INTERACTIVE SYSTEM SIZING

1 P_{mp} Enter the maximum DC power rating (at STC) for the chosen module.

2 C_g Enter a derating factor for manufacturer power guarantee. Due to small differences between cells, not every module designed for a certain rating will exactly equal that rating. It may be slightly less than the rating, but the manufacturer may guarantee that it will be at least a certain percentage, typically 90% (0.90), of the rating.

3 n_m Enter the number of modules in the array.

4 $P_{arr\text{-}g}$ Calculate the minimum guaranteed power output of the array.

$$P_{arr\text{-}g} = P_{mp} \times C_g \times n_m$$

$$\textbf{4} = \textbf{1} \times \textbf{2} \times \textbf{3}$$

5 T_{amb} Enter the average expected module operating temperature.

6 $C_{\%P}$ Enter the relative temperature coefficient for power. This value may be given by the module manufacturer. Otherwise, typical values range from –0.4%/°C to –0.5%/°C (–0.004/°C to –0.005/°C).

7 $P_{arr\text{-}T}$ Calculate the temperature-corrected array power output.

$$P_{arr\text{-}T} = P_{arr\text{-}g} + (P_{arr\text{-}g} \times C_{\%P} \times [T_{amb} - 25])$$

$$\textbf{7} = \textbf{4} + (\textbf{4} \times \textbf{6} \times [\textbf{5} - 25])$$

8 C_{loss} Enter a factor to account for power losses due to wiring and module mismatch. A typical value is 3% (0.03).

9 $P_{arr\text{-}net}$ Calculate the net array power output.

$$P_{arr\text{-}net} = P_{arr\text{-}T} - (P_{arr\text{-}T} \times C_{loss})$$

$$\textbf{9} = \textbf{7} - (\textbf{7} \times \textbf{8})$$

10 $P_{inv\text{-}DC}$ Enter the inverter maximum DC power input rating. This value should be given in the inverter specifications.

11 η_{inv} Enter the inverter power conversion efficiency. This value should be given in the inverter specifications. Typical values range from 90% to 95% (0.90 to 0.95).

12 η_{MPPT} Enter the inverter MPPT efficiency. This value can be as high as 100% (1.00)

13 $P_{inv\text{-}AC}$ Calculate the inverter maximum AC power output. This calculation depends on its input rating.

If the inverter maximum DC power input rating is greater than or equal to the maximum array output, the array output is used to calculate the inverter output.

If $P_{inv\text{-}DC} \geq P_{arr\text{-}net}$, then $P_{inv\text{-}AC} = P_{arr\text{-}net} \times \eta_{inv} \times \eta_{MPPT}$

If **10** ≥ **9**, then **13** = **9** × **11** × **12**

If the inverter maximum DC power input rating is less than the maximum array output, the inverter DC input rating is used to calculate the inverter output.

If $P_{inv\text{-}DC} < P_{arr\text{-}net}$, then $P_{inv\text{-}AC} = P_{inv\text{-}DC} \times \eta_{inv} \times \eta_{MPPT}$

If **10** < **9**, then **13** = **10** × **11** × **12**

14 PSH Enter the average daily insolation for the location and array orientation. This may be an average for either a certain month or the entire year.

15 E Calculate average daily energy production during the chosen period (month or year). To convert from watt-hours to kilowatt-hours, divide by 1000.

$$E = P_{inv\text{-}AC} \times PSH$$

$$\textbf{15} = \textbf{13} \times \textbf{14}$$

If the final system output is not within the desired range, such as above a minimum size requirement for an incentive program, different module and/or inverter choices can be made that change the calculation results.

Interactive System Sizing Worksheet

PV-Module Rated DC Power Output	1	W
Manufacturer Power Guarantee	2	
Number of Modules in Array	3	
Array Guaranteed Power Output	4	W
Array Avg Operating Temperature	5	°C
Temperature Coefficient for Power	6	/°C
Temperature-Corrected Array Power Output	7	W
Array Wiring and Mismatch Losses	8	
Net Array Power Output	9	W
Inverter Maximum DC Power Rating	10	W
Inverter Power Conversion Efficiency	11	
Inverter MPPT Efficiency	12	
Inverter Maximum AC Power Output	13	W
Average Daily Insolation	14	PSH/day
Average Daily Energy Production	15	Wh/day
	15	kWh/day

Input values that are entered into calculations

Output values that must be calculated or determined