



701 Ninth Street, NW
Washington, DC 20068

November 5, 2013

DANIEL HELLERSTEIN
1909 FRANWALL AV
SILVR SPRNG, MD 20902-2917

Re: Account #: 2414-8346-4-4

Dear Customer:

This letter confirms that Pepco accepted the completed Solar System Green Power Connection application for the above service address. This site is approved for the operation of the approved 6 kW capacity solar system.

Please feel free to contact me, should you have any questions at 202-872-3419.

Sincerely,

A handwritten signature in black ink, appearing to read "Tiki Harmon", written over the word "Sincerely,".

Tiki Harmon
Account Coordinator I
Green Power Connection Team



A PHI Company

**MARYLAND LEVEL 1
INTERCONNECTION APPLICATION
&
AGREEMENT**

**With Terms and Conditions for Interconnection
(Lab Certified Inverter-Based Small Generator Facilities Less than 10 or Equal to 10kW)**

The Green Power Connection™ Team
Pepco
A PHI Company
(202) 872-3419 - Phone
(202) 872-3228 - FAX
gpc-south@pepco.com

(Send applications via Email, FAX, or Mail to Pepco, GPC Team)

Mailing Address: Mail Stop 7642, 701 9th St. NW, Washington, DC 20001



A PHL Company

PART 1

MARYLAND LEVEL 1 INTERCONNECTION APPLICATION & AGREEMENT

With Terms and Conditions for Interconnection
(Lab Certified Inverter-Based Small Generator Facilities Less than or Equal to 10 kW)

(Application & Conditional Agreement – to be completed prior to installation)

INTERCONNECTION CUSTOMER CONTACT INFORMATION

Customer Name: Daniel Hellerstein

Mailing Address: 1909 Franwell Ave.

City: Silver Spring State: Md. Zip Code: 20902

Contact Person (If other than above): _____

Mailing Address (If other than above): _____

Telephone (Daytime) (301) 928-0970 (Evening): _____

Facsimile Number: _____ E-Mail Address (Required): danielh@crosslink.net

Alternate Contact Information

Name: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone (Daytime): _____ (Evening): _____

Facsimile Number: _____ E-Mail Address: _____

FACILITY INFORMATION

Facility Address: 1909 Franwell Ave

City: Silver Spring State: MD Zip Code: 20902

Pepco Account # of Facility Site: 2414 8346 44

Energy Source: Solar Prime Mover: Photo voltaic

Type of Application: Initial Addition/Upgrade

DC Nameplate Rating: 6.5 (kW) _____ (kVA), AC Inverter Rating 6 (kW), AC System Design Capacity: 5.67 (kW) _____ (kVA)

¹ Initial if first time generator request. Addition/Upgrade if this is an add-on to a previously approved system.

Generator (or PV Panel) Manufacturer, Model #: Helios 6T 260
(A copy of Generator Nameplate and Manufacturer's Specification Sheet May Also be Submitted)

Inverter Manufacturer: Aurora Model # & Rating: PV13.0, Rated 3000 watts
Number of Inverters: 2

Ampere Rating: 200 Amps_{AC}, Number of Phases: 1 3, Voltage Rating: 240 V_{AC},
Nominal DC Voltage: 30.84 V_{DC}, Power Factor: 99.5 %, Frequency: 60 Hz,
Pepco Accessible Disconnect or Lock Box: Yes No, If Yes, Location: Above Utility meter
1-line Diagram Attached (Required): Yes No, Site Plan Attached (Required): Yes No
Do you plan to export power?² Yes No, If Yes, Estimated Maximum: _____ kW_{AC}
Estimated Gross Annual Energy Production: 8075 kWh

Is the inverter IEEE/UL1741 lab certified? Yes No (If yes, attach manufacturer's cut sheet showing listing and label information from the appropriate listing authority, e.g. UL 1741 listing. If no, facility is not eligible for Level 1 Application.)

Estimated Commissioning Date: 11/10/13

EQUIPMENT INSTALLATION CONTRACTOR Check if owner-installed

Name: Kenergy Solar
Mailing Address: 7059 Blair Rd NW Ste 201
City: Washington State: DC Zip Code: 20012
Telephone (Daytime): (410) 729-4499 (Evening): _____
Facsimile Number: (410) 729-8544 E-Mail Address (Required): gridtie@kenergysolar.com

ELECTRICAL CONTRACTOR

Name: Plus Electric Corp
Mailing Address: 3405 Rosemary Lane
City: Hyattsville State: MD Zip Code: 20782
Telephone (Daytime): (202) 536-5859 (Evening): _____
Facsimile Number: _____ E-Mail Address: horacio@pluselectriccorp.com
License number: DM 902 040
Active License? Yes No

Is small generator facility eligible for Net Metering? Yes No

² Yes, if your expected maximum output of the inverter (kW AC) is greater than the lowest load you anticipate at your facility during maximum PV output (kW). The difference would be the amount you may export.

INSURANCE DISCLOSURE

The attached terms and conditions contain provisions related to liability and indemnification, and should be carefully considered by the interconnection customer. The interconnection customer is not required to obtain general liability insurance coverage as a precondition for interconnection approval; however, the interconnection customer is advised to consider obtaining appropriate insurance coverage to cover the interconnection customer's potential liability under this agreement.

CUSTOMER SIGNATURE

I hereby certify that: 1) I have read and understand the terms and conditions which are attached hereto by reference and are a part of this Agreement; 2) I hereby agree to comply with the attached terms and conditions; and 3) to the best of my knowledge, all of the information provided in this application request form is complete and true. I consent to permit the PSC and interconnecting utility to exchange information regarding the generating system to which this application applies.

Interconnection Customer Signature: Daniel M Heller Date: 8/6/12
Printed Name: Daniel M Hellerstein Title: owner

Conditional Agreement to Interconnect Small Generator Facility (for EDC use only)

Receipt of the application fee is acknowledged and, by its signature below, the EDC has determined the interconnection request is complete. Interconnection of the small generator facility is conditionally approved contingent upon the attached terms and conditions of this Agreement the return of the attached Certificate of Completion duly executed, verification of electrical inspection and successful witness test or EDC waiver thereof.

EDC Signature: Tek A. Harmon Date: 3-20-13
Printed Name: Tek A. Harmon Title: ACCOUNT COORDINATOR

Level 1 Interconnection Agreement
Terms and Conditions for Maryland Interconnection
(Lab Certified Inverter-Based Small Generator Facilities Less than 10 kW)

- 1) **Construction of the Small Generator Facility.** The Interconnection Customer may proceed to construct (including operational testing not to exceed 2 hours) the Small Generator Facility once the Conditional Agreement to Interconnect a Small Generator Facility on the preceding page has been signed by the EDC.
- 2) **Final Interconnection and Operation.** The Interconnection Customer may operate the Small Generator Facility and interconnect with the EDC's Electric Distribution System after all of the following have occurred:
 - a) **Electrical Inspection:** Upon completing construction, the Interconnection Customer will cause the Small Generator Facility to be inspected by the local electrical wiring inspector with jurisdiction who shall establish that the Small Generator Facility meets the requirements of the National Electrical Code.
 - b) **Certificate of Completion:** The Interconnection Customer shall provide the EDC with a completed copy of the Interconnection Agreement Certificate of Completion, including evidence of the electrical inspection performed by the local authority having jurisdiction. The evidence of completion of the electrical inspection may be provided on inspection forms used by local inspecting authorities. The Interconnection request shall not be finally approved until the EDC's representative signs the Interconnection Agreement Certificate of Completion.
 - c) EDC has either waived the right to a Witness Test in the Interconnection Request, or completed its Witness Test as per the following:
 - i) Within five (5) business days of the estimated commissioning date, the EDC may, upon reasonable notice and at a mutually convenient time, conduct a Witness Test of the Small Generator Facility to ensure that all equipment has been appropriately installed and that all electrical connections have been made in accordance with applicable codes;
 - ii) If the EDC does not perform the Witness Test within the 5-day period or such other time as is mutually agreed to by the parties, the Witness Test is deemed waived.
- 3) **IEEE 1547.** The Small Generator Facility is installed operated and tested in accordance with the requirements of IEEE standard 1547, "Standard for Interconnecting Distributed Resources with Electric Power Systems", as amended and supplemented, at the time the interconnection request is submitted.
- 4) **Access.** The EDC shall have direct, unabated access to the disconnect switch and metering equipment of the Small Generator Facility at all times. The EDC shall provide reasonable notice to the customer when possible prior to using its right of access.
- 5) **Metering.** Any required metering shall be installed pursuant to appropriate tariffs and tested by the EDC pursuant to the EDC's meter testing requirements pursuant to the Code of Maryland Regulations (COMAR)
- 6) **Disconnection.** The EDC may temporarily disconnect the Small Generator Facility upon the following conditions:
 - a) For scheduled outages upon reasonable notice;
 - b) For unscheduled outages or emergency conditions;

- c) If the Small Generator Facility does not operate in the manner consistent with this Agreement;
 - d) Improper installation or failure to pass the Witness Test;
 - e) If the Small Generator Facility is creating a safety, reliability or a power quality problem; or
 - f) The Interconnection Equipment used by the Small Generator Facility is de-listed by the Nationally Recognized Testing Laboratory that provided the listing at the time the interconnection was approved.
- 7) **Indemnification.** The parties shall at all times indemnify, defend, and save the other party harmless from any and all damages, losses, claims, including claims and actions relating to injury to or death of any person or damage to property, demand, suits, recoveries, costs and expenses, court costs, attorney fees, and all other obligations by or to third parties, arising out of or resulting from the other party's performance or failure to perform under this Agreement on behalf of the indemnifying party, except in cases of gross negligence or intentional wrongdoing by the indemnified party.
- 8) **Limitation of Liability.** Each party's liability to the other party for any loss, cost, claim, injury, liability, or expense, including reasonable attorney's fees, relating to or arising from any act or omission in its performance of this Agreement, shall be limited to the amount of direct damage actually incurred. In no event shall either party be liable to the other party for any indirect, incidental, special, consequential, or punitive damages of any kind whatsoever.
- 9) **Termination.** This Agreement may be terminated under the following conditions:
- a) By Interconnection Customer - The Interconnection Customer may terminate this application agreement by providing written notice to the EDC.
 - b) By the EDC - The EDC may terminate this Agreement if the Interconnection Customer fails to remedy a violation of terms of this Agreement within 30 calendar days after notice, or such other date as may be mutually agreed to prior to the expiration of the 30 calendar day remedy period. The termination date can be no less than 30 calendar days after the Interconnection Customer receives notice of its violation from the EDC.
- 10) **Modification of Small Generator Facility.** The Interconnection Customer must receive written authorization from the EDC before making any changes to the Small Generator Facility, other than minor changes that do not have a significant impact on safety or reliability of the Electric Distribution System as determined by the EDC. If the Interconnection Customer makes such modifications without the EDC's prior written authorization, the EDC shall have the right to temporarily disconnect the Small Generator Facility.
- 11) **Permanent Disconnection.** In the event the Agreement is terminated, the EDC shall have the right to disconnect its facilities or direct the customer to disconnect its Small Generator Facility.
- 12) **Disputes.** Each party agrees to attempt to resolve all disputes regarding the provisions of these interconnection procedures pursuant to the dispute resolution provisions of the Maryland Standard Small Generator Interconnection Rules.
- 13) **Governing Law, Regulatory Authority, and Rules.** The validity, interpretation and enforcement of this Agreement and each of its provisions shall be governed by the laws of the State of Maryland. Nothing in this Agreement is intended to affect any other agreement between the EDC and the Interconnection Customer. However, in the event that the provisions of this agreement are in conflict with the provisions of the EDC's tariff, the EDC tariff shall control.

- 14) **Survival Rights.** This Agreement shall continue in effect after termination to the extent necessary to allow or require either party to fulfill rights or obligations that arose under the Agreement.
- 15) **Assignment/Transfer of Ownership of the Small Generator Facility.** This Agreement shall terminate upon the transfer of ownership of the Small Generator Facility to a new Eligible Customer Generator (owner or tenant), unless the new Eligible Customer Generator notifies the EDC of the change, their agreement to abide by the Terms and Conditions of the original Interconnection Agreement, and so notifies the EDC in writing prior to or coincident with the transfer of electric service to the new customer. Should an interconnection agreement terminate for failure of a new customer to provide appropriate written agreement within 30 days, the EDC shall notify the Public Service Commission the Interconnection Agreement has been terminated.
- 16) **Definitions.** Any capitalized term used herein and not defined shall have the same meaning as the defined terms used in the Maryland Standard Small Generator Interconnection Rule.
- 17) **Notice.** Unless otherwise provided in this Agreement, any written notice, demand, or request required or authorized in connection with this Agreement ("Notice") shall be deemed properly given if delivered in person, delivered by recognized national courier service, or sent by first class mail, postage prepaid, to the person specified below:

If to Interconnection Customer:

Use the contact information provided in the Agreement for the Interconnection Customer. The Interconnection Customer is responsible for notifying the EDC of any change in the contact party information, including change of ownership.

If to EDC:

Use the contact information provided on the EDC's web page for small generator interconnection.

- 18) **Important Note.** Running grid-tied generation at a premise will generally raise voltage levels. A proper voltage drop/rise study must be done to insure that resulting voltages do not cause problems at the customer premise and/or to the operation of the inverter. If there are times when generator output will exceed the load of the premise, this will cause voltage rise across the line transformer and service line to the facility. Be sure this is taken into account when doing a voltage drop/rise analysis. If there are other customers that have grid-tied solar and their premise is fed by the same line transformer, be sure to take that into account when considering voltage rise across the line transformer. If the new generation system causes high voltage for other customers fed by the same transformer, it will be the responsibility of the newest generator installation to remediate the high voltage. The normal voltage at the meter without generation is 120 V +/- 4% (or other secondary voltages such as 208, 240, 480, etc.). Be sure to assume the highest voltage (+ 4%) at the meter when doing the voltage drop/rise analysis to insure acceptable voltage at the premise and at the inverter. **The utility is not responsible for elevated voltage caused by the operation of a generator.** The electrical grid has been designed to maintain 120 V +/- 4% (or other standard secondary voltages) during the course of the normal load cycle.



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PART 2

MARYLAND INTERCONNECTION APPLICATION & AGREEMENT

With Terms and Conditions for Interconnection
(Lab Certified Inverter-Based Small Generator Facilities Less than or Equal to 10 kW)

(Final Agreement – must be completed after installation and prior to interconnection)

Certificate of Completion

INTERCONNECTION CUSTOMER CONTACT INFORMATION

Name: Daniel M Hellerstein
Mailing Address: 1909 FRANWALL AVE
City: Wheaton State: MD Zip Code: 20902
Telephone (Daytime): 3016494728 (Evening): 301 908 0990
Facsimile Number: _____ E-Mail Address: danh@crosslink.net

FACILITY INFORMATION

Facility Address: 1909 FRANWALL AVE
City: Wheaton State: MD Zip Code: 20902
Pepco Account # of Facility Site: 2414834644
Energy Source: Solar Prime Mover: Photo Voltaic
DC Nameplate Rating: 6.5 (kW) _____ (kVA), AC Inverter Rating 6.0 (kW), AC System
Design Capacity: 5.67 (kW) _____ (kVA)
Inverter Manufacturer: AURORA Model # & Rating: PTI-3.0 outd
Number of Inverters: 2

EQUIPMENT INSTALLATION CONTRACTOR Check if owner-installed

Name: Capital-Sun Group
Mailing Address: 6503 81st St
City: Cabin John State: MD Zip Code: 20818
Telephone (Daytime): 301229 0671 (Evening): 301229 0671
Facsimile Number: _____ E-Mail Address: Solarnegman@gmail.com

SMALL ELECTRIC INSPECTION AND INTERCONNECTION CUSTOMER SIGNATURE

The Small Generator Facility is complete and has been approved by the local electric inspector having jurisdiction. A signed copy of the electric inspector's form indicating final approval is attached. The Interconnection Customer acknowledges that it shall not operate the Small Generator Facility until receipt of the final acceptance and approval by the EDC as provided below.

Signed: Daniel M Hellerstein Date 16 Oct 2013
(Signature of interconnection customer)

Printed Name: Daniel M Hellerstein

Type of Application: New/Initial Growth/Increase System Capacity 6.5 KW (DC)

Check if copy of signed electric inspection form is attached

ACCEPTANCE AND FINAL APPROVAL FOR INTERCONNECTION (for EDC use only)

The interconnection agreement is approved and the Small Generator Facility is approved for interconnected operation upon the signing and return of this Certificate of Completion by EDC:

Electric Distribution Company waives Witness Test? (Initial) Yes (TH) No ()
If not waived, date of successful Witness Test: _____ Passed: (Initial) ()

EDC Signature: Tibor H. Warner Date: 11-5-13

Printed Name: Tibor H. Warner Title: ACCOUNT COORDINATOR I



MONTGOMERY COUNTY
 DEPARTMENT OF PERMITTING SERVICES
 255 Rockville Pike, 2nd Floor
 Rockville, Maryland 20850-4166

APPROVED

Permit #: 647132 / 622341

Permit Type: Electrical, BIDC

Inspection Type: Solar PVS

Description: _____

Inspector: Bahrami

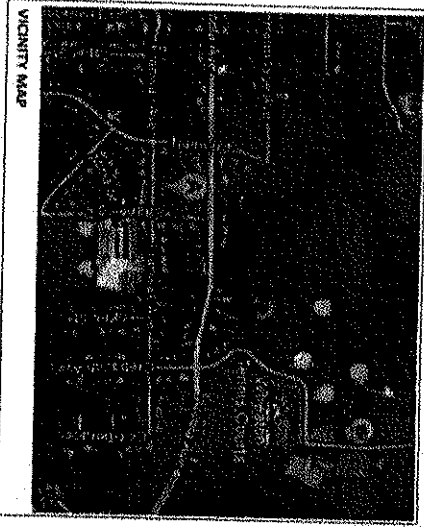
Date/Time: 10-10-13

Phone: _____

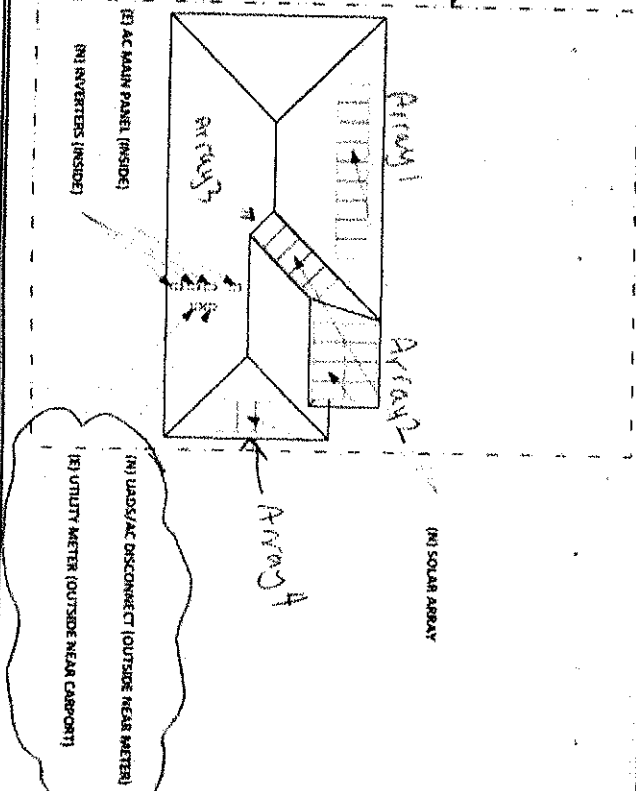
Code/Edition: _____

Notes/Comments: 1909 FARM ROAD AVE

SILVER SPRING, MD.



SYSTEM DESCRIPTION	
DESIGN WIND SPEED:	90 MPH @ 3 second gust = 20 PSF
EXPOSURE CATEGORY:	B High Temp: 37 Low -15 C
MODULE TYPE:	HELIOS ET 260 (260W)
QUANTITY:	25
SYSTEM SIZE:	6.5 kW
ROOF TYPE:	ASPHALT SHINGLE
ROOF ANGLE:	20 DEG.
ARRAY ADJUST(S):	0 DEG., 30 DEG. & 120 DEG.
ROOF STRUCTURE:	1.75" x 5.5" RAFTERS @ 16" O.C.
MOUNTING SYSTEM:	QUICKMOUNT STANDOFF w/ IRON RIDGE XRS RAILS
MONITORING SYS:	
CHARGE CONTROLLER:	MORNINGSTAR TRISTAR TS-60
BATTERIES:	(4) Deka B&D 12V 245AH (4/20)
INVERTERS:	(2) AUBORA PV-1.0-OUT & (1) MAGNUM HS-2400 PVE
EXT. ELEC. SERVICE:	200A @ 240VAC (CUTLER HAMMER PANEL)
NEW ELEC. SERVICE:	30A @ 240VAC CRITICAL LOADS SUB-PANEL
AGE OF HOME: 1960	



GENERAL NOTES:

1. IN CONFORMANCE WITH IRC 2011 AND NEC 2008
2. GROUNDING SNOW LOAD: 30 PSF
3. TOPGRAPHIC CATEGORY: A
4. DESIGN WIND SPEED: 90 MPH
5. WEATHER DESIGN CATEGORY: A
6. WIND FREQUENCY FACTOR: 1.0
7. MEAN ANNUAL WIND SPEED: 10.0
8. FROST LINE DEPTH: 30" (MIN)
9. TEMPERATURE: 37 F (MAX)
10. WINTER DESIGN TEMPERATURE: 13 F
11. ICE SHEILD OVERLAYMENT REQUIRED: YES
12. MEAN ANNUAL TEMPERATURE: 55 F

STRUCTURAL NOTES:

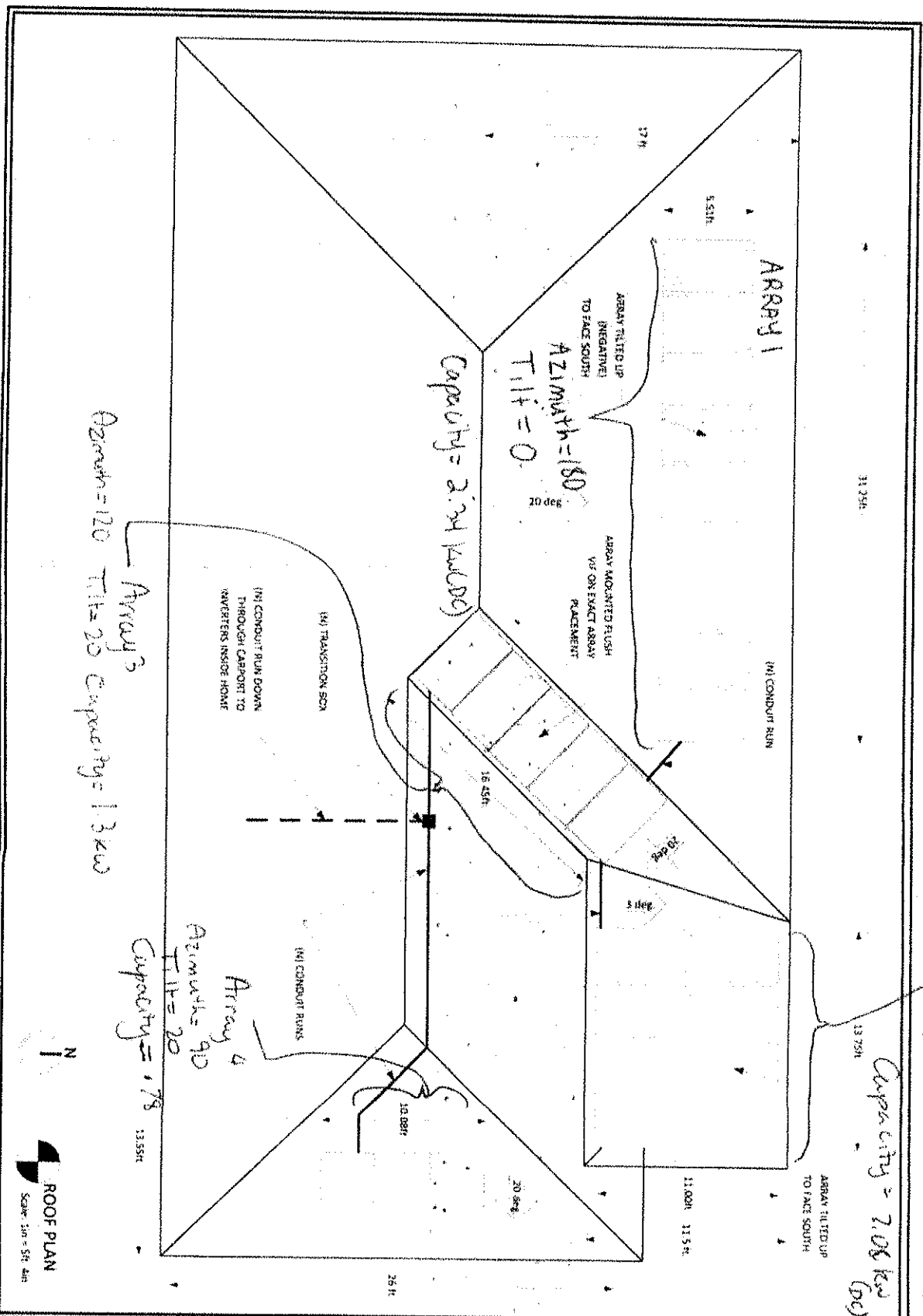
1. ALL WORK IS TO BE PERFORMED IN A PROFESSIONAL MANNER AND IN ACCORDANCE WITH STANDARD PRACTICE AND SHALL BE IN STRICT COMPLIANCE WITH MANUFACTURER'S SPECIFICATIONS AND/OR RECOMMENDATIONS
2. THE GENERAL AND SUB-CONTRACTORS SHALL CAREFULLY EXAMINE THE DRAWINGS, INSPECT THE SITE, AND ACCORDANT THEMSELVES WITH ALL GOVERNING ORDINANCES, LAWS AND OTHERWISE APPLICABLE THEMSELVES WITH ALL MATTERS THAT MAY AFFECT PERFORMANCE OF THE WORK.

ELECTRICAL NOTES:

1. ALL PV SYSTEMS COMPONENTS SHALL BE LISTED BY A RECOGNIZED TESTING AGENCY (i.e. UL, IEC, ETC.)
2. WARNING MATERIALS SHALL BE SUITABLE FOR THE SUN EXPOSURE AND WET LOCATION FIELD APPLIED PROTECTIVE COATINGS ARE NOT ACCEPTABLE.
3. WHERE THE REMOVAL OF THE DISCONNECTING MEANS MAY BE EMERGED IN THE OPEN POSITION, A WARNING SIGN SHALL BE MOUNTED ON OR ADJACENT TO THE DISCONNECTING MEANS HAVING THE FOLLOWING WORDS: "WARNING: ELECTRIC SHOCK HAZARD, DO NOT TOUCH TERMINALS TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION"
4. SIGNS SHALL BE POSTED ADJACENT TO EACH PV DISCONNECT AND INVERTER TO INDICATE "PHOTOVOLTAIC SYSTEM"
5. ALL PV MODULES AND ASSOCIATED EQUIPMENT AND WIRING MATERIAL SHALL BE PROTECTED FROM PHYSICAL DAMAGE
6. ALL FIELD MOUNTED CONNECTION, PULL AND OUTLET BOXES LOCATED BEHIND MODULES OR PANELS SHALL BE ACCESSIBLE DIRECTLY OR BY DISPLACEMENT OF A MODULE(S) OR PANEL(S) SECURED BY REMOVABLE FASTENERS.
7. REMOVAL OF INVERTER OR OTHER EQUIPMENT SHALL NOT DISCONNECT THE BONDING CONNECTION BETWEEN THE GROUNDING ELECTRODE CONDUCTOR AND THE PHOTOVOLTAIC SOURCE AND/OR OUTPUT CIRCUIT GROUNDING CONDUCTOR
8. PHOTOVOLTAIC SOURCE CIRCUITS, OUTPUT CIRCUITS, INVERTER OUTPUT CIRCUITS AND EQUIPMENT SHALL BE PROTECTED IN ACCORDANCE WITH THE REQUIREMENTS OF THE APPLICABLE NEC FOR THIS JURISDICTION.
9. MODULE FRAMES AND BACKING SYSTEMS SHALL BE GROUNDING AT UL LISTED LOCATION PROVIDED BY THE MANUFACTURER USING UL LISTED GROUNDING LUGS. THE REMOVAL OF ONE PANEL SHALL NOT INTERRUPT THE CONTINUITY OF THE GROUNDING SYSTEM FOR THE REST OF THE PANELS OR BACKING SYSTEMS.
10. ALL NEC REQUIRED PV SIGNAGE WILL BE POSTED.



ENERGY	Hellerstein Residence 1909 Franwall Avenue Silver Spring, MD 20902	Structural Engineer: Wolfman & Associates 8720 Georgia Avenue Suite 8908 Silver Spring, MD 20910	Kinergy Solar 7059 Blair Rd, NW Suite 201 Washington, DC 20017 410-720-4499 (office) MOBILE # 127519 DCIRC # 69008547
	DRAWN BY: Corey Ransden	DATE: 12/2/2012	DRAWING SITE PLAN



Capacity = 2.34 kW (DC)

Array 1
 Azimuth = 180
 Tilt = 0

Array 2
 Azimuth = 180, Tilt = 0
 Capacity = 2.08 kW (DC)

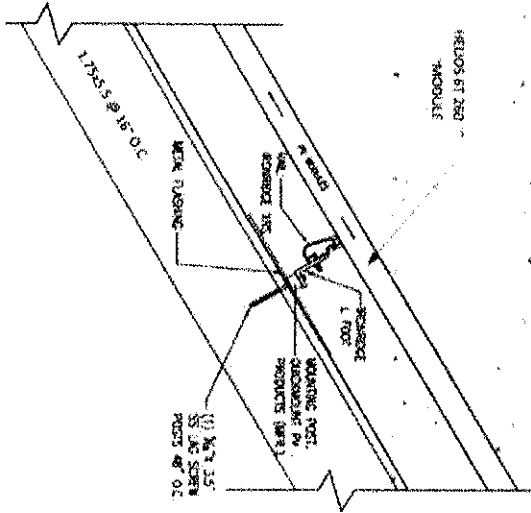
Array 3
 Azimuth = 120, Tilt = 20
 Capacity = 1.3 kW

Array 4
 Azimuth = 90
 Tilt = 20
 Capacity = 1.78

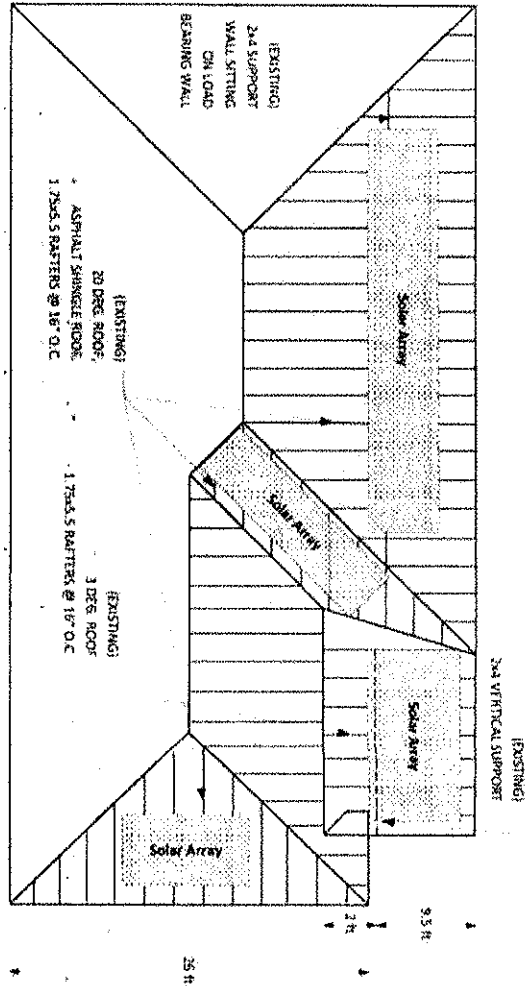
ROOF PLAN
 Scale: 1/8" = 5 ft

PV - 2	DRAWING ROOF PLAN	DATE: 12/27/2012	DRAWN BY: Cory Ramsden	Hellerstein Residence 1909 Franwall Avenue Silver Spring, MD 20902	Structural Engineer: Wolfman & Associates 8720 Georgia Avenue Suite 400B Silver Spring, MD 20910	Kenergy Solar 7059 Blair Rd, NW Suite 201 Washington, DC 20032 410-729-4499 (office) MDHC # 127518 DCHC # 69608547	
		SCALE					

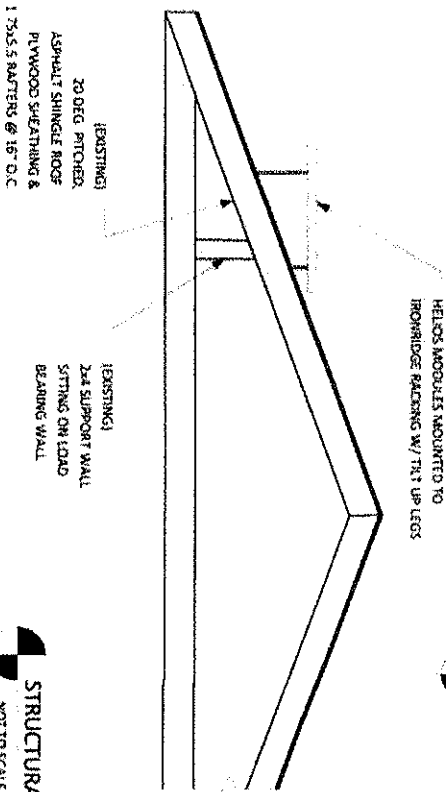
ROOF SUPPORT DETAILS	
MODULE WEIGHT	49.8 LBS. x 25 = 1245 LBS.
INVERTER WEIGHT	N/A
LINEAR FEET OF RACKING	173 ft
RACKING WEIGHT	0.8 LBS. per ft. x 173 = 139.6 LBS.
TOTAL WEIGHT	1384.6 LBS.
SOLAR ARRAY TOTAL SQ. FOOTAGE	17.87 sq. ft.
SOLAR ARRAY TOTAL SQ. FOOTAGE	446.75 sq. ft.
LBS. PER SQ. FOOT	3.09 LBS. per sq. ft.
ATTACHMENT POINTS (48" OC) (if applicable)	43
POINT LOADS (if applicable)	32.15 LBS. per attachment



ATTACHMENT DETAILS
NOT TO SCALE

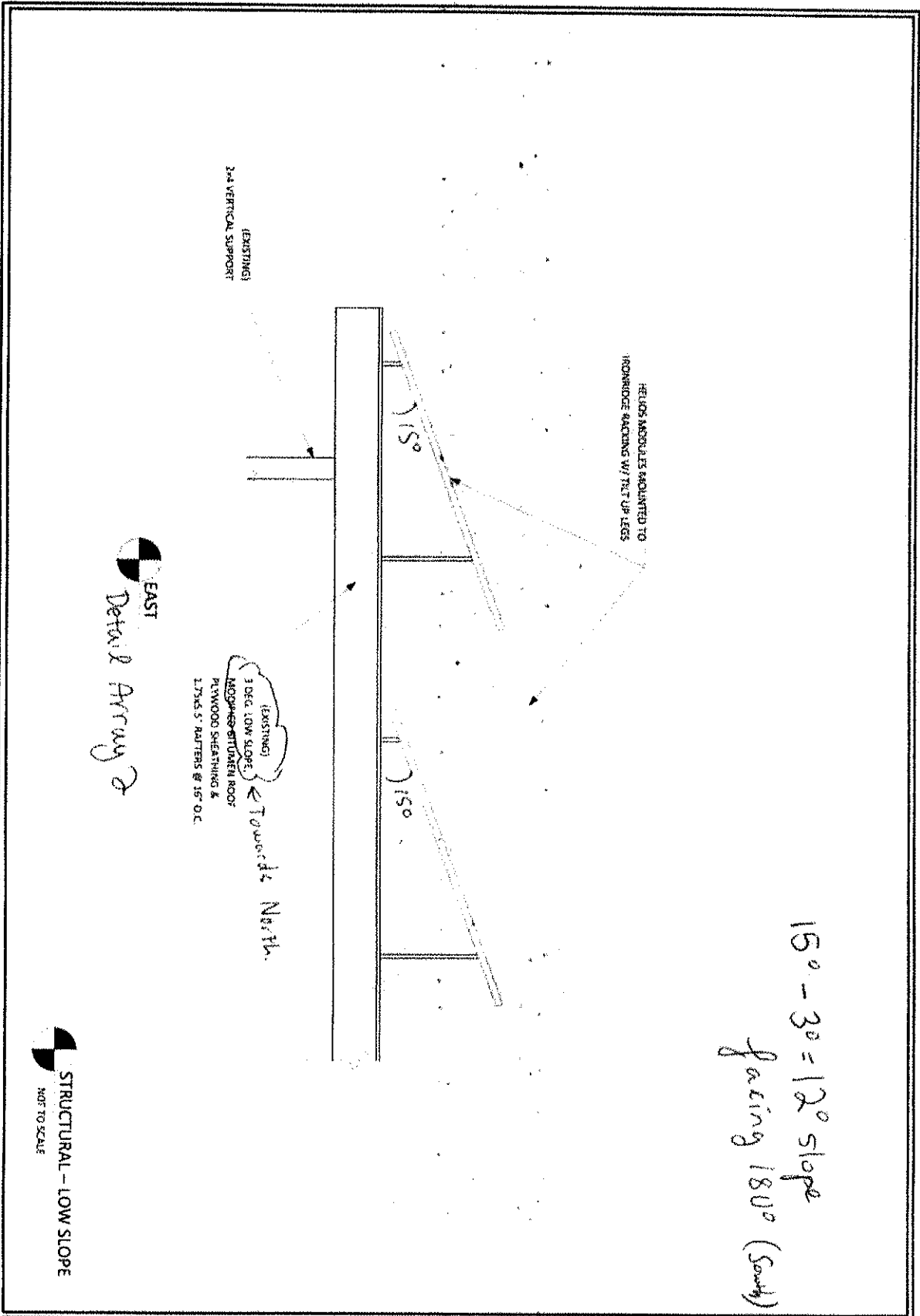


ROOF STRUCTURE
NOT TO SCALE



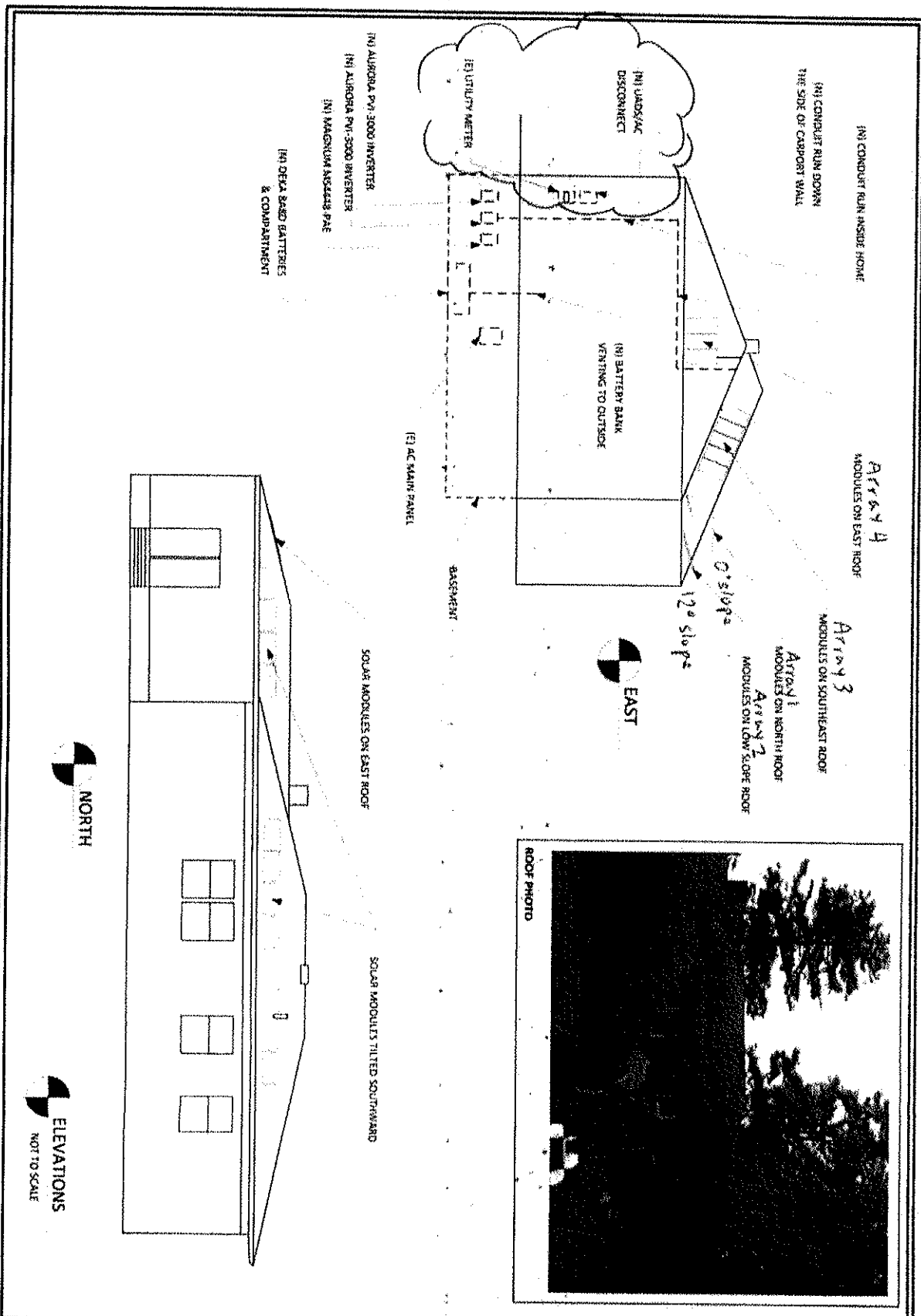
STRUCTURAL - PITCHED
NOT TO SCALE

pv - 3 PAGE	DRAWN BY: Cory Rainsden	Hellerstein Residence 1909 Franwall Avenue Silver Spring, MD 20902	Structural Engineer: Woffman & Associates 8720 Georgia Avenue Suite #908 Silver Spring, MD 20910	Kenergy Solar 7059 Blair Rd, NW Suite 201 Washington, DC 20012 410-729-4499 (office) MDHIC # 127519 DCHIC # 6908547	
	DATE: 12/2/2012	DRAWING: STRUCTURAL	ENERGY		

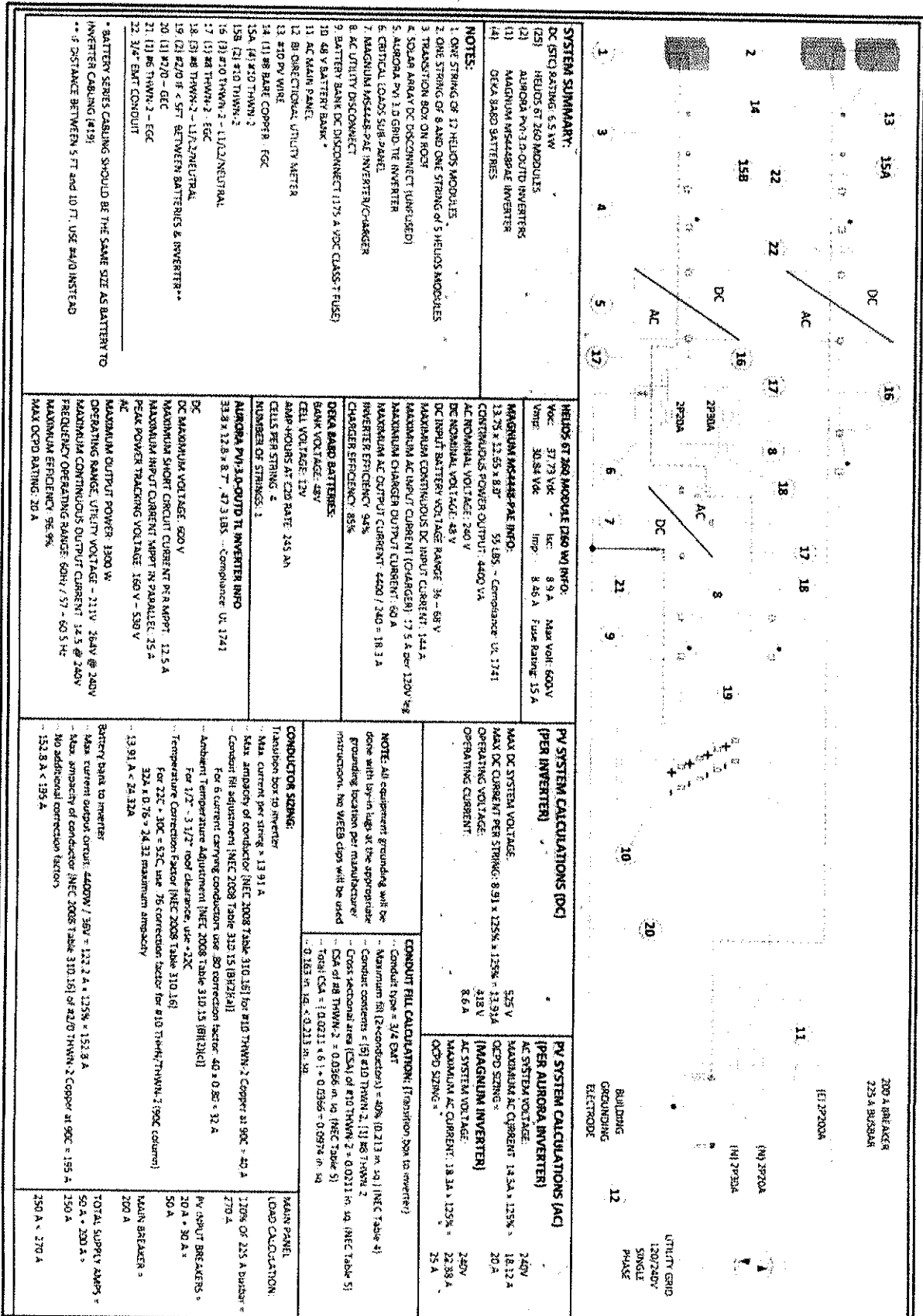


STRUCTURAL - LOW SLOPE
NOT TO SCALE

PV - 4	DRAWING STRUCTURAL	DATE: 12/2/2012	DRAWN BY: Corey Rainsden	Hellerstein Residence		Structural Engineer: Wolfman & Associates 8720 Georgia Avenue Suite #908 Silver Spring, MD 20910	Kenergy Solar 7059 Blair Rd, NW Suite 201 Washington, DC 20017 410-729-4499 (office) MBHIC # 122519 DCHC # 69008547	
				1909 Franwall Avenue Silver Spring, MD 20902				



PV - 5 PAGE	DRAWING: ELEVATION	DATE: 12/27/2012	DRAWN BY: Corey Ransden	Hellerstein Residence 1909 Franwall Avenue Silver Spring, MD 20902	Structural Engineer: Wolfman & Associates 8720 Georgia Avenue Suite #908 Silver Spring, MD 20910	Kenergy Solar 7059 Blair Rd, NW Suite 201 Washington, DC 20012 410-728-4499 (office) MDHC # 327519 DCHIC # 69008547	
	ELEVATIONS NOT TO SCALE						



SYSTEM SUMMARY:
 DC STRINGING 6.5 kW
 HELIOS AT 260 MODULES
 AURORA PV-3.0-OUTD INVERTERS
 MAGNUM MS448-2P2E INVERTER
 DEKA BATTERY BANK

NOTES:
 1. ONE STRING OF 17 HELIOS MODULES
 2. ONE STRING OF 8 AND ONE STRING OF 5 HELIOS MODULES
 3. TRANSITION BOX ON ROOF
 4. SOLAR ARRAY DC DISCONNECT (UNPLUGGED)
 5. AURORA PV 3.0 GRID TIE INVERTER
 6. CRITICAL LOADS SUB-PANEL
 7. MAGNUM MS448-2P2E INVERTER/CHARGER
 8. AC UTILITY DISCONNECT
 9. BATTERY BANK DC DISCONNECT (1) 75 A VCC CLASS 7 FUSE)
 10. 48 V BATTERY BANK
 11. AC MAIN PANEL
 12. BI-DIRECTIONAL UTILITY METER
 13. #10 PV WIRE
 14. (1) #8 BARE COPPER FGC

HELIOS AT 260 MODULE RPO W/ INFO:
 VOC: 37.73 VDC Imp: 8.9 A Max Volt: 600V
 VMP: 30.84 VDC Imp: 8.46 A Fuse Rating: 15 A

MAGNUM MS448-2P2E INFO:
 13.75 x 13.55 x 8.5" 55 LBS - Compliance: UL 1741
 CONTINUOUS POWER OUTPUT: 4400 VA
 AC NOMINAL VOLTAGE: 240 V
 DC NOMINAL VOLTAGE: 48 V
 DC INPUT BATTERY VOLTAGE RANGE: 36 - 58 V
 MAXIMUM CONTINUOUS DC INPUT CURRENT: 144 A
 MAXIMUM AC INPUT CURRENT (CHARGER): 17.5 A per 120V leg
 MAXIMUM AC OUTPUT CURRENT: 60 A
 MAXIMUM AC OUTPUT CURRENT (4000 / 240) = 18.1 A
 INVERTER EFFICIENCY: 94%

DEKA BATTERY BANK:
 BANK VOLTAGE: 48V
 CELL VOLTAGE: 12V
 AMP-HOURS AT 20 RATE: 245 AH
 CELLS PER STRING: 4
 NUMBER OF STRINGS: 1

AURORA PV-3.0-OUTD TI INVERTER INFO:
 33.3 x 12.8 x 8.7" 47.3 LBS - Compliance: UL 1741

DC MAXIMUM VOLTAGE: 600V
MAXIMUM SHORT CIRCUIT CURRENT PER RMPPT: 12.5 A
MAXIMUM INPUT CURRENT W/PT RR PARALLEL: 35 A
PEAK POWER TRACKING VOLTAGE: 160V - 530V
MAXIMUM OUTPUT POWER: 1300 W
OPERATING RANGE: UTILITY VOLTAGE - 211V - 264V @ 240V
MAXIMUM CONTINUOUS OUTPUT CURRENT: 32.5 @ 240V
FREQUENCY OPERATING RANGE: 60Hz / 57 - 60.5 Hz
MAXIMUM EFFICIENCY: 96.9%
MAX DC/DC RATING: 20 A

PV SYSTEM CALCULATIONS (DC) (PER INVERTER)

MAX DC SYSTEM VOLTAGE: 525 V
 MAX DC CURRENT PER STRING: 8.91 x 125% = 11.14 A
 OPERATING VOLTAGE: 418 V
 OPERATING CURRENT: 8.6 A

CONDUIT FILL CALCULATION: (Transition box to inverter)
 Conduit type = 3/4 EMT
 Maximum fill (2x-conductors) = 40% (0.213 in. sq) (NEC Table 4)
 Conductor area (18 THWN-2) = 0.0356 in. sq (NEC Table 5)
 Conductor area (18 THWN-2) = 0.0356 in. sq (NEC Table 5)
 Total CSA = (0.0213 x 4) + (0.0356 x 2) = 0.0974 in. sq
 0.1023 in. sq < 0.213 in. sq

PV SYSTEM CALCULATIONS (AC) (PER AURORA INVERTER)

MAXIMUM AC CURRENT: 18.5A x 125% = 23.1A
 OCPD SIZING: 25 A

CONDUCTOR SIZING:
 Main conductor per string = 13.91 A
 Max ampacity of conductor [NEC 2008 Table 310.15] for #10 THWN-2 Copper at 90C = 40 A
 Conductor fill adjustment [NEC 2008 Table 310.15] [80%] [80%]
 For 6 current carrying conductors use 80 correction factor: 40 x 0.80 = 32 A
 Ambient Temperature adjustment [NEC 2008 Table 310.15] [80%]
 For 120 - 312°F cool clearance, use -22%
 Temperature correction factor [NEC 2008 Table 310.15]
 For 22C = 10C = 52C use 75 correction factor for #10 THWN-2 (90C column)
 32A x 0.75 = 24.32 maximum ampacity
 13.91 A < 24.32 A

CONDUCTOR SIZING:
 Main Panel Load Calculation: 110% OF 225 A Breaker = 247.5 A
 PV SUBT BREAKERS: 20 A x 30 A x 50 A
 MAIN BREAKER: 200 A
 TOTAL SUPPLY AMPS: 50 A + 200 A = 250 A
 PV - 6

200 A BREAKER
225 A BREAKER
UTILITY METER
UTILITY GROUND
120V/240V SINGLE PHASE
BUILDING GROUNDING ELECTRODE
DEKA BATTERY BANK
MAGNUM MS448-2P2E INVERTER
AURORA PV-3.0-OUTD INVERTER
HELIOS MODULES

Hellerstein Residence
 1909 Franwall Avenue
 Silver Spring, MD 20902

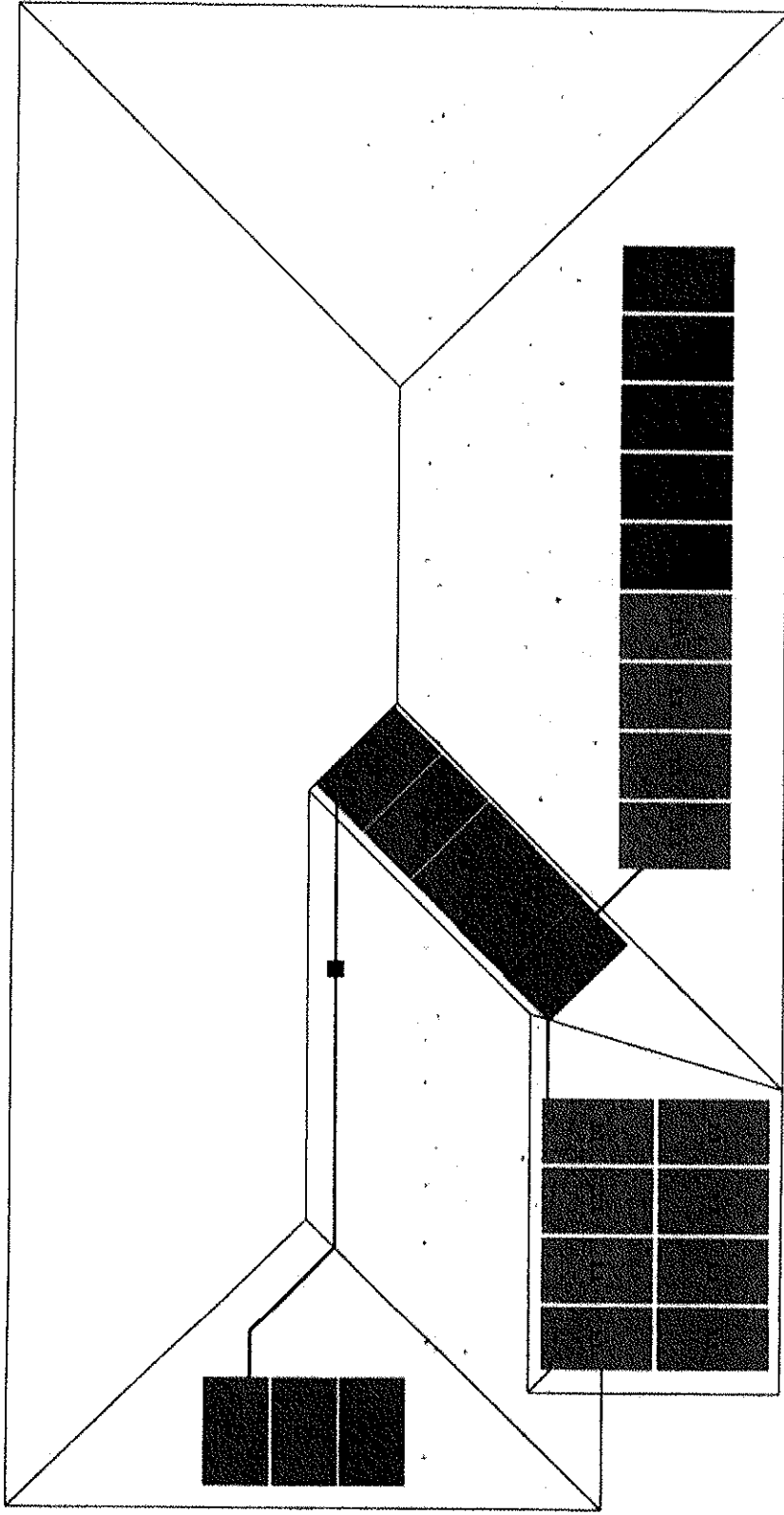
Structural Engineer:
 Wolfman & Associates
 8720 Georgia Avenue
 Suite #100
 Silver Spring, MD 20910

Xenergy Solar
 7059 Blair Rd, NW
 Suite 201
 Washington, DC 20012
 410-729-4499 (office)
 MD HIC # 127519
 DC HIC # 69068547

ENERGY

DRAWN BY: Corey Rasmussen
DATE: 12/2/2012
DRAWING: ONE LINE
PAGE: PV - 6

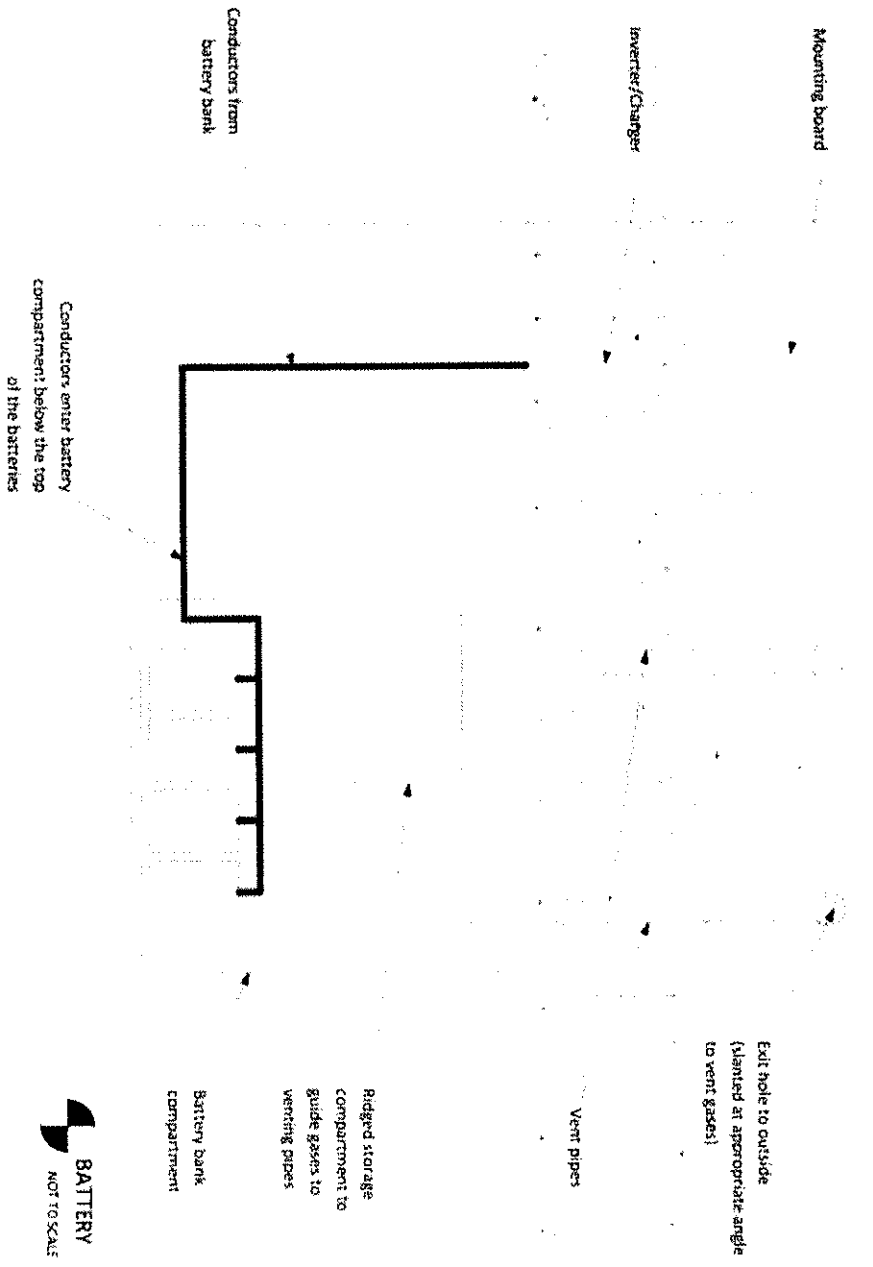
AURORA PVI 3.0 #1 (AC COUPLED WITH MAGNUM INVERTER)
 MPPT 1 = 1.1 (PARALLEL SETTING)
 MPPT 2 = NONE
 AURORA PVI 3.0 #2:
 MPPT 1 = 2.1
 MPPT 2 = 2.2
 ** Reduce activation voltage to 156V



N
 ROOF PLAN
 Scale: 1/4" = 5ft. dia.

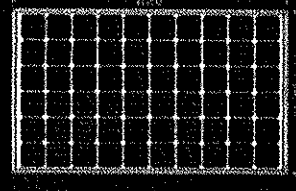
DRAWING STRING MAP PV - 7	DRAWN BY Corey Rasmussen	Hellerstein Residence 1909 Franwell Avenue Silver Spring, MD 20902	Structural Engineer Wolfman & Associates 8720 Georgia Avenue Suite 880R Silver Spring, MD 20910	Kenergy Solar 7059 Blair Rd, NW Suite 201 Washington, DC 20012 410-720-4499 (office) MDHC # 127519 DCHIC # 69008547	
	DATE: 12/27/2012		DATE: 12/27/2012		

BATTERY STORAGE DESIGN (TYPICAL)



PV - 8 PAGE	DRAWING: BATTERY BANK	DATE: 12/7/2012	DRAWN BY: Corey Rammden	Structural Engineer: Wellman & Associates 8720 Georgia Avenue Suite #908 Silver Spring, MD 20910	Kenegy Solar 7059 Blair Rd, NW Suite 201 Washington, DC 20013 410-729-4499 (office) MDHIC # 127519 DCNIC # 69K08547	
	Hellerstein Residence 1909 Franwell Avenue Silver Spring, MD 20902					

6T SERIES



Rated Power (kW)	200	250	250	250	240
Rated Power (kW)	200	250	250	250	240
Rated Power (VA)	30.84	30.85	30.30	30.10	30.00
Rated Current (A)	8.46	8.32	8.22	8.18	8.00
Open Circuit Voltage (V)	37.73	37.50	37.40	37.26	36.90
Short Circuit Current (A)	8.90	8.86	8.72	8.71	8.70

Rated Power (kW)	190	187.00	183.00	179.00	175.00
Rated Power (kW)	190	187.00	183.00	179.00	175.00
Rated Power (VA)	27.77	27.50	27.30	27.10	27.00
Rated Current (A)	6.84	6.80	6.70	6.60	6.50
Open Circuit Voltage (V)	34.90	34.80	34.50	34.40	34.30
Short Circuit Current (A)	7.32	7.30	7.25	7.20	7.15

System Voltage (V)	600/1,000	Temp. Coefficient (ppm / °C)	Temp. Coefficient (ppm / °C)	Temp. Coefficient (ppm / °C)	Temp. Coefficient (ppm / °C)
System Voltage (V)	600/1,000				
Temp. Coefficient (ppm / °C)	0.03				
Temp. Coefficient (ppm / °C)		-0.21			
Temp. Coefficient (ppm / °C)			-0.22		

Cell	3 Bz mono-crystalline, 3 bus bar	Backside	* Multi-layer steel
Cell Dimensions	* 158 mm x 158 mm, pseudo-square	Frame	* Anodized aluminum (color or black)
Front glass	* 4mm solar glass, highly transparent and non-reflective	Connection	* 2 x 1.2 m solar cables with MC4 connections or compatible
Encapsulation	* EVA - Solar Cells - EVA	Bypass Diodes	* 3 pieces

Module Temperature	-40°C to +80°C	IEC 61215, IEC 61730, UL1, IEC 61730, UL1, IEC 61730, UL1, IEC 61730, UL1
Module Temperature	-40°C to +80°C	IEC 61215, IEC 61730, UL1, IEC 61730, UL1, IEC 61730, UL1
		TUV Nord CE

25-year linear performance warranty. Also 10 years warranty. 4-13 percent.

TECHNICAL DATA

Model	200	250	250	250	240
Rated Output Power	200	250	250	250	240
Rated Output Power (VA)	30.84	30.85	30.30	30.10	30.00
Rated Output Current (A)	8.46	8.32	8.22	8.18	8.00
Open Circuit Voltage (V)	37.73	37.50	37.40	37.26	36.90
Short Circuit Current (A)	8.90	8.86	8.72	8.71	8.70

Model	190	187.00	183.00	179.00	175.00
Rated Output Power	190	187.00	183.00	179.00	175.00
Rated Output Power (VA)	27.77	27.50	27.30	27.10	27.00
Rated Output Current (A)	6.84	6.80	6.70	6.60	6.50
Open Circuit Voltage (V)	34.90	34.80	34.50	34.40	34.30
Short Circuit Current (A)	7.32	7.30	7.25	7.20	7.15

System Voltage (V)	600/1,000	Temp. Coefficient (ppm / °C)	Temp. Coefficient (ppm / °C)	Temp. Coefficient (ppm / °C)	Temp. Coefficient (ppm / °C)
System Voltage (V)	600/1,000				
Temp. Coefficient (ppm / °C)	0.03				
Temp. Coefficient (ppm / °C)		-0.21			
Temp. Coefficient (ppm / °C)			-0.22		

Cell	3 Bz mono-crystalline, 3 bus bar	Backside	* Multi-layer steel
Cell Dimensions	* 158 mm x 158 mm, pseudo-square	Frame	* Anodized aluminum (color or black)
Front glass	* 4mm solar glass, highly transparent and non-reflective	Connection	* 2 x 1.2 m solar cables with MC4 connections or compatible
Encapsulation	* EVA - Solar Cells - EVA	Bypass Diodes	* 3 pieces

Module Temperature	-40°C to +80°C	IEC 61215, IEC 61730, UL1, IEC 61730, UL1, IEC 61730, UL1
Module Temperature	-40°C to +80°C	IEC 61215, IEC 61730, UL1, IEC 61730, UL1, IEC 61730, UL1
		TUV Nord CE

25-year linear performance warranty. Also 10 years warranty. 4-13 percent.

MAAGNUM

ENERGY

MS-PAE 120/240V Series Specifications

MS-PAE 120VDC	MS-PAE 240VDC
Input battery voltage range	12.0V to 15.0VDC
Output battery voltage range	12.0V to 15.0VDC
Output current range (typical)	0.1 to 1.0 A
1 hour surge current (typical)	1.0 A
5 sec surge current (typical)	5.0 A
5 min surge current (typical)	10.0 A
5 min surge power (typical)	50.0 W
5 min surge power (peak)	100.0 W
Operating temperature range	-20°C to +60°C
Storage temperature range	-40°C to +85°C
Relative humidity	5% to 95%
Shock	100 g, 10 ms, 1000 cycles
Vibration	100 g, 10 ms, 1000 cycles
Weight	1.0 kg (2.2 lbs)
Dimensions	100 mm x 100 mm x 100 mm
Lead time	4 weeks
Warranty	3 years

Magnum Energy, Inc.
 2211 West Casino Road
 Everett, Washington 98204 USA
 Phone: 425-353-8833
 Fax: 425-353-8890
 Web: www.magnumenergy.com
 Authorized Magnum Dealer

AKA

ABSORBED GLASS MAT SERIES

GROUP	PART NO.	CELL COUNT	STARTING OR DEEP CYCLE	STANDARD TERMINAL	AMPERE HOUR CAPACITY	AMPERE HOUR CAPACITY (20°C)	AMPERE HOUR CAPACITY (25°C)	AMPERE HOUR CAPACITY (30°C)	AMPERE HOUR CAPACITY (35°C)	AMPERE HOUR CAPACITY (40°C)	AMPERE HOUR CAPACITY (45°C)	AMPERE HOUR CAPACITY (50°C)	AMPERE HOUR CAPACITY (55°C)	AMPERE HOUR CAPACITY (60°C)	AMPERE HOUR CAPACITY (65°C)	AMPERE HOUR CAPACITY (70°C)	AMPERE HOUR CAPACITY (75°C)	AMPERE HOUR CAPACITY (80°C)	AMPERE HOUR CAPACITY (85°C)	AMPERE HOUR CAPACITY (90°C)	AMPERE HOUR CAPACITY (95°C)	AMPERE HOUR CAPACITY (100°C)
1	AKA100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2	AKA200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
3	AKA300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
4	AKA400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
5	AKA500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500

STARTING OR DEEP CYCLE - 100% DUTY CYCLE

CONSTANT VOLTAGE vs. TEMPERATURE

CAPACITY vs. OPERATING TEMPERATURE

Capacity vs. Operating Temperature

Capacity (Ah) vs. Temperature (°C)

100 200 300 400 500 600 700 800 900 1000

0 10 20 30 40 50 60 70 80 90 100

AKA Series - Absorbed Glass Mat - Non-spillable

The AKA Series is made by East Penn Manufacturing Company, Inc. The AKA Series is a lead-acid battery with a glass mat separator. It is designed for use in a wide range of applications, including automotive, industrial, and marine. The AKA Series is known for its long life, high performance, and safety. It is a reliable and durable power source for many years.

Potential Applications of AKA

- Starting, Lighting and Ignition
- Car + Truck + Marine + Snowmobiles
- Tractors
- Wheelchairs + Floor Sweepers + Studied Vehicles
- Small Fuel Cells + Trolling Motors
- Industrial
- Cable TV + Emergency Lighting + Exit Lighting
- Alarm and Security Systems + FAX Systems + Alarm Control
- Structural Supports + Backup Equipment
- Facilities + Cash Registers
- Portable Devices
- Construction Equipment + Portable Power and Generators
- Portable Test and Measuring Equipment
- Portable Tools + Mobile TV, VCR, VHS

Capacity vs. Operating Temperature

Capacity (Ah) vs. Temperature (°C)

100 200 300 400 500 600 700 800 900 1000

0 10 20 30 40 50 60 70 80 90 100



Derate Calculator

Loss Name	PVWatts	Adjusted Calculation	Explanation for Adjustment
PV Module Nameplate DC Rating	0.95	1	Set to correspond with module's tolerance of Pmax ¹
Inverter and Transformer Mismatch	0.92	0.96	Set to inverter's CEC Efficiency ²
Diodes and Connections	0.98	0.98	
DC Wiring	0.995	0.995	
AC Wiring	0.98	0.99	
Soiling	0.99	0.99	
Soiling	0.95	0.97	Soiling losses are regionally specific. ³
System Availability	0.98	0.98	
Shading	1	1	
Sun-tracking	1	1	
Ageing	1	1	
Total	0.770	0.872	

¹ Please see the enclosed specifications for the module. There you will find the reliability of the power output tolerance.

² See either the enclosed inverter specifications or <http://www.gosolarcalifornia.org/equipment/inverter.php>

³ According to NREL, soiling losses have a range of .3-.995, depending on dust, snow and frequency of precipitation. Standard Solar takes into account these considerations when determining the soiling factor. Arid regions receive 0.95, temperate 0.97 and rainy 0.97. See http://www.nrel.gov/redc/pvwatts/changing_parameters.html



AC ENERGY & COST SAVINGS



Array 1 Annual Output

Station Identification	
City:	Baltimore
State:	Maryland
Latitude:	39.18° N
Longitude:	76.67° W
Elevation:	47 m
PV System Specifications	
DC Rating:	2.3 kW
DC to AC Derate Factor:	0.872
AC Rating:	2.0 kW
Array Type:	Fixed Tilt
Array Tilt:	0.0°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	7.8 ¢/kWh

Results			
Month	Solar Radiation (kWh/m ² /day)	AC Energy (kWh)	Energy Value (\$)
1	2.07	125	9.75
2	2.97	169	13.18
3	3.92	243	18.95
4	4.90	291	22.70
5	5.55	329	25.66
6	6.29	346	26.99
7	6.04	342	26.68
8	5.24	296	23.09
9	4.28	236	18.41
10	3.45	201	15.68
11	2.22	124	9.67
12	1.69	96	7.49
Year	4.06	2799	218.32

[Output Hourly Performance Data](#)

*

[Output Results as Text](#)
[ABOUT THE HOURLY PERFORMANCE DATA](#)
[SAVING TEXT FROM A BROWSER](#)

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 RUN PVWATTS V.2 (US ONLY)

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AC ENERGY & COST SAVINGS



Array 2 Annual Output

Station Identification	
City:	Baltimore
State:	Maryland
Latitude:	39.18° N
Longitude:	76.67° W
Elevation:	47 m
PV System Specifications	
DC Rating:	2.1 kW
DC to AC Derate Factor:	0.872
AC Rating:	1.8 kW
Array Type:	Fixed Tilt
Array Tilt:	12.0°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	7.8 ¢/kWh

Results			
Month	Solar Radiation (kWh/m ² /day)	AC Energy (kWh)	Energy Value (\$)
1	2.60	147	11.47
2	3.55	183	14.27
3	4.36	241	18.80
4	5.16	272	21.22
5	5.67	299	23.32
6	6.34	309	24.10
7	6.13	308	24.02
8	5.46	274	21.37
9	4.67	229	17.86
10	4.07	215	16.77
11	2.75	143	11.15
12	2.13	116	9.05
Year	4.41	2735	213.33

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ABOUT THE HOURLY PERFORMANCE DATA

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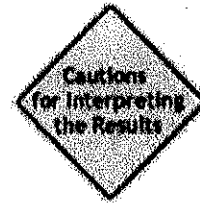
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AC ENERGY & COST SAVINGS



Array 3 Annual Output

Station Identification	
City:	Baltimore
State:	Maryland
Latitude:	39.18° N
Longitude:	76.67° W
Elevation:	47 m
PV System Specifications	
DC Rating:	1.3 kW
DC to AC Derate Factor:	0.872
AC Rating:	1.1 kW
Array Type:	Fixed Tilt
Array Tilt:	20.0°
Array Azimuth:	120.0°
Energy Specifications	
Cost of Electricity:	7.8 ¢/kWh

Results			
Month	Solar Radiation (kWh/m ² /day)	AC Energy (kWh)	Energy Value (\$)
1	2.44	86	6.71
2	3.40	110	8.58
3	4.15	143	11.15
4	5.01	165	12.87
5	5.53	181	14.12
6	6.24	190	14.82
7	5.93	185	14.43
8	5.26	165	12.87
9	4.49	138	10.76
10	3.85	127	9.91
11	2.59	84	6.55
12	2.00	67	5.23
Year	4.24	1639	127.84

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AC ENERGY & COST SAVINGS



Array 4 Annual Output

Station Identification	
City:	Baltimore
State:	Maryland
Latitude:	39.18° N
Longitude:	76.67° W
Elevation:	47 m
PV System Specifications	
DC Rating:	0.8 kW
DC to AC Derate Factor:	0.872
AC Rating:	0.7 kW
Array Type:	Fixed Tilt
Array Tilt:	20.0°
Array Azimuth:	90.0°
Energy Specifications	
Cost of Electricity:	7.8 ¢/kWh

Results			
Month	Solar Radiation (kWh/m ² /day)	AC Energy (kWh)	Energy Value (\$)
1	2.02	41	3.20
2	2.94	56	4.37
3	3.76	77	6.01
4	4.75	94	7.33
5	5.38	106	8.27
6	6.15	113	8.81
7	5.79	109	8.50
8	5.03	94	7.33
9	4.14	76	5.93
10	3.34	65	5.07
11	2.16	41	3.20
12	1.64	31	2.42
Year	3.93	902	70.36

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Calculation of Total Output From All Four Arrays

Array	Capacity	Tilt	Azimuth	Annual Output
Array 1	2.34	0	180	2799
Array 2	2.08	12	180	2735
Array 3	1.3	20	120	1639
Array 4	0.78	20	90	902
Total				8075