minimum (p.u.)	0.917
Voltage Maximum (p.u.)	1.05
Delay Before Export (s)	300
Ramp Time (s)	300
Ramp Characteristics	Linear
Enter Service Exceptions	Linear Ramp Required for Systems >50 kVA

Fixed Power Factor

Constant PF Active	Yes
Power Factor	0.97
Power Factor Excitation	0

Volt-VAR Settings

Volt-VAR Profile:	No
Vref	1
V1 - [PU]	N/A
Q1 - %Nameplate Apparent Power Rating	N/A
V2- [PU]	N/A
Q2 - %Nameplate Apparent Power Rating	N/A
V3 - [PU]	N/A
Q3 - %Nameplate Apparent Power Rating	N/A
V4 - [PU]	N/A
Q4 - %Nameplate Apparent Power Rating	N/A

Volt-Watt Active

Volt-Watt Profile:	No
Pmin	20%
V1 - [PU]	1.07
P1	100%
V2 - [PU]	1.1
P2	20%

8.0 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 #20274

Scope:

A . Install Interconnection PCC Recloser with SCADA capability
B . 3ph line construction from mainline to site
C . *Relocate 34.5/4.8 kV transformer and related fuses from L-802 P-180 to L-802 P-240
D . *Replace 3P recloser at L-802 P-50 with 3P recloser 34.5 Kv
E . *Replace 3P recloser at L-802 P-99A with 3P recloser 34.5 kV
F . *Replace 3P recloser at L-802 P-130 with 3P recloser 34.5 kV
G . *Replace 3P fuse at L-802 P-211 with 3P recloser 34.5 kV
H . *Upgrade 3P_100 Line regulator at L-802 P-196 from 100A to 418A
I . **Reconductor 3P_2AC OH conductor from L-802 P-151 to L-802 P-157 with 3P_477AL (0.4 miles)
J . **Reconductor 3P_2AC OH conductor from L-802 P-92 to L-802 P-94 with 3P_477AL (0.1 miles)
K . **Remove cutouts & solids at L-802 P-204 & L-802 P-183 & install a new 600A SCADA 3P_SWITCH
L . Reconductor 3P_1/0AA OH conductor from L-802 P-182 to L-802 P-183 with 3P_477AL (0.01 miles)
M . *Install a new 3P_418A line regulators at L-802 P-122
N . *Install 1P_219A line regulators at L-308 P-190
O . *Set SCADA Swith with directionally @ L-802 P-130 & L-802 P-99A
P . **Set SCADA Swith with directionally @ L-802 P-50 & L-803 P-11-1
Q . Power Quality Monitor/Meter
R . Primary metering installation
S . Engineering support
T . 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
***Relocate 34.5/4.8 kV transformer and related fuses**			
Labor	$41,250	1	$41,250

Materials	$68,750	1	$68,750
Overheads	$15,000	1	$15,000
***Replace 3P recloser with 3P recloser 34.5 kV**			
Labor	$29,700	3	$89,100
Materials	$49,500	3	$148,500
Overheads	$10,800	3	$32,400
***Replace 3P fuse with 3P recloser 34.5 kV**			
Labor	$30,000	1	$30,000
Materials	$37,000	1	$37,000
Overheads	$18,000	1	$18,000
***Upgrade 3P_100 Line regulator from 100A to 418A**			
Labor	$33,000	1	$33,000
Materials	$55,000	1	$55,000
Overheads	$12,000	1	$12,000
****Reconductor 3P_2AC OH conductor with 3P_477AL (0.4 miles)**			
Labor	$92,000	1	$92,000
Materials	$68,000	1	$68,000
Overheads	$40,000	1	$40,000
****Reconductor 3P_2AC OH conductor with 3P_477AL (0.1 miles)**			
Labor	$23,000	1	$23,000
Materials	$17,000	1	$17,000
Overheads	$10,000	1	$10,000
****Remove cutouts and solids and install 600A SCADA 3P_SWITCH**			
Labor	$29,700	2	$59,400
Materials	$49,500	2	$99,000
Overheads	$10,800	2	$21,600
Reconductor 3P_1/0AA OH conductor with 3P_477AL (0.01 miles)			
Labor	$2,300	1	$2,300
Materials	$1,700	1	$1,700
Overheads	$1,000	1	$1,000
***Install a new 3P_418A line regulators**			
Labor	$33,000	1	$33,000
Materials	$55,000	1	$55,000
Overheads	$12,000	1	$12,000
***Install 1P_219A line regulators**			
Labor	$19,250	1	$19,250
Materials	$11,550	1	$11,550
Overheads	$4,200	1	$4,200
***Set SCADA Swith with directionally @ L-802 P-130 & L-802 P-99A**			
Labor	$3,300	2	$6,600
Materials	$5,500	2	$11,000
Overheads	$1,200	2	$2,400
****Set SCADA Swith with directionally @ L-802 P-50 & L-803 P-11-1**			
Labor	$3,300	2	$6,600

Materials	$5,500	2	$11,000
Overheads	$1,200	2	$2,400
Power Quality Monitor/Meter			
Labor	$420	1	$420
Materials	$24,400	1	$24,400
Overheads	$180	1	$180
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			$1,390,000
15% Contingency			$208,500
Taxes			$126,680
Total			**$1,725,180**

Notes to Developer:
***If Project#20272 moves forward with interconnection and installs these upgrades then these upgrades are not required for this project.**
****If Project#20272 & 20273moves 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.

Project #20274

Scope:

A . **Upgrade 3P_100 Source Line regulator at L-801 P-21 from 100A to 418A
B . *Reconductor 3P_2AC OH conductor from L-802 P-182 to L-802 P-233 with 3P_477AL (2.2 miles)
C . *Reconductor 3P_2AC OH conductor from L-802 P-110 to L-802 P-121 with 3P_477AL (0.5 miles)
D . **Engineering support

Estimate Detail	cost/unit	unit	total
****Upgrade 3P_100 Source Line regulator from 100A to 418A**			
Labor	$105,929	1	$105,929
Materials	$159,198	1	$159,198
Overheads	$24,870	1	$24,870
***Reconductor 3P_2AC OH conductor with 3P_477AL (2.2 miles)**			
Labor	$97,706	1	$97,706
Materials	$72,218	1	$72,218
Overheads	$42,481	1	$42,481

***Reconductor 3P_2AC OH conductor with 3P_477AL (0.5 miles)**			
Labor	$22,206	1	$22,206
Materials	$16,413	1	$16,413
Overheads	$9,655	1	$9,655
**Engineering support - Source Line Regulator	$35,477	1	$35,477
Subtotal			$586,153
15% Contingency			$87,923
Taxes			$51,088
Total			**$725,164**

Notes to Developer:
***This item is eligible for cost sharing per Appendix E of the SIR Standardized Contract. The cost shown above is the pro-rata share of the Qualifying Upgrade Cost which this project is responsible for under the Cost Sharing 2.0 PSC Order. The upgrades will result in incremental hosting capacity amount of 25.89 MW The total cost of item B is $1,366,200 and the total cost of item C is $310,500. Upon receipt of additional payments by Sharing Projects the utility shall reconcile with this project based on a calculated estimated pro-rata share. Any remaining reconciliation for Qualifying Upgrade Cost will occur pursuant to Section I-C of the SIR. Qualifying Upgrade Costs are non-refundable until a Sharing project provides payment that is equal to or exceeds the Qualifying Cost Sharing Upgrade Charge payment made by this project. Triggering amount of item B is $1,366,200 and item C is $310,500.**
****This item is eligible for cost sharing per Appendix E of the SIR Standardized Contract. The cost shown above is the pro-rata share of the Qualifying Upgrade Cost which this project is responsible for under the Cost Sharing 2.0 PSC Order. This upgrade will result in an incremental hosting capacity amount of 15.16MW. The total cost of is $1,490,162. Please note that under the Cost Sharing 2.0 process, the mobilization threshold for substation Transformer Bank upgrades is upon payment of 75% of the Qualifying Upgrade Cost by the Triggering Project and Sharing Project(s). For other Qualifying Substation Upgrades, the mobilization threshold is 25% ($372,541) of the Qualifying Upgrade Cost. Any remaining reconciliation for Qualifying Upgrade Cost will occur pursuant to Section I-C of the SIR. Qualifying Upgrade Costs are non-refundable until another Sharing Project provides payment such that the utility has received payments equal to the pro-rata share of the Qualifying Upgrade. 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 rework
- 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.

9.0 REVISION HISTORY

Version	Date	Description
0.0	6/21/2023	Original
1.0	9/25/2023	Revised to reflect developer selected mitigation - section 6 point b
2.0	1/18/2024	Updated narrative in section 2 and section 6.6
3.0	7/1/2024	Inverters operating at 0.97 power factor
4.0	7/12/2024	Updated Sections 2 & 8 cost

AVANGRID	**Coordinated Electric System Interconnect Review**	DER #20275
	Distributed Energy Resources - NYSSIR	Revision 3 7/12/2024

For

Interconnection Customer: Tavelli 2

Applicant: Distributed Sun

2500 kVA PV Generator System

1036 76 Rd

Interconnection to NYSEG

Ithaca Division

4301101 Tap Circuit

34.5kV Feeder

Table of Contents

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 $2,547,302.

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 does not have any concerns with the installation of this proposed generation at this location.

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 a new study and costs associated shall be borne by the Interconnection Customer. An increase in system size may also forfeit the Interconnection Customer's existing queue position.

Triggering amount for the reconductoring is $1,676,700
Triggering amount for the Source Line regulator is $372,541

3.0 COMPANY EPS PARAMETERS

Substation	Brooktondale Tap
Transformer Name	N/A
Transformer Peak Load (kVA)	N/A
Contingency Condition Load, N-1 Criteria (kVA)	N/A
Minimum Daytime Load (kVA)	N/A
Generation: Total/Connected/Queued (kVA)	16363.81 / 1363.81 / 15000
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	not installed
Bus Tie	none
Number of Feeders Served from this Bus	N/A

Connecting Feeder/Line	4301101
Peak Load on Feeder (kVA)	3,310
Minimum Daytime Load on Feeder (kVA)	497
Feeder Primary Voltage at POI (kV)	34.50
Line Phasing at POI	Three-Phase
Circuit distance from POI to substation	8.69 miles
Distance to nearest 3-Phase (if applicable)	N/A
Line Regulation	Yes
Line/Source Grounding Configuration at POI	Non-Effective
Other Generation: Total/Connected/Queued (kVA)	16363.81 / 1363.81 / 15000

System Fault Characteristics without Interconnection Customer DG at POI with System Upgrades described in Section 6	
Interconnection Customer POI Location	L-802, P-239
I 3-Phase (3LLL)	1846 Amps
I Line to Ground (3I0)	1106 Amps
Z1 (100 MVA Base)	0.3979 + j0.9921 PU
Z0 (100 MVA Base)	0.6203 + j2.5445 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 4.8kV.

The proposed generating system consists of :

Seventeen (17) SMA-SHP-150-US inverters, three(3) inverters will be curtailed to 133.333 kVA each.

5.0 SYSTEM IMPACT ANALYSIS

Category	Criteria	Limit	Result
Voltage	Overvoltage	<105% (ANSI C84.1)	PASS
With the addition of the subject generator, the maximum voltage as modeled on the Feeder is 105.61% of nominal, and is not impacted by the proposed DER. No 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 83.29% of nominal, and is not impacted by the proposed DER. No remediation is required.			
Voltage	Source Regulation for Reverse Power	<15% minimum load criteria	FAIL
The total generation downstream of the source regulation is 18.864MVA. The total minimum load on this source is 0.497MVA. Therefore, the generation to load ratio is 3799%.			
Voltage	Line Regulation for Reverse Power	Minimum load to generation criteria	FAIL
The total generation downstream of line regulator #1 is 20.42 MVA. The minimum load on the regulator is 2.7 MVA. Therefore, the generation to load ratio is 756%.			
The total generation downstream of line regulator #2 is 20.243 MVA. The minimum load on the regulator is 2.769 MVA. Therefore, the generation to load ratio is 731%.			
Voltage	Fluctuation	<3% steady state from proposed generation on feeder	PASS
The greatest steady-state voltage fluctuation on the circuit is 0.1% 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 0.02V 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 2.49, the Pst for the location with the greatest voltage fluctuation is 0.042 and the emissions limit is 0.350.			
Voltage	Flicker	Aggregate Flicker	PASS
The Pst for the location with the greatest aggregate voltage fluctuation is 0.109 and the emissions limit is 0.900.			
Equipment Ratings	Thermal (Cont. Current)	Thermal limits (assuming no load)	FAIL
The proposed generation exceeds an existing equipment thermal capability. (see failed equipment chart below)			
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.			
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			
Protection	Protective Device Coordination	Company Guidelines (Dist. Line Fusing)	FAIL
There are 6 existing protective devices between the Source and PCC. Distribution line Protection and Coordination must be reviewed, any changes or upgrades will be included in the Section 6 below.			
Protection	Protective Device Coordination	Company Guidelines (Reclosers and Breakers)	FAIL
Due to the amount of reverse power flow, all upstream reclosers 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 has proposed a Grounding Bank with an impedance of 0.12 ohms and X/R ratio of 3.2. The Grounding Bank is within Company Guidelines. The Interconnection Customer will contribute approximately 11 A of 3I0 current to remote bolted line to ground faults and 11 A to faults at the PCC.			
Protection	Overvoltage - Transmission System Fault	Company 3V0 criteria	N/A
Not applicable due to circuit configuration.			
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 173%. See section 6 point 29.			
Protection	Effective Grounding	[individual utility specifications]	FAIL
With the subject generator interconnected the modeled R0/X1 is 2381.48 PU and the X0/X1 is 6446.98 PU. See section 6 point 29.			
SCADA	Required EMS Visibility for Generation Sources	Monitoring & Control Requirements	Needed
The 2.5 MVA subject generator triggers the requirement for SCADA reporting to the Utility			

Existing Equipment Rating Analysis Table:

EQUIPMENT	VOLTAGE (kV)	LINE or GISID	POLE	PASS/FAIL
3P_FUSE	4.8	802	211	FAIL
SOLID_BLADE	4.8	802	204	FAIL
GROUP_OP	4.8	802	203	FAIL
3P_REGULATOR	4.8	802	196	FAIL
SOLID_BLADE	4.8	802	183	FAIL
SOLID_BLADE	4.8	802	182	FAIL
3P_2AC	4.8	802	182	FAIL
3P_2AC	4.8	802	182	FAIL
OH-167-19.9YG/4.8D	34.5	802	182	FAIL
3P_FUSE	34.5	802	181	FAIL
3P_1/0AA	34.5	802	181	FAIL
3P_4/0AA	34.5	802	157	FAIL
3P_2AC	34.5	802	149	FAIL
3P_4/0AA	34.5	802	124	FAIL
3P_2AC	34.5	802	109	FAIL
SECT_ELECT_GW	34.5	802	51	FAIL
3P_REGULATOR	34.5	SUB	SUB	FAIL

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. The requirements for Remote Crediting, or Community Distributed Generation billing are that an hourly interval MV-90 meter be installed which has remote access via a dial-up telephone circuit known as a land line. The installation of the land line is the responsibility of the customer, and the installation of the meter is the responsibility of the utility.
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 Source Regulation:

   a. Circuit 4301101 Source Line Regulator at L-801 P-21

   Control is REQUIRED for the Line Regulation:

   b. Proposed 3P regulator at or L-802 P-122 on circuit 4301101

   Control is REQUIRED for the Line Regulation:

   c. Existing 3P regulator at L-802 P-196 on circuit 4301101

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

   Relocate 34.5/4.8 kV transformer and related fuses from L-802 P-180 to L-802 P-240 on circuit 4301101

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

   Replace 3P recloser at L-802 P-50 with 3P recloser 34.5 kV, 12.5 kA interrupting rating on circuit 4301101. A microprocessor control is needed with source side PT sensing on all three phases. The directionality feature will need to be enabled.

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

Replace 3P recloser at L-802 P-99A with 3P recloser 34.5 kV, 12.5 kA interrupting rating on circuit 4301101. A microprocessor control is needed with source side PT sensing on all three phases. The directionality feature will need to be enabled.

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

Replace 3P recloser at L-802 P-130 with 3P recloser 34.5 kV, 12.5 kA interrupting rating on circuit 4301101. A microprocessor control is needed with source side PT sensing on all three phases. The directionality feature will need to be enabled.

12. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Replace 3P fuse at L-802 P-211 with 3P recloser 34.5 kV, 12.5 kA interrupting rating on circuit 4301101. A microprocessor control is needed with source side PT sensing on all three phases. The directionality feature will need to be enabled. (*Also Required for IPP#20272, 20273 & 20274*)

13. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Upgrade 3P_100 Source Line regulator at L-801 P-21 from 100A to 418A. (123.0V Set, 3.0V bandwidth, No R&X compensation, 30 sec time delay, Co-generation/Auto-Determination mode). (*Also Required for IPP#20272 & 20274*)

14. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Upgrade 3P_100 Line regulator at L-802 P-196 from 100A to 418A. (123.0V Set, 3.0V bandwidth, No R&X compensation, 60 sec time delay, Co-generation/Auto-Determination mode). (*Also Required for IPP#20272 & 20273*)

15. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Reconductor 3P_2AC OH conductor from L-802 P-182 to L-802 P-233 with 3P_477AL (2.2 miles) on Circuit 4301101 (*Also Required for IPP#20273 & 20274*)

16. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Reconductor 3P_2AC OH conductor from L-802 P-151 to L-802 P-157 with 3P_477AL (0.4 miles) on Circuit 4301101 (*Also Required for IPP#20273 & 20274*)

17. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Reconductor 3P_2AC OH conductor from L-802 P-110 to L-802 P-121 with 3P_477AL (0.5 miles) on Circuit 4301101 (*Also Required for IPP#20273 & 20274*)

18. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Reconductor 3P_2AC OH conductor from L-802 P-92 to L-802 P-94 with 3P_477AL (0.1 miles) on Circuit 4301101 (*Also Required for IPP#20273 & 20274*)

19. | **Failure(s) Addressed:** | DP: Thermal |
|---|---|

Reconductor 3P_2AC OH conductor from L-802 P-233 to L-802 P-239 with 3P_477AL (0.35 miles) on Circuit 4301101

20. | **Failure(s) Addressed:** | DP: Thermal |
Remove cutouts and solids at L-802 P-204 and install 600A SCADA 3P_SWITCH on circuit 4301101

21. | **Failure(s) Addressed:** | DP: Thermal |
Remove cutouts and solids at L-802 P-183 and install 600A SCADA 3P_SWITCH on circuit 4301101

22. | **Failure(s) Addressed:** | DP: Thermal |
Remove cutouts and solids at L-802 P-51 and install 600A SCADA 3P_SWITCH on circuit 4301101

23. | **Failure(s) Addressed:** | DP: Thermal |
Reconductor 3P_1/0AA OH conductor from L-802 P-182 to L-802 P-183 with 3P_477AL (0.01 miles) on Circuit 4301101

24. | **Failure(s) Addressed:** | DP: Thermal |
Reconductor 3P_4/0AA OH conductor from L-802 P-126 to L-802 P-149 with 3P_477AL (.1 miles) on Circuit 4301101

25. | **Failure(s) Addressed:** | DP: Thermal |
Reconductor 3P_4/0AA OH conductor from L-802 P-159 to L-802 P-181 with 3P_477AL (.1 miles)on Circuit 4301101

26. | **Failure(s) Addressed:** | DP: Thermal |
Install new 3P_418A line regulators at L-802 P-122 on Circuit 4301101. (123.0V Set, 3.0V bandwidth, No R&X compensation, 45 sec time delay, Co-generation/Auto-Determination mode).(*Also Required for IPP#20272, 20273 & 20274*)

27. | **Failure(s) Addressed:** | DP: Thermal |
Install new 1P_219A line regulators at L-308 P-190 on Circuit 4301101. (123.0V Set, 3.0V bandwidth, No R&X compensation, 45 sec time delay, Co-generation/Auto-Determination mode).(*Also required for IPP#20272, 20273 & 20274*)

28. | **Failure(s) Addressed:** | **DP: Other** |
The customer's inverter will be set to generate power in the power factor mode (not voltage regulation mode) at 97% power factor (absorbing).

29. | **Failure(s) Addressed:** | **SPC: Overvoltage – Distribution** | **SPC: Overvoltage – Distribution** |
The design of the projects grounding scheme must be revised. The interconnection is required to meet the grounding requirements in NYSEG/RGE Bulletin 86-01 section 6.2.2.2. Please have a PE licensed in the state of NY submit a revised design of the interconnections grounding scheme to ensure the system remains effectively grounded when islanded from the utility for review and acceptance by the utility.

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

Due to the amount of generation back feed the SCADA SWITCH @ L-802 P-130 & SCADA SWITCH SW# 531AX6 @ L-802 P-99A must be set directionally (*Also Required for IPP#20272, 20273 & 20274*)

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

Due to the amount of generation back feed the SCADA SWITCH SW# 531-S3 @ L-802 P-50 & SCADA SWITCH @ L-803 P-11-1 must be set directionally (*Also Required for IPP#20273 & 20274*)

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

Mitigated by items 9 - 11 as well as setting 3P recloser at L-802 P-11A to be directional

7.0 Smart Inverter Settings

The following provides Smart Inverter Settings - JUDefault22

Inverter Mode: Vars precedence over Watts

Inverter Ratings

KVA rating:	2500
KW rating:	2500
KVAR rating:	2500
De-Rating Required?	YES

Inverter profiles

Reactive Power Profile	SA22
Real Power Profile	Watt22_1
Bulk System Settings	JUDefault22

Bulk Power System Settings

Performance Category	III

Frequency Distrubance Trip Settings

OF2 Frequency	62
OF2 Clearing Time	0.16
OF1 Frequency	61.2
OF1 Clearing Time	300
UF2 Frequency	56.5
UF2 Clearing Time	0.16
UF1 Frequency	58.5
UF1 Clearing Time	300

Voltage Disturbance Trip Settings

OV2 Voltage	1.2
OV2 Clearing Time	0.16
OV1 Voltage	1.1
OV1 Clearing Time	2
UV2 Voltage	0.5
UV2 Clearing Time	1.1
UV1 Voltage	0.88
UV1 Clearing Time	3

Enter Service Criteria

Frequency Minimum (Hz)	59.5

Frequency Maximum (Hz)	60.1
Voltage Minimum (p.u.)	0.917
Voltage Maximum (p.u.)	1.05
Delay Before Export (s)	300
Ramp Time (s)	300
Ramp Characteristics	Linear
Enter Service Exceptions	Linear Ramp Required for Systems >50 kVA

Fixed Power Factor

Constant PF Active	Yes
Power Factor	1
Power Factor Excitation	0

Volt-VAR Settings

Volt-VAR Profile:	No
Vref	1
V1 - [PU]	N/A
Q1 - %Nameplate Apparent Power Rating	N/A
V2- [PU]	N/A
Q2 - %Nameplate Apparent Power Rating	N/A
V3 - [PU]	N/A
Q3 - %Nameplate Apparent Power Rating	N/A
V4 - [PU]	N/A
Q4 - %Nameplate Apparent Power Rating	N/A

Volt-Watt Active

Volt-Watt Profile:	No
Pmin	20%
V1 - [PU]	1.07
P1	100%
V2 - [PU]	1.1
P2	20%

8.0 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 #20275

Scope:

A . Install Interconnection PCC Recloser with SCADA capability
B . 3ph line construction from mainline to site
C . *Relocate 34.5/4.8 kV transformer and related fuses from L-802 P-180 to L-802 P-240
D . *Replace 3P recloser at L-802 P-50 with 3P recloser 34.5 Kv
E . *Replace 3P recloser at L-802 P-99A with 3P recloser 34.5 kV
F . *Replace 3P recloser at L-802 P-130 with 3P recloser 34.5 kV
G . *Replace 3P fuse at L-802 P-211 with 3P recloser 34.5 kV
H . *Upgrade 3P_100 Line regulator at L-802 P-196 from 100A to 418A
I . ***Reconductor 3P_2AC OH conductor from L-802 P-151 to L-802 P-157 with 3P_477AL (0.4 miles)
J . ***Reconductor 3P_2AC OH conductor from L-802 P-110 to L-802 P-121 with 3P_477AL (0.5 miles)
K . ***Reconductor 3P_2AC OH conductor from L-802 P-92 to L-802 P-94 with 3P_477AL (0.1 miles)
L . Reconductor 3P_2AC OH conductor from L-802 P-233 to L-802 P-239 with 3P_477AL (0.35 miles)
M . **Remove cutouts and solids at L-802 P-204 and install 600A SCADA 3P_SWITCH
N . **Remove cutouts and solids at L-802 P-183 and install 600A SCADA 3P_SWITCH
O . Remove cutouts and solids at L-802 P-51 and install 600A SCADA 3P_SWITCH
P . ***Reconductor 3P_1/0AA OH conductor from L-802 P-182 to L-802 P-183 with 3P_477AL (0.01 miles)
Q . Reconductor 3P_4/0AA OH conductor from L-802 P-126 to L-802 P-149 with 3P_477AL (.1 miles)
R . Reconductor 3P_4/0AA OH conductor from L-802 P-159 to L-802 P-181 with 3P_477AL (.1 miles)
S . *Install new 3P_418A line regulators at L-802 P-122
T . *Install new 1P_219A line regulators at L-308 P-190
U . *Set SCADA Swith with directionally @ L-802 P-130 & L-802 P-99A
V . **Set SCADA Swith with directionally @ L-802 P-50 & L-803 P-11-1
W . Set recloser at L-802 P-11A to be directional
X . Power Quality Monitor/Meter
Y . Primary metering installation
Z . Engineering support
AA . 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
***Relocate 34.5/4.8 kV transformer and related fuses**			
Labor	$41,250	1	$41,250
Materials	$68,750	1	$68,750
Overheads	$15,000	1	$15,000
***Replace 3P recloser with 3P recloser 34.5 Kv**			
Labor	$29,700	3	$89,100
Materials	$49,500	3	$148,500
Overheads	$10,800	3	$32,400
***Replace 3P fuse with 3P recloser 34.5 kV**			
Labor	$30,000	1	$30,000
Materials	$37,000	1	$37,000
Overheads	$18,000	1	$18,000
***Upgrade 3P_100 Line regulator from 100A to 418A**			
Labor	$33,000	1	$33,000
Materials	$55,000	1	$55,000
Overheads	$12,000	1	$12,000
*****Reconductor 3P_2AC OH conductor with 3P_477AL (0.4 miles)**			
Labor	$92,000	1	$92,000
Materials	$68,000	1	$68,000
Overheads	$40,000	1	$40,000
*****Reconductor 3P_2AC OH conductor with 3P_477AL (0.1 miles)**			
Labor	$23,000	1	$23,000
Materials	$17,000	1	$17,000
Overheads	$10,000	1	$10,000
Reconductor 3P_2AC OH conductor with 3P_477AL (0.35 miles)			
Labor	$80,500	1	$80,500
Materials	$59,500	1	$59,500
Overheads	$35,000	1	$35,000
****Remove cutouts and solids and install 600A SCADA 3P_SWITCH**			
Labor	$29,700	2	$59,400
Materials	$49,500	2	$99,000
Overheads	$10,800	2	$21,600
Remove cutouts and solids and install 600A SCADA 3P_SWITCH			
Labor	$29,700	1	$29,700
Materials	$49,500	1	$49,500
Overheads	$10,800	1	$10,800
*****Reconductor 3P_1/0AA OH conductor with 3P_477AL (0.01 miles)**			
Labor	$2,300	1	$2,300
Materials	$1,700	1	$1,700
Overheads	$1,000	1	$1,000

Reconductor 3P_4/0AA OH conductor with 3P_477AL (.1 miles)			
Labor	$23,000	1	$23,000
Materials	$17,000	1	$17,000
Overheads	$10,000	1	$10,000
Reconductor 3P_4/0AA OH conductor with 3P_477AL (.1 miles)			
Labor	$23,000	1	$23,000
Materials	$17,000	1	$17,000
Overheads	$10,000	1	$10,000
***Install new 3P_418A line regulators**			
Labor	$33,000	1	$33,000
Materials	$55,000	1	$55,000
Overheads	$12,000	1	$12,000
***Install new 1P_219A line regulators**			
Labor	$19,250	1	$19,250
Materials	$11,550	1	$11,550
Overheads	$4,200	1	$4,200
***Set SCADA Swith with directionally @ L-802 P-130 & L-802 P-99A**			
Labor	$3,300	2	$6,600
Materials	$5,500	2	$11,000
Overheads	$1,200	2	$2,400
****Set SCADA Swith with directionally @ L-802 P-50 & L-803 P-11-1**			
Labor	$3,300	2	$6,600
Materials	$5,500	2	$11,000
Overheads	$1,200	2	$2,400
Set recloser at L-802 P-11A to be directional			
Labor	$1,650	1	$1,650
Materials	$2,750	1	$2,750
Overheads	$600	1	$600
Power Quality Monitor/Meter			
Labor	$420	1	$420
Materials	$24,400	1	$24,400
Overheads	$180	1	$180
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			$1,760,000
15% Contingency			$264,000
Taxes			$160,720

Total			**$2,184,720**

Notes to Developer:
***If Project#20272, 20273 & 20274 moves forward with interconnection and installs these upgrades then these upgrades are not required for this project.**
****If Project#20273 & 20274 moves forward with interconnection and installs these upgrades then these upgrades are not required for this project.**
*****If Project#20274 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.

Project #20275

Scope:

A . **Upgrade 3P_100 Source Line regulator at L-801 P-21 from 100A to 418A
B . *Reconductor 3P_2AC OH conductor from L-802 P-182 to L-802 P-233 with 3P_477AL (2.2 miles)
C . *Reconductor 3P_2AC OH conductor from L-802 P-110 to L-802 P-121 with 3P_477AL (0.5 miles)
D . **Engineering support

Estimate Detail	cost/unit	unit	total
***Upgrade 3P_100 Source Line regulator from 100A to 418A**			
Labor	$52,964	1	$52,964
Materials	$79,599	1	$79,599
Overheads	$12,435	1	$12,435
***Reconductor 3P_2AC OH conductor with 3P_477AL (2.2 miles)**			
Labor	$48,853	1	$48,853
Materials	$36,109	1	$36,109
Overheads	$21,240	1	$21,240
***Reconductor 3P_2AC OH conductor with 3P_477AL (0.5 miles)**			
Labor	$11,103	1	$11,103
Materials	$8,207	1	$8,207
Overheads	$4,827	1	$4,827
*Engineering support - Source Line Regulator	$17,739	1	$17,739
Subtotal			$293,076
15% Contingency			$43,961
Taxes			$25,544
Total			**$362,582**

Notes to Developer:
***This item is eligible for cost sharing per Appendix E of the SIR Standardized Contract. The cost shown**

above is the pro-rata share of the Qualifying Upgrade Cost which this project is responsible for under the Cost Sharing 2.0 PSC Order. The upgrades will result in incremental hosting capacity amount of 25.89 MW The total cost of item B is $1,366,200 and the total cost of item C is $310,500. Upon receipt of additional payments by Sharing Projects the utility shall reconcile with this project based on a calculated estimated pro-rata share. Any remaining reconciliation for Qualifying Upgrade Cost will occur pursuant to Section I-C of the SIR. Qualifying Upgrade Costs are non-refundable until a Sharing project provides payment that is equal to or exceeds the Qualifying Cost Sharing Upgrade Charge payment made by this project. Triggering amount of item B is $1,366,200 and item C is $310,500.

****This item is eligible for cost sharing per Appendix E of the SIR Standardized Contract. The cost shown above is the pro-rata share of the Qualifying Upgrade Cost which this project is responsible for under the Cost Sharing 2.0 PSC Order. This upgrade will result in an incremental hosting capacity amount of 15.16MW. The total cost of is $1,490,162. Please note that under the Cost Sharing 2.0 process, the mobilization threshold for substation Transformer Bank upgrades is upon payment of 75% of the Qualifying Upgrade Cost by the Triggering Project and Sharing Project(s). For other Qualifying Substation Upgrades, the mobilization threshold is 25% ($372,541) of the Qualifying Upgrade Cost. Any remaining reconciliation for Qualifying Upgrade Cost will occur pursuant to Section I-C of the SIR. Qualifying Upgrade Costs are non-refundable until another Sharing Project provides payment such that the utility has received payments equal to the pro-rata share of the Qualifying Upgrade. 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 rework
- 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.

9.0 REVISION HISTORY

Version	Date	Description
0.0	6/21/2023	Original
1.0	9/25/2023	Revised to reflect developer selected mitigation - section 6
2.0	1/18/2024	Updated narrative in section 2 and section 6.6
3.0	7/12/2024	Inverters operating at 0.97 power factor