NREL PVWatts© Calculator

Introduction to the PVWatts Calculator - replaced legacy Versions 1 and 2 in 2015

Disclaimer

- **Disclaimer of Endorsement**
  - Reference herein to any specific commercial products, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the New Jersey Board of Public Utilities (NJBPU), Office of Clean Energy (NJOCE), or Clean Energy Program™ (NJCEP). The views and opinions of authors expressed in the available or referenced documents do not necessarily state or reflect those of the NJBPU, NJOCE, or NJCEP.

NJCEP Requirements

Mandatory

- **"Ideal"** PVWatts
  - DC System Size (kW)
- **"As Built"** PVWatts *(Per Array Plane)*
  - DC System Size (kW)
  - Array Type (*fixed, 1-axis, 2-axis, etc.*)
  - System Losses % (*DC-to-AC Derate Factor*)
  - Tilt (°)
  - Azimuth (°)
  - Inverter Efficiency (%)
- **"As Built"** Loss Calc. (*derate calculator*)
  - (*PV Module*) Nameplate (*DC*) rating (%)
  - Shading (%) [*not "Solar Access" %*]

Optional

- "Ideal" PVWatts
  - "Draw Your System"
- "As Built" PVWatts
  - "Draw your System"
- **Do not alter any further values or options when submitting to the NJCEP.**

NJCEP Requirements

- The guidelines have changed regarding hard-copy submittal of PVWatts and Shading Report. Hard copies are not required to be submitted with the final As-Built packet. ***BUT…***

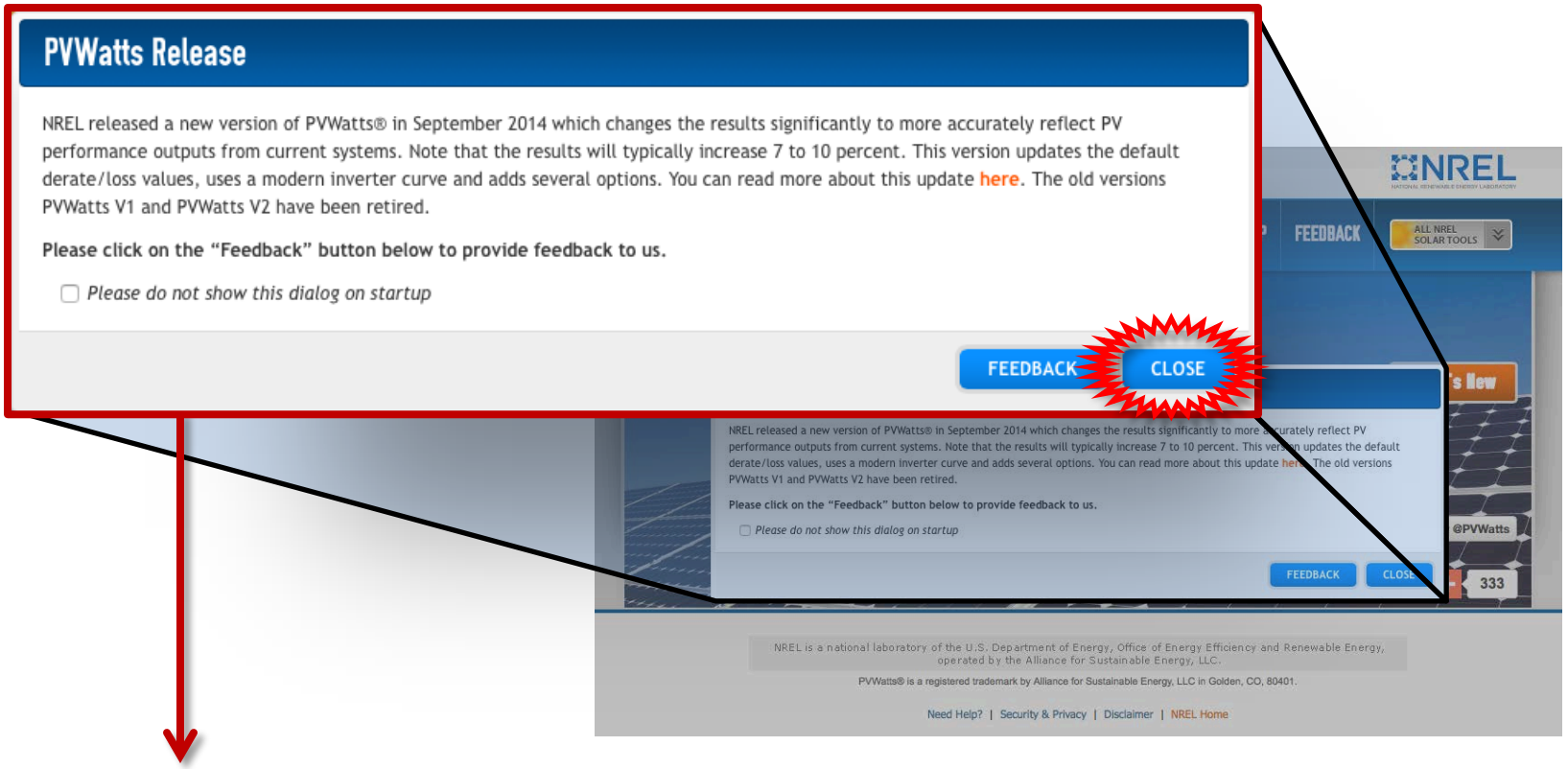
- The NJCEP reserves the right to request a complete copy of production estimates, a full shade analysis, or any relevant documentation from the installer at any time.

NREL Hyperlinks

- **Current NREL Versions accepted by NJCEP**
  - NREL PVWatts Calculator
    - http://pvwatts.nrel.gov/ *(standard interface-click this link to follow slides)*
  - NREL System Advisor Model (SAM)
    - https://**sam**.nrel.gov/ *(advanced design interface)*

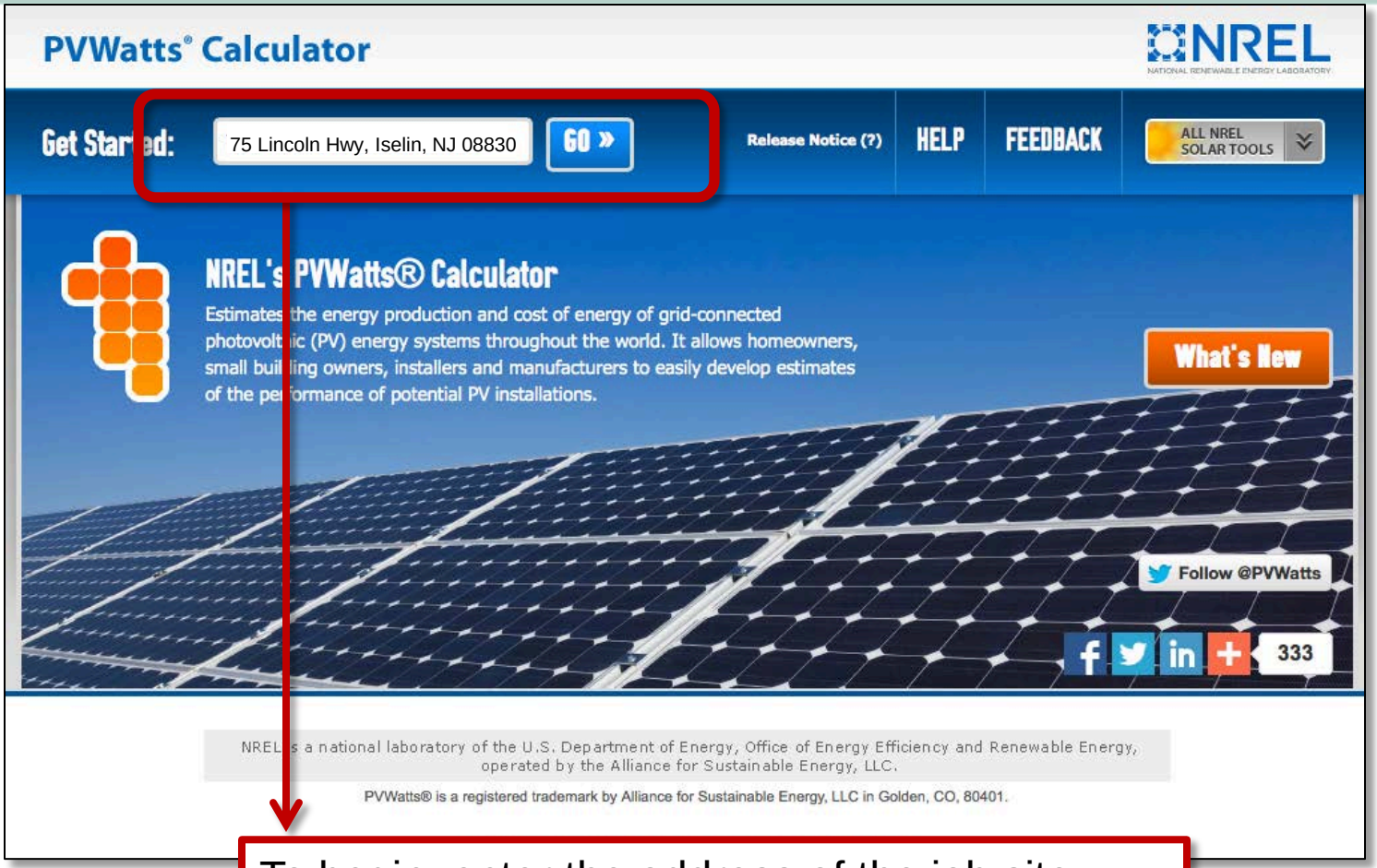
- **Legacy Calculators**
  - PVWatts Version 1 *(RETIRED 2015)*
    - ~~http://rredc.nrel.gov/solar/calculators/PVWATTS/version1/~~
  - PVWatts Version 2 *(RETIRED 2015)*
    - ~~http://gisatnrel.nrel.gov/PVWatts_Viewer/index.html~~

PVWatts Calculator Release



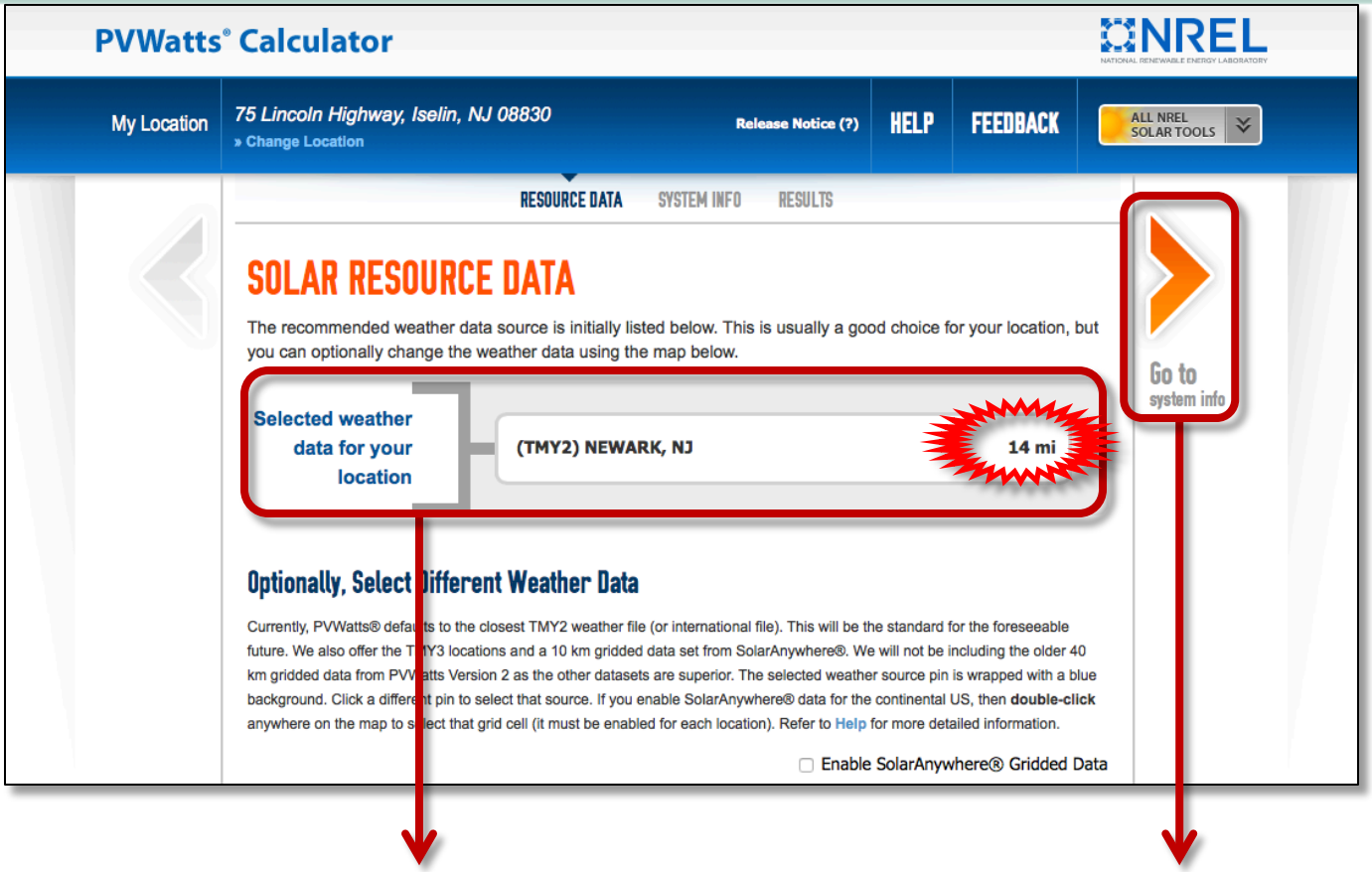
The newest revised version of PVWatts uses updated values. More information on value changes (http://pvwatts.nrel.gov/version_5.php). (click "**Close**" to continue on the site)

NREL's PVWatts Calculator



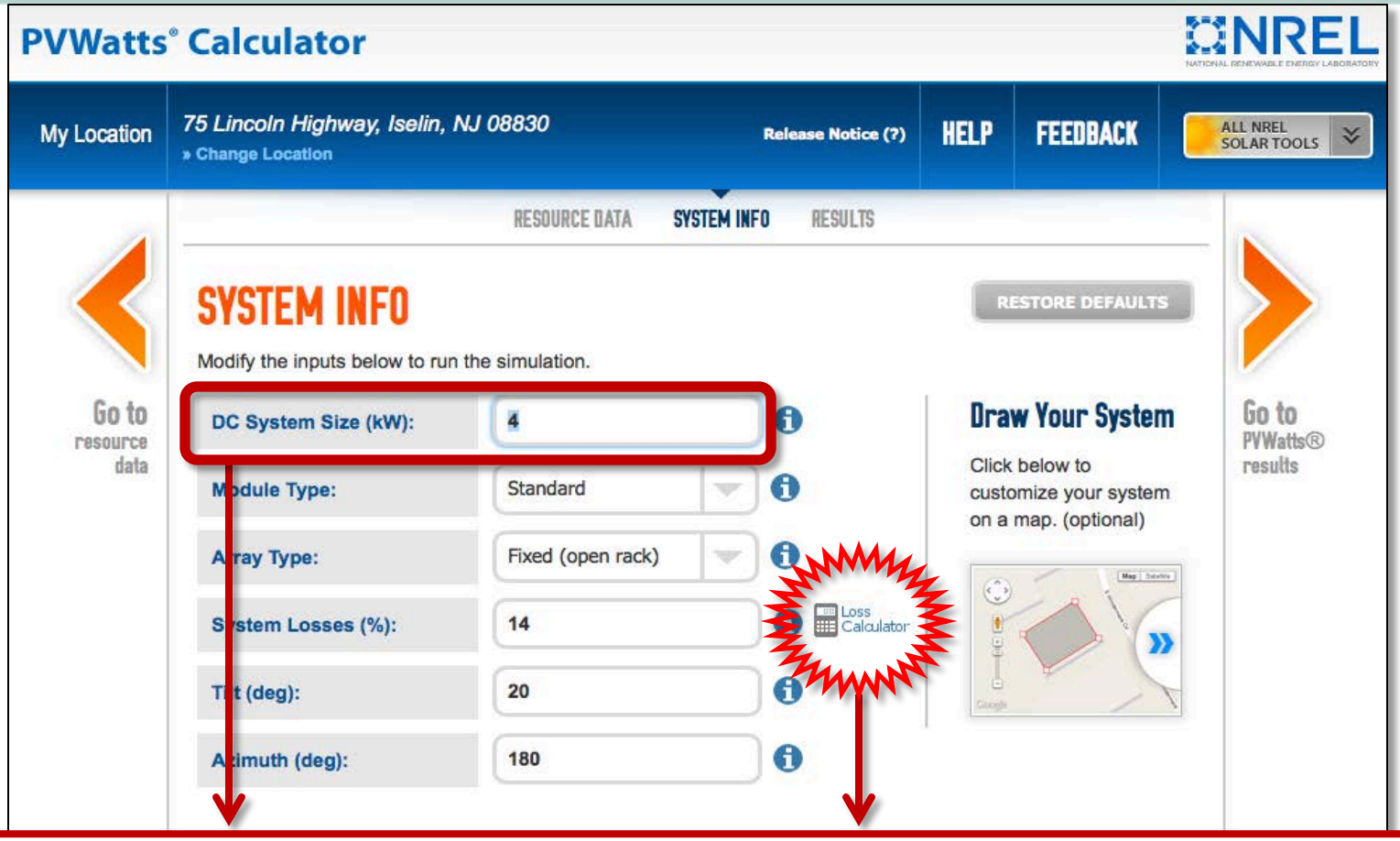
To begin, enter the address of the job site, then click on "**GO >>**".

NREL's PVWatts Calculator



Confirm that the default weather station is optimal for the site address. Select "**Go To system info**" to continue.

“Ideal” PVWatts Calculator

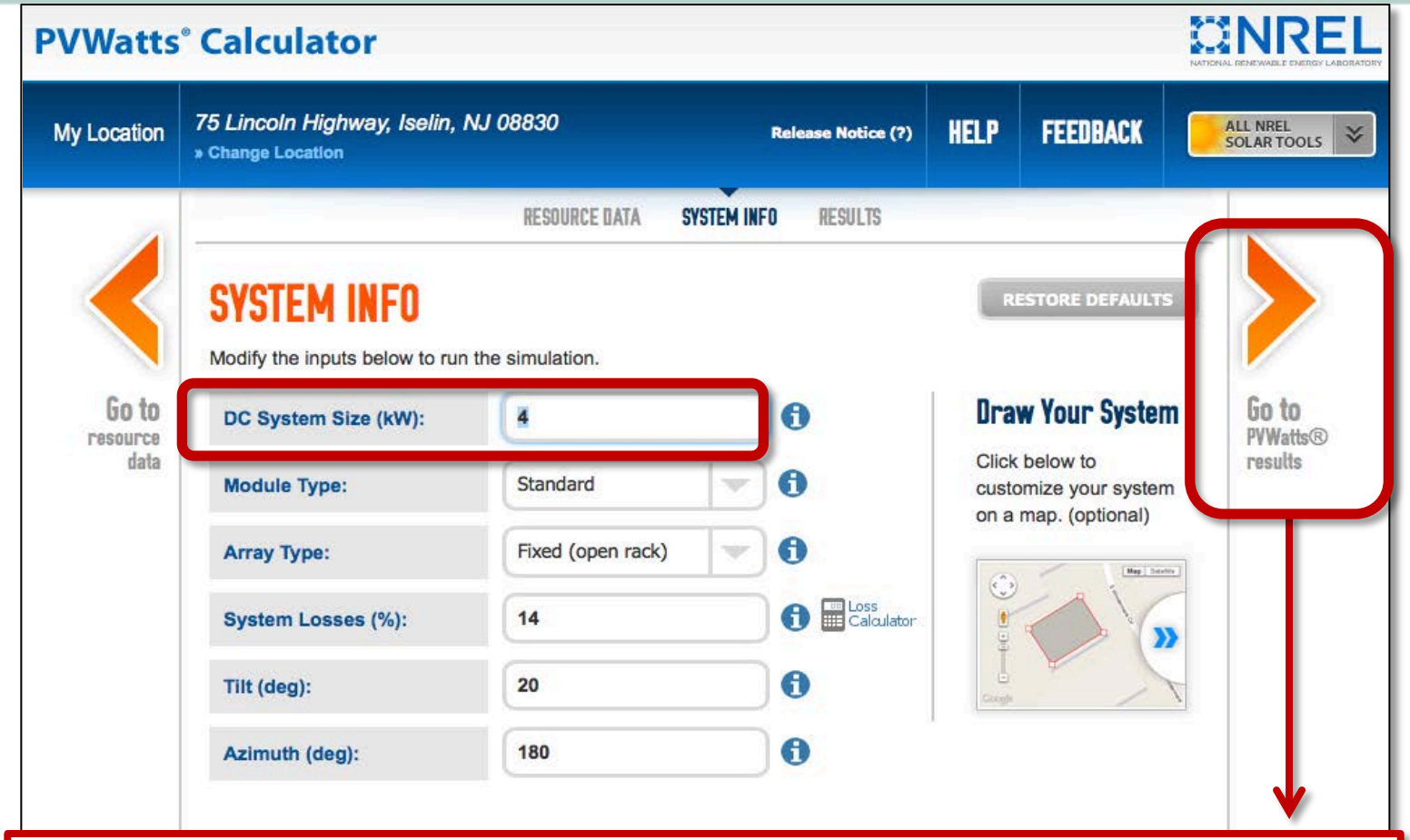


For **“Ideal” PVWatts, only change “DC System Size (kW)”**. All other values remain default. System Losses (%) remains “14”. Click on “**Loss Calc.**” to view.

“Ideal” Derate Calculator

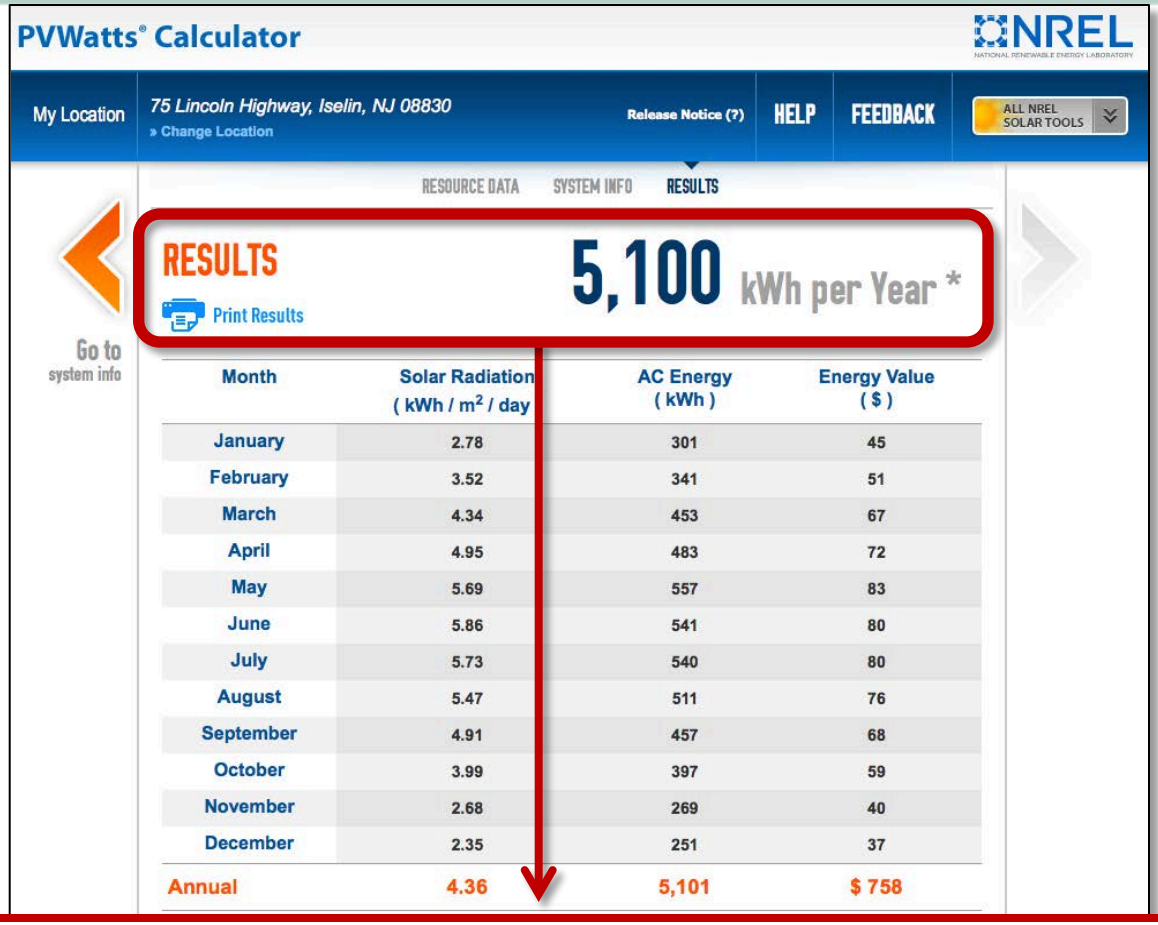
For “***Ideal***” PVWatts, **no values should be altered**. The “**Estimated DC to AC Factor**” should remain “**14%**.” Screen capture of the “Ideal Derate Calculator” is not required. Click “**Cancel**” to return to previous page without changes.

“Ideal” PVWatts Calculator



Verify only the “**DC System Size (kW)**” changed. Then click “**Go to PVWatts results**” to generate “Ideal” summary.

“Ideal” PVWatts Calculator



PVWatts® Calculator

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

My Location | 75 Lincoln Highway, Iselin, NJ 08830 » Change Location | Release Notice (?) | HELP | FEEDBACK | ALL NREL SOLAR TOOLS

RESOURCE DATA | SYSTEM INFO | RESULTS

Go to system info

RESULTS

Print Results

5,100 kWh per Year *

Month	Solar Radiation (kWh / m² / day)	AC Energy (kWh)	Energy Value ($)
January	2.78	301	45
February	3.52	341	51
March	4.34	453	67
April	4.95	483	72
May	5.69	557	83
June	5.86	541	80
July	5.73	540	80
August	5.47	511	76
September	4.91	457	68
October	3.99	397	59
November	2.68	269	40
December	2.35	251	37
Annual	4.36	5,101	$ 758

The results page displays the “***Ideal*** Estimated Annual Production” required on the NJCEP Final As Built Technical Worksheet, **Page 2, Section D, 2b**.

Roof Azimuth

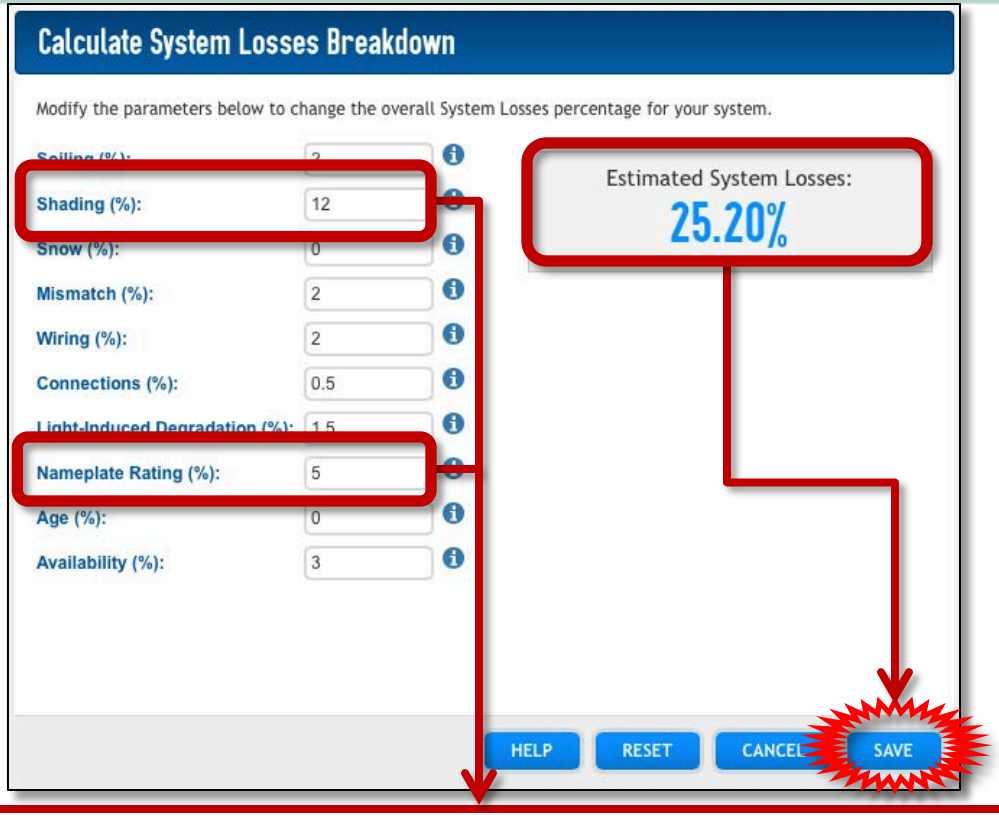
Capture the Azimuth measurement either on-site or by utilizing an available online measurement tool. For this example, we will use orientation **228.1°**.

(Example screen capture from Solmetric.com, Roof Azimuth Tool)

“As Built” PVWatts Calculator

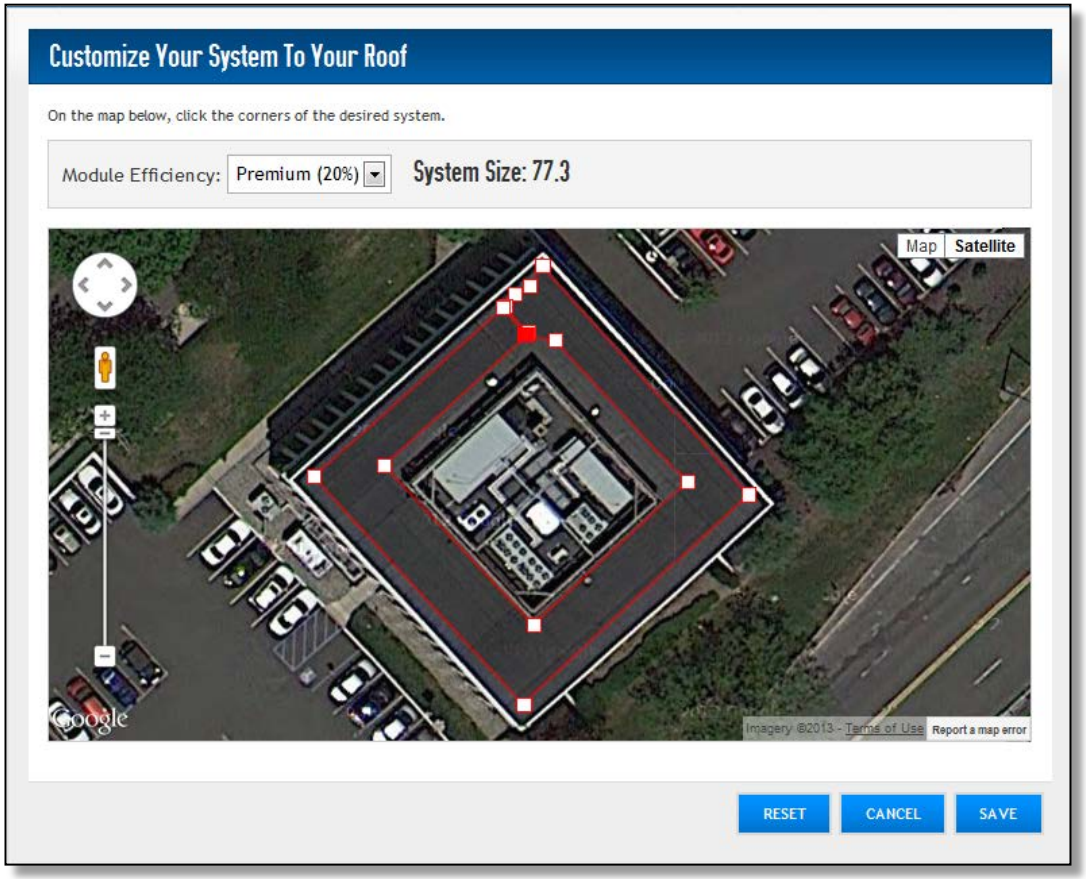
- For “***As Built***” PVWatts, change all system information, <u>*as permissible within NJCEP*</u>. Input “**Inverter Efficiency (%)**”, based upon manufacturer-specification.
- Update Derate Factor to reflect equipment and shading using the “**Loss Calulator**”. Click on “**Loss Calculator**” to view.

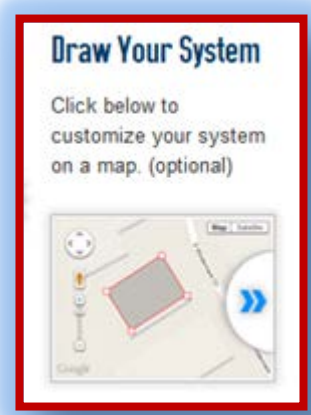
“As Built” Derate Calculator



- “***As Built***” PVWatts, only change “**(PV Module) Nameplate Rating (%)**” [*i.e.. power tolerance factor*], and **Shading (%)** [*not Solar Access %*].
- **Save a Screen Capture** of the “As Built Derate Calculator”.
- Click “**Save**” to apply the updated “Derate Factor”/System Losses.

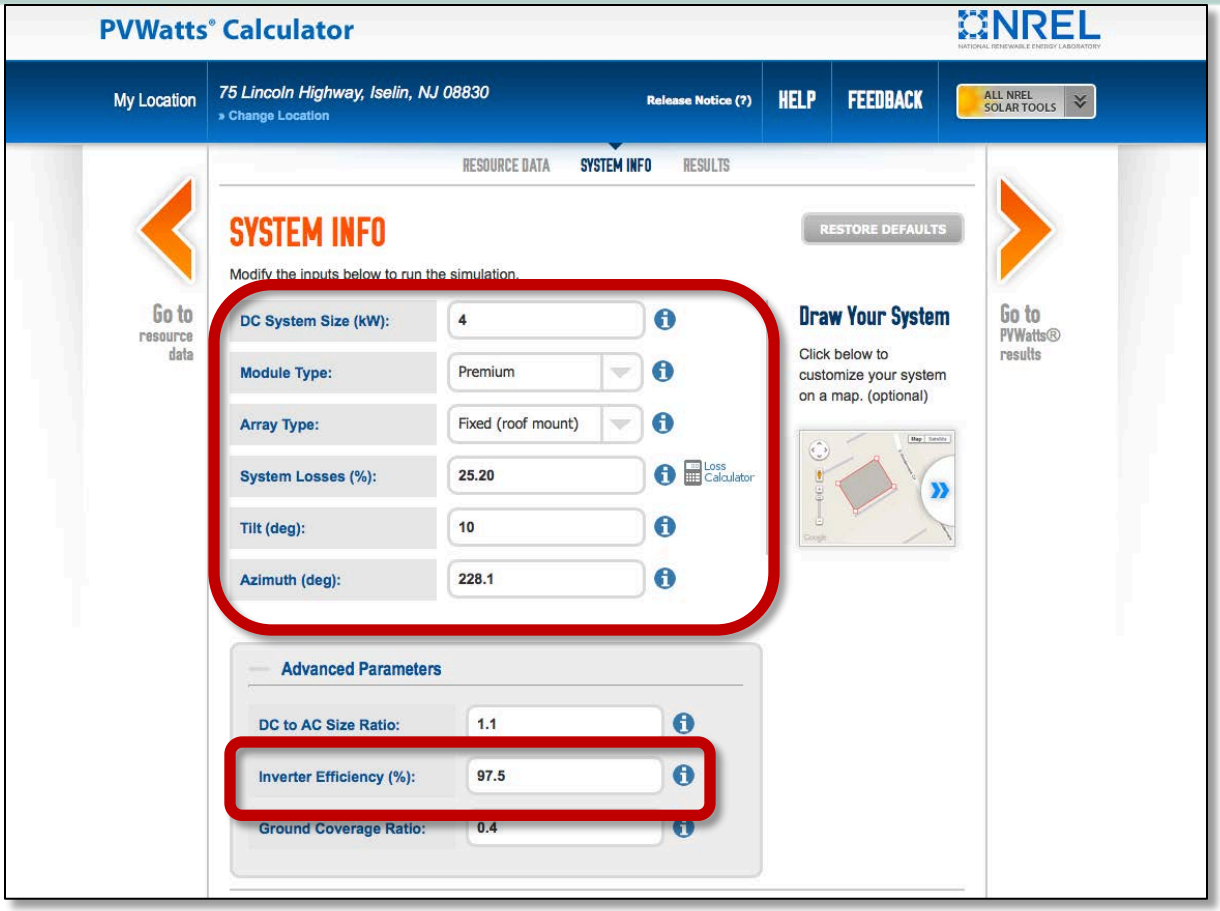
“Draw Your System” (Optional)





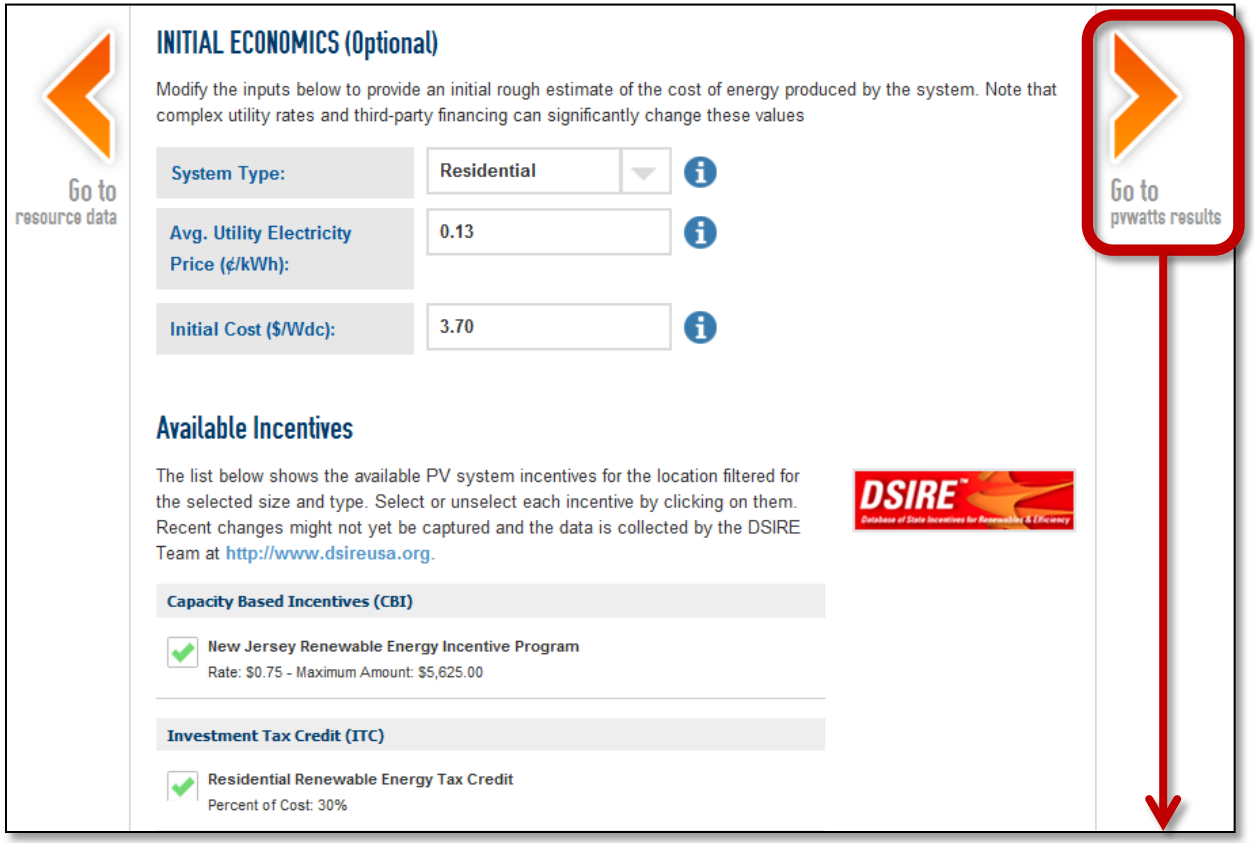
You may optionally “Draw Your System” using the corresponding button, but this feature does not print out with the summary report. **Not NJCEP-required.**

“As Built” PVWatts Calculator



Verify the “**System Info**” is all correct. Confirm that the “System Losses (%)” represents the final value from the Loss Calculator. Scroll down the screen.

“As Built” PVWatts Calculator



Scrolling down further on the page will reveal information that is not required to be selected or altered. Not required by the NJCEP. Finally, click “**Go to pvwatts results**” to generate “***As Built***” PVWatts summary.

PVWatts Summary Page

NREL

Caution: Photovoltaic system performance predictions calculated by PVWatts® include many inherent assumptions and uncertainties and do not reflect variations between PV technologies nor site-specific characteristics except as represented by PVWatts® inputs. For example, PV modules with better performance are not differentiated within PVWatts® from lesser performing modules. Both NREL and private companies provide more sophisticated PV modeling tools (such as the System Advisor Model at http://sam.nrel.gov) that allow for more precise and complex modeling of PV systems.

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RESULTS

4,159 kWh per Year *

Month	Solar Radiation (kWh / m² / day)	AC Energy (kWh)	Energy Value ($)
January	2.26	209	31
February	3.01	250	37
March	3.94	358	53
April	4.74	407	61
May	5.64	489	73
June	5.89	484	72
July	5.74	484	72
August	5.30	444	66
September	4.52	374	56
October	3.45	301	45
November	2.19	189	28
December	1.88	170	25
Annual	4.05	4,159	$ 619

Location and Station Identification

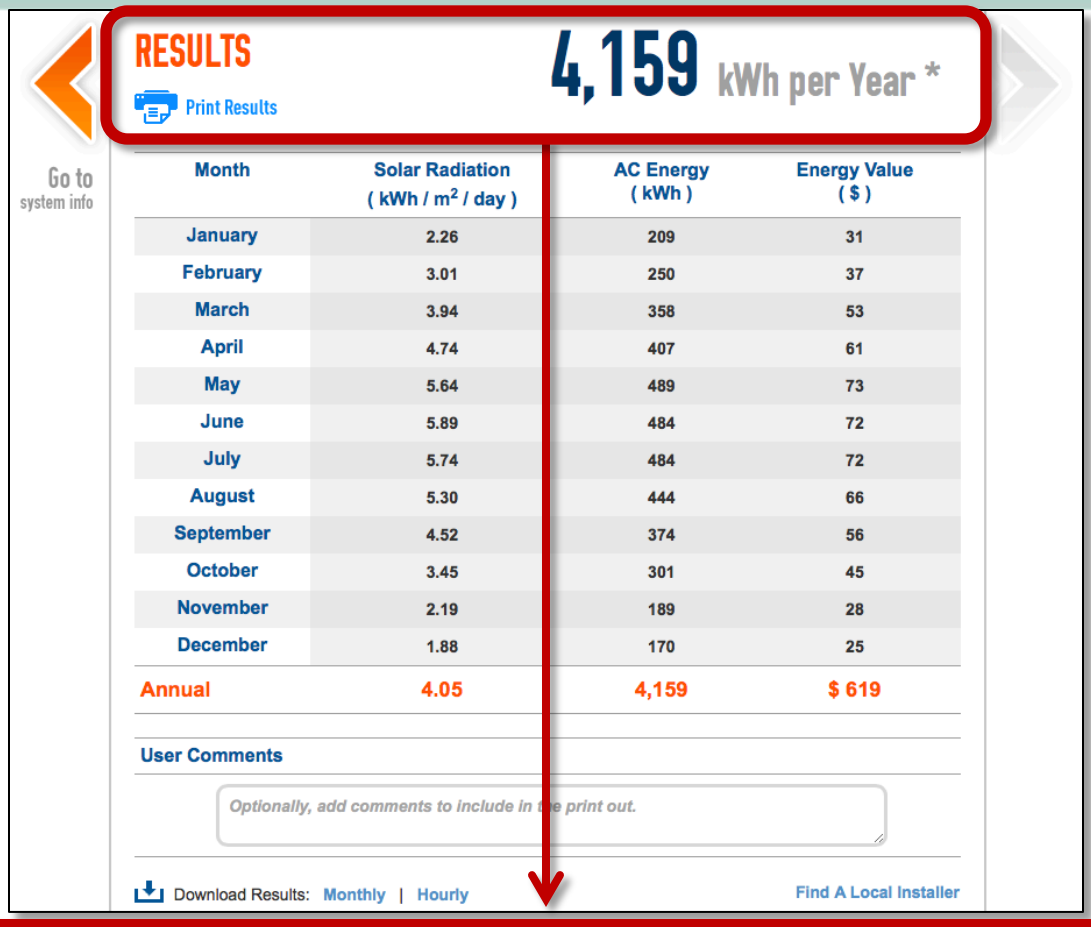
Requested Location	75 Lincoln Highway, Iselin, NJ 08830
Weather Data Source	(TMY2) NEWARK, NJ 14 mi
Latitude	40.7° N
Longitude	74.17° W

PV System Specifications *(Residential)*

DC System Size	4 kW
Module Type	Premium
Array Type	Fixed (roof mount)
Array Tilt	10°
Array Azimuth	228.1°
System Losses	25.20%
Inverter Efficiency	97.5%
DC to AC Size Ratio	1.1

(Example of the "As-Built" PVWatts Results Page)

"As Built" PVWatts Summary



RESULTS

Print Results

4,159 kWh per Year *

Go to system info

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User Comments

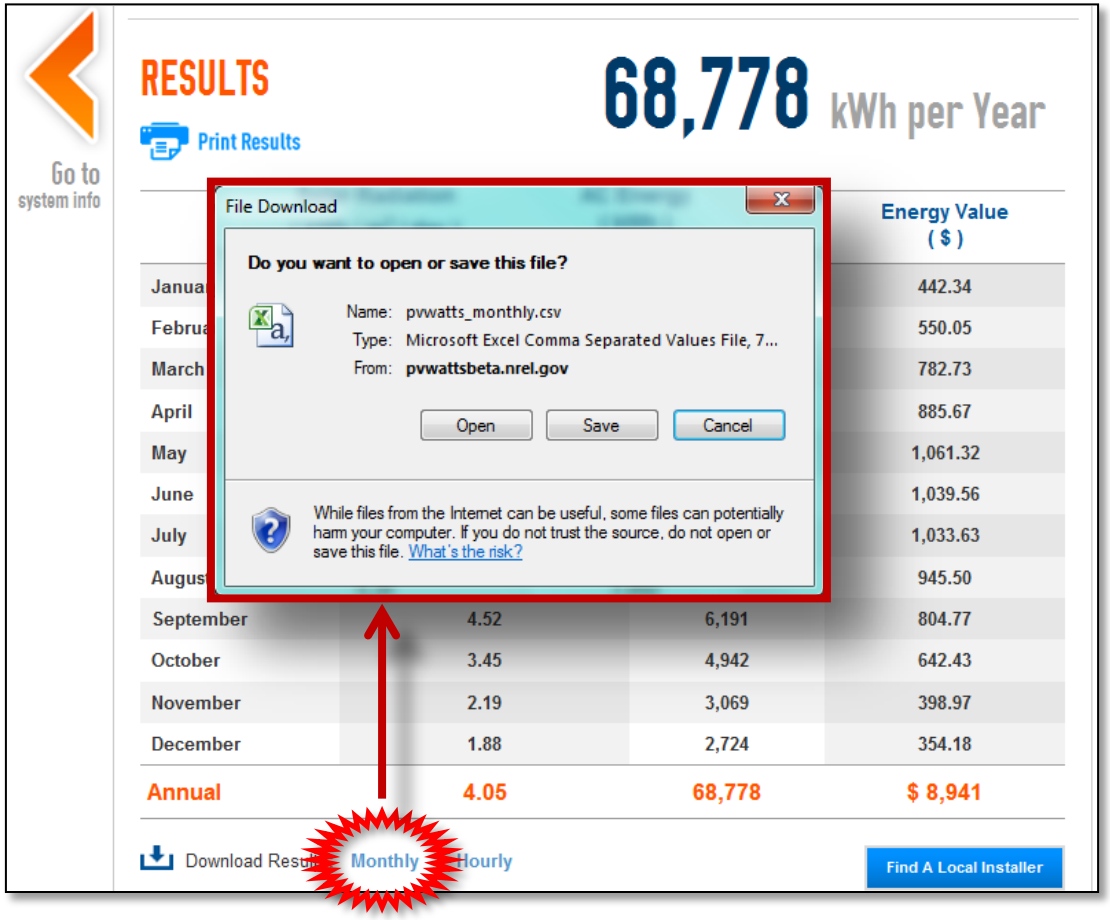
Optionally, add comments to include in the print out.

Download Results: Monthly | Hourly

Find A Local Installer

The results page displays the "***As-Built*** Estimated Annual Production" required on the NJCEP Final As Built Technical Worksheet, **Page 3, Section D, 2a**.

“As Built” PVWatts Summary



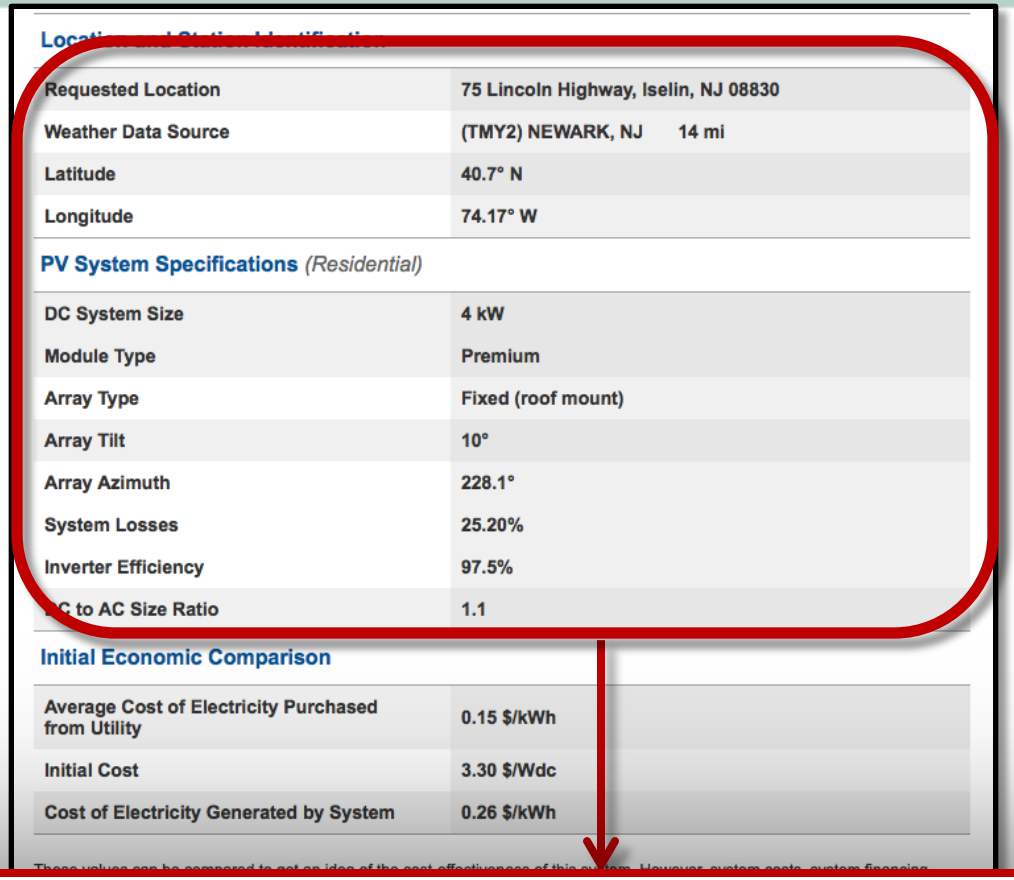
For a “Monthly” or “Hourly” report, click on the coordinating button to save/print.

"As Built" PVWatts Summary

PVWatts: Monthly PV Performance Data					
Requested Location:	75 Lincoln Highway, Iselin, NJ 08830				
Location:	NEWARK, NJ				
Lat (deg N):	40.7				
Long (deg W):	74.17				
Elev (m):	9				
DC System Size (kW):	4				
Module Type:	Premium				
Array Type:	Fixed (roof mount)				
Array Tilt (deg):	10				
Array Azimuth (deg):	228.1				
System Losses:	25.2				
Invert Efficiency:	97.5				
DC to AC Size Ratio:	1.1				
Average Cost of Elect	0.15				
Initial Cost	3.3				
Cost of Electricity Ge	0.26				
Month	AC System Output(kV	Solar Radiation (kWh	Plane of Array Irradia	DC array Output (kW	Value ($)
1	208.5287476	2.26105666	70.09275818	217.113266	31.03
2	250.27742	3.00999665	84.27990723	259.4143982	37.24
3	357.5105896	3.93590069	122.0129242	369.4858093	53.2
4	406.8931885	4.74304867	142.2914581	420.4057617	60.55
5	489.4229736	5.64286804	174.9289093	504.6875916	72.83
6	484.1106873	5.88504219	176.5512695	499.7634583	72.04
7	484.0104065	5.73821592	177.8846893	499.4909668	72.02
8	444.1933289	5.29734945	164.2178345	458.3167114	66.1
9	373.9916992	4.51975107	135.5925293	386.2345276	55.65
10	300.553833	3.44738007	106.868782	311.1755981	44.72
11	189.0877228	2.19017267	65.70517731	197.4369354	28.14
12	170.1273346	1.87966979	58.26976395	178.2002106	25.31
Total	4158.707932	48.55045187	1478.696003	4301.725235	618.83

The "Monthly" or "Hourly" report can be saved/printed from the generated spreadsheet, which may be used in advanced design planning. **Not NJCEP-Required**.

“As Built” PVWatts Summary



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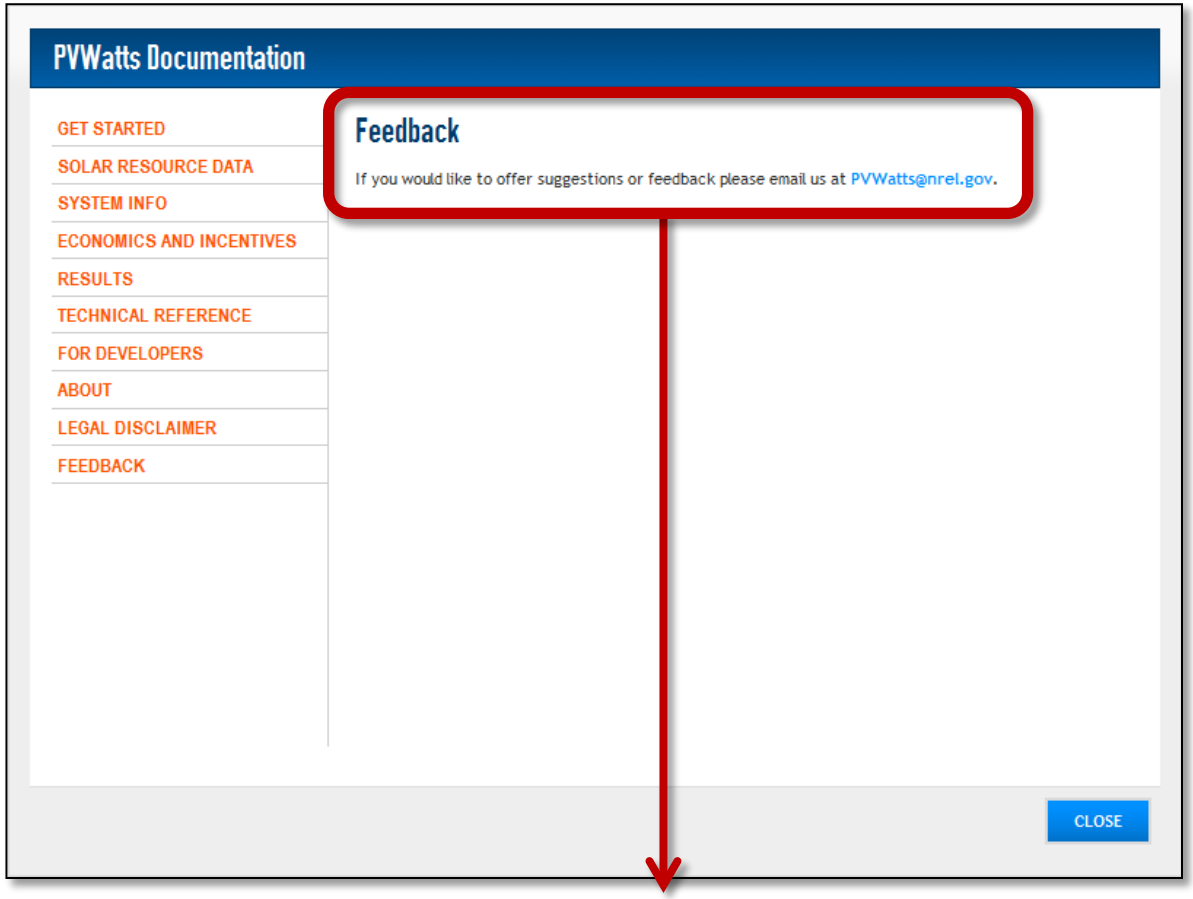
DC to AC Size Ratio	1.1

Initial Economic Comparison

Average Cost of Electricity Purchased from Utility	0.15 $/kWh
Initial Cost	3.30 $/Wdc
Cost of Electricity Generated by System	0.26 $/kWh

Verify all information was entered properly and measurements are accurate. Save a copy of the “***As-Built***” and “***Ideal***” PVWatts summary pages for your records.

PVWatts Feedback



For feedback regarding the PVWatts Calculator, email comments to PVWatts@nrel.gov.

Questions?

For questions pertaining to the NJCEP requirements within Final As Built Completion Packets, please refer to the following:

- SREC Registration Program Guidebook
  http://www.njcleanenergy.com/files/file/Renewable_Programs/RE%20Forms/2012/SRP_Guidebook_2012_Ch8revrr_6_26_12.pdf

- SREC Registration Program Checklist
  - Solar SRP Final As-Built Forms (updated Jan 2015) - .xlsx version (Excel 2010)
  - Solar SRP Final As-Built Forms (updated Jan 2015) - .xls version (Excel 2003-2007)
    - Note: Microsoft provides an Office Compatibility Pack for those users that are still using the earlier version of Excel (.xls).

- call: 866-NJSMART (866-657-6278)