




## **SAM Webinars 2017: Sizing Photovoltaic Systems in SAM 2017.1.17**

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August 10, 2017

- Overview of New Industrial Process Heat and CSP Capabilities, May 17
- Modeling Molten Salt Power Tower Systems, May 18
- Electricity Rates and Monthly Bill Savings for Residential and Commercial Projects, June 1
- Modeling PV-Battery Systems, July 13
- **Sizing Photovoltaic Systems, August 10**
- SAM Open Source, September 21

# Registration Links and Webinar Recordings



The screenshot shows a web browser window displaying the NREL System Advisor Model (SAM) website. The page title is "Webinars and Round Tables" and it was published by Paul Gilman on Thu, 2015-05-21 14:51. The page features a navigation menu with links for HOME, DOWNLOAD, SDK, SUPPORT, RESOURCES, CONTACT, ACCOUNT, and ABOUT. The main content is organized into three sections: Webinars, Round Tables, and Recordings of Past Webinars. A large blue box at the bottom right of the page contains the URL <https://sam.nrel.gov/webinars>.

Webinars and Round Tables

published by Paul Gilman on Thu, 2015-05-21 14:51

### Webinars

SAM webinars are one-hour lectures with question and answer sessions that cover various topics about SAM. All webinars are free and start at 2 pm Mountain. To register for a webinar, click its name in the following list.

- Overview of New Industrial Process Heat and CSP Capabilities, Wed May 17 2017
- Modeling Molten Salt Power Tower Systems, Thu May 18 2017
- Electricity Rates and Monthly Bill Savings for Residential and Commercial Projects, Thu Jun 1, 2017
- Modeling PV-Battery Systems, Thu Jul 13 2017
- Sizing Photovoltaic Systems, Thu Aug 10 2017
- SAM Open Source, Thu Sep 21 2017

### Round Tables

SAM round tables are 30-minute informal discussions online with the SAM team.

- Round table registration (January - June 2017): Free, every other Thursday at 2:30 pm Mountain Time.

### Recordings of Past Webinars

Video recordings and presentation materials are available for the following webinars.

2016 Webinars

- Modeling a Photovoltaic Battery System in SAM 2016.3.14
- Modeling a Residential Photovoltaic System in SAM 2016.3.14
- SAM Demonstration in Spanish, June 2016

2015 Webinars

- Battery Storage for Photovoltaic Systems, Sep 2015

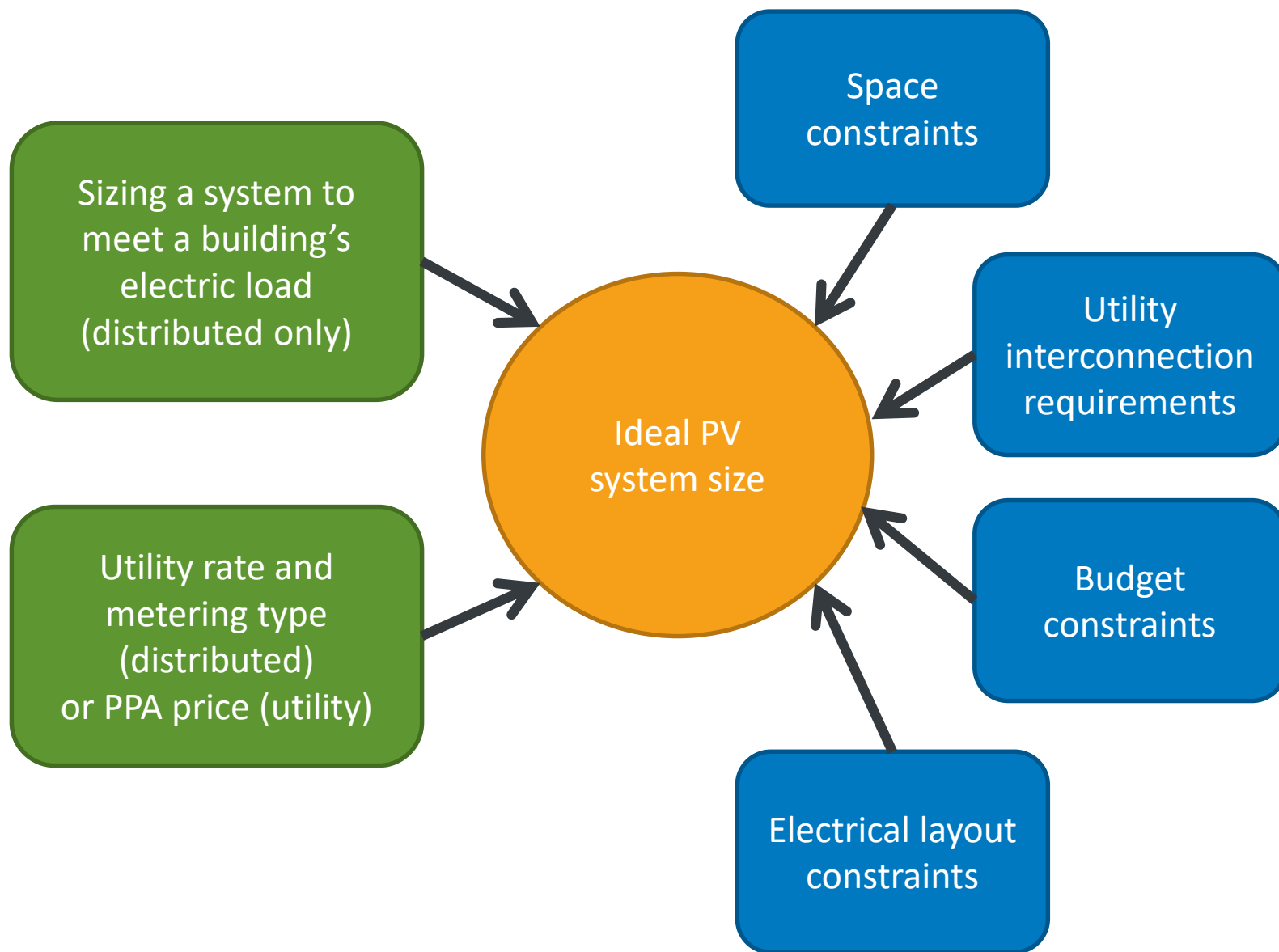
<https://sam.nrel.gov/webinars>

# Outline

- PV Sizing Considerations
- Electrical System Sizing Overview
- DC to AC Ratio
- Inverter Sizing Macro
- Microinverters, DC Optimizers, and More
- Multiple Subarrays
- Physical System Sizing
- Limitations of SAM for System Sizing
- Q&A

# PV System Sizing is a Complicated Problem

# PV System Size Selection Has a Lot of Input Factors



# System Size Metrics

*Nameplate capacity in SAM = DC capacity of PV modules (kW)*

$$DC - AC Ratio = \frac{DC \text{ capacity of PV modules (kW)}}{AC \text{ capacity of inverters (kW)}}$$



*Modules per string (modules in series)*

*Strings in parallel*

*Number of inverters*

# DC-AC Ratio is Limited by Discrete Component Sizes

## EXAMPLE



PV Panel: 200 W DC

Inverter: 3 kW AC



Desired system size: 8 kW DC  
Desired DC-AC ratio: 1

Number of modules: 40  
Number of inverters: 3  
Actual DC system size: 8 kW  
Actual DC-AC ratio: 0.89

Number of modules: 40  
Number of inverters: 2  
Actual DC system size: 8 kW  
Actual DC-AC ratio: 1.3



# Electrical Sizing: Live Demo

# Selecting a DC-AC Ratio

# Selecting a DC-AC Ratio

## Ideal DC-AC ratio isn't always 1:

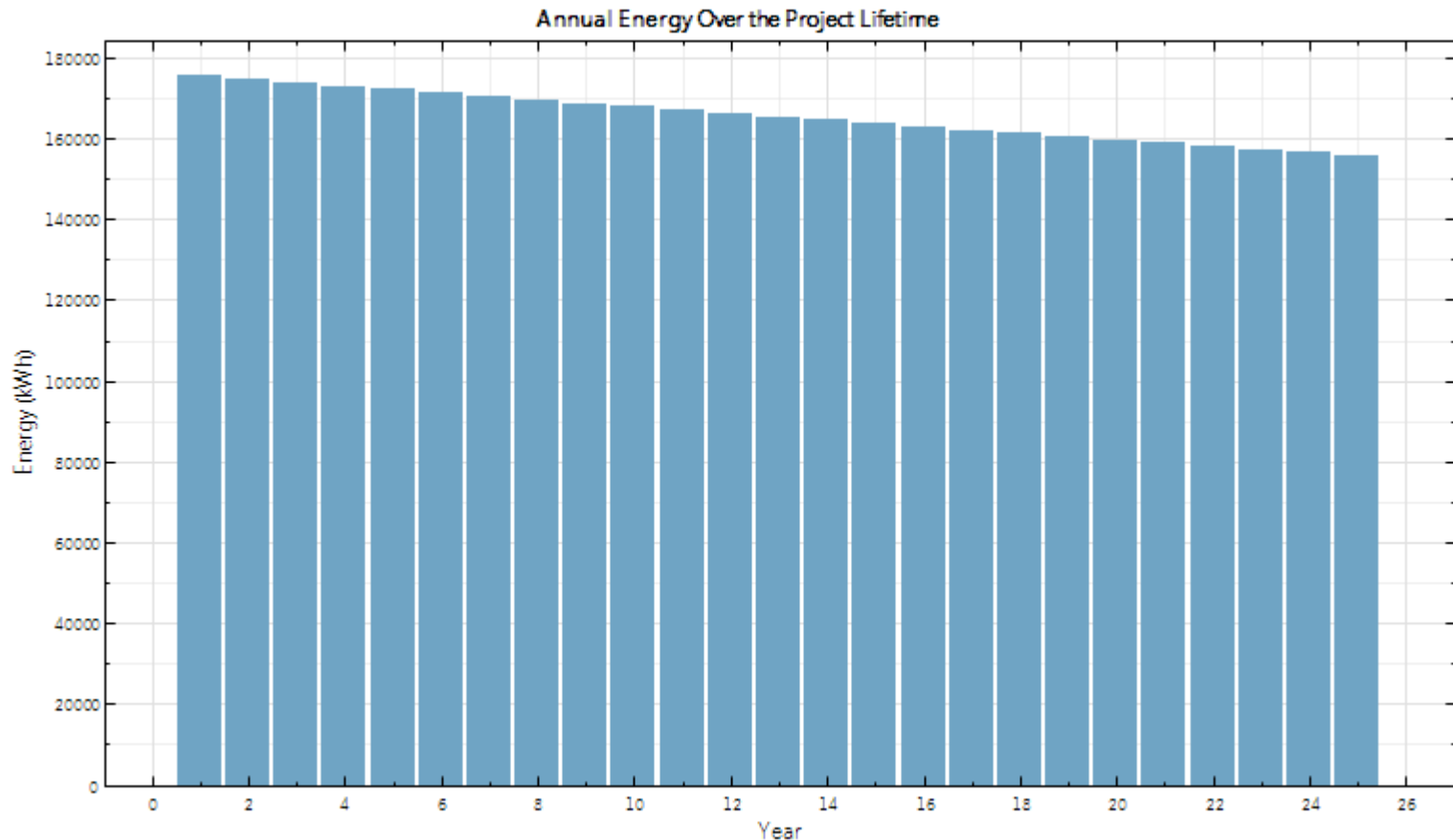
- Price difference in inverter sizes
- Inverter efficiency- inverter's kW-DC rating



# Selecting a DC-AC Ratio

## Ideal DC-AC ratio isn't always 1:

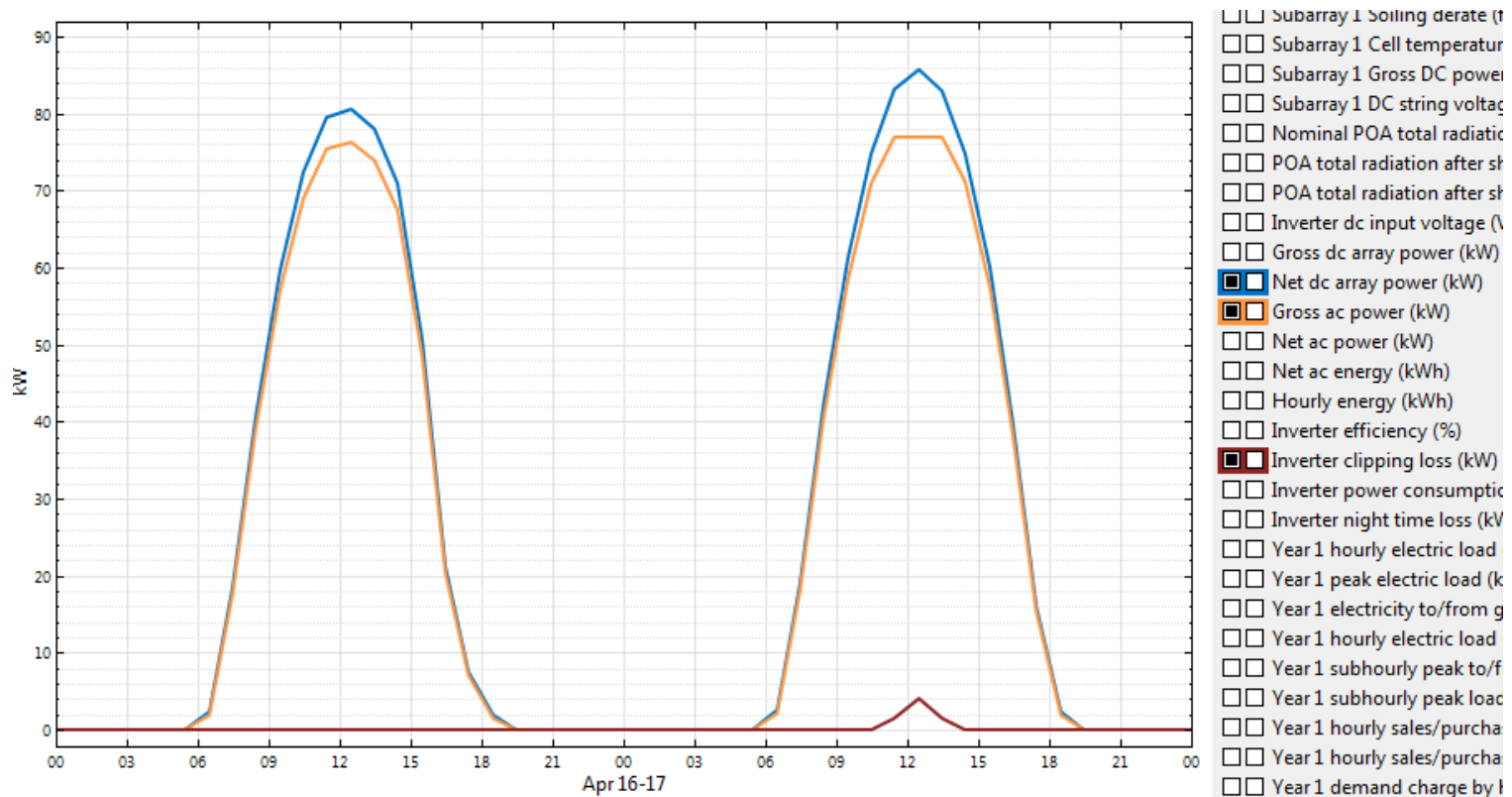
- Planning for degradation of PV modules



# Selecting a DC-AC Ratio

## Ideal DC-AC ratio isn't always 1:

- Infrequent occurrence of rated module conditions (aka planning for inverter clipping)





- Does not perform a full electrical model
- Does not show frequency effects
- Does not properly model inverter operation if the string voltage is outside of the MPPT range
- Assumes that the grid can handle any level of power created for distributed system models
- Does not calculate wiring losses (% loss)
- Cannot model stand-alone systems (system must be grid-tied)

Thank you!

[www.nrel.gov](http://www.nrel.gov)

