

# Pay for Performance EB Technical Tip

## Modeling PV in Existing Buildings

---

This technical tip pertains to existing building facilities with on-site PV during baseline year analysis period.

Like most on-site generation equipment, solar PV panels are not an eligible measure in the program and cannot contribute to the 15% savings target. Incentives for PV panels or related SRECs may be available separately from the NJCEP Renewable Energy Programs. Information regarding this program can be found at [www.njcleanenergy.com/renewable](http://www.njcleanenergy.com/renewable).

If PV is implemented in the project at any point during P4P participation, it must be separately metered. The metered data must be added back into the building utility data for Incentive #3 submittal to ensure that P4P incentives are not paid for savings related to renewable energy measures.

Existing PV energy equipment must have at least 12 months of historic metered data, must be added to the baseline building utility bills, and must be included within the baseline building model and Model Calibration Tool.

While this technical tip provides an example on how to model PV using eQuest, the same concepts shall be applied to other approved software packages such as Trane Trace, Carrier HAP, and DOE2.1. If the modeling software does not allow explicit PV modeling, PV Watts can be used to calculate solar energy generation.

### Key Inputs

- Capacity – capacity of the generator in kW (per inverter if applicable)
- PV Module
- Mount Type
- Number of Inverters

### ERP Documentation

The existing parameters used in Simulation must be clearly detailed in the ERP. The details may be included in the “Other Mechanical Systems” table of the “Mechanical” tab of the ERP tables. The PV meter should be entered as a separate meter in the utility tab so that measure savings from the model can be allocated amongst grid kWh, solar kWh, natural gas, etc. Although unlikely, any energy efficiency measure that also results in additional solar kWh

## Modeling PV in Existing Buildings

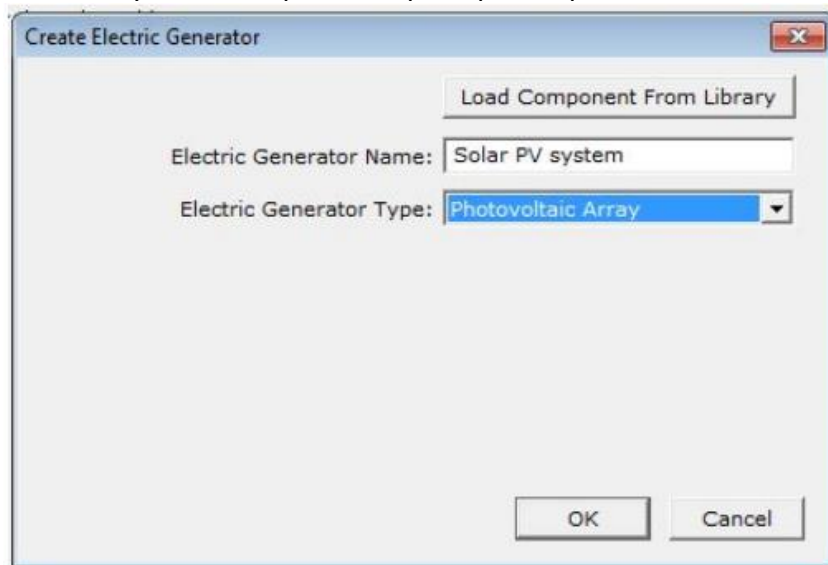
generation does not qualify for incentives but can count towards the 15% source energy savings target.

### Model Calibration

For calibration purposes, any kWh associated with PV may be bundled with grid kWh and calibrated per the typical process.

### Example: Modeling PV in eQuest

To model PV in eQuest, create an electric generator, then select PV array. Using the characteristics of the PV system, complete the prompted inputs.



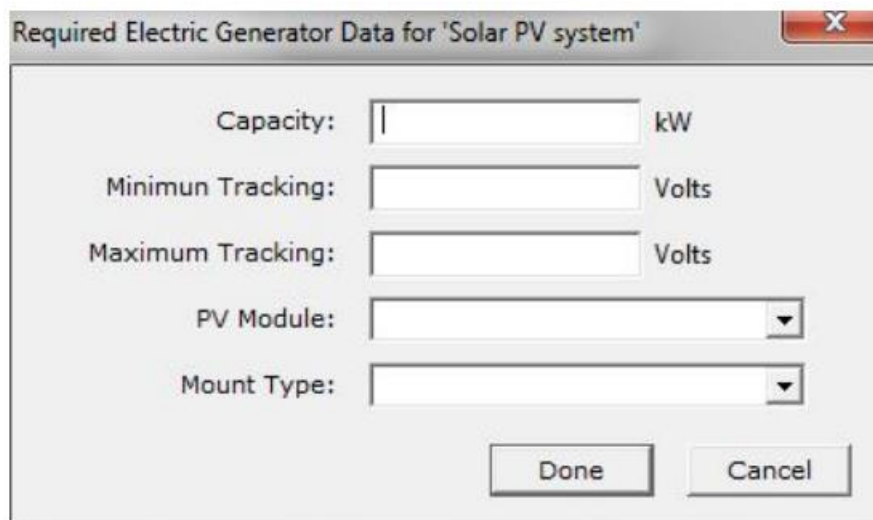
Create Electric Generator

Load Component From Library

Electric Generator Name: Solar PV system

Electric Generator Type: Photovoltaic Array

OK Cancel



Required Electric Generator Data for 'Solar PV system'

Capacity: | kW

Minimum Tracking: Volts

Maximum Tracking: Volts

PV Module:

Mount Type:

Done Cancel

## Modeling PV in Existing Buildings

\*If using building surface for the mount type, select the exterior wall or roof where the PV system is installed. The Sandia Laboratory in Los Alamos, New Mexico, USA maintains a database of PV modules that may be downloaded from their website.

Once the PV Array is created, a separate electric meter must be assigned. This can be done on the Electric Generator Properties tab.

The screenshot shows the 'Electric Generator Properties' dialog box. At the top, 'Currently Active Electric Generator' is set to 'PV Array' and 'Type' is 'Photovoltaic Array'. The 'Basic Specifications' tab is selected. The 'Electric Generator Name' is 'PV Array' and 'Type' is 'Photovoltaic Array'. The 'Meter Assignments' section includes: Fuel Meter (n/a), Electric Meter (EM2), and Surplus Meter (- undefined -). The 'Equipment Capacity' section includes: Capacity (4.000 kW), # of Inverters (2), Minimum Ratio (0.02 ratio), and Maximum Ratio (1.10 ratio). The 'Equipment Efficiency' section includes: Mechanical Efficiency (n/a ratio), Heat Input Ratio (n/a ratio), and Elec Input Ratio (1.0400 ratio). The 'Availability' section includes: Start-up Time (n/a h).

Once completed, you can use the component tree to select the PV Module and change the input data as necessary.

\*If surplus power generated is sold, a surplus meter should be specified as well. The meter type specified shall be "Electric-sale"

## Modeling PV in Existing Buildings

**Photovoltaic Module Properties**

Currently Active PV Module: **ACME SunSoaker 250**

Basic Specifications | Sandia/King Algorithm

Module Name: **ACME SunSoaker 250**

Module Type: **Multi-Crystalline Silicon**

Simulation: **Standard Model**

Glazing Type: **Smooth**

Dimensions: Height: **6.20** ft  
Width: **4.21** ft

Performance Data

Open Circuit Voltage, Voc: **62.00** Volts

Voc Temperature Coef, BVoc: **-0.1267** Volts/°C

Short Circuit Current, Isc: **6.20** amps

Isc Temperature Coef, aIsc: **0.00344** 1/°C

Max Power Voltage, Vmp: **50.50** Volts

Max Power Current, Imp: **5.65** amps

Cell - Back Surface dT: **2.0** °C

Irradiance Performance Curves

f(effective air mass): **mc-Si Spectral-fAirMass**

f(sun's angle of incid.): **Smooth Optical-fAOI**

The PS-H Loads and Energy Usage report will show the results of the simulation.

Solar PV system - Baseline Design - D2SimViewer

Report: PS-H Loads and Energy Usage for | Component: Chilled Water Loop

Chilled Water Loop  
Condenser Water Loop  
CHW Loop Pump  
CW Loop Pump  
Chiller1 (ERecipHerm)  
Open Tower  
Solar PV system  
ACME SunSoaker 250

Solar PV system

REPORT - PS-H Loads and Energy Usage for Chilled Water Loop WEATHER FILE- EPW AMMADABAD, -, IND

		HEATING CAPACITY (MBTU/HR)	COOLING CAPACITY (MBTU/HR)	LOOP FLOW (GAL/MIN)	TOTAL HEAD (FT)	SUPPLY UA PRODUCT (BTU/HR-F)	SUPPLY LOSS DT (F)	RETURN UA PRODUCT (BTU/HR-F)	RETURN LOSS DT (F)	LOOP VOLUME (GAL)	FLUID HEAT CAPACITY (BTU/LB-F)						
		0.000	2.371	470.0	41.6	0.0	0.00	0.0	0.00	708.0	1.00						
		COIL LOAD (MBTU)	PIPE GAIN (MBTU)	NET LOAD (MBTU)	OVERLOAD (MBTU)	Number of hours within each				PART LOAD range	TOTAL						
MON	SUM	PEAK (MBTU/HR)	DAY/HR	PEAK (MBTU/HR)	DAY/HR	00	10	20	30	40	50	60	70	80	90	100	RDN
JAN		SUM 132.968	0.000	137.641	0.000	COOL 56	2	50	112	11	0	0	0	0	0	0	231
PEAK		1031.849	0.000	1051.168	0.000	FLOW 0	0	0	0	0	0	0	0	0	0	0	231
DAY/HR		18/16	0/0	18/16	0/0												
FEB		SUM 158.496	0.000	162.588	0.000	COOL 24	3	24	108	40	9	1	0	0	0	0	209
PEAK		1513.751	0.000	1520.753	0.000	FLOW 0	0	0	0	0	0	0	0	0	0	0	209
DAY/HR		11/8	0/0	11/8	0/0												
MAR		SUM 250.328	0.000	254.848	0.000	COOL 0	0	3	46	120	43	17	3	0	0	0	231
PEAK		1875.234	0.000	1877.590	0.000	FLOW 0	0	0	0	0	0	0	0	0	0	0	231
DAY/HR		25/8	0/0	25/8	0/0												
APR		SUM 306.289	0.000	311.029	0.015	COOL 0	0	0	3	106	74	37	15	5	1	1	242
PEAK		2409.343	0.000	2394.598	14.599	FLOW 0	0	0	0	0	0	0	0	0	0	0	242
DAY/HR		29/8	0/0	29/8	29/8												
MAY		SUM 355.395	0.000	360.136	0.223	COOL 0	0	0	0	21	105	56	34	19	4	3	242
PEAK		2549.449	0.000	2413.332	134.428	FLOW 0	0	0	0	0	0	0	0	0	0	0	242
DAY/HR		28/8	0/0	20/8	28/8												
JUN		SUM 347.873	0.000	352.183	0.119	COOL 0	0	0	0	1	46	104	40	21	5	3	220
PEAK		2541.714	0.000	2421.740	119.582	FLOW 0	0	0	0	0	0	0	0	0	0	0	220
DAY/HR		10/8	0/0	24/8	10/8												
JUL		SUM 343.414	0.000	348.154	0.000	COOL 0	0	0	0	2	32	98	53	34	15	1	242
PEAK		2418.888	0.000	2407.768	0.000	FLOW 0	0	0	0	0	0	0	0	0	0	0	242
DAY/HR		8/8	0/0	8/8	0/0												