

Description of Property: Please describe the building and surrounding environment. Include information on significant structures, landscape features, or other significant features of the property:

Residential area, single family home

Description of Work Proposed: Please give an overview of the work to be undertaken:

Installation of 19 solar panels attached flush to existing south and west roof of the house. Roof shingles replacement of the south and west roofs.

Work Item 1: <u>Solar Panels</u>	
Description of Current Condition:	Proposed Work: Installation of 19 black solar panels attached flush to the roof of the house
Work Item 2: <u>Partial Roof Replacement</u>	
Description of Current Condition:	Proposed Work: Replacement of the south and west roofs of the house with new shingles to match the existing ones.
Work Item 3: _____	
Description of Current Condition:	Proposed Work:

HISTORIC AREA WORK PERMIT CHECKLIST OF APPLICATION REQUIREMENTS

	Required Attachments						
Proposed Work	I. Written Description	2. Site Plan	3. Plans/ Elevations	4. Material Specifications	5. Photographs	6. Tree Survey	7. Property Owner Addresses
New Construction	*	*	*	*	*	*	*
Additions/ Alterations	*	*	*	*	*	*	*
Demolition	*	*	*		*		*
Deck/Porch	*	*	*	*	*	*	*
Fence/Wall	*	*	*	*	*	*	*
Driveway/ Parking Area	*	*		*	*	*	*
Grading/Exc avation/Land scaing	*	*		*	*	*	*
Tree Removal	*	*		*	*	*	*
Siding/ Roof Changes	*	*	*	*	*		*
Window/ Door Changes	*	*	*	*	*		*
Masonry Repair/ Repoint	*	*	*	*	*		*
Signs	*	*	*	*	*		*



ROBERTA VALENTE AND NEIL GOLDSMAN RESIDENCE
NEW GRID-INTERACTIVE PHOTOVOLTAIC SYSTEM
DC SYSTEM SIZE (8.265 KW)

SYSTEM DETAILS	
DESCRIPTION	NEW GRID-INTERACTIVE PHOTOVOLTAIC SYSTEM WITH NO BATTERY STORAGE
DC RATING OF SYSTEM	SYSTEM SIZE :8.265 KW DC STC
AC RATING OF SYSTEM	6.080 KW
AC OUTPUT CURRENT	31.58 A
NO. OF MODULES	(19) HD HYUNDAI HIS-T435NF(BK)(435W) SOLAR MODULES
NO. OF INVERTERS	(19) ENPHASE IQ8MC-72-M-US MICROINVERTERS
POINT OF INTERCONNECTION	LINE SIDE TAP IN THE MSP
ARRAY STRINGING	(1) BRANCH OF CIRCUIT 10 MODULES (1) BRANCH OF CIRCUIT 9 MODULES

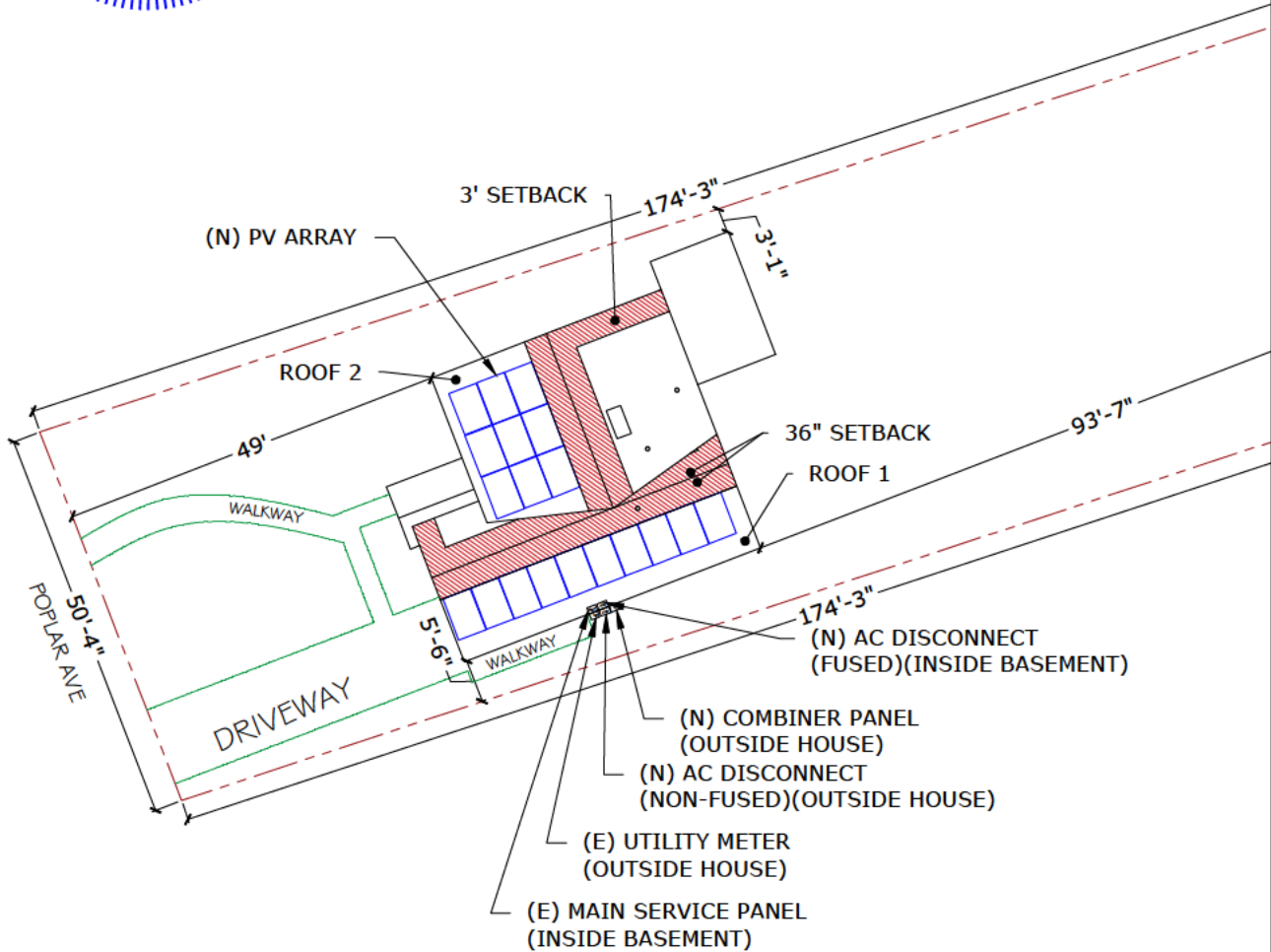
SITE DETAILS	
ASHRAE EXTREME LOW	-14°C
ASHRAE 2% HIGH	34°C
GROUND SNOW LOAD	30 PSF
WIND SPEED	115MPH (ASCE 7-16)
RISK CATEGORY	II
WIND EXPOSURE CATEGORY	B

GOVERNING CODES	
INTERNATIONAL BUILDING CODE (IBC) 2021	
INTERNATIONAL FIRE CODE (IFC) 2021	
INTERNATIONAL RESIDENTIAL CODE (IRC) 2021	
NATIONAL ELECTRICAL CODE (NEC) 2017	

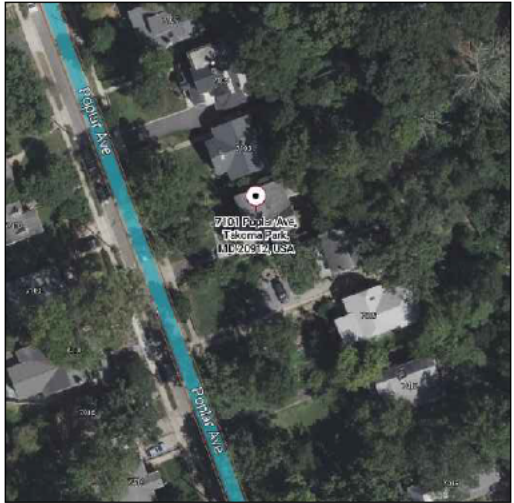
SHEET INDEX	
SHEET NO.	SHEET NAME
A - 00	SITE MAP & VICINITY MAP
A - 01	ROOF PLAN & MODULES
S - 01	ARRAY LAYOUT
S - 02	STRUCTURAL ATTACHMENT DETAIL
E - 01	ELECTRICAL LINE DIAGRAM
E - 02	WIRING CALCULATIONS
E - 03	SYSTEM LABELING
DS - 01	MODULE DATASHEET
DS - 02	MICROINVERTER DATASHEET
DS - 03	COMBINER DATASHEET
DS - 04	RACKING DATASHEET
DS - 05	ATTACHMENT DATASHEET



PROFESSIONAL CERTIFICATION, I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND
LICENSE NUMBER: 56915
EXPIRATION DATE: 12/16/2026



SITE MAP (N.T.S)



VICINITY MAP



WIND FLOW MAP



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TEL: 888-270-4030
BEE HAPPYSOLAR.COM
MHIC 157681

Signature with Seal

7101 POPLAR AVE,
TAKOMA PARK, MD 20912,
USA

PERMIT DEVELOPER

DATE 08/25/2025

DESIGNER OVV

REVIEWER

SHEET NAME

SITE MAP &
VICINITY MAP

SHEET NUMBER

A-00

MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 19 MODULES
MODULE TYPE = HD HYUNDAI HIS-T435NF(BK)(435W) SOLAR MODULES
WEIGHT = 53.57 LBS / 24.3 KG.
MODULE DIMENSIONS = 67.8"X44.6" = 21.00 SF

NUMBER OF INVERTER = 19 MICROINVERTERS
INVERTER TYPE = ENPHASE IQ8MC-72-M-US MICROINVERTERS

DC SYSTEM SIZE: 8.265 KW
AC SYSTEM SIZE: 6.080 KW



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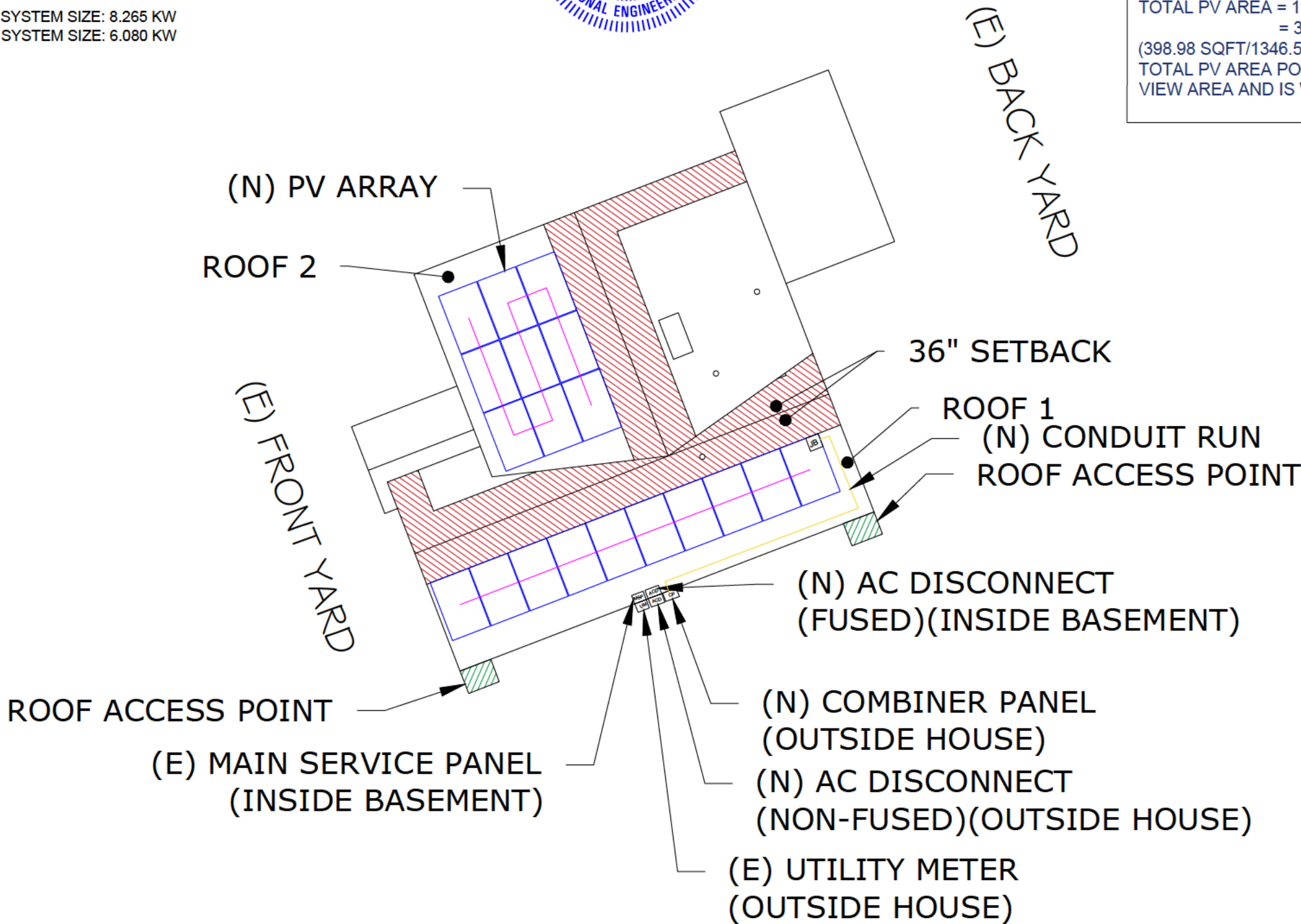
NOTES:
1. LOCATION OF JUNCTION BOX(ES), AC
DISCONNECTS(S), AC COMBINER PANEL(S), AND OTHER
ELECTRICAL EQUIPMENT(S) RELEVANT TO PV
INSTALLATION SUBJECT TO CHANGE BASED ON SITE
CONDITIONS.
2. SETBACKS AT RIDGES CAN BE REDUCED TO 18 INCHES
IN COMPLIANCE WITH IBC 2021:
TOTAL PLAN VIEW AREA = 1346.56 SQFT
TOTAL PV AREA = 19(67.8IN)(44.6 IN)/(144 IN^2)
= 398.98 SQFT
(398.98 SQFT/1346.56 SQFT)100 = 29.63%
TOTAL PV AREA POPULATES 29.63% OF TOTAL PLAN
VIEW AREA AND IS WITHIN THE 33% REQUIREMENT.



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LEGENDS

- UM - UTILITY METER
- MSP - MAIN SERVICE PANEL
- JB - JUNCTION BOX
- ACD - AC DISCONNECT
- CP - COMBINER PANEL
- [Red Hatched Box] - FIRE SETBACK
- [Circle with X] - VENT, ATTIC FAN (ROOF OBSTRUCTION)
- [Dashed Line] - CONDUIT
- [Pink Line] - STRING

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USA

PERMIT DEVELOPER	
DATE	08/25/2025
DESIGNER	OVV
REVIEWER	

SHEET NAME	
ROOF PLAN & MODULES	
SHEET NUMBER	
A-01	

ROOF DESCRIPTION:

(ROOF #1)

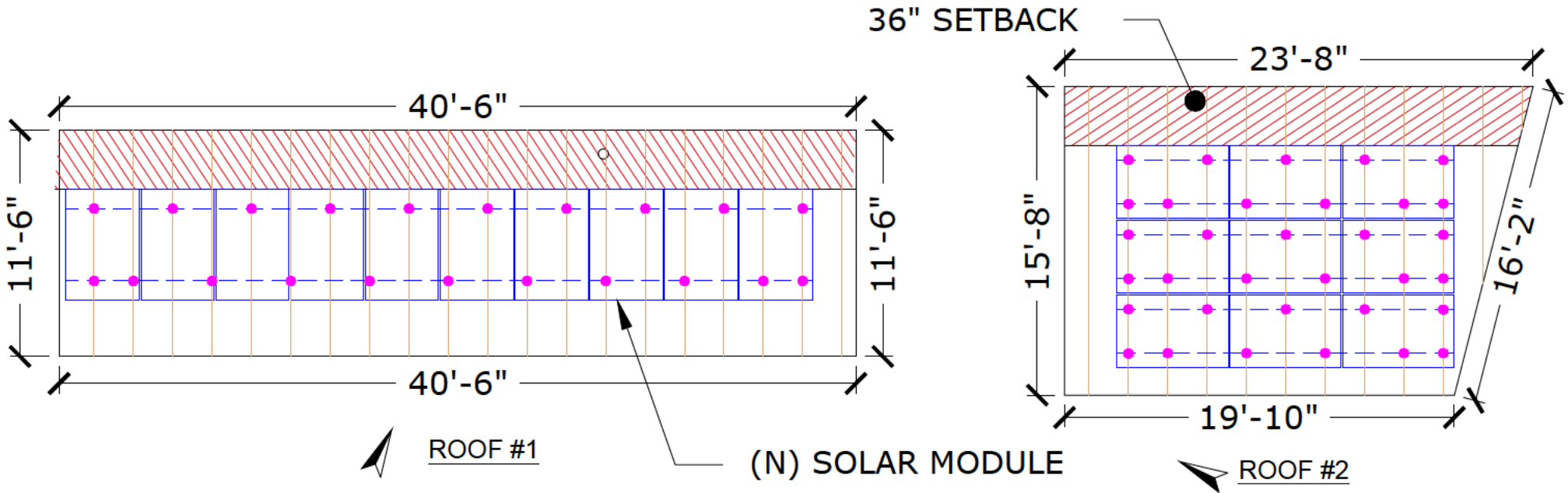
MODULES - 10
ROOF TILT - 45°
ROOF AZIMUTH - 159°
RAFTER SIZE - 2"x6"@24" O.C.

(ROOF #2)

MODULES - 9
ROOF TILT - 24°
ROOF AZIMUTH - 249°
RAFTER SIZE - 2"x6"@24" O.C.



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LEGENDS

- FIRE SETBACK
- VENT, ATTIC FAN (ROOF OBSTRUCTION)
- PV ROOF ATTACHMENT
- RAFTERS / TRUSSES



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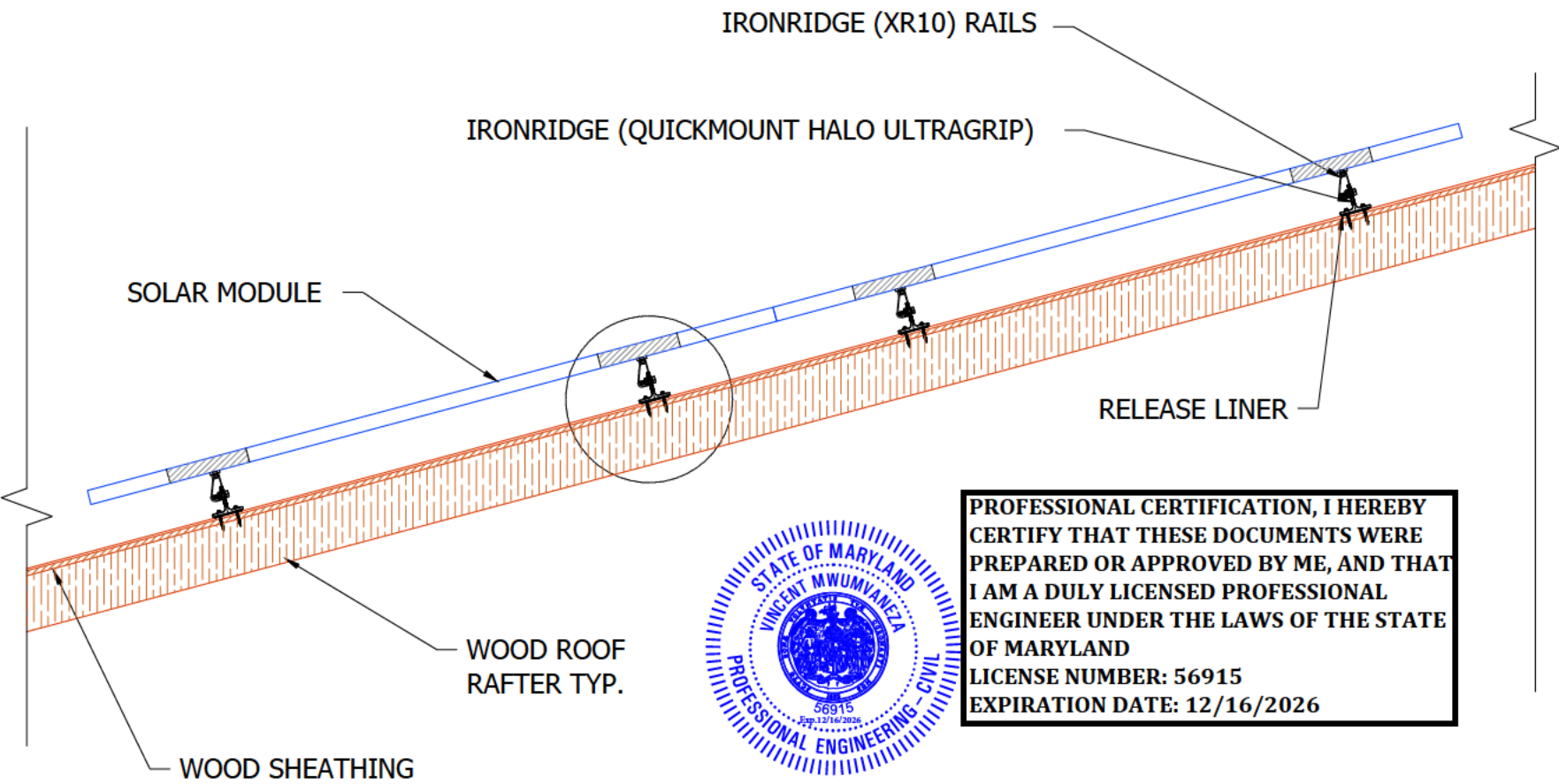
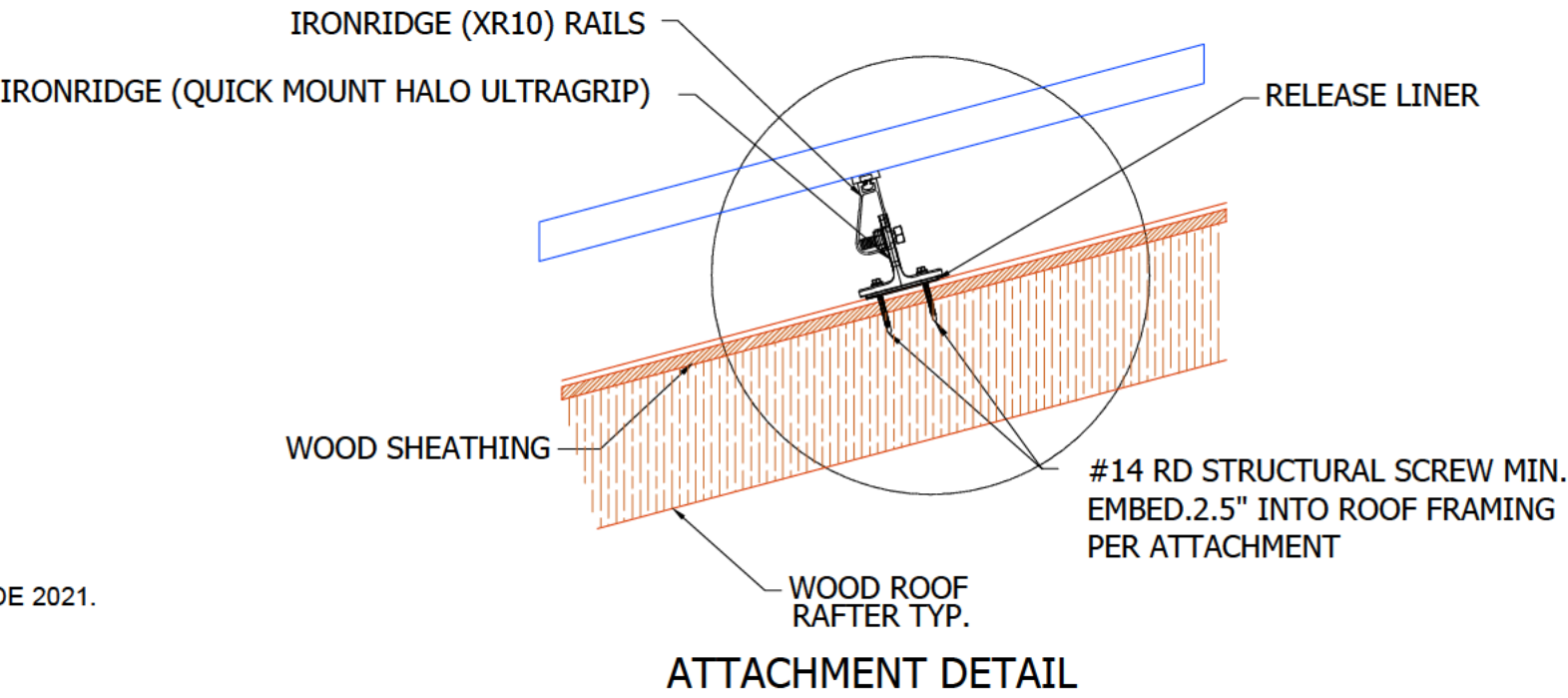
PERMIT DEVELOPER	
DATE	08/25/2025
DESIGNER	OVV
REVIEWER	

SHEET NAME
ARRAY
LAYOUT

SHEET NUMBER
S-01

PHOTOVOLTAIC MODULE GENERAL NOTES:

- 1. APPLICABLE CODE: INTERNATIONAL RESIDENTIAL CODE 2021
MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES
- 2. BOLT DIAMETER AND EMBEDMENT LENGTHS ARE DESIGNED PER NDS REQUIREMENTS. ALL BOLT CAPACITIES ARE BASED ON A WOOD ROOF RAFTER AS EMBEDMENT MATERIAL.
- 3. ALL WIND DESIGN CRITERIA AND PARAMETERS ARE FOR HIP AND GABLE RESIDENTIAL ROOFS, CONSIDERING FROM A 7° TO A MAXIMUM 45° (2/12 TO A MAXIMUM 9/12 PITCH) ROOF IN SCHEDULE. ALL RESIDENTIAL ROOFS SHALL NOT EXCEED 30'-0" MEAN ROOF HEIGHT.
- 4. ROOF SEALANTS SHALL CONFORM TO ASTM C920 AND ASTM 6511.
- 5. THIS SHEET REFLECTS STRUCTURAL CONNECTIONS ONLY. REFER TO MANUFACTURERS' MANUAL FOR ALL ARCHITECTURAL, MECHANICAL, ELECTRICAL, AND SOLAR SPECS.
- 6. ALL ALUMINUM COMPONENTS SHALL BE ANODIZED ALUMINUM 6105-T5 UNLESS OTHERWISE NOTED.
- 7. LAG BOLTS SHALL BE ASTM A276 STAINLESS STEEL UNLESS OTHERWISE NOTED.
- 8. ALL RAILING AND MODULES SHALL BE INSTALLED PER MANUFACTURERS' INSTRUCTIONS.
- 9. I CERTIFY THAT THE INSTALLATION OF THE MODULES IS IN COMPLIANCE WITH INTERNATIONAL RESIDENTIAL CODE 2021 AND INTERNATIONAL BUILDING CODE 2021. BUILDING STRUCTURE WILL SAFELY ACCOMMODATE CALCULATED WIND LATERAL AND UPLIFT FORCES, AND EQUIPMENT DEAD LOADS.



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STRUCTURAL ATTACHMENT DETAILS FOR ASPHALT SHINGLE



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PERMIT DEVELOPER	
DATE	08/25/2025
DESIGNER	OVV
REVIEWER	
SHEET NAME	
STRUCTURAL ATTACHMENT DETAILS	
SHEET NUMBER	
S-02	

MODULE SPECIFICATION	
MANUFACTURER	HD HYUNDAI SOLAR
MODEL NO	HIS-T435NF(BK)(435W)
OPEN CIRCUIT VOLTAGE (Voc)	38.90V
SHORT CIRCUIT CURRENT(Isc)	14.19A
RATED VOLTAGE (Vmpp)	32.08V
RATED CURRENT (Impp)	13.56A

MICRO INVERTER SPECIFICATION	
MANUFACTURER	ENPHASE
MODEL NO.	IQ8MC-72-M-US
MAX. OUTPUT POWER	320W
MAX. AC OUTPUT VOLTAGE	240V
AC OUTPUT CURRENT	1.33A

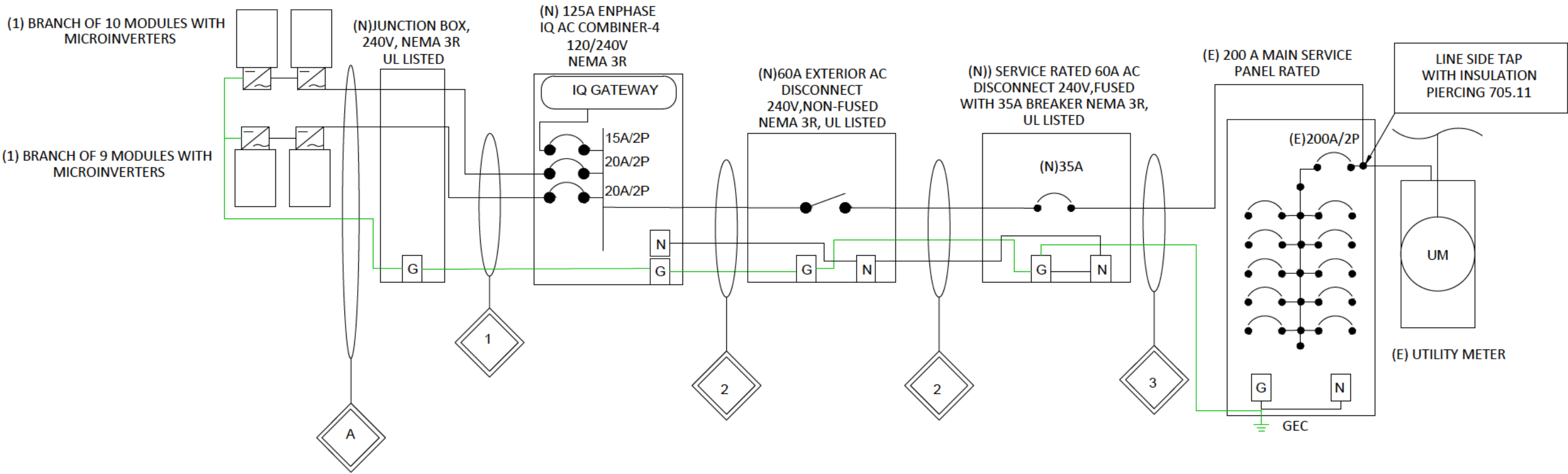
ARRAY DETAILS	
DC SYSTEM SIZE	8.265 KW
AC SYSTEM SIZE	6.080 KW
TOTAL NO. OF MODULES	19
NO. OF MODULE PER STRING	1@10,1@9
NO. OF STRING	2

NOTE:
1. SUBJECT PV SYSTEMS HAS BEEN DESIGNED TO MEET THE REQUIREMENTS OF THE NEC 2017, NFPA 70. INCLUDING MAXIMUM NUMBER OF MODULE STRINGS, MAXIMUM NUMBER OF MODULES PER STRING, MAXIMUM OUTPUT, MODULE MANUFACTURER AND MODEL NUMBER, INVERTER MANUFACTURER AND MODEL NUMBER, AS APPLICABLE.
2. PROVIDE TAP BOX IN COMPLIANCE WITH 312.8 IF PANEL GUTTER SPACE IS INADEQUATE.

NOTE: CONDUIT RUN AS PER NEC 2017
NOTE: EXTERIOR AC DISCONNECT IS LOCKABLE, TAGGABLE, VISIBLE BREAK AND ACCESSIBLE 24/7

SMART INVERTER COMPLIANCE
WITH IEEE-1547-2018 AND
CERTIFIED TO UL-1741-SB

CONDUIT SCHEDULE		
SR. NO.	DESCRIPTION	CONDUIT SIZE
(A)	ENPHASE Q-CABLES, (1)#6 BARE CU (G)	N/A FREE AIR
(1)	(2) #10 AWG THWN-2 CU (L1), (2) #10 AWG THWN-2 CU (L2), (1)#8 AWG THWN-2 CU (G)	IN 3/4" EMT CONDUIT
(2)	(3) #6 AWG THWN-2 CU (L1,L2,N) , (1) #8 AWG THWN-2 CU (G)	IN 3/4" EMT CONDUIT
(3)	(3) #6 AWG THWN-2 CU (L1,L2,N), (1) #8 AWG THWN-2 CU (G)	IN 3/4" EMT CONDUIT





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PERMIT DEVELOPER	
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DESIGNER	OVV
REVIEWER	
SHEET NAME	
ELECTRICAL LINE DIAGRAM	
SHEET NUMBER	
E-01	

ELECTRICAL CALCULATIONS:

1. CURRENT CARRYING CONDUCTOR

(A) BEFORE IQ COMBINER PANEL

AMBIENT TEMPERATURE - = 34°C ...NEC 310.15(B)(2)
TEMPERATURE DERATE FACTOR - 0.96 ...NEC 310.15(B)(1)(1)
GROUPING FACTOR -0.8...NEC 310.15(C)(1)

CONDUCTOR AMPACITY
= (INV O/P CURRENT) x 1.25 / A.T.F / G.F ...NEC 690.8(B)
= [(10x 1.33) x 1.25] / 0.96 / 0.8
= 21.64 A
SELECTED CONDUCTOR - #10 THWN-2 ...NEC 310.16

(B) AFTER IQ COMBINER PANEL

TEMPERATURE DERATE FACTOR - 0.96
GROUPING FACTOR - 1

CONDUCTOR AMPACITY
= (TOTAL INV O/P CURRENT) x 1.25 / 0.96 / 1 ...NEC 690.8(B)
= [(19x 1.33) x 1.25] / 0.96 / 1
= 32.90 A
SELECTED CONDUCTOR - #6 THWN-2 ...NEC 310.16

2. PV OVER CURRENT PROTECTION ..NEC 690.9(B)

= TOTAL INVERTER O/P CURRENT x 1.25
= (19 x 1.33) x 1.25 = 31.59 A
SELECTED OCPD = 35 A

GENERAL ELECTRICAL NOTES:

1. THE DC AND AC CONNECTORS OF THE ENPHASE IQ8MC-72-M-US MICROINVERTERS ARE LISTED TO MEET REQUIREMENTS AS A DISCONNECT MEANS AS ALLOWED BY NEC 690.15(A).
2. MICROINVERTER BRANCH CIRCUIT CONDUCTORS ARE MANUFACTURED ENPHASE Q CABLES LISTED FOR USE IN 20A OR LESS CIRCUITS OF ENPHASE IQ MICROINVERTERS. THEY ARE ROHS, OIL RESISTANT, AND UV RESISTANT. THEY CONTAIN AWG CONDUCTORS OF TYPE THHN/THWN-2 DRY/WET AND CERTIFIED TO UL3003 AND UL 9703. THE CABLE'S DOUBLE INSULATED RATING REQUIRES NO NEUTRAL OR GROUNDED CONDUCTOR.
3. ALL METAL ENCLOSURES, RACEWAYS, CABLES AND EXPOSED NONCURRENT-CARRYING METAL PARTS OF EQUIPMENT SHALL BE GROUNDED TO EARTH AS REQUIRED BY NEC 250.4(B) AND PART III OF NEC ARTICLE 250 AND EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO NEC 690.45. THE GROUNDING ELECTRODE SYSTEM SHALL ADHERE TO 690.47(A)
4. PV SYSTEM DISCONNECT SHALL BE READILY ACCESSIBLE.
5. POINT-OF-CONNECTION SHALL BE MADE IN COMPLIANCE WITH NEC 705.12
6. UTILITY HAS 24-HR UNRESTRICTED ACCESS TO ALL PHOTOVOLTAIC SYSTEM COMPONENTS LOCATED AT THE SERVICE ENTRANCE.
7. MODULES CONFORM TO AND ARE LISTED UNDER UL 1703. OPTIMIZERS CONFORM TO AND ARE LISTED UNDER UL 1741.
8. CONDUCTORS EXPOSED TO SUNLIGHT SHALL BE LISTED AS SUNLIGHT RESISTANT PER NEC ARTICLE 300.6(C)(1) AND ARTICLE 310.10 (D).
9. CONDUCTORS EXPOSED TO WET LOCATIONS SHALL BE SUITABLE FOR USE IN WET LOCATIONS PER NEC ARTICLE 310.10 (C).

GROUNDING NOTES:

PV MODULE AND RACKING GROUNDING AS PER APPROVED INSTALLATION PRACTICE AND IN LINE WITH MANUFACTURE'S GUIDELINES.



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USA

PERMIT DEVELOPER

DATE 08/25/2025

DESIGNER OVW

REVIEWER

SHEET NAME

WIRING
CALCULATIONS

SHEET NUMBER

E-02

SOLAR AC DISCONNECT & INVERTER LABELS

WARNING

ELECTRIC SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH LINE AND LOAD
SIDES MAY BE ENERGIZED IN THE OPEN
POSITION

WARNING

ELECTRIC SHOCK HAZARD
NO USER SERVICEABLE PARTS INSIDE
CONTACT AUTHORIZED SERVICE PROVIDE
FOR ASSISTANCE

WARNING

AC VOLTAGE = 240V
MAX FUSE: 35 A
MAX CURRENT: 31.58 A

WARNING

ELECTRIC SHOCK HAZARD
THE DC CONDUCTORS OF THIS
PHOTOVOLTAIC SYSTEM ARE
UNGROUND AND MAY BE ENERGIZED

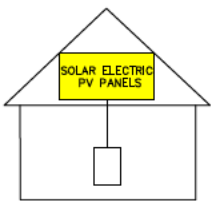
PHOTOVOLTAIC SYSTEM
EQUIPPED WITH RAPID
SHUTDOWN

AC COMBINER PANEL LABELS

SOLAR PV SYSTEM EQUIPPED
WITH RAPID SHUTDOWN

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

SOLAR ELECTRIC
PV PANELS



UTILITY METER

WARNING

⚠

DUAL POWER SOURCE

⚠

NOTICE

THIS SYSTEM IS EQUIPPED WITH RAPID
SHUTDOWN ROOFTOP INVERTERS WILL
DE-ENERGISE AT SERVICE PANEL OUTAGE

NOTICE

AC COMBINER AND DATA AQUISION.
DO NOT ADD LOADS.
DO NOT TOUCH TERMINALS.
LINE AND LOAD SIDE MAY BE ENERGIZED
IN OPEN POSITION.

LABEL

CAUTION

SOLAR CIRCUIT

EMERGENCY CONTACT
BEE HAPPY SOLAR
888-270-4030

CAUTION

PHOTOVOLTAIC AC SOURCE

SERVICE PANEL LABEL

WARNING

THIS SERVICE IS ALSO SERVED BY A PV SYSTEM WITH
RAPID SHUTDOWN. INVERTERS LOCATED ON ROOF
AUTO DE-ENERGISE WHEN SOLAR SERVICE MAIN IS
IN OPEN POSITION.
THE DC CONDUCTORS OF THE PV SYSTEM ARE
UNGROUND AND MAY BE ENEGIZED.
IF BACKFEED BREAKER PRESENT DO NOT RELOCATE
THIS OVERCURRENT DEVICE.

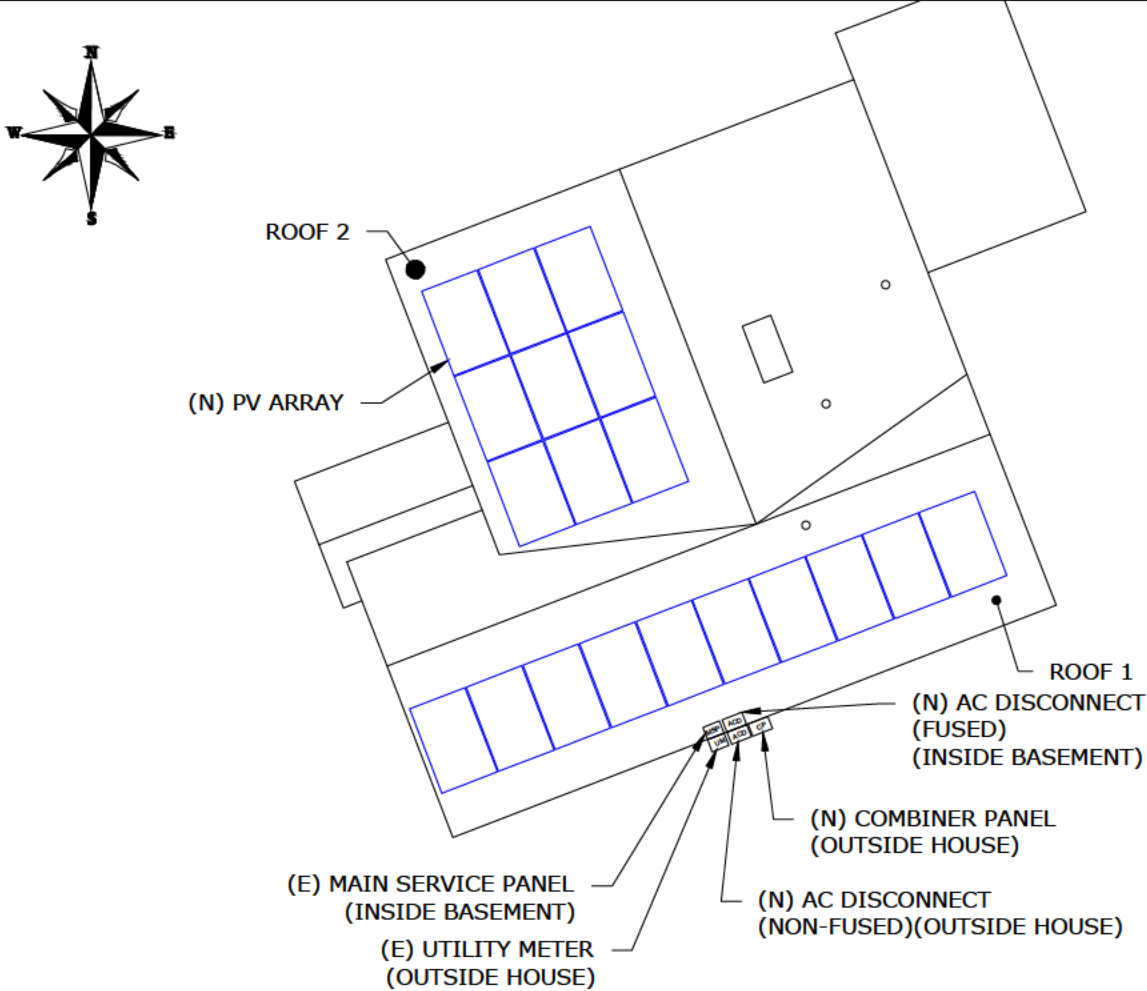
CAUTION

DO NOT DISCONNECT
UNDER LOAD

WARNING

⚠

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM THE FOLLOWING
SOURCES WITH DISCONNECTS LOCATED AS SHOWN



SITE ADDRESS: 7101 POPLAR AVE, TAKOMA PARK, MD 20912, USA



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PERMIT DEVELOPER	
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REVIEWER	
SHEET NAME	
SYSTEM LABELING	
SHEET NUMBER	
E-03	

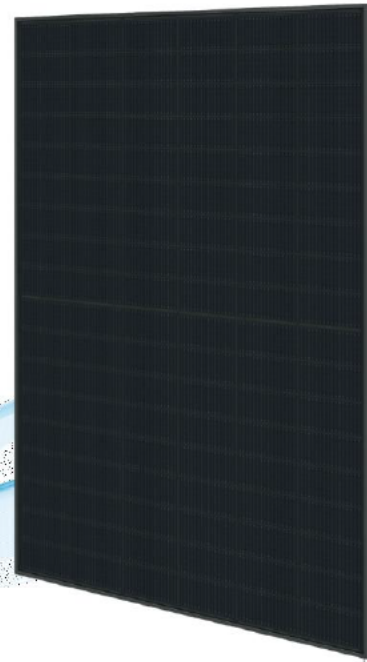
PRELIMINARY

HD HYUNDAI SOLAR MODULE

NF(BK) Series

Premium N-Type TOPCon Module

HIS-T425NF(BK) | HIS-T430NF(BK) | HIS-T435NF(BK)



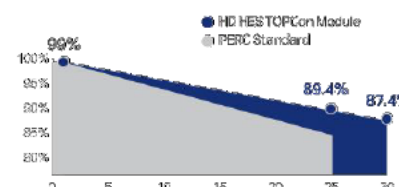
HD Hyundai's Warranty Provisions



- 25-Year Product Warranty
- Materials and workmanship



- 30-Year Performance Warranty
- First year degradation: 1%
- Linear warranty after initial year: with 0.47% annual degradation, 87.4% is guaranteed up to 30 years



*Refer to HD HEST standard warranty for details.

Certification



- UL 81215 / UL 61730 / IEC 61215 / IEC 61730 Certified
- ISO 9001: Quality management systems
- ISO 14001: Environmental management systems
- ISO 45001: Occupational health and safety management systems

Electrical Characteristics

HIS-TxxxNF(BK)		HIS-T425NF(BK)	HIS-T430NF(BK)	HIS-T435NF(BK)
Item	Unit	BNFP**	BNFI	BNFI
Nominal output (Pmax)	W	425	430	435
Open circuit voltage (Voc)	V	38.50	38.70	38.85
Short circuit current (Isc)	A	13.95	14.11	14.19
Voltage at Pmax (Vmpp)	V	31.76	31.85	32.03
Current at Pmax (Impp)	A	13.38	13.50	13.56
Module efficiency	%	21.76	22.02	22.28
Power Class Sorting	W	0 ~ +5		
Temperature coefficient of Pmax	%/K	-0.290		
Temperature coefficient of Voc	%/K	-0.260		
Temperature coefficient of Isc	%/K	0.043		
Bifaciality	%	83±5		

*STC: Irradiance 1,000 W/m², cell temperature 25°C, AM=1.5 / Measurement uncertainty for Pmax ±3%, Isc ±5%, Voc ±5%.
**The electrical properties of BNFI are measured under the irradiance corresponding to 1000 W/m² on the module front and 135 W/m² on the module rear.

Additional Power Gain from rear side

Pmpp gain	Pmpp [W]	Vmpp [V]	Impp [A]	Voc [V]	Isc [A]
5%	452	31.86	14.18	38.70	14.82
15%	485	31.85	15.53	38.70	16.23
25%	538	31.85	16.88	38.70	17.64

*Electrical characteristics with different rear power gain (reference to 430W)

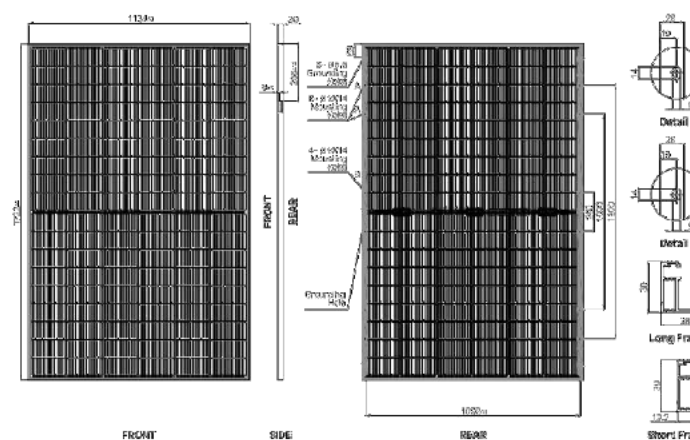
Mechanical Characteristics

Dimensions	1,723mm (L) x 1,134mm (W) x 30mm (H) (57.6in x 44.6in x 1.2in)
Weight	24.3 kg (53.57 lbs)
Solar Cells	N-Type TOPCon, 100 (6x18) monocrystalline 166B half-cut bifacial cells
Output Cables	Cable: (+) 1,200mm (47.2in), (-) 1,200mm (47.2in) / Customized length available Connector: Shuntail MC4 genuine Connector
Junction Box	3-part, 3 bypass diodes, IP68 rated
Construction	Front: 2.0mm (0.06in) semi-tempered solar glass with high transmittance and anti-reflective coating Rear: 2.0mm (0.06in) semi-tempered solar glass
Frame	Anodized aluminum alloy

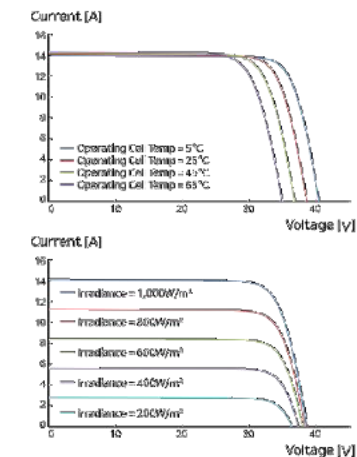
Shipping Configurations

Container Size (HC)	40'	Modules Per Pallet (pcs)	36
Pallets Per Container	26	Modules Per Container (pcs)	936

Module Diagram (unit: mm)



I-V Curves (HIS-T430NF(BK))



Sales & Marketing
hes_sales@hd.com

HD Hyundai Energy Solutions reserves the right to update or modify the specifications and features listed in this datasheet without prior notice. Always check the latest version of the datasheet for accurate information. Before using the product, please refer to the Installation and Operation Manual and Warranty. We retain the right of final interpretation.



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USA

PERMIT DEVELOPER

DATE	08/25/2025
DESIGNER	OVV
REVIEWER	

SHEET NAME

MODULE
DATASHEET

SHEET NUMBER

DS-01



DATA SHEET



IQ8MC Microinverter

Our newest IQ8 Series Microinverters are the industry's first microgrid-forming¹, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC), which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55-nm technology with high-speed digital logic and has superfast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.



Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the IQ Battery, IQ Gateway, and the Enphase App monitoring and analysis software.



Connect PV modules quickly and easily to the IQ8 Series Microinverters that have integrated MC4 connectors.



IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.



IQ8 Series Microinverters are UL Listed as PV rapid shutdown equipment and conforms with various regulations when installed according to the manufacturer's instructions.

Easy to install

- Lightweight and compact with plug-and-play connectors
- Power line communication (PLC) between components
- Faster installation with simple two-wire cabling

High productivity and reliability

- Produces power even when the grid is down²
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

Microgrid-forming

- Complies with the latest advanced grid support
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) and IEEE 1547-2018 (UL 1741-SB)

NOTE:

- IQ8 Microinverters cannot be mixed together with previous generations of Enphase microinverters (IQ7 Series, IQ6 Series, and so on) in the same system.
- IQ Microinverters ship with default settings that meet North America's IEEE 1547 interconnection standard requirements. Region-specific adjustments may be requested by an Authority Having Jurisdiction (AHJ) or utility representative. An IQ Gateway is required to make these changes during installation.

IQ8MC Microinverter

INPUT DATA (DC)	UNITS	IQ8MC-72-M-US	
Commonly used module pairings ¹	#	260–460	
Module compatibility	—	To meet compatibility, PV modules must be within the following max. input DC voltage and max. module I_{sc} . Module compatibility can be checked at https://enphase.com/installer/compatibility-checker .	
MPPT voltage range	V	25–65	
Operating range	V	18–58	
Min./Max. start voltage	V	22/58	
Max. input DC voltage	V	60	
Max. continuous operating DC current	A	14	
Max. input DC short-circuit current	A	25	
Max. module I_{sc}	A	20	
Overvoltage class DC port	—	II	
DC port backfeed current	mA	0	
PV array configuration	—	Ungrounded arrays: no additional DC side protection required; AC side protection requires max. 20 A per branch circuit	
OUTPUT DATA (AC)	UNITS	IQ8MC-72-M-US @240 VAC	IQ8MC-72-M-US @208 VAC
Peak output power	VA	330	315
Max. continuous output power	VA	320	303
Nominal grid voltage (L-L)	V	240, split-phase (L-L), 180°	208, single-phase (L-L), 120°
Min./Max. grid voltage ²	V	211–254	183–229
Max. continuous output current	A	1.33	1.49
Nominal frequency	Hz	60	
Extended frequency range	Hz	47–68	
AC short-circuit fault current over three cycles	Amps	2.70	
Max. units per 20 A (L-L) branch circuit ³	—	12	10
Total harmonic distortion	%	4.5	
Overvoltage class AC port	—	II	
AC port backfeed current	mA	18	
Power factor setting	—	1.0	
Grid feed power factor (adjustable)	—	0.85 leading ... 0.85 lagging	
Peak efficiency	%	97.4	97.2
CEC-weighted efficiency	%	97.0	96.5
Nighttime power consumption	W	33	25
MECHANICAL DATA	UNITS		
Ambient temperature range	-40°C to 60°C (-40°F to 149°F)		
Relative humidity range	4% to 100% (condensing)		
DC connector type	Standard MC4		
Dimensions D1 × W × D2 Weight	212 mm (8.3") × 175 mm (6.8") × 30.2 mm (1.2") 1.1 kg (2.43 lbs)		
Cooling	Natural convection – no fans		
Approved for wet location installation degree	Wet, PD5		
Enclosure	Class II double-insulated, corrosion-resistant polymeric enclosure		
Environment category/UV exposure rating	IEEMA Type I; outdoor		

COMPLIANCE	
Certifications	CA Rule 21 (UL 1741-SA), UL 62109-1, IEEE 1547-2018 (UL 1741-SB), FCC Part 15 Class B, ICS-0003 Class B, CMV/C50-C22.2 NO. 1073-01. This product is UL Listed as PV rapid shutdown equipment and conforms with NEC 2014, NEC 2017, NEC 2020, and NEC 2023 section 690.12 and C22.1-2018 Rule 64-218 rapid shutdown of PV systems for AC and DC conductors when installed according to the manufacturer's instructions.

¹ To interface DC input modules.
² Nominal voltage range can be modified based on AHJ if required by the utility.
³ 20 A limit applies to each branch circuit. Requirements to derive the number of microinverters per branch circuit are subject to change.

IQ8MC-72-M-US-00046-40-08-48-256x-05-09

Revision history

REVISION	DATE	DESCRIPTION
DSH-00049-4.0	February 2024	Added information about IEEE 1547 interconnection standard requirements.
DSH-00049-3.0	October 2023	Included NEC 2023 specification in the "Compliance" section.
DSH-00049-2.0	September 2023	Updated module compatibility information.
DSH-00049-1.0	May 2023	Preliminary release.

¹ Meets UL 1741 as a PV rapid shutdown system component 2 or 3.

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DATE	08/25/2025
DESIGNER	OVV
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SHEET NAME

MICROINVERTER
DATASHEET

SHEET NUMBER

DS-02

Enphase IQ Combiner 4/4C

X-IQ-AM1-240-4
X-IQ-AM1-240-4C



To learn more about Enphase offerings, visit enphase.com

The **Enphase IQ Combiner 4/4C** with Enphase IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure and streamlines IQ microinverters and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.

Smart

- Includes IQ Gateway for communication and control
- Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), included only with IQ Combiner 4C
- Includes solar shield to match Enphase IQ Battery aesthetics and deflect heat
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

Simple

- Centered mounting brackets support single stud mounting
- Supports bottom, back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80A total PV or storage branch circuits

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner SKU's
- UL listed



Enphase IQ Combiner 4/4C

MODEL NUMBER	
IQ Combiner 4 (X-IQ-AM1-240-4)	
IQ Combiner 4C (X-IQ-AM1-240-4C)	
IQ Combiner 4 with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes a silver solar shield to match the IQ Battery system and IQ System Controller 2 and to deflect heat.	
IQ Combiner 4C with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.	
ACCESSORIES AND REPLACEMENT PARTS (not included, order separately)	
Ensemble Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan for Ensemble sites - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan
Circuit Breakers BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220 Circuit breaker, 2 pole, 15A, Eaton BR2153 with hold down kit support Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 4/4C
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Gateway printed circuit board (PCB) for Combiner 4/4C
X-IQ-NA-HD-125A	Hold down kit for Eaton circuit breaker with screws.
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating	85 A
Max. continuous current rating (input from PV/storage)	64 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. total branch circuit breaker rating (input)	80A of distributed generation / 95A with IQ Gateway breaker included
Envy breaker	10A or 15A rating GE/Siemens/Eaton included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-SPLIT)	A pair of 200 A split core current transformers
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 x 49.5 x 16.8 cm (14.75" x 19.5" x 6.63"). Height is 21.06" (53.5 cm) with mounting brackets.
Weight	7.5 kg (16.3 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, IQ Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CAN/CSA 22.2 No. 61010-1

To learn more about Enphase offerings, visit enphase.com

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COMBINER
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SHEET NUMBER

DS-03



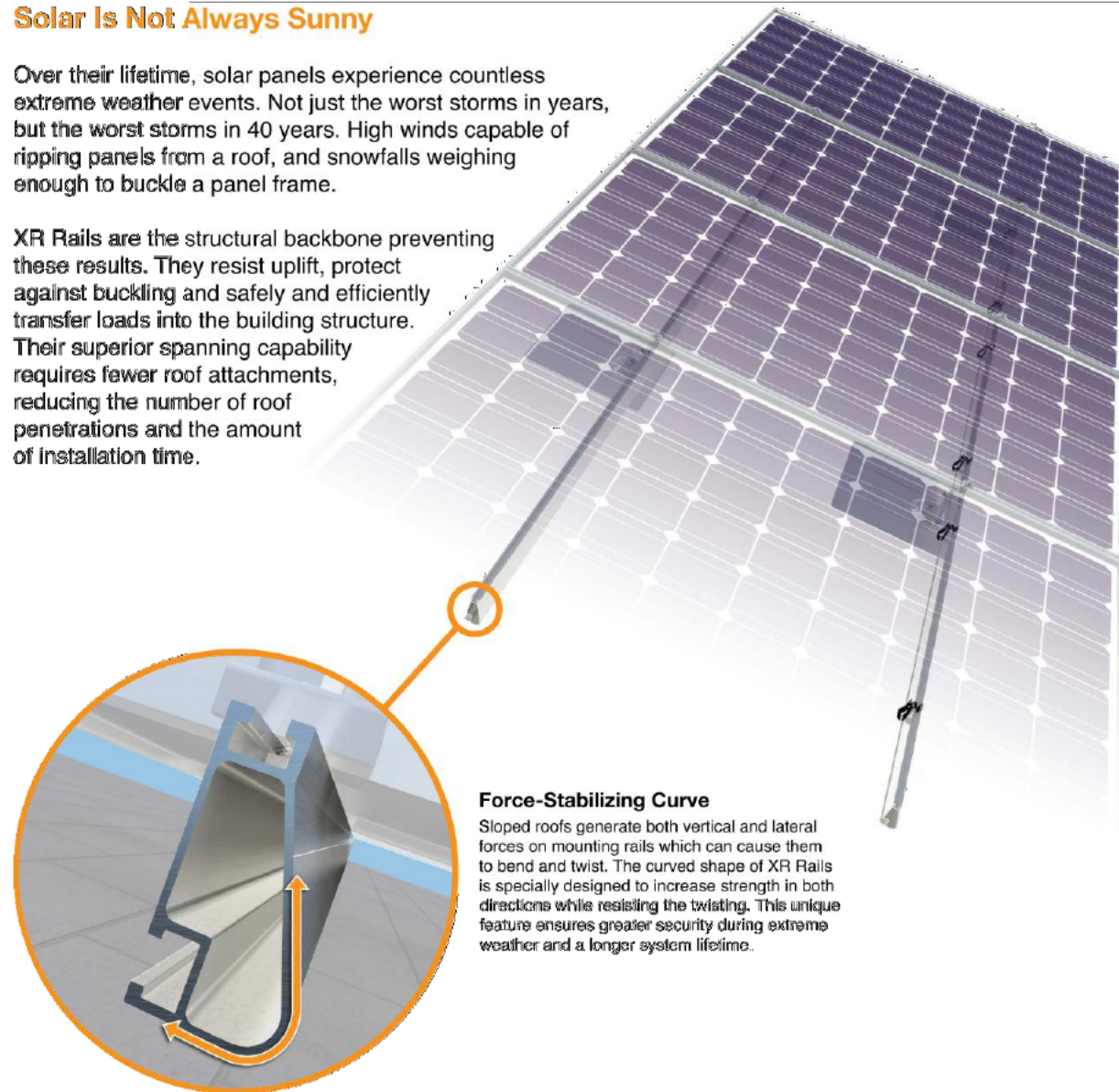
Tech Brief

XR Rail Family

Solar Is Not Always Sunny

Over their lifetime, solar panels experience countless extreme weather events. Not just the worst storms in years, but the worst storms in 40 years. High winds capable of ripping panels from a roof, and snowfalls weighing enough to buckle a panel frame.

XR Rails are the structural backbone preventing these results. They resist uplift, protect against buckling and safely and efficiently transfer loads into the building structure. Their superior spanning capability requires fewer roof attachments, reducing the number of roof penetrations and the amount of installation time.



Force-Stabilizing Curve

Sloped roofs generate both vertical and lateral forces on mounting rails which can cause them to bend and twist. The curved shape of XR Rails is specially designed to increase strength in both directions while resisting the twisting. This unique feature ensures greater security during extreme weather and a longer system lifetime.

Compatible with Flat & Pitched Roofs



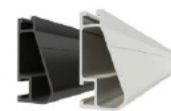
XR Rails are compatible with FlashFoot and other pitched roof attachments.



IronRidge offers a range of tilt leg options for flat roof mounting applications.

Corrosion-Resistant Materials

All XR Rails are made of marine-grade aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.



XR Rail Family

The XR Rail Family offers the strength of a curved rail in three targeted sizes. Each size supports specific design loads, while minimizing material costs. Depending on your location, there is an XR Rail to match.



XR10

XR10 is a sleek, low-profile mounting rail, designed for regions with light or no snow. It achieves 6 foot spans, while remaining light and economical.

- 6' spanning capability
- Moderate load capability
- Clear anodized finish
- Internal splices available



XR100

XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 8 feet.

- 8' spanning capability
- Heavy load capability
- Clear & black anodized finish
- Internal splices available



XR1000

XR1000 is a heavyweight among solar mounting rails. It's built to handle extreme climates and spans 12 feet or more for commercial applications.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish
- Internal splices available

Rail Selection

The following table was prepared in compliance with applicable engineering codes and standards. Values are based on the following criteria: ASCE 7-10, Roof Zone 1, Exposure B, Roof Slope of 7 to 27 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed span tables and certifications.

Load		Rail Span					
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'
None	100	XR10		XR100		XR1000	
	120						
	140						
	160						
10-20	100						
	120						
	140						
	160						
30	100						
	160						
40	100						
	160						
50-70	160						
80-90	160						



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DS-04



The Respect Your Roof Deserves

When integrating with a home, solar attachments must be dependable for the lifetime of the rooftop. Due to recent innovations, many asphalt shingles have bonded courses. A mount that protects without the need to pry shingles can really speed things up.

Halo UltraGrip™ (HUG™) is here to respect the roof. Its Halo is a cast-aluminum barrier that encases the UltraGrip, our industrial-grade, foam-and-mastic seal. This allows HUG to accelerate the installation process and provide the utmost in waterproofing protection. Give your roof a HUG.™



UltraGrip™ Seal Technology

HUG UltraGrip utilizes a state-of-the-art seal design that uses a unique, foam-and-mastic combination. The foam-backed adhesive provides an entirely new flashing system that conforms and adheres to every nook and cranny of composition shingles, filling gaps and shingle step-downs (up to 1/8" in height).

Multi-Tiered Waterproofing
HUG utilizes a multi-tiered stack of components to provide revolutionary waterproofing protection. The Halo cast-aluminum, raised-perimeter foundation surrounds the UltraGrip base—a foam-backed mastic seal combination that prevents water intrusion by adhering and sealing with the shingle surface.

Halo UltraGrip™ is part of the QuickMount® product line.



Rafter & Deck Mounting Options

Mount HUG to the roof rafters, the roof deck, or both with our custom-engineered RD (rafter-or-deck) Structural Screw. The RD Structural Screw anchors HUG to the roof with an EPDM sealing washer, completing the stack of waterproofing barriers. See backside for more installation information.



Triple Rated & Certified
to Respect the Roof™
UL 2703, 441 (27)
TAS 100(A)-95

Tech Brief

QuickMount® HUG

Adaptive, Rafter-Friendly Installation



Hit the rafter? Good to go!

When you find a rafter, you can move on. Only 2 RD Structural Screws are needed.



Miss the rafter? Try it again.

Place another screw to the left or right. If rafter is found, install 3rd and final screw.



Still no luck? Install the rest.

If more than 3 screws miss the rafter, secure six screws to deck mount it.

Trusted Strength & Less Hassle



25-Year Warranty
Product guaranteed free of impairing defects.

Structural capacities of HUG™ were reviewed in many load directions, with racking rail running cross-slope or up-slope in relation to roof pitch.

For further details, see the HUG certification letters for attaching to rafters and decking.

IronRidge designed the HUG, in combination with the RD Structural Screw to streamline installs, which means the following:

- No prying shingles
- No roof nail interference
- No pilot holes necessary
- No sealant (in most cases)
- No butyl shims needed

Attachment Loading



The rafter-mounted HUG has been tested and rated to support 1004 (lbs) of uplift and 368 (lbs) of lateral load.

Structural Design



Parts are designed and certified for compliance with the International Building Code & ASCE/SEI-7.

Water Seal Ratings



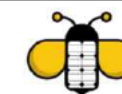
HUG passed both the UL 441 Section 27 "Rain Test" and TAS 100(A)-95 "Wind Driven Rain Test" by Intertek.

UL 2703 System



Systems conform to UL 2703 mechanical and bonding requirements. See Flush Mount Manual for more info.

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DS-05

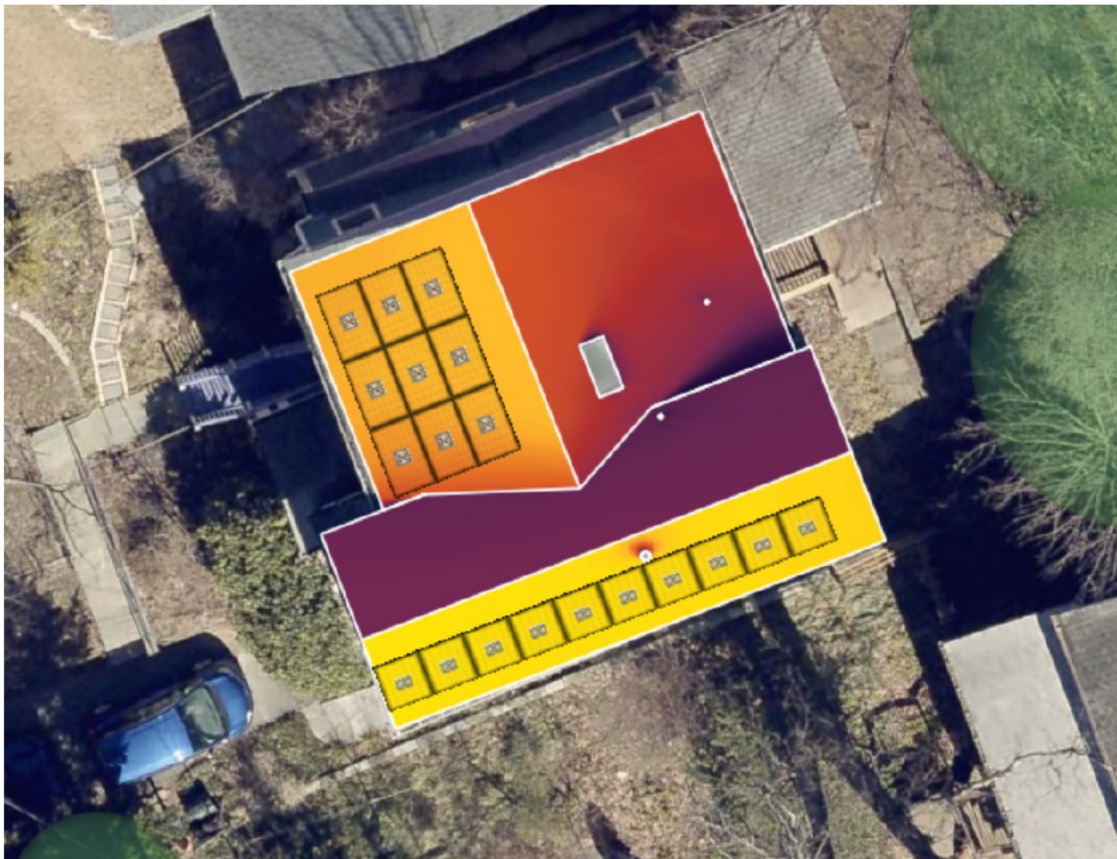
Murtha, Devon



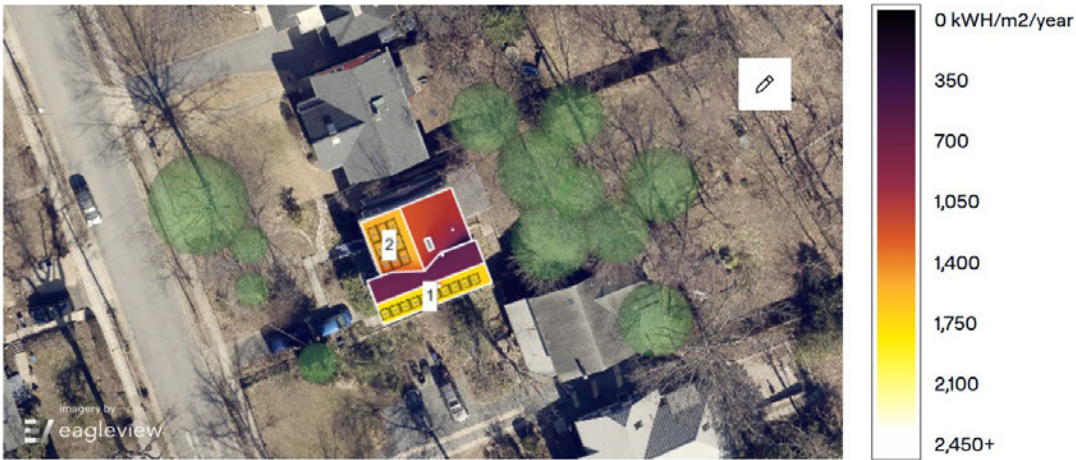
[EXTERNAL EMAIL] Exercise caution when opening attachments, clicking links, or responding.

Hi Devon,

As per your request, please find the attached heat map for the current proposed system.



Annual irradiance



Summary

Array ID	Panel count	Azimuth	Pitch	Annual TOF	Annual solar access	Annual TSRF
1	10	159°	50°	96%	97%	94%
2	9	249°	20°	88%	91%	80%
Weighted average by panel count:					94.2%	87.4%

The estimated system production with the current layout is 10,745 kwh a year.

If we move the panels to the back roof, the system production will be 8,759 kwh a year, **which is an 18% drop in production.**

The estimated amount of energy required to make this project financially feasible is 10,745 kwh a year.

Please also note that the front roof is not visible from the sidewalk or the sidewalk across. Please see the attached pictures. Also, the house is quite tall, making it almost impossible to see the solar from any angle.

Please let me know if you have any questions or require any additional information.

Best Regards,

Elena Zenke
Founder/Solar Guru



On Thu, Sep 11, 2025 at 1:39 PM Murtha, Devon <Devon.Murtha@montgomeryplanning.org> wrote:

Hello Elena,

I hope this email finds you well!

I am reviewing your Historic Area Work permit application for solar panel installation on the roof of 7101 Poplar Avenue. I understand that recent federal legislation has impacted financing for these projects, and that there is a rush to get these projects underway before the end of the year. Considering this, I am reaching out to all applicants in advance of the HPC deadline to ensure that applications are complete and do not get bumped to a later agenda due to a lack of documentation.

In reviewing your application, I see that you are proposing installing some panels on the front-facing main roof. The HPC policy discourages this placement - see the full policy here: <https://montgomeryplanning.org/wp-content/uploads/2021/12/Solar-Panel-Interactive.pdf>. However, the HPC can consider approval of panels on front roof slopes if the applicant provides evidence that this is the only feasible location for the panels. Please submit your justification, including

- A heat map
- The breakdown of the estimated energy output per panel

- The estimated amount of energy required to make the project practically and financially feasible.

All materials for the October 8th HPC meeting are **due September 17th at 5pm**. Please let me know in advance if you have any questions or need an example of a justification that we have accepted in the past.

Thanks,

Devon



Devon Murtha

Cultural Resources Planner II

she/her

Montgomery County Planning Department

2425 Reedie Drive, 3rd Floor, Wheaton, MD 20902

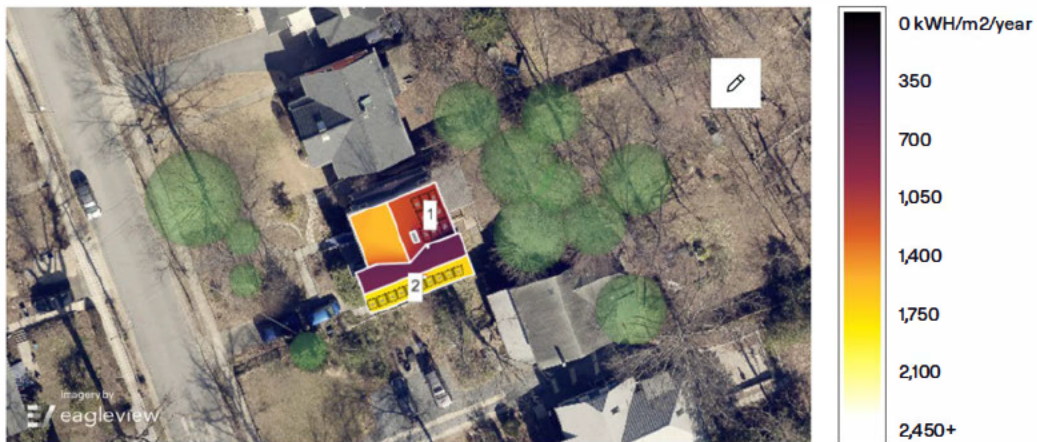
devon.murtha@montgomeryplanning.org

o: 301.495.1328





Annual irradiance



Summary

Array ID	Panel count	Azimuth	Pitch	Annual TOF	Annual solar access	Annual TSRF
1	9	69°	29°	74%	72%	53%
2	10	159°	50°	96%	97%	94%
Weighted average by panel count:					85.2%	74.6%

The estimated amount of energy required to make this project financially feasible is 10,745 kwh a year.

Please also note that the front roof is not visible from the sidewalk or the sidewalk across. Please see the attached pictures. Also, the house is quite tall, making it almost impossible to see the solar from any angle.

Please let me know if you have any questions or require any additional information.

Best Regards,

Elena Zenke
Founder/Solar Guru



Devon,

As a follow up on the above questions, and to compare the front vs the back:

The 9 panels (3.92 KW) on the front will produce 4,585 kwh

The 9 panels(3.92 KW) on the back will produce 2,599 kwh

The comparison between just those two arrays is very significant.

Hope this helps.

Best Regards,

Elena Zenke

Founder/Solar Guru

1) The estimated electricity consumption for the past 12 months is 10,702 kwh.

2) We can only fit one additional panel on the rear slope, the estimated total system production will be 9,243 KWh a year which is under the required coverage. Adding one panel will also increase the system cost by \$1,546.00. Using the back roof will not be feasible or financially attainable for the homeowners.

Best Regards,

Elena Zenke