

# PHOTON BROTHERS

## AGREEMENT FOR THE TURNKEY INSTALLATION OF A PHOTOVOLTAIC ENERGY SYSTEM

This agreement for the turnkey installation of a photovoltaic energy system (the "System") is entered into by and between Town of Johnstown, a Colorado home rule municipality, with a principal place of business at 450 S. Parish Avenue, Johnstown, CO 80534 (the "Owner"), and Photon Brothers Inc., a Colorado corporation, with a principal place of business at 7705 W 108<sup>th</sup> Ave, Broomfield, CO 80021 (the "Contractor") (the Owner and Contractor collectively referred to herein as the "Parties"). This document, together with Exhibits A - E attached hereto and incorporated herein by reference, and any amendments entered into from time to time, constitute the entire agreement between the Parties (the "Agreement")

In consideration of the mutual covenants and agreements hereinafter set forth, and other good and valuable consideration, the receipt and sufficiency of which are hereby mutually acknowledged, the Parties hereto, intending to be legally bound, agree as follows:

### 1. Certain Defined Terms:

- a. "Statement of Work" means a narrative description of products, services, or results to be supplied, which includes, but is not limited to, the installation of the System at the Premises. The Statement of Work is set forth as Exhibit A.
- b. "Premises" shall mean the Johnstown YMCA, 165 Settler Way, Johnstown, CO 80534.
- c. "Work" means the work described in the Statement of Work and in this Agreement and includes all labor, materials, equipment and services to be provided by Contractor to fulfill its obligations under this Agreement. As used herein, the term "Work" shall specifically exclude any and all work agreed to be performed by the Owner.
- d. "Work Site" shall mean the installation area of the System at the Premises, the area immediately adjacent to the installation site and path of underground cable(s) and shall not include any areas used to access the site.

2. **Term of Agreement:** This Agreement shall be in effect upon execution by the Owner and Contractor and will continue until the earlier to occur of (i) completion of all duties and obligations of Contractor under this Agreement and Owner's acceptance and approval of the Work, including all required licenses, permits, and utility service connections for use of the System, if any, or (ii) until termination, as provided in Section 3 below (the "Term"). The indemnification and warranty provisions survive the termination of the

Agreement.

**3. Contract Termination:**

- a. Either party may terminate the Agreement if the other party commits a material breach of its obligations under this Agreement, which breach is not cured within thirty (30) days after receipt of written notice specifying the basis of such breach or immediately by written notice to the other party if the other party: (i) becomes subject to a voluntary petition in bankruptcy or any voluntary proceeding relating to insolvency, receivership, liquidation, or composition for the benefit of creditors, (ii) becomes subject to an involuntary petition regarding the foregoing that is not dismissed within 60 days after filing, (iii) declares or admits publicly and in writing that it is insolvent or is unable to meet its debts as they mature, or (iv) makes an assignment for the benefit of all or substantially all of its creditors.
- b. Additionally, if Owner, within fourteen (14) days of execution of this Agreement, independently or after consultation with a third-party consultant, determines in good faith that the Statement of Work is reasonably likely to pose safety concerns or is reasonably unlikely to produce energy approximately consistent with the production estimates, Owner shall be entitled to terminate the Agreement, which termination notice must be provided to Contractor in writing and signed by Owner. In the event the Owner terminates this Agreement pursuant to this Section 4.b, the Contractor shall refund any unexpended payments made by Owner within thirty (30) days.
- c. In addition to the foregoing, upon ten (10) days notice to Contractor, Owner may terminate this Agreement with or without cause. In such case, Owner shall pay all funds due to Contractor through the date of termination. Alternatively, the Contractor shall refund any unexpended payments made by Owner.

**4. Contract Price and Payment Schedule:**

- a. Owner agrees to pay Contractor the total sum of \$380,000.00 for the Work pursuant to this Agreement.
- b. Within thirty (30) days of receipt of an invoice from Contractor to Owner, Owner agrees to make or cause to have made payments on the contract price, to the Contractor, per the payment schedule set out and agreed to in Exhibit B attached hereto and incorporated herein by reference.
- c. All late payments shall incur a monthly finance charge of 1.5%. Contractor to provide full and unconditional lien releases with each application for payment.

**5. Project Changes:**

- a. Owner and Contractor agree that should either party desire a change to the Statement of Work, Contractor and Owner will document the change request using Exhibit C attached hereto, known as a "Project Change Request." The Contractor agrees to promptly review a Project Change Request submitted by



Owner and, within a reasonable time, provide Owner with an estimate of the impact on material cost, labor cost, and work schedule. If, following review of the estimate on the Project Change Request, the Owner wishes to proceed with the change and agrees to the additional payments for said change, if any, the Parties will execute the Project Change Request and approve the same which shall thereby be incorporated in to Statement of Work. During the period of estimate by Contractor and review by Owner, work shall continue per the original Statement of Work, unless said Project Change Request materially alters the performance of the Statement of Work, in which case work will cease until Owner determines if Owner will proceed with Project Change Request.

- b.** Contractor has visited the Work Site and has become familiar with the conditions of the Work Site. Contractor shall not be entitled to an adjustment to the contract price or contract time based upon conditions, known or unknown, at the Work Site.
- 6. Time of Essence:** Contractor acknowledges and agrees that time is of the essence with respect to Contractor's performance of this Agreement. Specifically, Contractor agrees to work every business day and to complete the project on or before June 30, 2022. Owner acknowledges and agrees that time is of the essence with respect to Owner's performance of this Agreement. Specifically, Owner agrees to make payments by the due date as outlined in Section 3.

**7. Owner's Representations and Warranties; Acknowledgements and Responsibilities:**

- a.** The owner represents and warrants that:
    - i. Owner is the lawful owner of the Premises;
    - ii. Owner is duly authorized to enter into the Agreement;
    - iii. Owner has sufficient assets to pay the total contract price; and
    - iv. Owner shall make all payments when due to the Contractor in accordance with this Agreement.
  - b.** Owner hereby agrees to provide Contractor with access to the Premises as required to complete all Work required pursuant to the Statement of Work during regular business hours.

**8. Contractor's Representations and Warranties; Acknowledgements and Responsibilities:**

- a.** Contractor represents and warrants that:
    - i. Contractor is qualified to perform the turnkey installation of the System and all related Work, shall obtain all requisite licenses and permits, as may be required, to perform the Work and shall furnish copies of all requisite licenses and permits to Owner;
    - ii. Contractor agrees to provide Owner with the services required for the successful completion of the project including documents and activities required by local utilities, building departments, and/or other regulatory agencies, including, without limitation, building permit applications, and

- iii. Contractor agrees to install the System and perform all related Work in a good and workmanlike manner consistent with the standards of the industry;
  - iv. Contractor shall provide documentation for all major System components and provide instructions to the Owner on basic maintenance and troubleshooting; and
  - v. Contractor shall not discriminate against any qualified employee or applicant for employment because of race, color, national origin, ancestry, age, sex, religion, physical or mental handicap, or sexual orientation.
- b. The Contractor hereby agrees and acknowledges that (i) in the event Contractor performs any Work when Contractor knows or should have discovered that it is contrary to applicable laws, rules, regulations, ordinances, orders or requirements of the State of Colorado or any governmental authority relating to the installation of the System and delivery of all related Work specified in this Agreement, Contractor shall assume full responsibility therefore and shall bear those costs attributable to the correction of said Work; and (ii) in the event Contractor performs any Work without the requisite licenses and permits required to perform the Work, Contractor shall assume full responsibility therefore and shall bear all costs attributable thereto.

#### **9. Warranty and Repairs:**

- a. The Contractor warrants to the Owner that materials and equipment furnished hereunder will be new, and that the Work will be in accordance with standards of good workmanship, and that the Work will conform to the requirements of this Agreement, including without limitation in accordance with the Statement of Work. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, modifications or maintenance of improvements not performed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage.
- b. The Contractor shall promptly correct Work reasonably rejected by the Owner and not in compliance with the terms and conditions of this Agreement, or known by the Contractor to be defective or failing to conform to the requirements of this Agreement, whether observed before or after substantial completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such reasonably rejected Work. The standard of performance of Contractor with respect to correction of defective or non-conforming Work shall be to utilize best efforts to ensure the System is operating properly.
- c. The Contractor shall remove from the Premises portions of the Work which are not in accordance with the requirements of this Agreement and are neither corrected by the Contractor nor accepted by the Owner.
- d. The warranties outlined in Exhibit D are applicable to this Agreement.

## **10. Disputes:**

- a.** This Agreement shall be interpreted under the laws of the State of Colorado. The venue for any litigation or dispute resolution shall be in the County of Weld, State of Colorado. The Contractor and the Owner hereby irrevocably consent to the jurisdiction of such Court and waive any defense, whether asserted by motion or pleading, that such Court is an inconvenient or inappropriate venue.
- b.** Except to the extent that this Agreement expressly permits a Party to suspend performance, pending final resolution of a dispute, the Parties shall each proceed diligently and faithfully with performance of their respective obligations under this Agreement pending a final resolution of a dispute and failure to so proceed shall be considered a default under the terms of this Agreement.

## **11. Insurance:**

- a.** At no additional cost to Owner, the Contractor shall purchase from and maintain for the term of the Agreement or longer as may be required herein, in a company or companies lawfully authorized to do business in the State of Colorado, the following insurance:
  - i.** Commercial general liability insurance in a limit of not less than \$1,000,000 per occurrence, \$1,000,000 per occurrence for personal injury, \$2,000,000 general aggregate and \$2,000,000 products.
  - ii.** Minimum additional \$1,000,000 umbrella for excess liability coverage.
  - iii.** Commercial automobile liability with a combined single limit of \$1,000,000 with a hired and non-owned endorsement.
  - iv.** Workers' Compensation as required by the State of Colorado.
- b.** The Contractor agrees that the insurance set forth in Section 12 shall be primary and non-contributing with respect to any insurance carried by Owner or the Contractor's subcontractors and that Contractor's insurance policy shall not (i) exclude subcontractors from coverage or (ii) have any restrictions on coverage resulting from subcontractors failing to maintain certain levels of insurance.
- c.** The insurance set forth in Section 12.1(a) shall name the Owner as additional named insured.
- d.** The Contractor agrees that the insurance set forth in Section 12 shall be written on an occurrence basis.
- e.** Contractor shall provide Certificates of Insurance that include insurance coverages required by Section 12, which shall be delivered to the Owner within fourteen (14) days of the written request from Owner. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to the Statement of Work. These certificates and the insurance policies required by this Section 12 shall contain a provision that coverages afforded under the policies will not be canceled, modified or allowed to expire until at least Thirty (30) days after

project completion. In the event that any insurance policy providing coverage required by this Agreement will expire during the term of this Agreement, the Contractor shall, not less than seven (7) days prior to the policy's expiration date, renew such policies.

- f. The Contractor hereby agrees and acknowledges that (i) Contractor shall give prompt written notice to Owner upon becoming aware of any and all losses, damages, or injuries to any person, which may in any way be related to the Work or which might reasonably give rise to a claim against Contractor or Owner; (ii) Contractor shall promptly report to Owner any claims asserted against the Contractor relative to this Agreement, whether related to matters insured or uninsured; (iii) Contractor shall not settle or provide payment for any claim or loss, injury or damage or other matter as to which Owner may be charged with an obligation to make any payment or reimbursement without the prior written approval of Owner as applicable; (iv) the carrying of any of the insurance required hereunder shall not be interpreted as relieving the Contractor of any responsibility to Owner; and (v) Contractor shall assist and cooperate with any insurance company in the adjustment or litigation of all claims arising under this Agreement.
- g. Owner may maintain such insurance as will protect it from contingent liability for damages to persons or property, which may arise from operations under this Agreement. Upon written request by Contractor, Owner will provide Contractor with written proof of such insurance, if any, on or before the start date.
- h. Owner shall affect and maintain for the benefit of the parties to this Contract, as their interests may appear, Fire and Extended Coverage Insurance to the extent of 100% of the value of the materials to be incorporated in the Premises. Equipment owned or rented by Contractor, the cost of which is not wholly included in the Contract Price, are not covered by this insurance.

## **12. Indemnity Clause:**

- a. Contractor shall be liable for loss, damage, injury, or other incidental or consequential costs, expenses, or damages incurred by Owner or any other person resulting from those tasks Contractor is obliged to perform under this Agreement.
- b. The Contractor shall defend, indemnify and hold the Owner harmless from any and all claims, injuries, damages, losses or suits including attorney fees, arising out of the Contractor's performance of, or failure to perform, this Agreement, except for injuries and damages caused by the negligence of the Owner or third party not directly under the supervision of the Contractor.
- c. In the event of liability for damages arising out of bodily injury to persons or damages to property caused by or resulting from the concurrent negligence of the Contractor and the Owner, their officers, agents, employees, and any party claiming through Contractor and Owner, the Contractor's liability hereunder shall be only to the extent of the Contractor's negligence.
- d. The provisions of this section 11 shall survive the expiration or termination of this Agreement.

- 13. Assignment by Contractor and Subcontracting:** The Contractor shall not assign or subcontract any portion of this Agreement, unless Contractor obtains the written consent from the Owner, which shall not be unreasonably withheld. The Contractor shall have the right, without the necessity of obtaining permission of the Owner, to assign or subcontract any portion of this Agreement which is incidental to the installation of the System, including but not limited to excavating, plumbing, shade mitigation, and any work requiring a license that Contractor does not possess. The Contractor shall pay each subcontractor, upon receipt of payment from the Owner, an amount equal to the percentage of completion allowed to the Contractor on completion of the subcontractor's work. The Contractor shall also require each subcontractor to make similar payments to its subcontractors. The Owner shall not have any obligation to pay or see to the payment of any money to any subcontractor.
- 14. Choice of Law:** This Agreement shall be governed by and constructed in accordance with the laws of the State of Colorado, without giving effect to its conflict of laws principles.
- 15. Survival:** Any provision of this Agreement which contemplates performance or observance subsequent to any termination or expiration of this Agreement will survive and continue in effect and will incur to the benefit of and be binding upon the Parties and their legal representatives, heirs, successors, and assigns.
- 16. Entire Agreement:** This Agreement may be amended only through a written agreement signed by both Parties. The Parties understand and agree that this Agreement is the complete agreement and supersedes all other verbal and written agreements and negotiations by the Parties relating to the Work hereunder.
- 17. Severability:** If any part, term or provision of this Agreement is declared unlawful or unenforceable, the remainder of this Agreement shall remain in full force and effect, except that, in the event any state or federal governmental agency or court authoritatively determines that the relationship between the Town and Contractor is one of employment rather than independent contractor, this Agreement shall become null and void in its entirety.
- 18. Waiver:** No consent or waiver, express or implied, by a Party to or of any breach or default by the other Party in the performance by the other Party of its obligations hereunder shall be deemed or construed to be a consent or waiver to or of any other breach or default by the non-defaulting Party. Failure on the part of any Party to complain of any act or failure to act or to declare any other Party in default, irrespective of how long such failure continues, shall not constitute a waiver by such Party of its rights hereunder.
- 19. Governmental Immunity:** The Parties agree that the Owner is relying on, and does not waive or intend to waive by any provision of the Agreement, the monetary limitations or any other rights, immunities, and protections provided by the Colorado Governmental Immunity Act, §§ 24-10-101 et seq., 10 C.R.S., as from time to time amended, or otherwise available to the Town, its officers, or its employees.

**20. Right to Injunction:** The Parties hereto acknowledge that the services to be rendered by the Contractor under this Agreement and the rights and privileges granted to the Owner under the Agreement are of a special, unique, unusual and extraordinary character which gives them a peculiar value, the loss of which may not be reasonably or adequately compensated by damages in any action at law, and the breach by the Contractor of any of the provisions of this Agreement may cause the Owner irreparable injury and damage. The Contractor agrees that the Owner, in addition to other relief at law, shall be entitled to injunctive and other equitable relief in the event of, or to prevent, a breach of any provision of this Agreement by the Contractor.

**21. No Presumption:** Each Party acknowledges that it has carefully read and reviewed the terms of this Agreement. Each Party acknowledges that the entry into and execution of this Agreement is of its own free and voluntary act and deed, without compulsion. Each Party acknowledges that it has obtained, or has had the opportunity to obtain, the advice of legal counsel of its own choosing in connection with the negotiation and execution of this Agreement and with respect to all matters set forth herein. The Parties agree that this Agreement reflects the joint drafting efforts of all Parties and in the event of any dispute, disagreement or controversy arising from this agreement, the Parties shall be considered joint authors and no provision shall be interpreted against any Party because of authorship.

**22. Non-Appropriation of Funds:** Pursuant to Section 29-1-110, C.R.S., as amended, financial obligations of the Town payable as set forth herein, after the current fiscal year, are contingent upon funds for that purpose being appropriated, budgeted, and otherwise made available. This Agreement shall be terminated effective January 1 of the first fiscal year for which funds are not appropriated.

**23. Workers Without Authorization:** Contractor shall not knowingly employ or contract with a worker without authorization to perform work under this Agreement or enter into a contract with a subcontractor that fails to certify to the Contractor that the subcontractor shall not knowingly employ or contract with a worker without authorization to perform work under this Agreement. Contractor has confirmed the employment eligibility of all employees who are newly hired for employment to perform work under this Agreement through participation in either the e-verify program or the Department of Labor and Employment program. Contractor is prohibited from using either the e-verify program or the Department of Labor and Employment program procedures to undertake pre-employment screening of job applicants while this Agreement is being performed.

If Contractor obtains actual knowledge that a subcontractor performing work under this Agreement knowingly employs or contracts with a worker without authorization, the Contractor shall: (i) notify the subcontractor and the contracting state agency or political subdivision within three days that the Contractor has actual knowledge that the subcontractor is employing or contracting with a worker without authorization and (ii) terminate the subcontract with the subcontractor if, within three days of receiving the

notice described above, the subcontractor does not stop employing or contracting with the worker without authorization; except that the Contractor shall not terminate the contract with the subcontractor if during such three days that subcontractor provides information to establish that the subcontractor has not knowingly employed or contracted with a worker without authorization.

Contractor shall comply with any reasonable request by the department made in the course of an investigation that the Department of Labor and Employment is undertaking pursuant to the authority established in subsection (5) of Section 8-17.5-102 of the Colorado Revised Statutes. If Contractor violates any of the aforementioned requirements, the Owner may terminate the Agreement. If this Agreement is so terminated, Contractor shall be liable for actual and consequential damages to the Owner.

#### **24. Miscellaneous:**

- a. All time limits stated in the Agreement are of the essence in this Agreement.
- b. All obligations imposed by this Agreement and the rights and remedies available hereunder shall be in addition to and not in limitation of any duties, obligations, rights, and remedies otherwise imposed available by law.
- c. All notices under this Agreement shall be effective upon personal delivery to the Owner or to the Contractor, as the case may be, or via electronic mail ("e-mail") on the condition of notice of receipt of the e-mail by the intended recipient, or 24 hours after deposit in the United States mail, postage fully prepaid and addressed to the respective party at the address contained in the Agreement or to such other address as the parties may from time to time designate in writing.
- d. E-mail correspondence between the Parties and signatures via e-mail and attachments thereto shall create a valid and binding obligation of the party sending (or on whose behalf such e-mail is sent) with the same force and effect as if such were an original signature thereof.

#### **25. Exhibits and Addendums**

- a. The following Exhibits and Addendums are referenced to and incorporated herein by reference:
  - i. A: Statement of Work
  - ii. B: Payment Schedule
  - iii. C: Project Change Request
  - iv. D: Warranties and Guarantees
  - v. E. Production Guarantees

In **witness whereof**, the Parties hereto set their hands:

Signature:

Signature:

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**Town of Johnstown, Colorado**

**Photon Brothers**

**Date:**

**Date:**



## **Exhibit A – Statement of Work**

### **Work:**

1. Installation at the Johnstown YMCA of a custom 200kW Photovoltaic System
2. Building and Electrical Permits
3. Utility Interconnection Paperwork
4. Install of racking, wiring, inverters, panels, monitoring, switchgear
5. System Test and commissioning
6. Final Building and Electrical Inspections
7. Utility Permission to Operate
8. System Activation
9. Customer Training

### **Site Notes, Additional Work, Project Assumptions:**

1. Customer to provide dedicated internet connection at facility for System monitoring.
2. Contractor to secure all materials and tools on site.
3. Contractor to follow safety program conforming to OSHA.

# JOHNSTOWN YMCA COMM PV PROJECT - 99.88kWdc

Project Type - Photovoltaic

CONTRACTOR  
PHOTON BROTHERS  
7705 W 108th Ave  
Westminster, CO 80021

**JOHNSTOWN YMCA  
COMMERCIAL  
165 SETTLER WAY  
JOHNSTOWN, CO 80534**

PV SYSTEM SPECIFICATIONS  
1. PV MODULE: 227 x 1134-72PHH-440M, 99.88kWdc  
2. INVERTER: SE100KUS  
3. RACKING: EcoRoof 2+  
4. ROOF TYPE: TPO  
5. AZIMUTH: 180°  
6. ROOF SLOPE: 10°

File Name:  
01\_JOHNSTOWN YMCA COMM\_COVER.DWG

Sheet Number and Title:  
PV01 - COVER

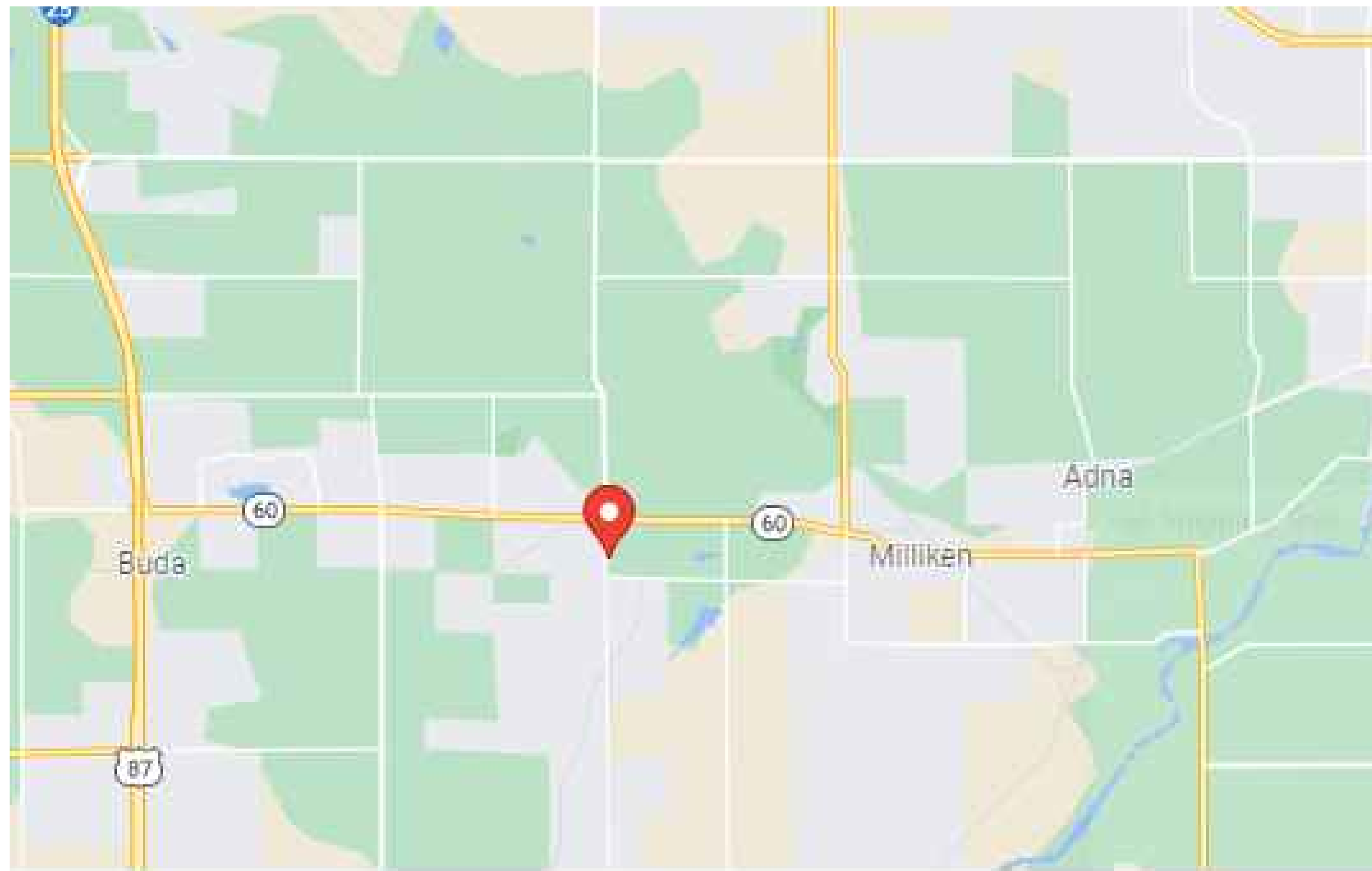
Sheet Size:  
ARCH full bleed D (36.00 x 24.00 Inches)

### Drawing history

no.	drawn by	revision	date
01	DCG	----	---

Preliminary draft  
- not for construction

PV01



1 PROJECT LOCATION - MAP VIEW  
Scale: NTS



2 PROJECT LOCATION - AERIAL VIEW  
Scale: NTS



3 ARCHITECTURAL SITE PLAN  
Scale: NTS

**SCOPE OF WORK**  
THESE PLANS ARE FOR THE INSTALLATION OF A ROOF MOUNTED PHOTOVOLTAIC (PV) SYSTEM. THE PV SYSTEM WILL BE INTERCONNECTED WITH THE UTILITY GRID THROUGH EXISTING ELECTRICAL EQUIPMENT AND WILL OPERATE IN PARALLEL VIA LOAD SIDE CONNECTION WITH NET ENERGY METER.

**GOVERNING BUILDING CODES**  
1. 2018 INTERNATIONAL BUILDING CODE, IBC  
2. 2018 INTERNATIONAL FIRE CODE, IFC  
3. 2020 NATIONAL ELECTRICAL CODE, NEC  
4. IEEE 1547  
5. UL STANDARDS  
5.1. RACKING - UL 2703  
5.2. PV MODULE - UL 1703  
5.3. INVERTER - UL 1741

**DESIGN SPECIFICATIONS**  
1. AHJ - TOWN OF JOHNSTOWN BUILDING PERMIT  
2. UTILITY - -  
3. BUILDING RISK CATEGORY II  
4. DESIGN WIND SPEED (ULT) - 115MPH  
5. DESIGN SNOW LOAD - 30PSF  
6. EXPOSURE CATEGORY - C  
7. MEAN ROOF HEIGHT - 20FT  
8. ROOF SLOPE - 10°

**INSTALLATION NOTES**  
1. THE EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.  
2. THE ACTUAL LOCATION OF THE ARRAY AND PLACEMENT OF THE MECHANICAL ANCHORS ARE SUBJECT TO VARIANCES DEPENDING ON SITE CONDITIONS AND/OR ROOF OBSTRUCTIONS. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND SPECIFICATIONS BEFORE COMMENCING.  
3. ALL OUTDOOR EQUIPMENT SHALL BE RAIN TIGHT WITH MINIMUM NEMA3-R RATING.  
4. ALL LOCATIONS ARE APPROXIMATE AND REQUIRE FIELD VERIFICATION.  
5. ALL WORK SHALL COMPLY WITH THE BUILDING CODES SET FORTH BY THE GOVERNING JURISDICTION.  
6. ALL EQUIPMENT SHALL MEET MINIMUM SETBACKS AS REQUIRED BY THE NATIONAL FIRE CODE, NFC AND THE NATIONAL ELECTRICAL CODE, NEC.

**ABBREVIATIONS**  
(E) - EXISTING  
(N) - NEW  
TYP - TYPICAL  
NTS - NOT TO SCALE  
MIN - MINIMUM  
MAX - MAXIMUM  
AC - ALTERNATING CURRENT  
DC - DIRECT CURRENT  
PV - PHOTOVOLTAIC  
MOD - PV MODULE  
INV - DC/AC PV INVERTER  
POC - POINT OF CONNECTION(PV)  
RSB - RAPID SHUTDOWN BOX  
CB - CIRCUIT BREAKER (EX. 20A/2P CB - 20AMP 2-POLE CIRCUIT BREAKER)  
C - CONDUIT  
OCP - OVERCURRENT PROTECTION  
OCPD - OVERCURRENT PROTECTION DEVICE  
MSD - MAIN SERVICE DISCONNECT  
DISC - DISCONNECT  
MSP - MAIN SERVICE PANEL  
SP - SUB PANEL  
PLP - PROTECTED LOADS PANEL  
MLO - MAIN LUG ONLY  
MB - MAIN BREAKER  
EGC - EQUIPMENT GROUNDING CONDUCTOR  
GEC - GROUNDING ELECTRODE CONDUCTOR  
GES - GROUNDING ELECTRODE SYSTEM

**ELECTRICAL NOTES**  
1. INSTALLATION TO BE COMPLIANT WITH NFPA 1 & NFPA70 (NATIONAL ELECTRICAL CODE)  
2. THE INVERTER HAS INTEGRATED GROUND AND NO DC GEC IS REQUIRED. THE DC CIRCUIT IS ISOLATED AND INSULATED FROM GROUND AND MEETS THE REQUIREMENTS OF 690.35 (UNGROUNDING PHOTOVOLTAIC POWER SYSTEMS)  
3. THE EXACT LOCATION OF NEW ELECTRICAL EQUIPMENT AND CONDUIT RUN RELATING TO THIS PROJECT IS SUBJECT TO CHANGE AND WILL BE DETERMINED ON SITE BY THE CONTRACTOR  
4. ALL EQUIPMENT TO BE LISTED OR LABELED FOR ITS APPLICATION(UL OR OTHER APPROVED LISTINGS)  
4.1. PV MODULE - UL1703  
4.2. INVERTER - UL1741  
4.3. RACKING SYSTEM - UL2703  
5. GROUNDING  
5.1. ALL EQUIPMENT SHALL BE PROPERLY GROUNDED PER THE REQUIREMENTS OF NEC ARTICLES 250 & 690  
5.2. MODULE BONDING METHOD SHALL BE INTEGRATED GROUNDING MID CLAMPS. REFER TO MANUFACTURER'S SPECIFIC INSTRUCTIONS FOR PROPER BONDING TECHNIQUES.  
5.3. GROUNDING SYSTEM COMPONENTS SHALL BE LISTED FOR THEIR PURPOSE, AND GROUNDING DEVICES SHALL BE RATED FOR DIRECT BURIAL  
5.4. EGC SHALL BE SIZED IN ACCORDANCE WITH 250.122 AND ARRAY EGC'S SMALLER THAN 6AWG SHALL COMPLY WITH 250.120(C)  
6. ALL CONDUCTORS ARE COPPER, UNLESS SPECIFIED OTHERWISE  
7. ALL CONDUIT, RACEWAYS, AND JUNCTION BOXES SHALL BE SIZED ACCORDING TO THE APPLICABLE CODE IF THE SIZE IS NOT SPECIFIED.  
8. SIGNAGE SHALL BE APPLIED ACCORDING TO GOVERNING BUILDING CODES AND LOCAL JURISDICTIONS SPECIFIC REQUIREMENTS.  
9. EQUIPMENT INSTALLED IN DIRECT SUNLIGHT MUST BE RATED FOR EXPECTED OPERATING TEMPERATURE AS SPECIFIED BY NEC.  
10. CALCULATION OF MAXIMUM CIRCUIT CURRENT FOR THE SPECIFIC CIRCUIT SHALL BE CALCULATED IN ACCORDANCE WITH 690.8(A)(1) THROUGH (A)(5). CONDUCTOR AMPACITY SHALL BE SIZED TO NOT CARRY LESS THAN THE LARGER OF 690.(B)(1) OR (2)  
11. DC PV SOURCE AND DC OUTPUT CURRENT CIRCUITS ON OR INSIDE A BUILDING SHALL BE CONTAINED IN METAL RACEWAYS, TYPE MC METAL-CLAD CABLE THAT COMPLIES WITH 250.118(10), OR METAL ENCLOSURES FROM THE POINT OF PENETRATION OF THE SURFACE OF THE BUILDING OR STRUCTURE TO THE FIRST READILY ACCESSIBLE DISCONNECTING MEANS.(690.31(G))  
12. ACCESS TO BOXES, JUNCTION, PULL, AND OUTLET BOXES LOCATED BEHIND MODULES OR PANELS SHALL BE SO INSTALLED THAT THE WIRING CONTAINED IN THEM CAN BE RENDERED ACCESSIBLE DIRECTLY OR BY DISPLACEMENT OF A MODULE(S) SECURED BY REMOVABLE FASTENERS AND CONNECTED BY FLEXIBLE WIRING SYSTEM.(690.34)  
13. PV POINT OF CONNECTION. THE OUTPUT OF AN INTERCONNECTED ELECTRIC POWER SOURCE SHALL BE CONNECTED AS SPECIFIED IN 705.12(A),(B),(C), OR (D).

Sheet List Table	
Sheet Number	Sheet Title
PV01	COVER
PV02	SITE PLAN
PV03	LINE DIAGRAM
PV04	ELEVATION
PV05	SITE LAYOUT
R01	DATASHEETS

1 2 3 4 5 6 7 8 9 10 11

Project Type - Photovoltaic

CONTRACTOR  
PHOTON BROTHERS  
7705 W 108th Ave  
Westminster, CO 80021

**JOHNSTOWN YMCA  
COMMERCIAL  
165 SETTLER WAY  
JOHNSTOWN, CO 80534**

- PV SYSTEM SPECIFICATIONS
1. PV MODULE: 227 x 114.72PHH-440M, 99.88kWdc
  2. INVERTER: SE100KUS
  3. RACKING: EcoFoot 2+
  4. ROOF TYPE:TPO
  5. AZIMUTH:180°
  6. ROOF SLOPE:10°

File Name:  
02\_JOHNSTOWN YMCA COMM\_SITE  
PLAN.DWG

Sheet Number and Title:  
PV02 - SITE PLAN

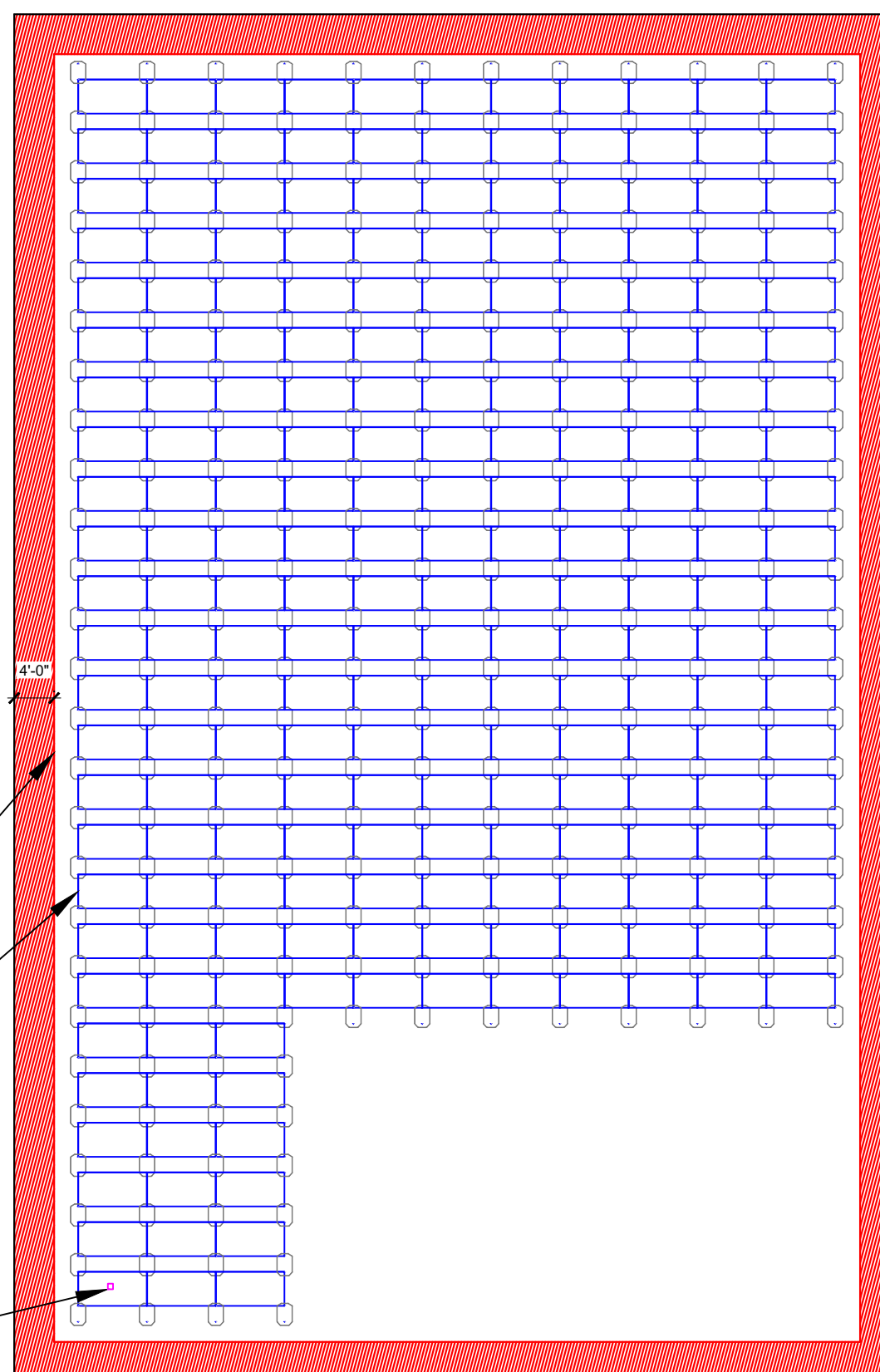
Sheet Size:  
ARCH full bleed D (36.00 x 24.00 Inches)

Drawing history

no.	drawn by	revision	date
01	DCG	----	---

Preliminary draft  
- not for construction

PV02



4FT FIRE SETBACK

PV MODULE (N)

J-BOX (N)

4 SITE PLAN W/ PV

Scale: 1/16" = 1'-0"

A

B

C

D

E

F

G



NEC Electrical Calculations - Photovoltaic System									
Project Details			PV Module Data		SolarEdge Inverter Data			Optimizer Data	
<b>Project Name</b>	Johnstown YMCA COMM PV		Model Number	LR4-72HPH-440M	Model Number	SE100KUS		Optimizer	P960
<b>Project Location</b>	Johnstown, CO		Nominal Output @ STC, Pmp	440 Wdc	Max DC Power(STC)	100000	Wdc	DC Input Power	960
Module -	227	Longi LR4-72HPH-440M	Open Circuit Voltage, Voc	48.9 Vdc	DC Max Voltage	1000	Vdc	Max Input Voltage	60
Inverter -	1	SolarEdge SE100KUS	Max Power Point, Vmp	41.1 Vdc	DC Max Input Current	3 x 40	A	MPPT Range	12.5-60
Optimizer	114	SolarEdge P960	Short Circuit Current, Isc	11.46 A	AC Max Output Power	135000	Wac	Max DC Input Current	23
Utility -	480	Vac	Max Power Point Current, Imp	10.71 A	Nominal Output Voltage (Vac)	850	Vac	Max Output Current	18
DC Rating	99.88	kW	VOC Temp Coeff	-0.27 %/°C	AC Max Output Current	120	A	Max Output Voltage	480
AC Rating	84.90	kW	Dimensions, LxWxH (in)	82.44 x 40.87 x 1.38	CEC Weighted Efficiency	98.5	%	Min. # of Opt's/String	14
Min. Ambient Temp, °C	-17	1.4 °F	Weight	44 lbs	Dimensions, LxWxH (in)	n/a		Max # of Opt's/String	30
Max. Ambient Temp, °C	35	95 °F			Weight	304	lbs	Max Watts/String	15300

Project Type - Photovoltaic

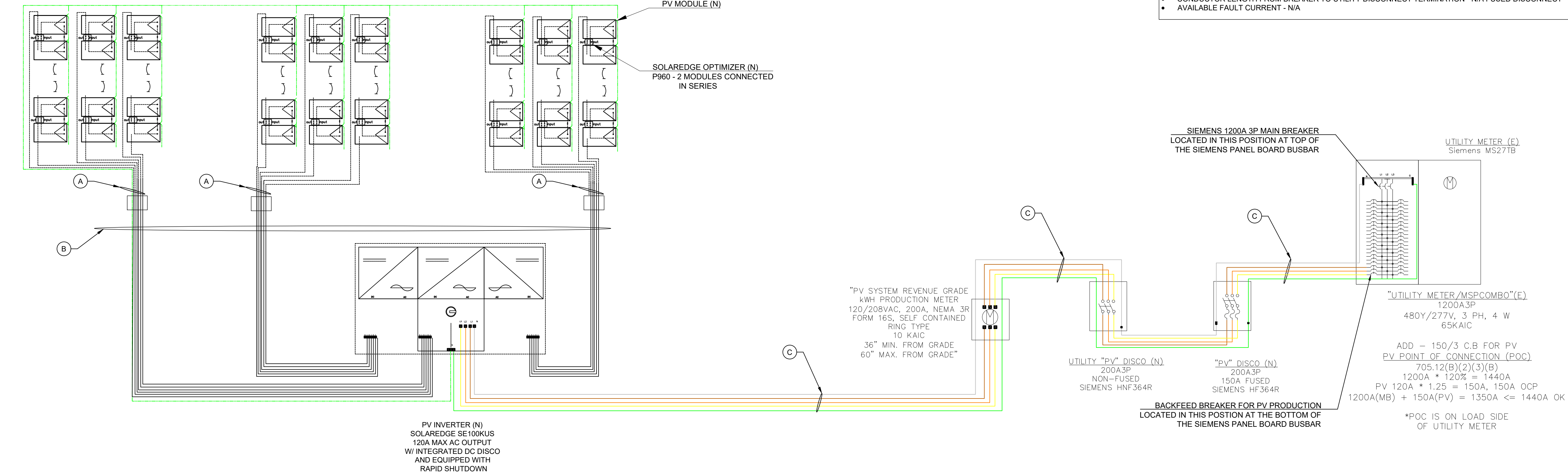
**CONTRACTOR**  
**PHOTON BROTHERS**  
 7705 W 108th Ave  
 Westminster, CO 80021

**JOHNSTOWN YMCA COMMERCIAL**  
 165 SETTLER WAY  
 JOHNSTOWN, CO 80534

PV SYSTEM SPECIFICATIONS  
 1. PV MODULE: 227 x LR4-72HPH-440M, 99.88kWdc  
 2. INVERTER: SE100KUS  
 3. RACKING: Ecofoot 2+  
 4. ROOF TYPE: TPO  
 5. AZIMUTH: 180°  
 6. ROOF SLOPE: 10°

3 STRINGS REQ'D  
 STRING 1 = 26 MOD(13 P960)  
 STRING 2 = 26 MOD(13 P960)  
 STRING 3 = 24 MOD(12 P960)

3 STRINGS REQ'D  
 STRING 1 = 26 MOD(13 P960)  
 STRING 2 = 26 MOD(13 P960)  
 STRING 3 = 23 MOD(12 P960)



14,318 FAULT CURRENT REQUIREMENT IS UNDER 10,000A  
 - FAULT CURRENT REQUIREMENTS FOR PV UTILITY DISCONNECT:  
 • CONDUCTOR SIZE IN CONDUIT - 10AWG CU  
 • BREAKER - 150A/3P CIRCUIT BREAKER  
 • CONDUCTOR LENGTH FROM BREAKER TO UTILITY DISCONNECT TERMINATION - N/A FUSED DISCONNECT  
 • AVAILABLE FAULT CURRENT - N/A

Tag	Circuit Description	Location Description	Max Circuit Current 690.8(A)	Min. Cond. Ampacity	Conductor Material	Ampacity Check						Voltage Drop					
						Conductor AWG	Temp. rating of Cond.	Allowable Ampacity	Ampacity Check #1 690.8(B)(1)	Adjusted Temp Range	Amb. Temp Corr. Factor	# of Current Carr. Cond.	Raceway Fill Adj. Factor	Ampacity Check #2 690.8(B)(2)	Phase	One way Length(ft)	%Vd
A	PV Source	Module to DC/DC Converter	14.33	17.9	CU	12	90°C	30	17.9A * 125% = 22.4A < 30A, OK	123-131	0.76	<4	1	30A * 0.76 * 1 = 22.8 > 17.9A OK	DC	100	1.22%
B	DC to DC Converter Output	Array to Inverter	18	18.0	CU	10	90°C	40	18A * 125% = 22.5A < 40A, OK	123-131	0.76	4-6	0.8	40A * 0.76 * 0.8 = 24.32 > 18A OK	DC	150	1.45%
C	Inverter Output	Inverter A to OCP	120	120.0	CU	1/0	90°C	170	120A * 125% = 150A < 170A, OK	96-104	0.91	<4	1	170A * 0.91 * 1 = 154.7 > 120A OK	3ph	10	0.17%

Conduit and Conductor Schedule						
Tag	Description and Conductor Type	Min. Conductor Gauge	Number of Conductors	Typical Conduit Type	Min. Conduit Size	Max one way length (ft)
A	Mods to j-box, PV Wire	12AWG	3 x (+,-)	FREE AIR	MFG CABLE	100
B	j-box to Inv., THWN-2	10AWG	3 x (+,-) (G)	PVC, EMT, or FMC	1"	150
C	Inv to POC, THWN-2	1/0AWG	L1, L2, L3 N, (#6G)	PVC, EMT, or FMC	2"	10

Notes: \*MC Cable can be EMT or FMC  
 (G) can be #8AWG THWN-2  
 For Conduit sizing refer to Chapter 9 Tables, NEC  
 NEC 690.45-46, Table 250.66, Table 250.122

**! WARNING !**  
**ELECTRIC SHOCK HAZARD**  
 TERMINALS ON BOTH THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

LABEL 1 - NEC 690.13(B)  
 APPLY TO DISCONNECTING MEANS WHERE THE LINE AND LOAD TERMINALS MAY BE ENERGIZED IN THE OPEN POSITION

**PHOTOVOLTAIC SYSTEM ! DC DISCONNECT !**  
 MAX SYSTEM VOLTAGE: 929VDC  
 MAX CIRCUIT CURRENT: 11A  
 MAX OUT CURRENT(DC TO DC CONV.): N/A

LABEL 4 - 690.53  
 APPLY TO DC DISCONNECT/INVERTER

**PHOTOVOLTAIC SYSTEM ! AC DISCONNECT !**  
 RATED AC OUTPUT CURRENT: 120A  
 NOMINAL OPERATING VOLTAGE: 480VAC

LABEL 5 - NEC 690.54  
 APPLY TO MAIN PV AC DISCONNECT

**WARNING: PHOTOVOLTAIC POWER SOURCE**

LABEL 2 - NEC 690.31(G)(4)  
 APPLY TO EXPOSED RACEWAYS, CABLE TRAYS, OTHER WIRING METHODS, COVERS, ENCLOSURES OF PULL BOXES, AND J-BOXES. SPACING BETWEEN LABELS OR MARKINGS SHALL NOT BE MORE THAN 10FT APART.

**! WARNING !**  
 DUAL POWER SUPPLY SOURCES: UTILITY GRID AND PV SOLAR ELECTRIC SYSTEM

LABEL 6 - NEC 705.12(B)(3)  
 APPLY TO MSP

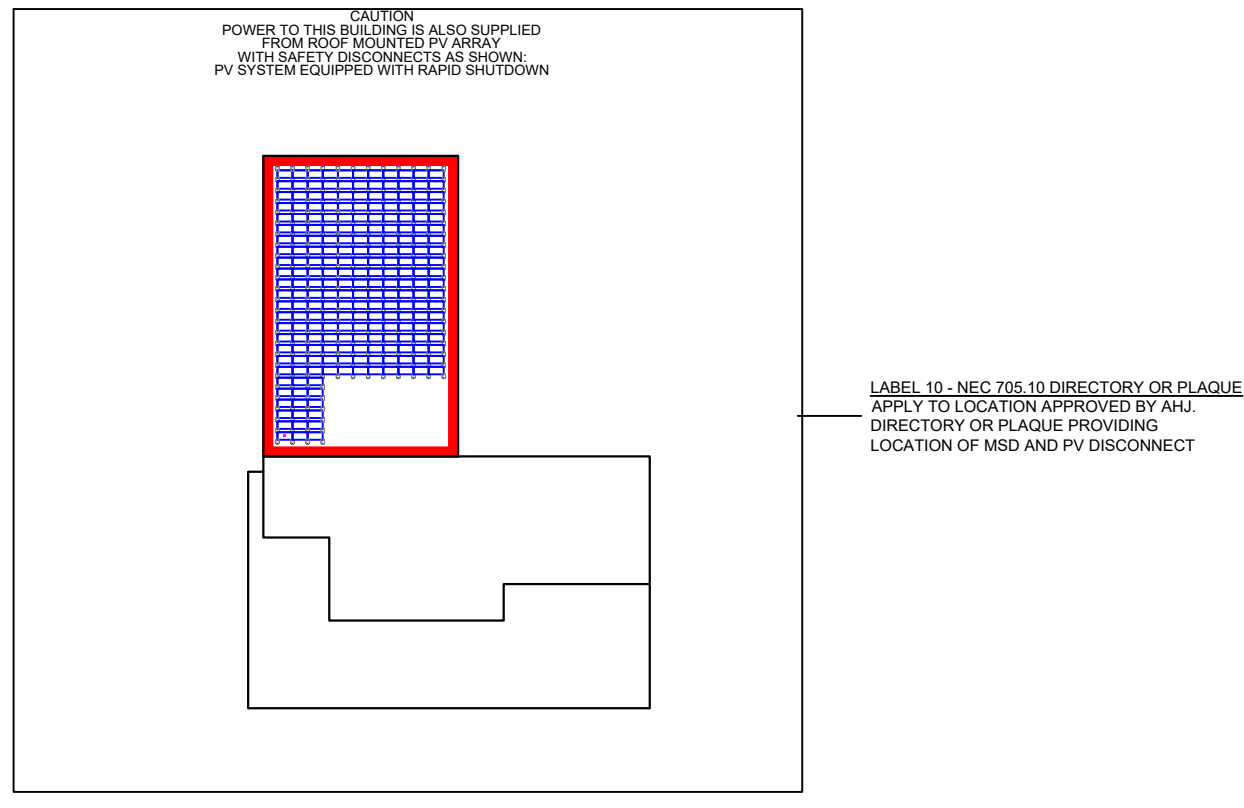
**SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN**

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

LABEL 3 - NEC 690.56(C)(1)(a)  
 APPLY TO LABEL ON OR NO MORE THAN 3FT FROM THE SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED AND SHALL INDICATE THE LOCATION OF ALL IDENTIFIED RAPID SHUTDOWN SWITCHES IF NOT AT THE SAME LOCATION

**! WARNING !**  
 POWER SOURCE OUTPUT CONNECTION: DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL 7 - NEC 705.12(B)(2)(3)(b)  
 APPLY TO BACK-FED BREAKER, IF APPLICABLE



File Name: 04\_JOHNSTOWN YMCA COMM\_LINE DIAGRAM\_METER 1.DWG

Sheet Number and Title: PV03 - LINE DIAGRAM

Sheet Size: ARCH full bleed D (36.00 x 24.00 Inches)

Drawing history

no.	drawn by	revision	date
01	DCG	---	---

Preliminary draft - not for construction

PV03



CONTRACTOR  
PHOTON BROTHERS  
7705 W 108th Ave  
Westminster, CO 80021

JOHNSTOWN YMCA  
COMMERCIAL  
165 SETTLER WAY  
JOHNSTOWN, CO 80534

- PV SYSTEM SPECIFICATIONS
1. PV MODULE: 227 x LR4-72HPH-440M, 99.88%Wdc
  2. INVERTER: SE100KUS
  3. RACKING: EcoRoof 2+
  4. ROOF TYPE: TPO
  5. AZIMUTH: 180°
  6. ROOF SLOPE: 10°

File Name:  
04\_JOHNSTOWN YMCA COMM\_L - COPY.DWG

Sheet Number and Title:  
PV04 - ELEVATION

Sheet Size:  
ARCH full bleed D (36.00 x 24.00 Inches)

Drawing history

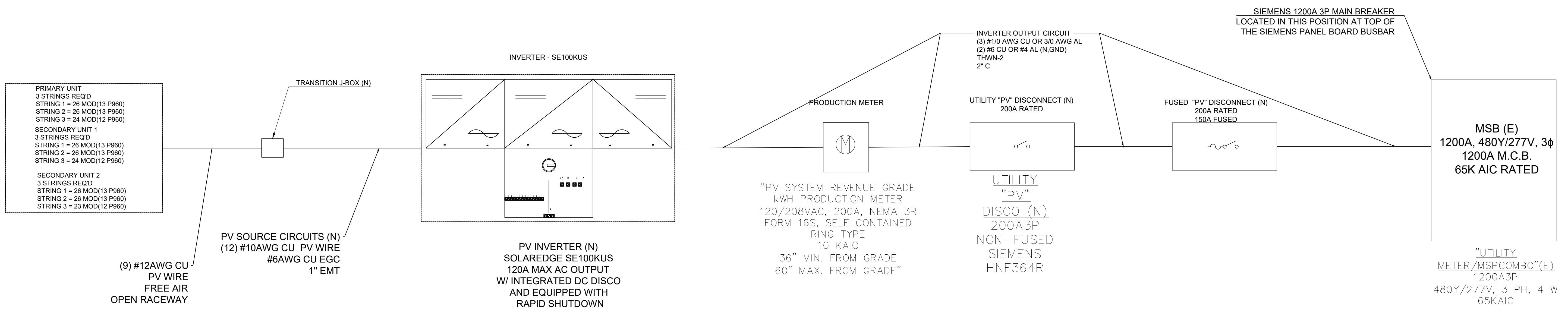
no.	drawn by	revision	date
01	DCG	----	----

Preliminary draft  
- not for construction

NEC Electrical Calculations - Photovoltaic System

Project Details			PV Module Data		SolarEdge Inverter Data			Optimizer Data		
<b>Project Name</b>	Johnstown YMCA COMM PV		Model Number	LR4-72HPH-440M	Model Number	SE100KUS		Optimizer	P960	
<b>Project Location</b>	Johnstown, CO		Nominal Output @ STC, Pmp	440 Wdc	Max DC Power(STC)	100000	Wdc	DC Input Power	960	Wdc
Module -	227	Longi LR4-72HPH-440M	Open Circuit Voltage, Voc	48.9 Vdc	DC Max Voltage	1000	Vdc	Max Input Voltage	60	Vdc
Inverter -	1	SolarEdge SE100KUS	Max Power Point, Vmp	41.1 Vdc	DC Max Input Current	3 x 40	A	MPPT Range	12.5-60	Vdc
Optimizer	114	SolarEdge P960	Short Circuit Current, Isc	11.46 A	AC Max Output Power	135000	Wac	Max DC Input Current	23	A
Utility -	480	Vac	Max Power Point Current, Imp	10.71 A	Nominal Output Voltage (Vac)	850	Vac	Max Output Current	18	A
DC Rating	99.88	kW	VOC Temp Coeff	-0.27 %/°C	AC Max Output Current	120	A	Max Output Voltage	480	Vdc
AC Rating	84.90	kW	Dimensions, LxWxH (in)	82.44 x 40.87 x 1.38	CEC Weighted Efficiency	98.5	%	Min. # of Opt's/String	14	
Min. Ambient Temp, °C	-17	1.4 °F	Weight	44 lbs	Dimensions, LxWxH (in)	n/a		Max # of Opt's/String	30	
Max. Ambient Temp, °C	35	95 °F			Weight	304	lbs	Max Watts/String	15300	

14,318 FAULT CURRENT REQUIREMENT IS UNDER 10,000A  
- FAULT CURRENT REQUIREMENTS FOR PV UTILITY DISCONNECT:  
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• BREAKER - 150A/3P CIRCUIT BREAKER  
• CONDUCTOR LENGTH FROM BREAKER TO UTILITY DISCONNECT TERMINATION - N/A FUSED DISCONNECT  
• AVAILABLE FAULT CURRENT - N/A



Conductor Schedule and Calculations																	
Tag	Circuit Description	Location Description	Max Circuit Current 690.8(A)	Min. Cond. Ampacity	Conductor Material	Ampacity Check					Voltage Drop						
						Conductor AWG	Temp. rating of Cond.	Allowable Ampacity	Ampacity Check #1 690.8(B)(1)	Adjusted Temp Range	Amb. Temp Corr. Factor	# of Current Carr. Cond.	Raceway Fill Adj. Factor	Ampacity Check #2 690.8(B)(2)	Phase	One way Length(ft)	%Vd
A	PV Source	Module to DC/DC Converter	14.33	17.9	CU	12	90°C	30	17.9A * 125% = 22.4A < 30A, Ok	123-131	0.76	<4	1	30A * 0.76 * 1 = 22.8 > 17.9A OK	DC	100	1.22%
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C	Inverter Output	Inverter A to OCP	120	120.0	CU	1/0	90°C	170	120A * 125% = 150A < 170A, Ok	96-104	0.91	<4	1	170A * 0.91 * 1 = 154.7 > 120A OK	3ph	10	0.17%

"UTILITY METER/MSPCOMBO"(E)  
1200A3P  
480Y/277V, 3 PH, 4 W  
65KAIC  
ADD - 150/3 C.B FOR PV  
PV POINT OF CONNECTION (POC)  
705.12(B)(2)(3)(B)  
1200A \* 120% = 1440A  
PV 120A \* 1.25 = 150A,  
150A OCP  
1200A(MB) + 150A(PV)  
= 1350A <= 1440A OK  
\*POC IS ON LOAD SIDE OF UTILITY METER



Project Type - Photovoltaic

CONTRACTOR  
PHOTON BROTHERS  
7705 W 108th Ave  
Westminster, CO 80021

JOHNSTOWN YMCA  
COMMERCIAL  
165 SETTLER WAY  
JOHNSTOWN, CO 80534

- PV SYSTEM SPECIFICATIONS
1. PV MODULE: 227 x LR4-72HPH-440M, 99.88kWdc
  2. INVERTER: SE100KUS
  3. RACKING: EcoFoot 2+
  4. ROOF TYPE:TPO
  5. AZIMUTH:180°
  6. ROOF SLOPE:10°

File Name:  
05\_JOHNSTOWN YMCA COMM\_ATTACH  
PLAN\_ARCH D.DWG

Sheet Number and Title:  
PV05 - SITE LAYOUT

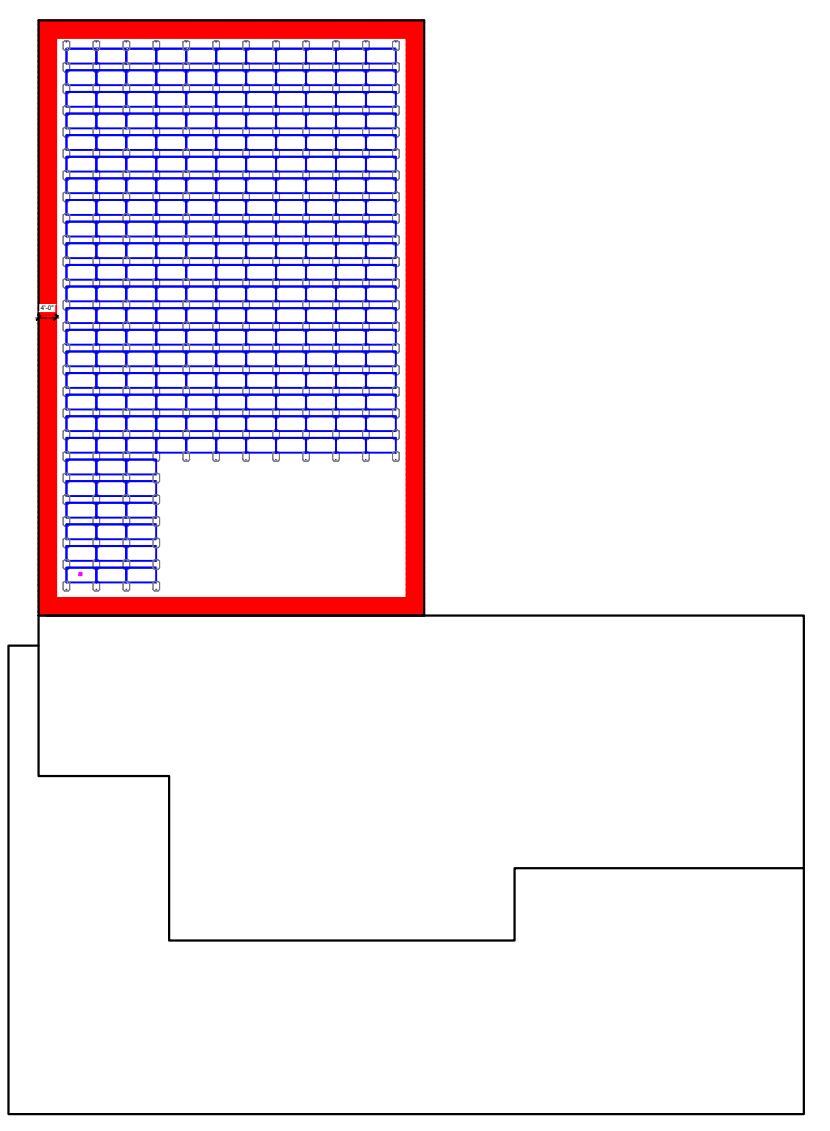
Sheet Size:  
ARCH full bleed D (36.00 x 24.00 Inches)

Drawing history

no.	drawn by	revision	date
01	DCG	----	---

Preliminary draft  
- not for construction

PV05



**EcoDesigner Report**

**PROJECT SUMMARY**

Name: 165 Settler Way  
Address: 165 Settler Way  
Johnstown, CO 80534  
Prepared By: Jonathan DeBauge  
Godwin Engineering  
debauge@godwineng.com  
3038856331

**SYSTEM OVERVIEW**

System Size:	99,880 kW	Module Mfr:	Longi Solar
Product:	EcoFoot2+	Module Model:	LR4-72HPH-440M
Annual Production:	0,000 kWh	Modules Quantity:	227
Module Tilt:	9°	Module Width:	40.866 in.
Module Thickness:	35 mm.	Module Length:	82.441 in.
Cell Quantity:	144		

**DESIGN CRITERIA**

Wind Exposure:	0	Seismic (S <sub>s</sub> ):	0.17
Wind Speed:	115 mph	Soil Site Class:	D
Ground Snow Load:	30 psf	ASCE 7 Version:	2010
Ballast Block Weight:	32.00 lbs	Risk Category:	II

**ROOF DETAILS**

Roof Name:	Roof 1	Roof Height:	30.00'
Product:	EcoFoot2+	Roof Azimuth:	180°, 270°
Tilt Angle:	9°	Roof Material:	TPO Membrane
Inter-row Spacing:	18.90"	Parapet Height:	0"
Array Azimuth:	180°	Roof Slope:	0°
Array Setback:	48"	Skewed Array:	No

**BILL OF MATERIAL**

Part	Description	Quantity
ECO-002_207	EcoFoot2+ Base	264
ES10466	EcoFoot Universal Clamp Kit	252
ECO-002_311H	EcoFoot2+ 86" Wind Deflector	227
	Ballast Block Estimate	266
ES10970	EcoFoot MLPE Bracket	0
ES10378	38" Bonding Jumpers	24
	Modules Quantity	227

sales@ecolibrumsolar.com Page 1 of 4 740-249-1877

**EcoDesigner Report**

sales@ecolibrumsolar.com Page 2 of 4 740-249-1877

**EcoDesigner Report**

**Roof 1 Array 1**

NOT FOR CONSTRUCTION: Ballast Layout and Array Specifications are preliminary estimates. Please contact Sales@EcolibriumSolar.com for final ballast design prior to installation.

**ARRAY SPECIFICATIONS**

Height:	30'	Array Sq. Ft.:	7,746 sq.ft
Skewed:	No	Array Weight:	23,500.012 lb
Created:	November 02, 2021 01:53 PM	Array lbs/sq. ft.:	3.04 lb/sq.ft
Mounting:	EcoFoot 2+	Ballast Block Weight:	32.000 lb
Modules:	Longi Solar LR4-72HPH-440M	Ballast Blocks Qty:	266

sales@ecolibrumsolar.com Page 3 of 4 740-249-1877

**EcoDesigner Report**

**ARRAY BILL OF MATERIALS**

Part	Description	Quantity
ECO-002_207	EcoFoot2+ Base	264
ES10466	EcoFoot Universal Clamp Kit	252
ECO-002_311H	EcoFoot2+ 86" Wind Deflector	227
ES10970	EcoFoot MLPE Bracket	0
ES10378	38" Bonding Jumpers	24
	Ballast Block Estimate	266
	Modules Quantity	227

sales@ecolibrumsolar.com Page 4 of 4 740-249-1877



## LR4-72HPH 425~455M

**High Efficiency Low LID Mono PERC with Half-cut Technology**

12-year Warranty for Materials and Processing  
25-year Warranty for Extra Linear Power Output

**-0.55%** 25-year Annual Energy Yield  
**+4.10%** 25-year Annual Energy Yield

**Complete System and Product Certifications**

- IEC 61215 (IEC 61646)
- IEC 61730 (Class II)
- UL 9540 (UL 9540A)
- UL 1741
- UL 1741E
- UL 1741F
- UL 1741G
- UL 1741H
- UL 1741I
- UL 1741J
- UL 1741K
- UL 1741L
- UL 1741M
- UL 1741N
- UL 1741O
- UL 1741P
- UL 1741Q
- UL 1741R
- UL 1741S
- UL 1741T
- UL 1741U
- UL 1741V
- UL 1741W
- UL 1741X
- UL 1741Y
- UL 1741Z

2020054151 for EU only

## LR4-72HPH 425~455M

**Electrical Characteristics**

Model Number	LR4-72HPH-425M	LR4-72HPH-435M	LR4-72HPH-445M	LR4-72HPH-455M
Testing Condition	STC	NOCT	STC	NOCT
Maximum Power (Pmax)	425	374	445	394
Open Circuit Voltage (Voc)	46.1	46.8	46.1	46.7
Short Circuit Current (Isc)	12.23	9.98	13.33	9.93
Voltage at Maximum Power (Vmpp)	40.5	37.7	40.1	37.9
Current at Maximum Power (Impp)	10.92	8.42	10.97	8.47

**Temperature Ratings (STC)**

Temperature Coefficient of Voc: -0.32%/°C  
Temperature Coefficient of Isc: +0.05%/°C  
Temperature Coefficient of Pmax: -0.55%/°C

**Mechanical Loading**

Front Side Maximum Static Loading: 5400Pa  
Rear Side Maximum Static Loading: 2400Pa  
Hailstone Test: 25mm hailstone at the speed of 23m/s

**1.5°C Coefficient**

Current-voltage curves (I-V) for STC and NOCT conditions.

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## Three Phase Inverter with Synergy Technology

for the 277/480V Grid for North America  
SE66.6KUS / SE100KUS

**INVERTERS**

Specifically designed to work with power optimizers

- Easy two-person installation – each unit mounted separately, equipped with cables for simple connection between units
- Balance of System and labor reduction compared to using multiple smaller string inverters
- Independent operation of each unit enables higher uptime and easy serviceability
- No wasted ground area: wall/rail mounted, or horizontally mounted under the modules (10° inclination)
- Integrated arc fault protection and rapid shutdown for NEC, 2014, NEC, and NEC 3000, per article 690.11 and 690.12
- Built-in module-level monitoring with Ethernet or cellular GSM
- Fixed voltage inverter for superior efficiency (98.5%) and longer strings
- Integrated DC Safety Switch
- Built-in RS485 Surge Protection, to better withstand surges caused by lightning or other events
- 150% DC oversizing, enabling higher energy production

**DC SAFETY SWITCH**

DC Voltage: 1000V / 2 x 48A  
DC Current: 1000V / 3 x 48A

**INSTALLATION SPECIFICATIONS**

Number of units: 2 / 3  
AC Output Cord Size / Max AWG / Max # AWG: 12 / 12 / 16-18  
DC Output Cord Size / Terminal Block AWG Range / Number of Strands: 2 x 12 / 16-18 / 8  
Dimensions (H x W x D): 17.4 x 15.5 x 10.5 / 14.0 x 11.5 x 10.0  
Weight: 16.5 kg / 36.4 lb  
Operating Temperature Range: -40 to +60 °C / -40 to +140 °F  
Country: USA, UK  
Noise: < 60 dBA  
Protection Rating: NEMA 3R  
Mounting: brackets provided

2020054151 for EU only

## Three Phase Inverter with Synergy Technology

for the 277/480V Grid for North America  
SE66.6KUS / SE100KUS

**OUTPUT**

SE66.6KUS	SE100KUS
Rated AC Power Output: 66000	100000
Maximum AC Power Output: 66000	100000
AC Output Line Connections: 4-wire WYE (L1-L2-L3-N) plus PE	
AC Output Voltage Minimum-Nominal-Maximum (V-L-N): 240-277-360	
AC Output Voltage Minimum-Nominal-Maximum (L-L): 400-480-576	
AC Frequency Min-Max (Hz): 50-60	
Maximum Continuous Output Current per Phase @ 277V: 80	100
GFPE Threshold: 1	1
UL954 Monitoring, Standby Protection, Configurable Power Factor, Country Configurable Thresholds: Yes	Yes
Maximum DC Power (Modules 17V) Unit: 100000 / 150000	150000 / 100000
Transformerless, Ungrounded: Yes	Yes
Maximum Input Voltage DC to DC: 500	500
Maximum Input Voltage DC to AC: 500	500
Normal Input Voltage DC to DC: 400	400
Normal Input Voltage DC to AC: 400	400
Maximum Input Current: 2 x 40	3 x 40
Maximum Input Short Circuit Current: 50	50
Reverse-Polarity Protection: Yes	Yes
Ground Fault Protection: 3000A Sensitivity per Line	3000A Sensitivity per Line
CEC Weighted Efficiency: 98.5	98.5
CEC Weighted Efficiency: +12	+12

**ADDITIONAL FEATURES**

Supported Communication Interfaces: RS485, Ethernet, Cellular GSM (optional)  
Input Purposes: NEC2014 NEC2007 and NEC2009 compliant, upon AC Grid Disconnect  
RFLS Surge Protection: Built-in

**STANDARD COMPLIANCE**

Safety: UL1641, UL1741E, UL1741F, UL1741G, UL1741H, UL1741I, UL1741J, UL1741K, UL1741L, UL1741M, UL1741N, UL1741O, UL1741P, UL1741Q, UL1741R, UL1741S, UL1741T, UL1741U, UL1741V, UL1741W, UL1741X, UL1741Y, UL1741Z  
Grid Connection Standards: IEEE 1547, IEEE 1547.2, IEEE 1547.4, IEEE 1547.5, IEEE 1547.6, IEEE 1547.7, IEEE 1547.8, IEEE 1547.9, IEEE 1547.10, IEEE 1547.11, IEEE 1547.12, IEEE 1547.13, IEEE 1547.14, IEEE 1547.15, IEEE 1547.16, IEEE 1547.17, IEEE 1547.18, IEEE 1547.19, IEEE 1547.20, IEEE 1547.21, IEEE 1547.22, IEEE 1547.23, IEEE 1547.24, IEEE 1547.25, IEEE 1547.26, IEEE 1547.27, IEEE 1547.28, IEEE 1547.29, IEEE 1547.30, IEEE 1547.31, IEEE 1547.32, IEEE 1547.33, IEEE 1547.34, IEEE 1547.35, IEEE 1547.36, IEEE 1547.37, IEEE 1547.38, IEEE 1547.39, IEEE 1547.40, IEEE 1547.41, IEEE 1547.42, IEEE 1547.43, IEEE 1547.44, IEEE 1547.45, IEEE 1547.46, IEEE 1547.47, IEEE 1547.48, IEEE 1547.49, IEEE 1547.50, IEEE 1547.51, IEEE 1547.52, IEEE 1547.53, IEEE 1547.54, IEEE 1547.55, IEEE 1547.56, IEEE 1547.57, IEEE 1547.58, IEEE 1547.59, IEEE 1547.60, IEEE 1547.61, IEEE 1547.62, IEEE 1547.63, IEEE 1547.64, IEEE 1547.65, IEEE 1547.66, IEEE 1547.67, IEEE 1547.68, IEEE 1547.69, IEEE 1547.70, IEEE 1547.71, IEEE 1547.72, IEEE 1547.73, IEEE 1547.74, IEEE 1547.75, IEEE 1547.76, IEEE 1547.77, IEEE 1547.78, IEEE 1547.79, IEEE 1547.80, IEEE 1547.81, IEEE 1547.82, IEEE 1547.83, IEEE 1547.84, IEEE 1547.85, IEEE 1547.86, IEEE 1547.87, IEEE 1547.88, IEEE 1547.89, IEEE 1547.90, IEEE 1547.91, IEEE 1547.92, IEEE 1547.93, IEEE 1547.94, IEEE 1547.95, IEEE 1547.96, IEEE 1547.97, IEEE 1547.98, IEEE 1547.99, IEEE 1547.100

2020054151 for EU only

## Power Optimizer For North America

P860 / P960 / P1100

**POWER OPTIMIZER**

25 YEAR WARRANTY

PV power optimization at the module-level  
The most cost-effective solution for commercial and large field installations

- Specifically designed to work with SolarEdge
- Up to 25% more energy
- Superior efficiency (99.5%)
- Balance of System cost reduction; 50% less cables, fuses and combiner boxes, over 2x longer string lengths possible
- Fast installation with a single bolt
- Advanced maintenance with module-level monitoring
- Module-level voltage shutdown for installer and firefighter safety
- Meets NEC requirements for arc fault protection (AFCI) and Photovoltaic Rapid Shutdown System (PVRS)

**PV System Design Using a Power Optimizer**

Module Type	277V Grid	277V Grid	277V Grid	277V Grid
Configuration	1P/1P	1P/1P	1P/1P	1P/1P
Minimum String Length	8	14	14	14
Maximum String Length	30	30	30	30
Maximum System Voltage	1500	1500	1500	1500
Maximum System Power	1000	1000	1000	1000
Maximum Allowed Connected Power per String	1 string - 8400	1 string - 10000	1 string - 10000	1 string - 10000
Maximum Allowed Connected Power per String (with 150% DC oversizing)	2 strings or more - 10000	2 strings or more - 10000	2 strings or more - 10000	2 strings or more - 10000
Maximum Allowed Connected Power per String (with 150% DC oversizing and 150% DC oversizing)	2 strings or more - 10000	2 strings or more - 10000	2 strings or more - 10000	2 strings or more - 10000

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## Power Optimizer For North America

P860 / P960 / P1100

**Power Optimizer Model**

Power Optimizer Model	P860 (For 2 x 72 cell modules)	P960 (For 2 x 72 cell modules)	P1100 (For up to 2 x High Power or Bi-facial modules)
Rated Input DC Power <sup>1</sup>	860	960	1100
Connection Method	Dual Input for independently connected modules <sup>2</sup>	Dual Input for independently connected modules <sup>2</sup>	Single Input for series connected modules <sup>2</sup>
Maximum Input Voltage (DC at lowest temperature)	60	60	60
MPPT Operating Range (DC at lowest temperature)	15.5 - 60	23.2	15.5 - 60
Maximum Short Circuit Current (Isc)	22	23.2	26.1
Maximum Short Circuit Current per String (Isc)	12	12.6	14.6
Maximum Efficiency	99.5	99.5	99.5
Weighted Efficiency	99.5	99.5	99.5
Overvoltage Category	II	II	II
Maximum Output Current	18	18	18
Maximum Output Voltage	60	60	60
Maximum Output Power	860	960	1100
Standard Compliance	UL1741, UL1741E, UL1741F, UL1741G, UL1741H, UL1741I, UL1741J, UL1741K, UL1741L, UL1741M, UL1741N, UL1741O, UL1741P, UL1741Q, UL1741R, UL1741S, UL1741T, UL1741U, UL1741V, UL1741W, UL1741X, UL1741Y, UL1741Z	UL1741, UL1741E, UL1741F, UL1741G, UL1741H, UL1741I, UL1741J, UL1741K, UL1741L, UL1741M, UL1741N, UL1741O, UL1741P, UL1741Q, UL1741R, UL1741S, UL1741T, UL1741U, UL1741V, UL1741W, UL1741X, UL1741Y, UL1741Z	UL1741, UL1741E, UL1741F, UL1741G, UL1741H, UL1741I, UL1741J, UL1741K, UL1741L, UL1741M, UL1741N, UL1741O, UL1741P, UL1741Q, UL1741R, UL1741S, UL1741T, UL1741U, UL1741V, UL1741W, UL1741X, UL1741Y, UL1741Z

**INSTALLATION SPECIFICATIONS**

Compatible SolarEdge Inverters: Three phase inverters  
Maximum Allowed System Voltage: 1500V  
Dimensions (H x W x D): 129 x 109 x 51 / 51 x 129 x 109 / 129 x 109 x 51 / 51 x 129 x 109  
Weight: 1.9kg / 4.2 lbs  
Input Connector: MC4  
Input Wire Length Options: Input #1, Input #2, Input #3, Input #4  
Output Wire Type / Connector: PV1-UV, PV1-UV, PV1-UV, PV1-UV  
Output Wire Length: 2.1 / 2.1, 2.1 / 2.1, 2.1 / 2.1, 2.1 / 2.1  
Operating Temperature Range: -40 to +60 °C / -40 to +140 °F  
Protection Rating: NEMA 3R

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## EcoFoot2+

Our design enhancements help you master the most challenging site and rooftop conditions

**Back in Black**  
PV installation Professionals use EcoFoot2+ to complete their projects in record time. The refreshed EcoFoot2+ design is now available in Black, along with a comprehensive UL2703 certification.

**Three main components**

- Base
- Preassembled Universal Clamp
- Wind Deflector

**Technical Specifications**

Dimensions: 26.5"L x 18.25"H  
Typical System Weight: 3.5-6 lbs. per sq. ft.  
Module orientation: Landscape/Portrait  
Tilt angle: Landscape 10°/Portrait 5°  
Module inter-row spacing: 18.9"  
Roof pitch: 0° to 7°  
Ballast requirements: 4" x 8" x 16"  
Warranty: 25 years

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## EcoFoot2 + Installer Feedback = EcoFoot2+™

Our design enhancements help you master the most challenging site and rooftop conditions

**System Benefits**

- Low part count
- Rapid system deployment
- Preassembled Universal Clamp
- Increased design flexibility
- More ballast capacity
- Simplified logistics (up to 50kW per pallet)

**Validation Summary**

- Certified to UL2703 Fire Class A for Type I and II modules
- Certified to UL2703
- Grounding and Bonding
- Wind tunnel tested to 150mph
- SEAOC seismic compliant
- CFD and structurally tested DNV GL rated at 13.5 panels per installer-hour

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## APPENDIX A Module Removal

The EcoFoot2+ system has been tested by TÜV Rheinland and conforms to UL 2703 for Grounding and Bonding when installed per the published installation instructions.

EcoFoot2+ carries module-to-module ground bond through the Wind Deflector, Item E listed in the "EcoFoot2+ Core Components" table in this document.

Each row of modules/wind deflectors in an array of up to 400 modules must be grounded per the NEC and ANSI/NFPA 70 either through the designated ground hole in the Wind Deflector, or by drilling a 3/8" ground hole into the Wind Deflector a minimum of 3/8" from any edge. One Ground Lug is required for every 400 modules connected within an array.

Ecobalmsolar recommends using #6 copper ground wire in conjunction with WEBB grounding devices such as the WEBB-LUG-6.7 or WEBB OAKS16. Lugs are a single use component.

Other grounding methods must be reviewed and approved by a licensed master electrician or electrical engineer and Authority Having Jurisdiction (AHJ).

**Grounding & Bonding**

Note: If a module is to be removed from an array, the following steps must be taken.

- Determine module to be removed. Identify and mark the module to be removed.
- Install ground lug on adjacent modules. Install a WEBB Lug 6.7 on both modules adjacent to the module to be removed. Utilize the grounding hole on the frame of the module.
- Connect Bonding Jumper. Lay a bare #6 CU conductor into the two lay in lugs connected to the adjacent modules. Tighten lay-in lug terminal screw onto the conductor and torque to 7 ft.-lbs.

When wiring the array, keep bare copper from contacting bare aluminum.

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## APPENDIX C Grounding & Bonding

The low-voltage system fire tests of UL 1703 were conducted using SolarWorld modules certified by CSA as Fire Classification Type 1 and Type 3\*.

With Type 1 modules, the requirements for Class A fire rating requirements were met using full-cover metal deflectors in the North and East-West orientations. With Type 3\* modules, the Class A fire rating requirements were met without the use of any additional mitigation.

The complete test report (R1-ELS140728) has been provided to Ecobalmsolar.

This letter is not intended to replace a certification nor is it an authorization to mark.

Sincerely,

Mark Witt  
Engineering Manager  
TUV Rheinland PTL

\* The SolarWorld modules designated as Type 3 include an aluminum frame

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## TÜV Rheinland PTL

**Business Stream Products**  
Renewable and Solar Technology

Attn: Chad Parsons/Christopher Bamat  
Ecobalmsolar Solar Inc.  
340 West State Street  
Athens, OH 45701  
Phone: 740-447-8688  
Email: cbamat@ecobalmsolar.com

Email: chad@ptl.com  
Phone: 480-966-1700  
Main Fax: 480-966-1700  
Email: chad@ptl.com

October 10, 2014

**Letter of Compliance**

Type of Equipment: Low-slope PV racking system  
Model Designation: EcoFoot2+  
Module Fire Classification Types: Type 1, Type 3\*  
Test Requirement: UL 1703: 2002, R2014.5.20, §31.2  
Client Number: 802811  
TUV Rheinland Project Number: ELS140728

Dear Mr. Bamat,

TUV Rheinland PTL has undertaken and completed a test program to evaluate the fire performance of the Ecobalmsolar EcoFoot2+ PV racking system according to the system fire test requirements of UL 1703: 2002, R2014.5.20, §31.2.

The low-voltage system fire tests of UL 1703 were conducted using SolarWorld modules certified by CSA as Fire Classification Type 1 and Type 3\*.

With Type 1 modules, the requirements for Class A fire rating requirements were met using full-cover metal deflectors in the North and East-West orientations. With Type 3\* modules, the Class A fire rating requirements were met without the use of any additional mitigation.

The complete test report (R1-ELS140728) has been provided to Ecobalmsolar.

This letter is not intended to replace a certification nor is it an authorization to mark.

Sincerely,

Mark Witt  
Engineering Manager  
TUV Rheinland PTL

\* The SolarWorld modules designated as Type 3 include an aluminum frame

244 W. State Street, Athens OH 45701 | 740-249-1877 | www.ecobalmsolar.com

## TÜV Rheinland PTL

**Business Stream Products**  
Renewable and Solar Technology

Attn: Mr. Chad Parsons  
Ecobalmsolar Solar Inc.  
340 West State Street  
Athens, OH 45701 USA

Email: chad@ptl.com  
Phone: 480-966-1700  
Main Fax: 480-966-1700  
Email: chad@ptl.com

October 10, 2014

**UL SU 2703 Bonding Tests Completed**

Type of Equipment: PV Mounting System  
Model Designation: Ecobalmsolar Solar EcoFoot2+  
Test Requirement: UL Subject 2703

TUV Rheinland File Number: L1-ELS130905  
TUV Rheinland Project Number: ELS130905

Dear Mr. Parsons,

This letter is confirmation that the Ecobalmsolar Solar EcoFoot2+ PV Mounting System has successfully completed electrical bonding tests according to the UL Subject 2703 standard.

Congratulations on this achievement.

All summary test results will be provided to you separately when the full report is completed. The final Test Report and associated Constructional Data Form (CDF) will be submitted to our certification department for final processing and subsequent listing on the TÜV Rheinland Certipedia website.

You may use this correspondence as an interim Letter of Compliance (LOC) indicating your system has met the relevant bonding requirements of UL Subject 2703.

Sincerely,

Jack Castagna  
Solar Components Program Manager  
TUV Rheinland PTL, LLC

TUV Rheinland  
North America Holding, Inc.  
1 Federal Street  
Boston, MA 02110  
Main Phone: 617-426-6888  
Main Fax: 617-426-6888  
Email: jack@ptl.com

TUV Rheinland  
North America Holding, Inc.  
1 Federal Street  
Boston, MA 02110  
Main Phone: 617-426-6888  
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CREATING A  
**BRIGHTER** FUTURE

PHOTON  
BROTHERS



# YOUR SOLAR POWER SYSTEM

## THE PHOTON WAY

It is our mission to power your life through a quality solar installation at a reasonable price. With over 10 years of electrical experience and hundreds of happy customers, we are committed to providing the best installations in the business. Your system, with the Photon Brothers stamp of approval, will outperform, outlive, and outcompete all others while being a showpiece that you and your community are proud of for decades to come.

## INSTALLATION WARRANTY & SYSTEM MONITORING

We provide a 10 year warranty that covers the workmanship of our installation. If any of your system components need to be replaced within the warranty period, we cover all costs associated with replacement. In addition, we provide web based monitoring for your system during the warranty period so you can view your system performance in real time from any device. And for a little more peace of mind, we back our claims with a 5 year production guarantee ensuring your financial goals are met.

## SYSTEM OVERVIEW

*SOLAR* 200.0 kW-DC

*STORAGE* 0.0 kW

*SAVINGS* \$16,806



# FINANCING SUMMARY

Payment Options	Cash Purchase
IRR - Term	7.0%
LCOE PV Generation	\$0.023 /kWh
Net Present Value	\$96,582
Payback Period	12.5 Years
Total Payments	\$380,000
Total Incentives	\$199,742
Net Payments	\$180,258
Electric Bill Savings - Term	\$823,244
Upfront Payment	\$380,000

- Maximize your savings by owning a secure long-term investment.
- Use federal investment tax credit to reduce your tax liability.
- Increase the market value of your business.

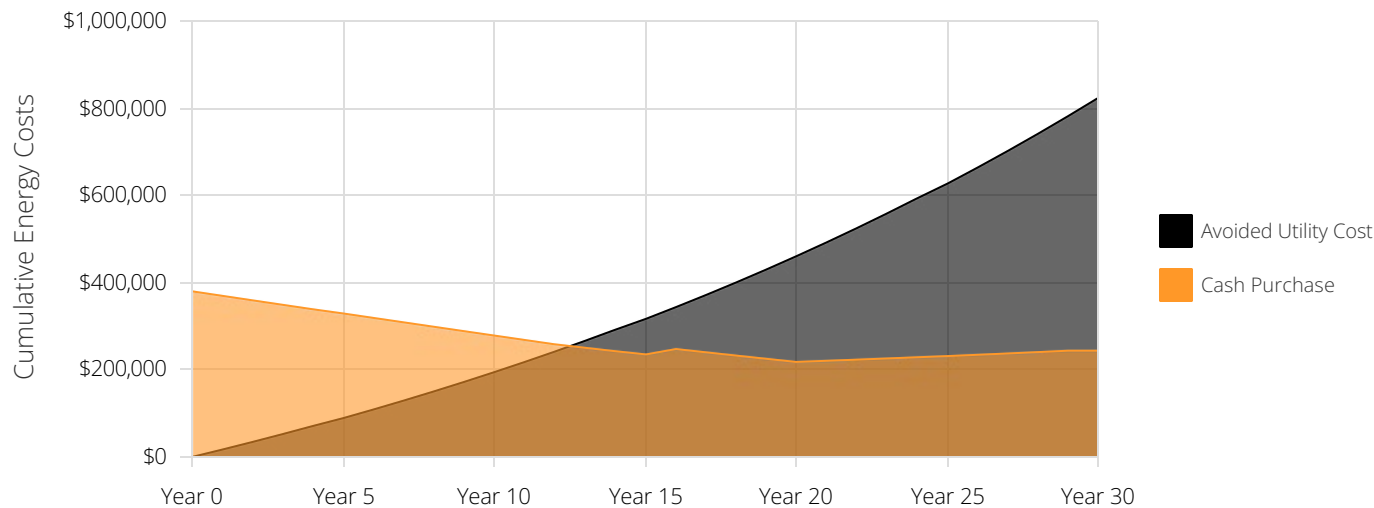
### Lease or PPA:

- Receive the benefits of having solar, with little or no money down.
- Avoid the responsibility of maintenance and repairs.
- Do not have tax liability to monetize the federal tax credit.

### Loan:

- Numerous low-cost, low interest rate loan programs are available.
- 'Own' an asset that generates significant financial value including electricity bill savings and tax incentives.
- Achieve immediate savings as you repay the loan over time.

Cummulative Energy Costs By Payment Option



# Cash Purchase CASH FLOW ANALYSIS

Years	Cash				Total Cash Flow	Cumulative Cash Flow
	Project Costs	O&M / Equipment Replacement	Solar Rewards Program	Electric Bill Savings		
Upfront	<b>-\$380,000</b>	-	-	-	<b>-\$380,000</b>	<b>-\$380,000</b>
1	-	-	\$10,280	\$16,806	\$27,086	<b>-\$352,914</b>
2	-	-	\$10,249	\$17,342	\$27,591	<b>-\$325,322</b>
3	-	-	\$10,218	\$17,895	\$28,113	<b>-\$297,209</b>
4	-	-	\$10,188	\$18,466	\$28,653	<b>-\$268,556</b>
5	-	-	\$10,157	\$19,054	\$29,211	<b>-\$239,345</b>
6	-	-	\$10,126	\$19,661	\$29,787	<b>-\$209,558</b>
7	-	-	\$10,095	\$20,287	\$30,382	<b>-\$179,176</b>
8	-	-	\$10,064	\$20,933	\$30,997	<b>-\$148,179</b>
9	-	-	\$10,033	\$21,599	\$31,633	<b>-\$116,546</b>
10	-	-	\$10,003	\$22,287	\$32,289	<b>-\$84,257</b>
11	-	-	\$9,972	\$22,995	\$32,967	<b>-\$51,290</b>
12	-	-	\$9,941	\$23,727	\$33,668	<b>-\$17,623</b>
13	-	<b>-\$2,000</b>	\$9,910	\$24,481	\$32,391	\$14,768
14	-	<b>-\$2,060</b>	\$9,879	\$25,259	\$33,078	\$47,846
15	-	<b>-\$2,122</b>	\$9,848	\$26,061	\$33,788	\$81,634
16	-	<b>-\$22,185</b>	\$9,818	\$26,889	\$14,521	\$96,155
17	-	<b>-\$2,251</b>	\$9,787	\$27,743	\$35,278	\$131,434
18	-	<b>-\$2,319</b>	\$9,756	\$28,623	\$36,060	\$167,494
19	-	<b>-\$2,388</b>	\$9,725	\$29,531	\$36,868	\$204,363
20	-	<b>-\$2,460</b>	\$9,694	\$30,468	\$37,702	\$242,065
21	-	<b>-\$2,534</b>	-	\$31,434	\$28,901	\$270,966
22	-	<b>-\$2,610</b>	-	\$32,430	\$29,821	\$300,787
23	-	<b>-\$2,688</b>	-	\$33,458	\$30,770	\$331,557
24	-	<b>-\$2,768</b>	-	\$34,518	\$31,749	\$363,306
25	-	<b>-\$2,852</b>	-	\$35,611	\$32,759	\$396,066
26	-	<b>-\$2,937</b>	-	\$36,738	\$33,801	\$429,867
27	-	<b>-\$3,025</b>	-	\$37,901	\$34,875	\$464,742
28	-	<b>-\$3,116</b>	-	\$39,100	\$35,984	\$500,726
29	-	<b>-\$3,209</b>	-	\$40,336	\$37,126	\$537,852
30	-	<b>-\$3,306</b>	-	\$41,611	\$38,305	\$576,157
<b>Totals:</b>	<b>-\$380,000</b>	<b>-\$66,829</b>	\$199,742	\$823,244	\$576,157	-

## Financial Metrics

Payback: 12.5 Years

ROI: 151.6%

10 Year IRR: (4.2%)

20 Year IRR: 5.0%

## Assumptions

Utility Escalator: 3.5%

Federal tax rate: 21.0%

State tax rate: 8.0%

Modeling: Before Tax

**Exhibit B – Payment Schedule**

<b>Payment Initiating Event</b>	<b>Payment Amount</b>
Deposit	\$55,000
Payment #1- Design and Permitting Submittal and Owner Approval	\$100,000
Payment #2 Panel Delivery	\$100,000
Payment #3 Final Inspection and Approval	\$100,000
Payment #4 Permission to Operate	\$25,000
<b>Total</b>	<b>\$380,000</b>

**Exhibit C – Project Change Request**

<b>Date:</b>	
<b>Customer/premises address:</b>	
<b>Nature of change</b>	
<b>Change requested by:</b>	
<b>Detailed description of change:</b>	
<b>Additional materials required, estimated customer cost:</b>	
<b>Additional schedule required, estimated customer cost:</b>	
<b>Total additional cost:</b>	
<b>Payment terms:</b>	

**Signature and Date:**

<b>Contractor agrees to implement changes as described above:</b>	
<b>Owner agrees to contract adjustments and payment terms above:</b>	

## Exhibit D – Photon Brothers Inc. Warranties

### 1. Defined Terms of Warranties:

- a. “Owner” shall have the meaning it has in the Agreement.
- b. “Premises” shall have the meaning it has in the Agreement.
- c. “Contractor” shall have the meaning it has in the Agreement.
- d. “System” shall have the meaning it has in the Agreement.
- e. “Operational Date” shall be defined as the date on which the electricity utility service provider of Owner authorizes the Owner to energize or turn on the System.
- f. “Warranty Start Date” shall be defined as the first day of the first month following the “Operational Date” of the System.
- g. “Substantial completion” shall be the “Operational Date” of the System.
- h. “Work” shall have the meaning it has in the Agreement.

**2. Limited Defects Warranty:** The Contractor warrants the System against defective workmanship for a period of 10 years after substantial completion. This warranty covers the solar system as a whole and provides for no-cost repair or replacement of the solar system, including any associated labor during the warranty period. The separately included manufacturer warranties for the solar panels and inverter are excluded from the contractor's warranty obligations. Per the manufacturer's warranty, solar modules carry a 25 year performance warranty and a 20 year workmanship warranty, inverters are under 12 year warranty, which has been extended to 20 years, and the power optimizers carry a standard 25 year warranty. Photon Brothers, Inc., a Colorado corporation, its successors, assigns or transferees, will be the warranty administrator for these manufacturer's warranties and provide a first line of support on all manufacturer's warranty claims, unless the business entity, its successors, assigns or transferees, no longer conduct business in the State of Colorado. The warranty period will not be extended, nor will a new warranty period begin, when any repair or replacement is conducted under this warranty. This warranty does not warrant a specific power output, other than the warranty against degradation noted above, which is exclusively covered under the module manufacturer warranty. The Contractor shall, on or before substantial completion and final payment, provide to the Owner all warranty documents relative to the equipment and materials incorporated in the Work as such are provided by their manufacturers.

- a. This Limited Warranty specifically excludes claims on any component which does not have a manufacturer's warranty and is not a result of a defect in workmanship. This Limited Warranty includes servicing manufacturers' warranties free of charge. If a covered defect is discovered, Contractor will, at no additional cost to Owner, provide such labor and materials as required to restore the System to its originally installed state, either with new or used materials. If Contractor finds problems in the System caused by the acts or omissions of

Owner or if the problems are not an actual problem of the System (e.g. shade or un-authorized alterations to the System), upon written notice to Owner and written approval by Owner, Contractor may charge Owner for any new parts and materials at the then retail market rate and labor services at an hourly rate basis for all services rendered by Contractor or its agents at the then current labor service rate and further that each labor service charge shall be billed at a minimum rate of two (2) hours. This Limited Warranty does not cover: power outages; force majeure (events such as earthquake, lightning, hailstorms, severe weather, insect infestation, pest infestation, fire, flood, or other acts of God), war, invasion, terrorist activity, government sanction, or normal wear and tear of the roof or other site of the System, sub-structure, siding, plumbing or electrical work not related to the System. This Limited Warranty does not cover any problems caused by improper maintenance of the System or any other improper action by any party other than Contractor.

- b.** Photon Brothers has inspected the site of the installation and there is nothing that we have, in good faith, seen that would increase our costs or cause a change order.

### Exhibit E – Production Guarantee

In addition to the warranty provided in Exhibit D, Contractor provides the following production guarantee.

Contractor estimates that each year during the Production Term (as defined below) the System will generate the Guaranteed Range of Annual Production (as defined below) of kilowatt hours (kWh) in the table set forth below:

Guarantee Year	Guaranteed Range of Annual Production (kWh)
Year 1	264,160
Year 2	262,680
Year 3	261,367
Year 4	260,060
Year 5	258,759

1. If, at the end of each successive twelve (12) month anniversary of the Energy Start Date, the Actual Annual kWh (defined below) generated by the System is less than the bottom of the Guaranteed Range of Annual Production, then Contractor will send Customer a refund check or transfer funds electronically in an amount equal to the difference between the bottom of the Guaranteed Range of Annual Production and the Actual Annual kWh, multiplied by the Guaranteed Energy Price per kWh (defined below) ("Payment Amount") after such Payment Amount is equal to or greater than \$100.00 ("Minimum Payment Amount"), unless such Payment Amount is due and payable in the last year of the Production Term, in which case there is no minimum dollar amount requirement to remit the Payment Amount to Customer. If a Payment Amount is due under this Production Guarantee, but the Minimum Payment Amount requirement has not been satisfied, then the Payment Amount will continue to roll over to the next twelve (12) month anniversary of the Energy Start Date until the Minimum Payment Amount has been reached. Contractor will make that payment at the end of a Guarantee Year. Customer is responsible for ensuring that the System remains free of shading in the same condition of the site at time of installation (for example, future trees planted in front of the PV array). Customer is also responsible for cleaning the array twice annually to prevent significant performance degradation.
  - a. For example, if the first twelve (12) month period commences on October 1, 2014, and ends on September 30, 2015, and the energy the System generated is less than the energy the system was guaranteed to generate during such twelve (12) month period, Contractor will pay the difference between the Actual Annual kWh and the bottom of the Guaranteed Range of Annual Production multiplied



by the Guaranteed Energy Price per kWh.

2. If, at the end of each successive twelve (12) month anniversary of the Energy Start Date, the Actual Annual kWh is greater than the top of the Guaranteed Range of Annual Production during any twelve (12) month period, this surplus will be carried over and will be used to offset any deficits that may occur in the future.
3. **Defined Terms:** The following capitalized terms will have the below meanings when used in this Production Guarantee:
  - a. **“Actual Annual kWh”** means the AC electricity produced by the System in kilowatt-hours measured and recorded by Contractor during each successive twelve (12) month anniversary of the Energy Start Date as measured by the monitoring system. The total kWh shall be the sum of all inverter outputs as recorded by the monitoring system and as communicated to Contractor by Customer pursuant to the Communication Requirements (as defined below).
  - b. **“Communication Requirements”** Customer shall provide a dedicated internet connection at the main facility for the entire length of the Production Term.
  - c. **“Energy Start Date”** means the date that the System becomes fully energized, with permission to operate from the utility, is producing power continuously, and has a fully operational monitoring system capable of reporting production. Note the System may be energized for testing purposes prior to the Energy Start Date.
  - d. **“Guarantee Year”** is each successive period of a calendar year from the Energy Start Date, as described above, to the next anniversary of the Energy Start Date.
  - e. **“Guaranteed Energy Price per kWh”** is the value set forth on Table A of this Production Guarantee for the applicable Guarantee Year.
  - f. **“Guaranteed Range of Annual Production”** is the estimate of the range of production for a Guarantee Year made by Contractor using details related to the installation of the System, including but not limited to, typical meteorological year data, equipment efficiency, pitch, and orientation. The Guaranteed Range of Annual Production for the System for each Guarantee Year is in column 2 of Table A.
  - g. **“Production Term”** is 5 years, beginning at the Energy Start Date.
4. **Contingency for Lost Data:** In the event of hardware, communication, or other failure affecting Actual Annual kWh retrievable from the Monitoring System, Contractor will make commercially reasonable efforts to resolve the failure in a timely manner and the calculations in this Section 2 will be adjusted to compensate for such lost data during such period of failure. Contractor will use commercially reasonable methods to estimate the missing kWh based on utility bills or other available information and such estimate will be included in the calculations under this Section 2 for such period. In the event that no such information is reasonably accessible, Contractor will make the adjustment based on the original kWh expectation attributable to such period. This section states Contractor’s sole liability, and Customer’s exclusive remedy, for any

shortfall in Actual Annual KWh arising from any equipment failure or lost data relating to the Monitoring System.