



SRP Program Deficiencies

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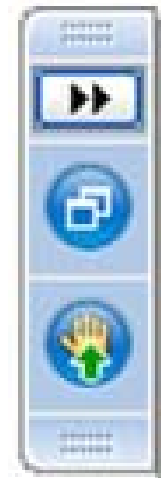
Jeremiah Diaz

Lead Renewable Energy Inspector



Questions?

Please click “Raise Your Hand” on your screen to you ask your question or Type in a Question on the “Q & A” section.



Please note for those listening to this webinar through their telephone, you are required to dial the audio pin number on your screen to allow us to un-mute your phone line to ask your question. Input the “#” sign as indicated.

If you are listening to this webinar through your speakers it would be best to type in your question unless you are using headphones.



Agenda

- SRP Registration Deficiencies Resulting in Non Compliance
- SRP Registration Deficiencies
- Final As-Built Documents Requirements and Deficiencies
- Shading Analysis and Reporting
- PV-Watts and De-rate Calculations
- 2013 PV Commissioning Form (Draft) Explained
- PV System Grounding/Wire Management
- Contact Information



SRP Registration-Non Compliance

- If the most recent executed contract signature date exceeds 10 business days of when the **completed** SRP Registration packet was received by the Market Manager the SRP registration will be deemed **Non Compliant**.
- If the EDC Approval to Operate date is **BEFORE** the date of the SRP Acceptance letter (After June 4, 2012) the SRP Registration will be deemed **Non Compliant**.
- If the EDC Approval to Operate date is **AFTER** the expiration date, the resubmitted SRP Registration will be deemed **Non Compliant**.

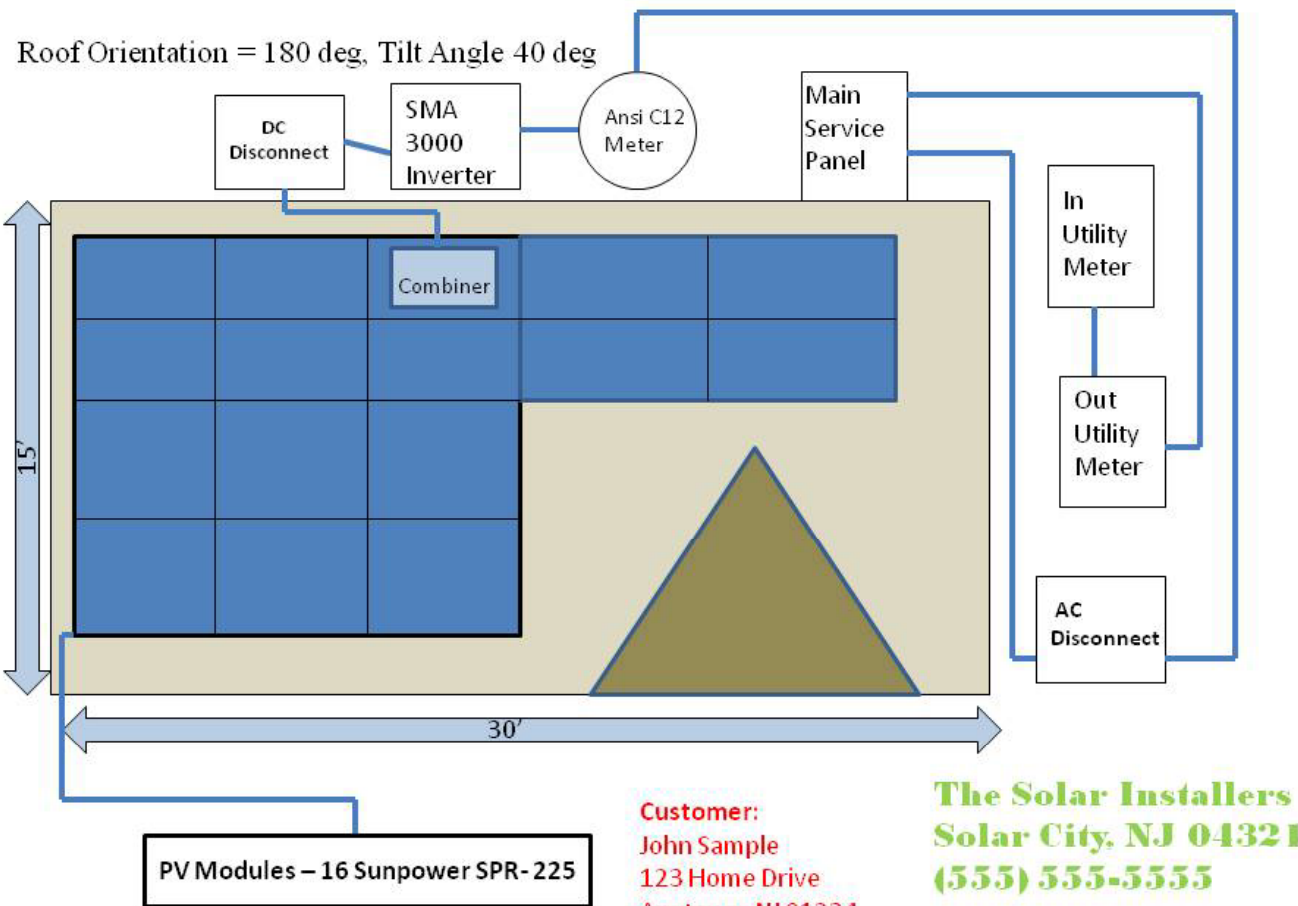


2012-2013 SRP Registration Deficiencies

- Use 2012-2013 Version - Forms found:
<http://www.njcleanenergy.com/renewable-energy/programs/srec-registration-program/registration-forms>
- Include a Site Map.
- Ensure the utility account number and installation address on SRP form is consistent with the utility bill provided.
- Signed Contract-A full copy of contract not required. Must provide key elements of the contract; host location, parties to contract with contract execution dates, project cost and **dated signatures**.
 - The last contract signature date must be within 10 business days of when the **completed** registration packet was received by our office for the registration to be compliant with the 10 business day contract rule.



Site Map Requirements



NJ Utility Company Acct: 123456789

- Can be an overhead-view drawing or a single line electrical diagram
- Clearly indicates:
 - RE Technology
 - Inverter(s)
 - Batteries (if any)
 - Disconnect switch
 - Point of connection with utility system
- Includes customer installation address and utility account number
- Includes installer's name and telephone number



Final As Built Packet Requirements

- A Complete Final As Built packet must be received on or before the expiration date.
- All projects will remain in Final DE status until a completed Final As Built packet is submitted to include the EDC Authorization to Energize Notification and will not be scheduled for a program inspection or receive a waiver of inspection.
- Participants in the PSE&G Loan Program must submit the complete Final As Built packet to the Market Manager and PSE&G. Any questions regarding the PSEG Loan Programs can be directed to Charlie Garrison at charlie.j.garrison@honeywell.com or Robert Graham at robert.graham@honeywell.com.
- Use the 2012-2013 checklist and forms to ensure all required documents are included in the packet.
- All documents must be mailed or hand-delivered, no emails or faxes are accepted.



EDC Approval to Operate Notification

- EDC Approval to Operate must be included with the Final As-Built package.
- Interconnection applications are **NOT** acceptable as a final EDC Approval to Operate.
- For EDC Approvals that are sent via email, (Ex. JCP&L) the entire e-mail including the date it was sent is required.
- If the EDC Approval includes an account number, the account number must match what was on the initial SRP Registration form and the corresponding utility bill.
 - If the account number has changed, you will need to submit a revised SRP Registration form with a copy of the new utility bill.



Final As Built Technical Worksheet



New Jersey's Clean Energy Program Final As-Built Technical Worksheet for Solar Electric Equipment



A: SITE HOST CONTACT / APPLICANT INFORMATION

Name: _____ Application/Registration Number: _____
Host Company Name (if applicable): _____
(Name corresponds to applicant name on the REIP Application Form or site host contact on the SREC Registration Form and the numbers corresponds to the number listed on the Approval or Acceptance Letter by the NJBPU)

B: EQUIPMENT INFORMATION

1. Solar Electric Module (provide ratings in DC Watts at STC)

| Manufacturer | Model Number | Power Rating | Quantity | Total Array Output | Orientation | Tilt |
|--------------|--------------|--------------|----------|--------------------|-------------|-------|
| _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ | _____ |

Total: _____

Total Array Output = Power Rating x Module Quantity,
Orientation in degrees True (e.g., 180° True South is 191° Magnetic), Tilt in degrees (e.g., flat mount = 0°; vertical mount = 90°).

2. Inverter (Continuous AC Watts Rating)

| Manufacturer | Model Number | AC Watts | Quantity | Total Inverter Output | Peak Efficiency | # of Strings | Modules/ String |
|--------------|--------------|----------|----------|-----------------------|-----------------|--------------|-----------------|
| _____ | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ | _____ | _____ |

Total: _____

Total Inverter Output = Continuous AC Watts Rating x Number of Inverters

C: INSTALLATION INFORMATION

- Array Location: Rooftop Pole Mount Ground Mount
- Tracking: Fixed Single-axis Double-axis
- Inverter Location: Indoor Outdoor Location: _____
- Number of strings and modules per inverter: _____
- Interconnection Type: Behind-the-Meter Direct Grid-Supply

Double check calculations – Do not Round-off numbers

Array Breakdown List each array separately

Inverter Breakdown List each separately



Final As Built Technical Worksheet



New Jersey's Clean Energy Program Final As-Built Technical Worksheet for Solar Electric Equipment



D: SYSTEM PRODUCTION CALCULATION

Include total shade % (per array), not total solar access %

1. **Shading analysis** has been performed for this installation. The attached shade calculation has been completed and is accurate to the best of the technical and administrative ability of the installer. The shading analysis shows the loss of production associated with shading is _____ %.
2. **Installer** must provide the appropriate inputs as described below for the ideal system verses designed system when using the PV WATTS tool to ensure accurate completion of this section.
 - o When calculating the production estimate for the **ideal system**, use the system size inputs submitted on the **Final As-Built Technical Worksheet**, but use true south (180 degrees) as the orientation (azimuth) and use the latitude for the location selected for tilt and do not include shading. This demonstrates the best possible system output for this proposed installation.
 - o When calculating the production estimate for the **designed system**, use the system size inputs, tilt and orientation submitted on the **Final As-Built Technical Worksheet**. Indicate shading by changing the derate factor only for shading as appropriate. This demonstrates the estimated system output for the designed installation based upon the specific conditions proposed.
- 2 a. Designed system rated kWh output (AC Energy from PWATTS): _____
- 2 b. Ideal system rated kWh output (AC Energy from PWATTS): _____
- 2 c. The expected system rated output percent equals 2a divided by 2b: _____. A value of 100% indicates that the proposed system output equals the ideal system output.
3. There is no minimum system output percent requirement for SRP projects. However, payments for REIP and CORE projects will be determined as follows:
 - a. System output percent $\geq 80.0\%$ will receive full payment
 - b. System output percent $\geq 70.0\%$ and $< 80.0\%$ will be prorated by multiplying the payment by the system output percent (item 2c) divided by 80.0 %.
 - c. System output percent $< 70.0\%$ will receive **NO** rebate payment
4. It is acknowledged that this production estimate is for SREC calculation only and may not be a true representation of annual system production. The attached estimated production calculation has been completed and is accurate to the best of the technical and administrative ability of the installer.

Update to reflect final system cost

E: SYSTEM COST INFORMATION

1. Total Installed System Cost: \$ _____
(Eligible installed system cost **includes all equipment, installation, and applicable interconnection costs.**)

Registrants **must** supply cost information that is accurate and based upon the actual as-built installation cost. Cost can be submitted for protection under OPRA by following the Board's procedures found at www.nj.gov/bpu.

F: CERTIFICATION (Signatures Required)

The undersigned by signing below attest to the accuracy and completeness of the above and any information provided with this submittal. If the NJCEP determines through an evaluation process of either on-site inspection or audit that the system has been misrepresented or that the paper work submittal is found to have violated program procedures then the contractor may be subject to corrective action as described in the Contractor Remediation Procedures specified in the Board Order dated October 15, 2010, Docket No. EO07030203.

The signature for the installer shall be an Officer, Principle or Executive of the company that has signing authority for the company.

| | | |
|---|-------------------|------------------------------------|
| System Owner: _____ | Installer: _____ | Applicant/Site Host Contact: _____ |
| Signature: _____ | Signature: _____ | Signature: _____ |
| Print Name: _____ | Print Name: _____ | Print Name: _____ |
| Date: _____ | Date: _____ | Date: _____ |
| Registrant (only needed if different from above): | | |
| Signature: _____ | Print Name: _____ | Date: _____ |

If either installer or system owner have changed from the initial registration; a revised SRP Registration form and updated contract must be submitted.

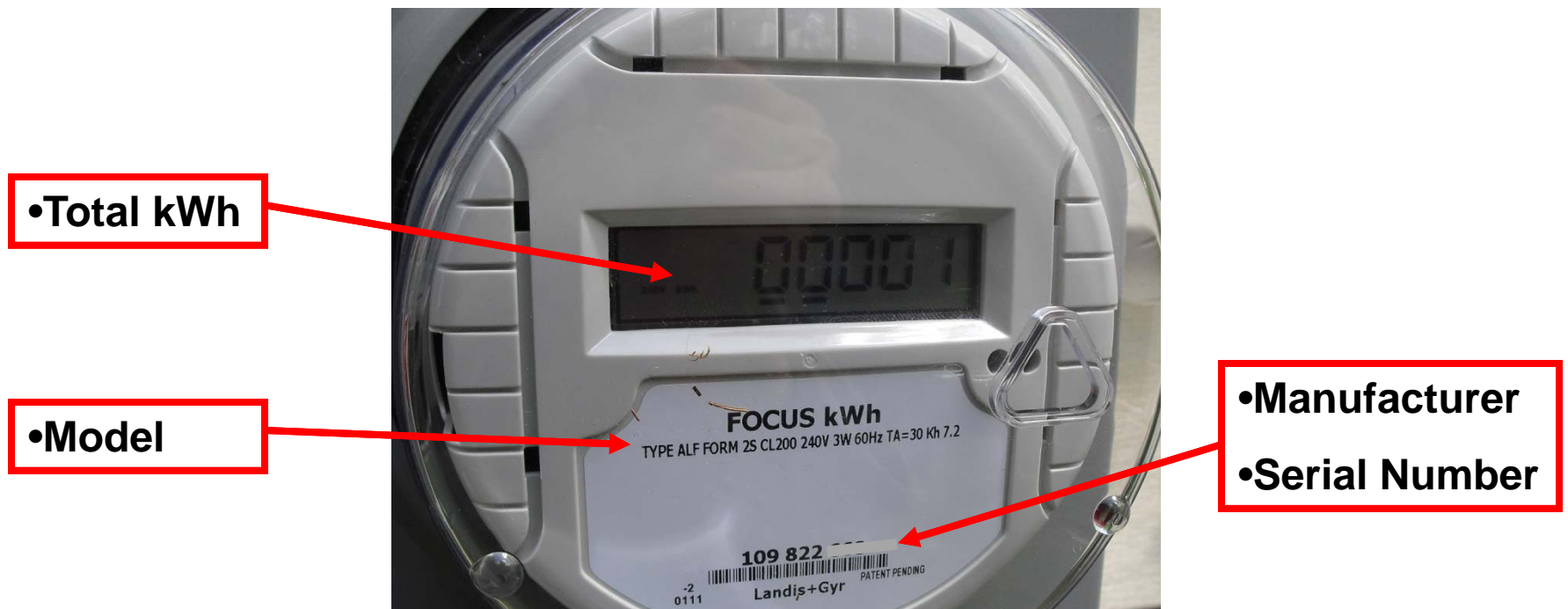
Ensure all parties have signed

Registrant



Photo Requirements

- Each photo should be a minimum of 5 x 7 of at least 300 DPI.
- If there are multiple orientations and tilts, photos should be provided of each array.
- Provide **separate** photos of panels, inverters and meters.
- Meter serial number should be visible and legible in photo.





Shading Analysis - Installation Considerations

“Short of outright physical destruction, hard shadows are the worst possible thing you can do to a PV module output.”- The Solar Living Source Book

Shade Analysis is Critical to Determine Solar Array Performance



- SOLAR PATHFINDER™
- SOLMETRIC SUNEYE™
- SATELLITE/AERIAL IMAGERY (COMMERCIAL FLAT ROOF ONLY)

Many cells are hard-shaded causing significant reduction in energy production.



Shading Analysis - Requirements

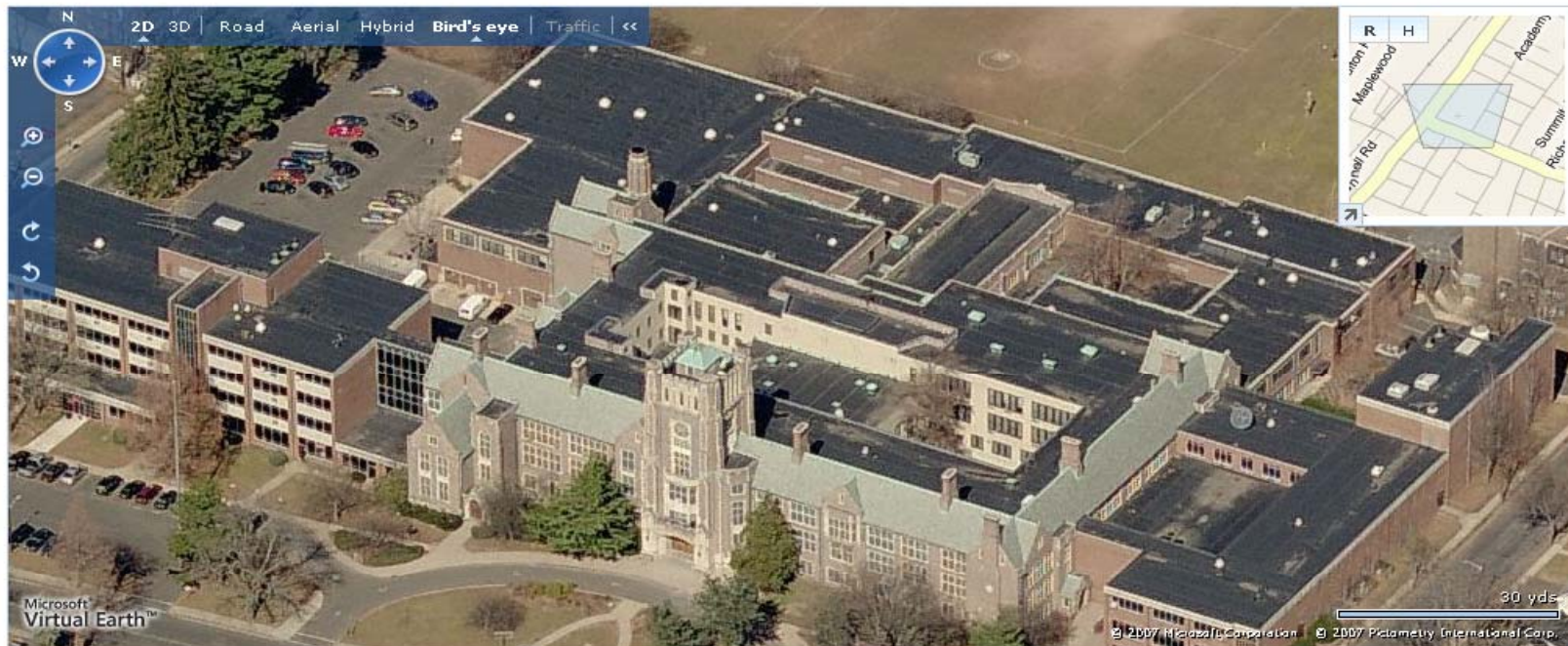
- Perform and submit a shading analysis for all installations
- Require a minimum of **four (4) skyline photos per array plane** (*i.e. 4 corners of a rectangular array per each roof level*)
- For an asymmetrical array layout: capture semi-symmetrically opposite skyline photos (an even number of skylines), in order to obtain a balanced shading percent average.
- Full summary report utilizing corresponding software.





Shading Analysis – Requirements (cont.)

- **Flat roof and ground-mounted Commercial systems ONLY:**
 - If there is no potential impact from shading on the solar modules, then the submittal of a satellite image or aerial photo clearly displaying the site of the photovoltaic system may be acceptable.
 - Aerial/satellite photo may be compared against blue-prints of actual array layout, to observe obstructions and potential shading impact. (*note tower shade*)





PV Watts

- Log into PV Watts, version 1.
<http://rredc.nrel.gov/solar/calculators/PVWATTS/version1/>
- Select the state and the closest city to your project.
- For western-central regions of New Jersey, you may use Philadelphia, PA as a reference point, if it is closer than Newark or Atlantic City.
- The PSE&G Loan Program only accepts version 1 and location Newark.
- Print and submit copies of all PV Watts forms once completed.



"Ideal" System Performance PV Watts



Click on **Calculate** if default values are acceptable, or after selecting your system specifications. Click on **Help** for information about system specifications. To use a DC to AC derate factor other than the default, click on **Derate Factor Help** for information.



AC Energy
&
Cost Savings



Station Identification:

WBAN Number: 14734
City: Newark
State: New_Jersey

Only change the system size

PV System Specifications:

DC Rating (kW): **4.0**
DC to AC Derate Factor: 0.77

DERATE FACTOR HELP

Array Type: Fixed Tilt

Fixed Tilt or 1-Axis Tracking System:

Array Tilt (degrees): 40.7 (Default = Latitude)
Array Azimuth (degrees): 180.0 (Default = South)

Energy Data:

Cost of Electricity (cents/kWh): Default = State Average

| Station Identification | |
|--------------------------|------------|
| City: | Newark |
| State: | New_Jersey |
| Latitude: | 40.70° N |
| Longitude: | 74.17° W |
| Elevation: | 9 m |
| PV System Specifications | |
| DC Rating: | 4.0 kW |
| DC to AC Derate Factor: | 0.770 |
| AC Rating: | 3.1 kW |
| Array Type: | Fixed Tilt |
| Array Tilt: | 40.7° |
| Array Azimuth: | 180.0° |
| Energy Specifications | |
| Cost of Electricity: | 11.2 ¢/kWh |

Verify DC Rating (system size) is accurate and all other values are default.

Transcribe the annual estimated kWh production onto the "Final As Built Technical Worksheet", Section D, 2b.

Annual Estimated kWh

| | | | |
|------|-----|------|--------|
| Year | 446 | 4732 | 529.98 |
|------|-----|------|--------|



“Designed” System Performance PV Watts

Perform a
“Designed” PV
Watts in 5 easy
steps:



Click on **Calculate** if default values are acceptable, or after selecting your system specifications. Click on **Help** for information about system specifications. To use a DC to AC derate factor other than the default, click on **Derate Factor Help** for information.

1. Input Derate Information

The Derate Factor Help button is commonly called the...

“PV Watts Derate Calculator”

Station Identification:

WBAN Number: 14734
City: Newark
State: New_Jersey

PV System Specifications:

DC Rating (kW):

DC to AC Derate Factor:

DERATE FACTOR HELP

Array Type:

Fixed Tilt or 1-Axis Tracking System:

Array Tilt (degrees): (Default = Latitude)

Array Azimuth (degrees): (Default = South)



“Designed” PV Watts Derate Changes

Calculator for Overall DC to AC Derate Factor

| Component Derate Factors | Component Derate Values |
|--------------------------------|-------------------------|
| PV module nameplate DC rating | 0.95 |
| Inverter and Transformer | 0.92 |
| Mismatch | 0.98 |
| Diodes and connections | 0.995 |
| DC wiring | 0.98 |
| AC wiring | 0.99 |
| Soiling | 0.95 |
| System availability | 0.98 |
| Shading | 1.00 |
| Sun-tracking | 1.00 |
| Age | 1.00 |
| Overall DC to AC derate factor | 0.77 |

2. Allowed to Change.

4. Transcribe to “As-Built” PV Watts page

3. Click “Calculate...”

Calculate Derate Factor

NJCEP guidelines state that **only three (3)** derate values that **may be altered** in the PV Watts Derate Calculator:

- **Module Efficiency** - according to the module label and/or manufacturer’s product specification sheet
- **Inverter Efficiency** - according to the inverter label and/or manufacturer’s product specification sheet
- **Shading** - based upon the shading analysis submitted with the project’s Final As Built documentation
- NJCEP maximum acceptable value = the inverter Max. efficiency% or module lowest power tolerance%.
- *Equipment Spec. sheets must accompany any Derate Value alterations*



Estimated “Designed” PV Watts



Click on **Calculate** if default values are acceptable, or after selecting your system specifications. Click on **Help** for information about system specifications. To use a DC to AC derate factor other than the default, click on **Derate Factor Help** for information.

5. Input “Designed” Data:

- DC Rating (actual system size)
- Derate Factor from Calculator
- Array Type
- True Array Tilt
- True Array Azimuth (orientation)

Click “Calculate”...You’re Done!

Station Identification:

WBAN Number: 14734
City: Newark
State: New_Jersey

PV System Specifications:

DC Rating (kW):

DC to AC Derate Factor:

DERATE FACTOR
HELP

Array Type:

Fixed Tilt

Fixed Tilt or 1-Axis Tracking System:

Array Tilt (degrees):

(Default = Latitude)

Array Azimuth (degrees):

(Default = South)

New Derate
from PV
Watts
Calculator



Estimated “Designed” PV Watts

| Station Identification | |
|--------------------------|------------|
| City: | Newark |
| State: | New_Jersey |
| Latitude: | 40.70° N |
| Longitude: | 74.17° W |
| Elevation: | 9 m |
| PV System Specifications | |
| DC Rating: | 4.0 kW |
| DC to AC Derate Factor: | 0.682 |
| AC Rating: | 2.7 kW |
| Array Type: | Fixed Tilt |
| Array Tilt: | 25.0° |
| Array Azimuth: | 220.0° |
| Energy Specifications | |
| Cost of Electricity: | 11.2 ¢/kWh |

Make sure to review and verify that all final information is based upon actual, “Designed” conditions:

- Location
- DC Rating (system size)
- Derate Factor from Calculator
- Array Type
- True Array Tilt
- True Array Azimuth (orientation)

Transcribe the Annual Estimated kWh production onto the “Final As Built Technical Worksheet”, Section D, 2a.

Annual Estimated kWh

| Year | 4.25 | 3941 | 441.39 |
|------|------|------|--------|
| | | | |



PV Commissioning Form - Draft

Data in Section A is required.

Don't forget temperatures/ Max System Voltage (NEC 690.7)

Sections B & C are for String Commissioning and continue on a separate attachment.

On-Site Readings: Voc & Imp

A: Site Information

1. NJCEP Application #: _____
 2. Date of Commissioning: _____
 3. Site Host Contact Name: (Non-residential use the Company name) _____
 4. Site Address: _____
 5. Technician Name: _____
 6. Time: (HH:MM 12-hour) _____ AM | PM
 7. Utility Meter Serial #: _____
 8. Weather Conditions: (i.e.: Cloudy; Overcast; Partial Cloud; Clear, etc.) _____

9. Currently Producing Watts (Total AC Watts combined from all operational inverters): _____ watts
 10. Voltage (circle one): 208 | 240 | 277 | 480 | 600 | other: _____
 11. Phase (check one): single Φ _____ | three Φ _____
 notes: _____
 12. Total System Size: _____ kW | MW

13. ASHRAE Average High Temp: _____ °C | °F
 14. ASHRAE Record Low Temp: _____ °C | °F
 15. Maximum System Voltage (NEC 690.7): (calculation using ASHRAE average high / record low temps) _____ volts

B: Inverter Production

Are micro-inverters installed? (Use Section D) [†] Yes | No

| 1. Inverter ID | 2. Inverter Serial Number | 3. Instantaneous Production (AC kW) | 4. Imp |
|----------------|---------------------------|-------------------------------------|--------|
| Inverter | | | |
| Inverter | | | |
| Inverter | | | |
| Inverter | | | |
| Inverter | | | |
| Inverter | | | |

C: PV String Measurements

Sections B & C are continued on attachment # _____

| 1. String ID | 2. # of Modules | 3. Voc | 4. Imp |
|--------------|-----------------|--------|--------|
| String | | | |
| String | | | |
| String | | | |
| String | | | |
| String | | | |
| String | | | |



PV System Grounding/Wire Management

Use listed and labeled equipment and install to listing instructions.

Common Installation Mistakes with Module and Array Grounding that result in failure:

- Not installing a grounding conductor on the array at all.
- Using non-Stainless screws with insufficient thread count to fasten grounding lugs to modules.
- Using grounding lugs on PV modules and support structures not listed for outdoor use or for contact with copper wire or aluminum framing.
- Allowing copper equipment grounding conductor to come in contact with the aluminum rails and module frames.
- Bolting aluminum frames to support structures without breaking the anodized aluminum coating to provide effective grounding, then re-sealing aluminum.

One of the most important safety issues with a PV array is that the conductors are properly supported. It is unacceptable for conductors to lay on roofing materials or come in contact with sharp or abrasive surfaces.

Brooks Engineering. "Field Inspection Guidelines for PV Systems." Version 1.1. June 2010: 10. Brooks Engineering. Web. 14 Nov, 2012.



Contact Information

SRP Registration Status or General Questions:

NJCEP Call Center:

1-866-NJSMART (657-6278)

njreinfo@njcleanenergy.com