GEORGIA — VERMONT
Application for Zoning Permit

Recording Information

⇒ For any change of use on State Highways (Route 7 & 104A) contact VTRANS
⇒ Post **Permit Poster** so it is visible to the road immediately as the Permit is appeal-able within 15 days of issuance.
⇒ Complete a Certificate of Occupancy application upon completion of project.
⇒ Provide a diagram showing the proposed project, well location, septic location and setbacks from the property line.
⇒ Property information & forms are available at townofgeorgia.com or using the Georgia VT Parcel Map.

Application Approval Date 3/25/24
Appeal Period Expires 4/9/24
Zoning District AR-1
Permit Number ZA-013-24

A

Parcel Number: 116300000
Property Address (E911): 5581 Ethan Allen Hwy Georgia VT USA 05478
Applicant Name: Sunrun
Applicant Address: 131 Red Pine Circle, Suite 2 Essex Junction VT 05452
Applicant Phone: 802-302-9036 Applicant Email: zahra.wynter@sunrun.com
Owners Name (if different): Brandon Sprano

Property Owner Authorization: *The undersigned property owner hereby certifies that the information submitted in this application regarding the property line is true, accurate, and complete. The Applicant has full authority to request approval for the proposed use of the property and any proposed structure.*

Date: 3/20/24 ***Owner's Signature:*** [redacted] (Brandon Sprano (Mar 20, 2024 12:22 EDT))

B

Proposed Construction
Dimensions: (1) L 34' x W 12' x H ___ (2) L 6' x W ___ x H 12' Total ft² 498'

# of floors: ____ # of Bedrooms ____ # of Bathrooms ____

C

Property Information
Lot Size 2 acres Lot road frontage ____
Proposed Setbacks *(in feet)*
Center of Road 106' Right Side 126' Left Side 550' Rear 185'

D

Previous Permits / Subdivision Name / Driveway Permit / DRB Application
____ / ____
____ / ____

E

Septic Information: *Applicants should visit the Agency of Natural Resources Department of Environmental Conservation to determine if a wastewater and Potable Water Supply Permit is required in accordance with 10 V.S.A. Chapter 64.*
Website: https://dec.vermont.gov/water/forms/ww-systems-permits
☑ Changes are not proposed to the building or to the use which will increase the amount of wastewater disposal. (i.e. adding bedroom or change of use)
☐ Wastewater & Potable Supply Permit is required. State Permit # ____

F

VT Building Energy Standards Certificate (RBES): *The Vermont Residential Building Energy Standard (RBES) - 30 V.S.A. § 51 affects all new homes built after July 1, 1998. It is the energy code for all residential buildings 3 stories or less above grade in Vermont. RBES Disclosure Statement must be filled out and recorded with the town prior to the issuance of a Certificate of Occupancy. Applicant must certify the following:*

☑ Structure which is subject of this application DOES NOT require an RBES Certificate
☐ Structure which is subject of this application DOES require an RBES Certificate

G

Check box(es) which describe proposed use or construction (circle choice in parenthesis)

N = New A = Addition R = Remodel

Residential:	N	A	R
Single Family	☐	☐	☐
Two-family (Duplex)	☐	☐	☐
Multi-family	☐	☐	☐
Condominium / Townhouse	☐	☐	☐
Manufactured Home	☐	☐	☐
Seasonal Camp	☐	☐	☐
ADU (accessory dwelling unit)	☐	☐	☐
Inclusions or Additions:			
Garage ☐attached ☐detached Addition	☐	☐	☐
Porch ☐enclosed ☐open	☐	☐	☐
Deck / Patio	☐	☐	☐
Pool ☐in ground ☐above	☐	☐	☐
Shed / Play House / Coop	☐	☐	☐
Barn ☐residential ☐agriculture	☐	☐	☐
Greenhouse ☐residential ☐agriculture	☐	☐	☐
Fence (< 5' in height no permit required)	☐	☐	☐
☑ Other: solar			
Non-Residential:			
Commercial / Industrial	☐	☐	☐
Sign	☐	☐	☐

Other:	**check if needed**
Change in Use	☐
Home Occupation	☐
Permit Renewal Appeal	☐
Variance / Waiver	☐

H

Please check the appropriate box for the following:

Additional Property Information	**Yes**	**No**
Is there a stream or wetland on property?	☐	☑
Is the property in a Special Flood Hazard Area?	☐	☑
Is the property in an L1 zone on Lake Champlain?	☐	☑
Is the property in the South Village?	☐	☐
Project involve work in town right of way?	☐	☑
Project involve a change in the # of bedrooms?	☐	☑
Project involve demolition / renovation?	☐	☑
Have you attached a drawing of project?	☑	☐
Is this a primary residence?	☑	☐
Is there an HOA (Home Owners Association)?	☐	☑
Property have a E911 sign at end of driveway?	☑	☐
Is there an increase in impervious surface? (includes roof, deck, porch, pavement, patio etc.)	☐	☑

If yes total square feet ____ ft²

Property Owner Acknowledgement: *The undersigned applicant hereby affirms that the information provided in this application is true, accurate, and complete. I understand if this application is approved, I must post the building poster provided on the property in public view and allow a 15 day appeal period before work begins. I understand Vermont law allows 30 days to find this application complete. I understand that my signature on this application constitutes permission for on-site inspection of the property described on this application form under Article 3 of the Georgia Development Regulations.*

Applicant Signature [redacted] **Date** 3/19/24 **Co-Applicant Signature:** ____ **Date** ___/___/___

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Zoning Administrator Section

Town of Georgia
Application for Zoning Permit
& Building Permit

OFFICIAL USE ONLY — ZONING ADMINISTRATOR ACTION — ***OFFICIAL USE ONLY***

Date Application Received: 3/25/24 **Zoning District:** AR-1

Project Description: Rooftop Solar

Additional Action Needed:

Variance / Waiver:		**Meeting date with DRB:** __/__/____
Appeal:		**Meeting date with DRB:** __/__/____
Conditional Use Res:		**Meeting date with DRB:** __/__/____
Conditional Use Com:		**Meeting date with DRB:** __/__/____
Concept / Sketch Plan:		**Meeting date with DRB:** __/__/____
Site Plan:		**Meeting date with DRB:** __/__/____
BLA:		**Meeting date with DRB:** __/__/____
Amend / Renew:		**Meeting date with DRB:** __/__/____

Final Zoning Administrator Action

ZONING PERMIT

☒ **Approved** **Date:** 3/25/24 **Zoning Administrator:** [redacted]

Permit EFFECTIVE date: 4/10/24 **Permit EXPIRATION date:** 3/25/25

CONDITIONS of Approval:

- ☐ **RBES Required**
- ☒ **Certificate of Occupancy Required**
- ☐ **VTRANS Permit Required**
- ☐ **Driveway Permit**
- ☐ **ROW Permit**
- ☐ **Class 4 Road Agreement**
- ☐ **Other:**
- ☐ **E911 Sign**

☐ **Denied** **Date:** __/__/____ **Zoning Administrator:**

Reason for Denial:

Fees	
Permit Fee:	$ 100
Recording Fee:	$ 60
RBES Record:	$
VTRANS Record:	$
Driveway Permit:	$
ROW Permit:	$
Road Inspection:	$
Cert. of Occupancy:	$ 50
Cert of Occ Record:	$
Impact Town:	$
Impact School:	$
Other:	$
Total Fees Zone:	$ 150
Total Record:	$ 60
Total Highway:	$
Total Impact Town:	$
Total Permit Fees:	$ 210

Notice of Appeal Rights: Any interested person may appeal this decision by filing a written Notice of Appeal with the Zoning Administrator or DRB Clerk within 15 days of the date of this decision. (Title 24 VSA ch. 117 Section 4465)

This permit does not authorize commencement of any development activity approved by the permit until the permit takes effect as set forth above.

Site modifications and improvements made prior to this permit becoming effective may be subject to removal and site restoration if a timely appeal is commenced.

Expiration: This permit expires one year from the date of issue or date listed at top of permit and may be extended one additional year upon application.

Conditions: Conditions imposed by the Zoning Administrator, Planning Commission, DRB, or Selectboard are hereby incorporated into this permit and are binding on the permittee.

Note: The applicant retains the obligation to identify, apply for, and obtain relevant state permits for this project. Call (802) 477-2241 to speak with a regional Permit Specialist.

SHEET INDEX

PAGE #	DESCRIPTION
PV-1.0	COVER SHEET
PV-2.0	SITE PLAN
PV-3.0	LAYOUT
PV-4.0	ELECTRICAL
PV-5.0	SIGNAGE

SCOPE OF WORK

- SYSTEM SIZE: 9600W DC, 7680W AC
- MODULES: (24) HANWHA Q-CELLS: Q.PEAK DUO BLK ML-G10+/T 400
- INVERTERS: (1) DELTA ELECTRONICS: E8-TL-US
- RACKING: ULTRA RAIL WIDE BASE SEAM CLAMP. SEE UR40-PEN-D04

- RAPID SHUTDOWN: (24) APSMART RSD-S-PLC ROOFTOP MODULE LEVEL RAPID SHUTDOWN DEVICE

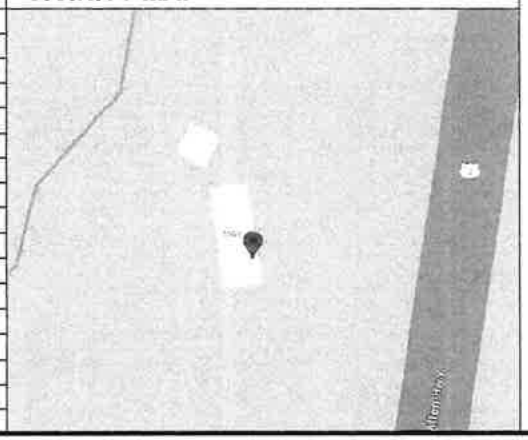
GENERAL NOTES

- ALL WORK SHALL COMPLY WITH IRC, 2015 IBC, IEBC, MUNICIPAL CODE, AND ALL MANUFACTURERS' LISTINGS AND INSTALLATION INSTRUCTIONS.
- PHOTOVOLTAIC SYSTEM WILL COMPLY WITH NEC 2020.
- ELECTRICAL SYSTEM GROUNDING WILL COMPLY WITH NEC 2020.
- PHOTOVOLTAIC SYSTEM IS UNGROUNDED. NO CONDUCTORS ARE SOLIDLY GROUNDED IN THE INVERTER. SYSTEM COMPLIES WITH 690.35.
- MODULES CONFORM TO AND ARE LISTED UNDER UL 61730.
- INVERTER CONFORMS TO AND IS LISTED UNDER UL 1741.
- RACKING CONFORMS TO AND IS LISTED UNDER UL 2703.
- SNAPNRACK RACKING SYSTEMS, IN COMBINATION WITH TYPE I, OR TYPE II MODULES, ARE CLASS A FIRE RATED.
- RAPID SHUTDOWN REQUIREMENTS MET WHEN INVERTERS AND ALL CONDUCTORS ARE WITHIN ARRAY BOUNDARIES PER NEC 690.12(1).
- CONSTRUCTION FOREMAN TO PLACE CONDUIT RUN PER 690.31(D).
- ARRAY DC CONDUCTORS ARE SIZED FOR DERATED CURRENT.
- 12.18 AMPS MODULE SHORT CIRCUIT CURRENT.
- 19.04 AMPS DERATED SHORT CIRCUIT CURRENT [690.8 (A) & 690.8 (B)].
- PV INSTALLATION COMPLIES WITH THE NEC 2020 ARTICLE 690.12(B)(2)(2). CONTROLLED CONDUCTORS LOCATED INSIDE THE ARRAY BOUNDARY ARE LIMITED TO 80 VOLTS WITHIN 30 SECOND OF A RAPID SHUTDOWN INITIATION

ABBREVIATIONS

A	AMPERE
AC	ALTERNATING CURRENT
AFC	ARC FAULT CIRCUIT INTERUPTER
AZIM	AZIMUTH
COMP	COMPOSITION
DC	DIRECT CURRENT
(E)	EXISTING
ESS	ENERGY STORAGE SYSTEM
MSP	MAIN SERVICE PANEL
(N)	NEW
PRE-FAB	PRE-FABRICATED
PSF	POUNDS PER SQUARE FOOT
PV	PHOTOVOLTAIC
RSD	RAPID SHUTDOWN DEVICE
TL	TRANSFORMERLESS
V	VOLTS
W	WATTS

VICINITY MAP



sunrun

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PHONE 503.870.1662
FAX 0

CUSTOMER RESIDENCE:
BRANDON SPRANO
5581 ETHAN ALLEN HWY,
GEORGIA, VT, 05478

TEL: (802) 782-0000
APN: 237-076-11490

PROJECT NUMBER:
281R-581SPRA

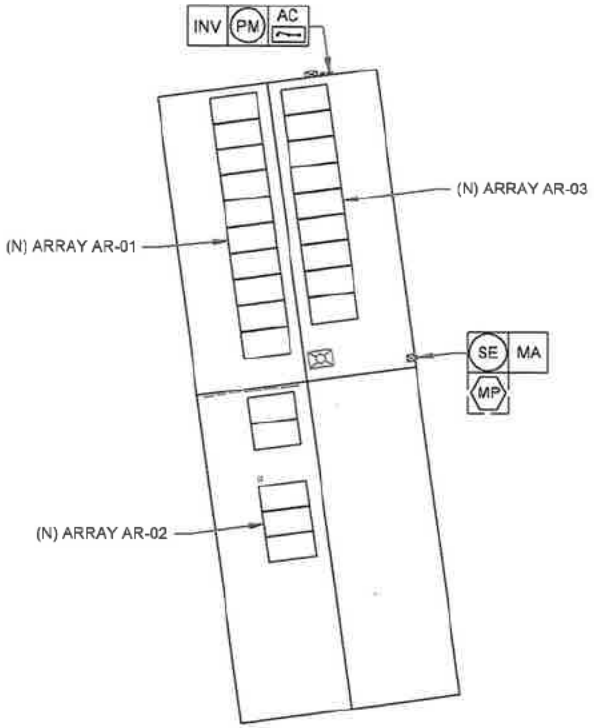
DESIGNER: (415) 580-6920 ex3
JOSH TONOGBANUA

SHEET
COVER SHEET

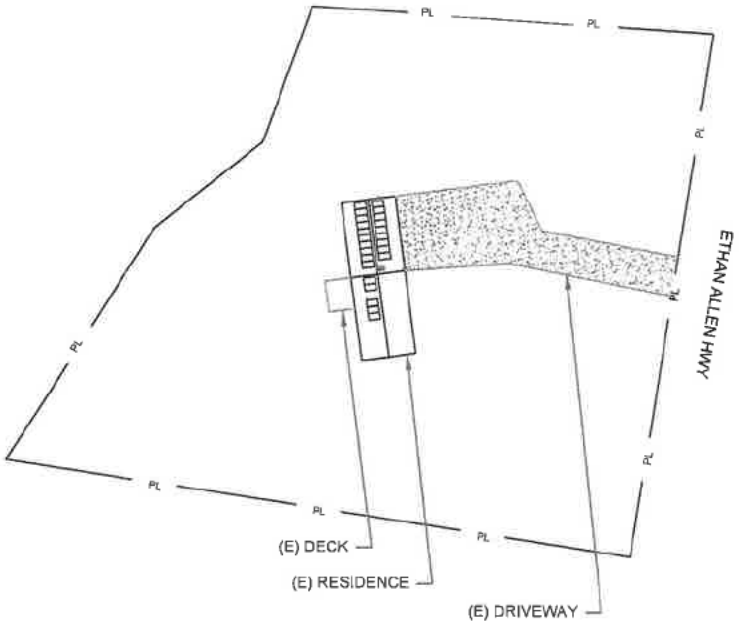
REV: A1 3/20/2024

PAGE PV-1.0

SITE PLAN - SCALE = 1/16" = 1'-0"



SITE PLAN - SCALE = 1/64" = 1'-0"



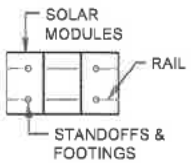
NOTE: ROOFTOP MODULE LEVEL RAPID SHUTDOWN DEVICE INSTALLED ON EACH MODULE PER NEC 690.12

	ARRAY PITCH	TRUE AZIM	MAG AZIM	PV AREA (SQFT)
AR-01	17°	262°	276°	211.4
AR-02	17°	262°	276°	190.2
AR-03	17°	82°	96°	105.7

LEGEND

SCALE: NTS
NOTE: NOT ALL ITEMS IN LEGEND WILL APPEAR IN SITE PLAN

- SE — SERVICE ENTRANCE
- MP — MAIN PANEL
- SM — SUNRUN METER
- PM — DEDICATED PV METER
- SP — SUB-PANEL
- LC — PV LOAD CENTER
- AC — AC DISCONNECT(S)
- DC — DC DISCONNECT(S)
- INV — INVERTER(S)
- CB — IQ COMBINER BOX
- MA — METER ADAPTER
- INTERIOR EQUIPMENT SHOWN AS DASHED
- 1 — COMMUNICATION WIRES
- CHIMNEY
- ATTIC VENT
- FLUSH ATTIC VENT
- PVC PIPE VENT
- METAL PIPE VENT
- T-VENT
- SATELLITE DISH
- PL — PROPERTY LINE
- HARDSCAPE



SUNRUN
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FAX:

CUSTOMER RESIDENCE:
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5581 ETHAN ALLEN HWY,
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JOSH TONOGBANUA

SHEET
SITE PLAN

REV: A1 3/20/2024

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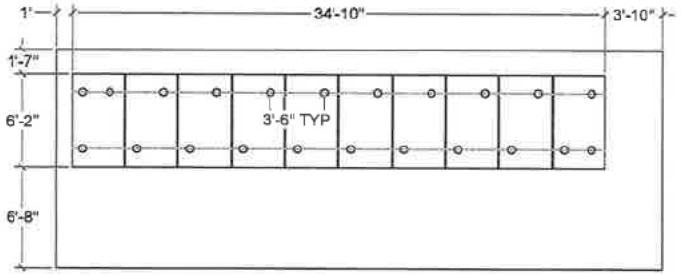
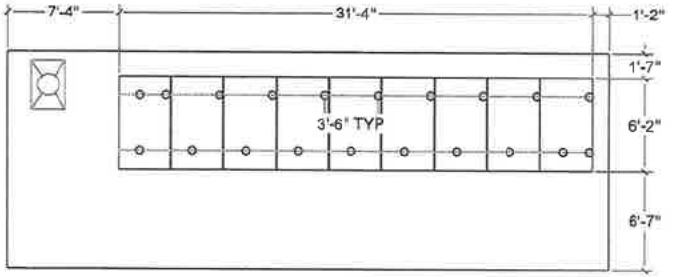
ROOF INFO			FRAMING INFO			ATTACHMENT INFORMATION					
Name	Type	Height	Type	Max Span	OC Spacing	Detail	Max Landscape OC Spacing	Max Landscape Overhang	Max Portrait OC Spacing	Max Portrait Overhang	Configuration
AR-01	STANDING SEAM - UR	2-Story	2X4 PRE-FABRICATED TRUSSES	5' - 7"	24"	ULTRA RAIL WIDE BASE SEAM CLAMP. SEE UR40-PEN-D04	3' - 6"	0' - 6"	3' - 6"	0' - 6"	STAGGERED
AR-02	STANDING SEAM - UR	2-Story	2X4 PRE-FABRICATED TRUSSES	4' - 2"	24"	ULTRA RAIL WIDE BASE SEAM CLAMP. SEE UR40-PEN-D04	3' - 6"	0' - 6"	3' - 6"	0' - 6"	STAGGERED
AR-03	STANDING SEAM - UR	2-Story	2X4 PRE-FABRICATED TRUSSES	5' - 7"	24"	ULTRA RAIL WIDE BASE SEAM CLAMP. SEE UR40-PEN-D04	3' - 6"	0' - 6"	3' - 6"	0' - 6"	STAGGERED

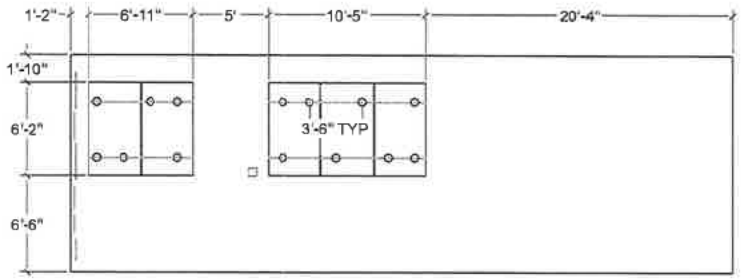
D1 - AR-01 - SCALE: 1/8" = 1'-0"
AZIM: 262°
PITCH: 17°



D2 - AR-02 - SCALE: 1/8" = 1'-0"
AZIM: 262°
PITCH: 17°



D3 - AR-03 - SCALE: 1/8" = 1'-0"
AZIM: 82°
PITCH: 17°



STRUCTURAL NOTES:
INSTALLERS SHALL NOTIFY ENGINEER OF ANY POTENTIAL STRUCTURAL ISSUES OBSERVED PRIOR TO PROCEEDING W/ INSTALLATION.

- IF ARRAY (EXCLUDING SKIRT) IS WITHIN 12" BOUNDARY REGION OF ANY ROOF PLANE EDGES (EXCEPT VALLEYS), THEN ATTACHMENTS NEED TO BE ADDED AND OVERHANG REDUCED WITHIN THE 12" BOUNDARY REGION ONLY AS FOLLOWS:
  - ALLOWABLE ATTACHMENT SPACING INDICATED ON PLANS TO BE REDUCED BY 50%.
  - ALLOWABLE OVERHANG INDICATED ON PLANS TO BE 1/5TH OF ALLOWABLE ATTACHMENT SPACING INDICATED ON PLANS.

DESIGN CRITERIA

MAX DISTRIBUTED LOAD: 3 PSF
SNOW LOAD: 40 PSF
WIND SPEED:
115 MPH 3-SEC GUST.
S.S. LAG SCREW
5/16"x4.5": 2.5" MIN. EMBEDMENT

STATE OF VERMONT
ALI NAJIMA SHEIKH
NO. 135214
CIVIL - STRUCTURAL
LICENSED
PROFESSIONAL ENGINEER

STAMPED 03/20/2024

sunrun

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PHONE 603.970.1662
FAX 0

CUSTOMER RESIDENCE:
BRANDON SPRANO
5581 ETHAN ALLEN HWY,
GEORGIA, VT, 05478

TEL. (802) 782-0000
APN: 237-076-11490

PROJECT NUMBER:
281R-581SPRA

DESIGNER: (415) 580-6920 ex3
JOSH TONOGBANUA

SHEET
LAYOUT

REV: A1 3/20/2024

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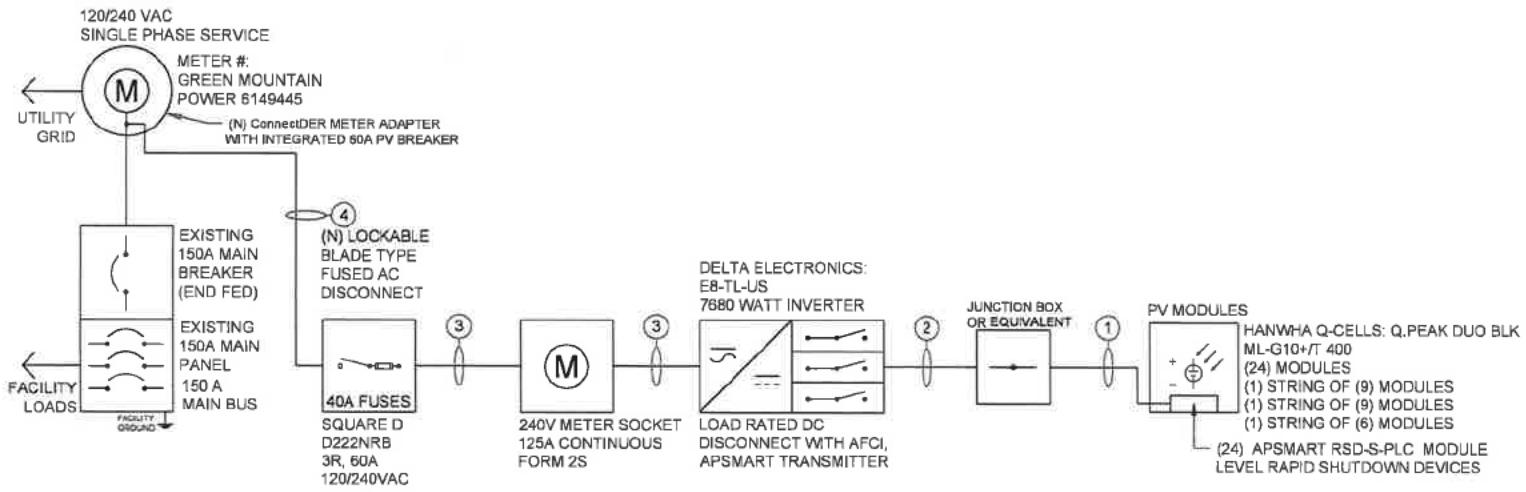

NOTE: TOTAL PV BACKFEED = 35.41A
USED FOR INTERCONNECTION CALCULATIONS

CONDUIT SCHEDULE

#	CONDUIT	CONDUCTOR	NEUTRAL	GROUND
1	NONE	(6) 10 AWG PV WIRE	NONE	(1) 10 AWG BARE COPPER
2	1" PVC OR EQUIV.	(6) 10 AWG THHN/THWN-2	NONE	(1) 10 AWG THHN/THWN-2
3	1" PVC OR EQUIV.	(2) 8 AWG THHN/THWN-2	(1) 10 AWG THHN/THWN-2	(1) 8 AWG THHN/THWN-2
4	1" LTFC	(2) 6 AWG THHN/THWN-2	(1) 8 AWG THHN/THWN-2	(1) 8 AWG THHN/THWN-2

MODULE CHARACTERISTICS

HANWHA Q-CELLS: Q.PEAK DUO BLK

ML-G10+/T 400:	400 W
OPEN CIRCUIT VOLTAGE:	45.55 V
MAX POWER VOLTAGE:	38.09 V
SHORT CIRCUIT CURRENT:	12.18 A

SYSTEM CHARACTERISTICS - INVERTER 1

SYSTEM SIZE:	9600 W
SYSTEM OPEN CIRCUIT VOLTAGE:	466.41 V
MAX ALLOWABLE DC VOLTAGE:	480 V
SYSTEM SHORT CIRCUIT CURRENT:	45.68 A

sunrun

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JOSH TONOGBANUA

SHEET
ELECTRICAL

REV: A1 3/20/2024

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⚠WARNING

ELECTRICAL SHOCK HAZARD

TERMINALS ON LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

LABEL LOCATION:
INVERTER(S), AC/DC DISCONNECT(S), AC COMBINER PANEL (IF APPLICABLE).
PER CODE(S): NEC 2020: 690.13(B), CEC 2022: 690.13(B)

⚠WARNING

DUAL POWER SUPPLY

SOURCES: UTILITY GRID AND PV SOLAR ELECTRIC SYSTEM

LABEL LOCATION:
UTILITY SERVICE METER AND MAIN SERVICE PANEL.
PER CODE(S): NEC 2020: 705.12(C), CEC 2022: 705.12(C)

⚠WARNING

POWER SOURCE OUTPUT CONNECTION

DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL LOCATION:
ADJACENT TO PV BREAKER AND ESS OCPD (IF APPLICABLE).
PER CODE(S): NEC 2020: 705.12(B)(3)(2), CEC 2022: 705.12(B)(3)(2)

PV SYSTEM DISCONNECT

MAXIMUM AC OPERATING CURRENT: 32 AMPS

NOMINAL OPERATING AC VOLTAGE: 240 VAC

LABEL LOCATION:
AC DISCONNECT(S), PHOTOVOLTAIC SYSTEM POINT OF INTERCONNECTION.
PER CODE(S): NEC 2020: 690.54, CEC 2022: 690.54

INVERTER 1

PHOTOVOLTAIC DC DISCONNECT

MAXIMUM SYSTEM VOLTAGE: 480 VDC

LABEL LOCATION:
INVERTER(S), DC DISCONNECT(S).
PER CODE(S): NEC 2020: 690.53, CEC 2022: 690.53

WARNING: PHOTOVOLTAIC POWER SOURCE

LABEL LOCATION:
INTERIOR AND EXTERIOR DC CONDUIT EVERY 10 FT, AT EACH TURN, ABOVE AND BELOW PENETRATIONS, ON EVERY JB/PULL BOX CONTAINING DC CIRCUITS.
PER CODE(S): NEC 2020: 690.31(D)(2), CEC 2022: 690.31(D)(2)

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

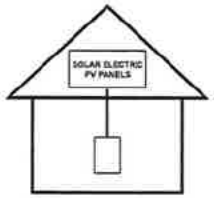
LABEL LOCATION:
INSTALLED WITHIN 3' OF RAPID SHUT DOWN SWITCH PER CODE(S): NEC 2020: 690.56(C)(2), CEC 2022: 690.56(C)(2), IFC 2018: 1204.5.3

4"

3"

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY.



LABEL LOCATION:
ON OR NO MORE THAT 1 M (3 FT) FROM THE SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED.
PER CODE(S): NEC 2020: 690.56(C), CEC 2022: 690.56(C)

NOTES AND SPECIFICATIONS:
- SIGNS AND LABELS SHALL MEET THE REQUIREMENTS OF THE NEC 2020 ARTICLE 110.21(B), UNLESS SPECIFIC INSTRUCTIONS ARE REQUIRED BY SECTION 690, OR IF REQUESTED BY THE LOCAL AHJ.
- SIGNS AND LABELS SHALL ADEQUATELY WARN OF HAZARDS USING EFFECTIVE WORDS, COLORS AND SYMBOLS.
- LABELS SHALL BE PERMANENTLY AFFIXED TO THE EQUIPMENT OR WIRING METHOD AND SHALL NOT BE HAND WRITTEN.
- LABEL SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED.
- SIGNS AND LABELS SHALL COMPLY WITH ANSI Z535.4-2011, PRODUCT SAFETY SIGNS AND LABELS, UNLESS OTHERWISE SPECIFIED.
- DO NOT COVER EXISTING MANUFACTURER LABELS.

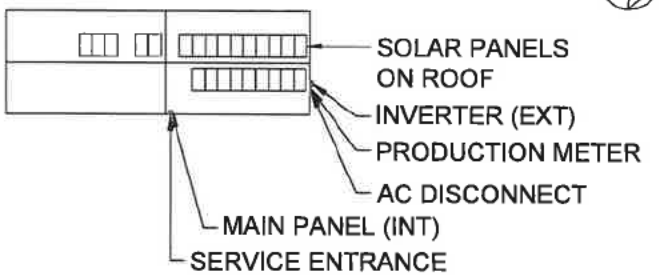
PV SYSTEM DISCONNECT FOR UTILITY OPERATION

SERVICE DISCONNECT 1 OF 2

SERVICE DISCONNECT 2 OF 2

CAUTION:

MULTIPLE SOURCES OF POWER



5581 ETHAN ALLEN HWY, GEORGIA, VT, 05478

PER CODE(S): NEC 2020 : 705.10, 710.10, CEC 2022: 705.10, 710.10

sunrun

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JOSH TONOGBANUA

SHEET
SIGNAGE

REV: A1 3/20/2024

PAGE PV-5.0

Current Renewables Engineering

3/20/2024

SUNRUN, ,

Subject: Structural Certification for Installation of Residential Solar
re job: Brandon Sprano, 5581 Ethan Allen Hwy, Georgia, VT 05478,

Attn.: To Whom It May Concern

A field observation was performed to document the existing framing of the above mentioned address. From the field observation, the existing roof structure was observed as:

ROOF 1: Shingle roofing supported by 2x4 Truss @ 24 in. OC spacing. The roof is sloped at approximately 17 degrees and has a max beam span of 5.6 ft between supports.

ROOF 2: Shingle roofing supported by 2x4 Truss @ 24 in. OC spacing. The roof is sloped at approximately 17 degrees and has a max beam span of 4.1 ft between supports.

ROOF 3: Shingle roofing supported by 2x4 Truss @ 24 in. OC spacing. The roof is sloped at approximately 17 degrees and has a max beam span of 5.6 ft between supports.

Design Criteria:

Code:	2015 IBC (ASCE 7-10)		
Ult Wind Speed:	115 mph	Ground Snow:	40 psf
Exposure Cat:	C	Min Roof Snow:	NA psf

After review of the field observation report and based on our structural capacity calculations in accordance with applicable building codes, the existing roof framing supporting the proposed solar panel layout has been determined to be:

ROOF 1: adequate to support the imposed loads. Therefore, no structural upgrades are required.

ROOF 2: adequate to support the imposed loads. Therefore, no structural upgrades are required.

ROOF 3: adequate to support the imposed loads. Therefore, no structural upgrades are required.

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3/20/2024

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SUNRUN

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5581 Ethan Allen Hwy, Georgia, VT 05478

The following calculations are for the structural engineering design of the photovoltaic panels and are valid only for the structural info referenced in the stamped plan set. The verification of such info is the responsibility of others.
After review, I certify that the roof structure has sufficient structural capacity for the applied PV loads.

All mounting equipment shall be designed and installed per manufacturer's approved installation specifications.

Design Criteria:

Code:	2015 IBC		
	ASCE 7-10		
Live Load:	20	psf	
Ult Wind Speed:	115	mph	
Exposure Cat:	C		
Ground Snow:	40	psf	Min Roof Snow: NA

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Roof Properties:

	Roof 1	Roof 2	Roof 3
Roof Type =	Shingle	Shingle	Shingle
Roof Pitch (deg) =	17	17	17
Mean Roof Height (ft) =	13	13	13
Attachment Trib Width (ft) =	3.25	3.25	3.25
Attachment Spacing (ft) =	3.5	3.5	3.5
Framing Type =	Truss	Truss	Truss
Framing Size =	2x4	2x4	2x4
Framing OC Spacing (in.) =	24	24	24
Section Thickness, b (in.) =	1.5	1.5	1.5
Section Depth, d (in.) =	3.5	3.5	3.5
Section Modulus, Sx (in.^3) =	3.1	3.1	3.1
Moment of Inertia, Ix (in.^4) =	5.4	5.4	5.4
Framing Span (ft) =	5.6	4.1	5.6
Deflection Limit D+L (in.) =	1.12	0.82	1.12
Deflection Limit S or W (in.) =	0.75	0.55	0.75
Framing Upgrade =	Adequate	Adequate	Adequate
Sister Size =	NA	NA	NA
Wood Species =	SPF #2	SPF #2	SPF #2
Wood Fb (psi) =	875	875	875
Wood Fv (psi) =	135	135	135
Wood E (psi) =	1400000	1400000	1400000
C_D (Wind) =	1.6	1.6	1.6
C_D (Snow) =	1.15	1.15	1.15
$C_M = C_t = C_L = C_i$ =	1.0	1.0	1.0
C_F =	1.5	1.5	1.5
C_{fu} =	1.00	1.00	1.00
C_r =	1.15	1.15	1.15
F'b_wind (psi) =	2415	2415	2415
F'b_snow (psi) =	1736	1736	1736
F'v_wind (psi) =	216	216	216
F'v_snow (psi) =	155	155	155
M_allowable_wind (lb-ft) =	616	616	616
M_allowable_snow (lb-ft) =	443	443	443
V_allowable_wind (lbs) =	756	756	756
V_allowable_snow (lbs) =	543	543	543
E' (psi) =	1400000	1400000	1400000

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Load Calculation:

Dead Load Calculations:

Panels Dead Load (psf) =	3.0		
	Roof 1	**Roof 2**	**Roof 3**
Roofing Weight (psf) =	3.0	3.0	3.0
Decking Weight (psf) =	2.0	2.0	2.0
Framing Weight (psf) =	0.6	0.6	0.6
Misc. Additional Weight (psf) =	1.0	1.0	1.0
Existing Dead Load (psf) =	6.6	6.6	6.6
Total Dead Load (psf) =	9.6	9.6	9.6

Snow Load Calculations:

Ground Snow Load, pg (psf) =	40		
Min Flat Snow, pf_min (psf) =	NA		
Min Sloped Snow, ps_min (psf) =	NA		
Snow Importance Factor, Ic =	1.0		
Exposure Factor, Ce =	0.9		
	Roof 1	**Roof 2**	**Roof 3**
Thermal Factor, Ct =	1.1	1.1	1.1
Flat Roof Snow, pf (psf) =	27.72	27.72	27.72
Slope Factore, Cs =	1.00	1.00	1.00
Sloped Roof Snow, ps (psf) =	28	28	28

Wind Load Calculations:

Ultimate Wind Speed (mph) =	115		
Directionality Factor, kd =	0.85		
Topographic Factor, kzt =	1.0		
	Roof 1	**Roof 2**	**Roof 3**
Velocity Press Exp Factor, kz =	0.85	0.85	0.85
Velocity Pressure, qz (psf) =	21.1	24.4	24.4
External Pressure Up, GCp_1 =	-0.85	-0.85	-0.85
External Pressure Up, GCp_2 =	-1.55	-1.55	-1.55
External Pressure Up, GCp_3 =	-2.45	-2.45	-2.45
External Pressure Down, GCp =	0.45	0.45	0.45
Design Pressure Up, p_1 (psf) =	-16.0	-23.9	-23.9
Design Pressure Up, p_2 (psf) =	-22.6	-43.5	-43.5
Design Pressure Up, p_3 (psf) =	-35.7	-68.8	-68.8
Design Pressure Down, p (psf) =	16.0	16.0	16.0

Hardware Checks:

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Lag Screw Checks:

	Roof 1	Roof 2	Roof 3
Ref. Widthrawal Value, W (lb/in) =	205	205	205
($C_M = C_t = C_{eg} = 1.0$) C_D =	1.6	1.6	1.6
Adjusted Widthrawal Value, W' (lb/in) =	328	328	328
Lag Penetration, p (in.) =	2.5	2.5	2.5
Allowable Widthrawal Force, W'p (lbs) =	820	820	820
Applied Uplift Force (lbs) =	-90	-143	-143
Uplift DCR =	**0.11**	**0.17**	**0.17**
Ref. Lateral Value, Z (lbs) =	250	250	250
($C_M = C_t = C_\Delta = C_{eg} = 1.0$) C_D =	1.15	1.15	1.15
Adjusted Lateral Value, Z' (lbs) =	288	288	288
Applied Laeral Force (lbs) =	102	102	102
Angle of Resultant Force, α (deg) =	41	55	55
djusted Interaction Lateral Value, Z'_α (lbs) =	401	505	505
Lateral DCR =	**0.26**	**0.20**	**0.20**

Roof Framing Checks:

Force Checks:

	Roof 1	Roof 2	Roof 3
LC1: D+S			
Applied Moment (lb-ft) =	195	105	195
Applied Shear (lbs) =	209	153	209
Allowable Moment (lb-ft) =	443	443	443
Allowable Shear (lbs) =	543	543	543
Moment DCR =	**0.44**	**0.24**	**0.44**
Shear DCR =	**0.38**	**0.28**	**0.38**
LC2: D+0.6W			
Applied Moment (lb-ft) =	100	54	100
Applied Shear (lbs) =	108	79	64
Allowable Moment (lb-ft) =	616	616	616
Allowable Shear (lbs) =	756	756	756
Moment DCR =	**0.16**	**0.09**	**0.16**
Shear DCR =	**0.14**	**0.10**	**0.08**
LC3: D+0.75(S+0.6W)			
Applied Moment (lb-ft) =	196	105	196
Applied Shear (lbs) =	211	154	178
Allowable Moment (lb-ft) =	616	616	616
Allowable Shear (lbs) =	756	756	756

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Moment DCR =	**0.32**	**0.17**	**0.32**
Shear DCR =	**0.28**	**0.20**	**0.24**
LC4: 0.6D+0.6W			
Applied Moment (lb-ft) =	20	24	45
Applied Shear (lbs) =	21	35	48
Allowable Moment (lb-ft) =	616	616	616
Allowable Shear (lbs) =	756	756	756
Moment DCR =	**0.03**	**0.04**	**0.07**
Shear DCR =	**0.03**	**0.05**	**0.06**

Deflection Checks (Service Level):

	Roof 1	Roof 2	Roof 3
LC1: D+L			
Deflection (in.) =	0.02	0.00	0.02
Deflection Limit (in.) =	1.12	0.82	1.12
Deflection DCR =	**0.02**	**0.01**	**0.02**
LC2: S			
Deflection (in.) =	0.03	0.01	0.03
Deflection Limit (in.) =	0.75	0.55	0.75
Deflection DCR =	**0.04**	**0.02**	**0.04**
LC3: W (Down)			
Deflection (in.) =	0.01	0.00	0.01
Deflection Limit (in.) =	0.75	0.55	0.75
Deflection DCR =	**0.01**	**0.00**	**0.01**
LC4: W (Up)			
Deflection (in.) =	-0.01	0.00	-0.01
Deflection Limit (in.) =	0.75	0.55	0.75
Deflection DCR =	**0.01**	**0.01**	**0.02**

Seismic Check:

Existing Weight:

Wall Weight (psf) =	17
Tributary Wall Area (ft^2) =	1000
Total Wall Weight (lbs) =	17000
Roof Weight (psf) =	7
Roof Area (ft^2) =	2400
Total Roof Weight (lbs) =	15844
Total Existing Weight (lbs) =	**32844**

Additional PV Weight:

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Total Additional PV Weight (lbs) = 1287

Weight Increase:

(Existing W + Additional W)/(Existing W) = 104%

The increase in weight as a result of the solar system is less than 10% of the existing structure and therefore no further seismic analysis is required.

Limits of Scope of Work and Liability:

Existing structure is assumed to have been designed and constructed following appropriate codes at time of erection, and assumed to have appropriate permits. The calculations produced are only for the roof framing supporting the proposed PV installation referenced in the stamped planset and were completed according to generally recognized structural analysis standards and procedures, professional engineering and design experience, opinions and judgements. Existing deficiencies which are unknown or were not observable during time of inspection are not included in this scope of work. All PV modules, racking, and mounting equipment shall be designed and installed per manufacturer's approved installation specifications. The Engineer of Record and the engineering consulting firm assume no responsibility for misuse or improper installation. This analysis is not stamped for water leakage. Framing was determined based on information in provided plans and/or photos, along with engineering judgement. Prior to commencement of work, the contractor shall verify the framing sizes, spacings, and spans noted in the stamped plans, calculations, and cert letter (where applicable) and notify the Engineer of Record of any discrepancies prior to starting construction. Contractor shall also verify that there is no damaged framing that was not addressed in stamped plans, calculations, and cert letter (where applicable) and notify the Engineer of Record of any concerns prior to starting construction.