

Solar Advisor Model Release Notes

Version 2010.4.12 April 2010 (Update)

This update corrects several issues with SAM 2010.3.31.:

- **System summary:** Units for the total installed cost per capacity were incorrect for photovoltaic, solar water heating, and generic systems.
- **Financing:** Projects with commercial or utility financing and an analysis period less than the depreciation period caused simulations to fail. (This was also true for previous versions.)
- **Incentives:** Production-based incentives (PBI), production tax credits (PTC), and investment tax credits (ITC) were incorrectly calculated.
- **Photovoltaic systems:** The annual energy production was incorrect for systems with bipolar inverters from the Sandia inverter database.
Solar water heating: System energy savings were incorrectly calculated.
- **Parabolic trough (physical):** Receiver heat loss calculation was incorrect for receivers with lost vacuum or hydrogen leakage.
- **Power tower:** Water usage was incorrectly reported, values of the solar field delivered energy and power block input energy were incorrectly reported in the hourly results worksheet, and default values of some input variables were incorrect.
- **Parabolic trough and power tower:** Power block capacity-based costs were incorrectly calculated based on the net capacity instead of the gross capacity.

The update includes the following improvements:

- Several new functions and improvements to the SamUL scripting language, including the ability to run scripts from the command line.
- Revised user documentation.

Version 2010.3.31 March 2010**Summary**

This version adds a solar water heating model and a new parabolic trough model to Solar Advisor, improves the display of graphs on the results page, and adds capabilities to the statistical analysis simulation option. It also includes interface improvements to the photovoltaic module and inverter pages, improves modeling of temperature effects on module performance, and includes the latest module and inverter databases from the CEC and Sandia. Finally, this version adds a weather data download feature for U.S. locations, and a function to create weather files in TMY3 format.

General New Features

- New solar water heating model for residential systems.
- Tax credits and incentives can be defined as annual schedules.
- Add levelized cost of energy (LCOE) with and without incentives.
- New functions in SamUL
- Graph thumbnails on Results page.
- Input window for loads (photovoltaic, solar water heating) adds options for specifying load data: Daily profiles by month, cut and paste from clipboard.

Weather Data

- Location lookup option automatically downloads NREL Solar Prospector weather data for U.S. locations using an address or latitude and longitude.
- TMY3 creator facilitates creating custom weather files.

PV

- Simple load and storage models added to all photovoltaic models. Was only available in PVWatts model in previous versions.
- Revised default rating conditions for concentrating photovoltaic (CPV) model. This will affect capacity-based calculations including LCOE when the module cost is specified in \$/W.
- Temperature correction added to concentrating photovoltaic (CPV) model, and improved in simple efficiency and Sandia models to include more options for specifying mounting options.
- Improved layout of Module page for CEC and Sandia model. Display I-V curve and other changes.
- Improved layout of Inverter page. Display inverter efficiency curves and rename input variables.
- Azimuth tracking option added to photovoltaic models.
- New hourly output data columns added to hourly outputs.
- Corrected system performance factor calculation for systems with shading.

Parabolic Trough

- New physical model for parabolic trough systems. Original trough model renamed "empirical trough model." Both trough models are available in the current version.

Power Tower

- New field land area variables on Heliostat Field page.
- Variables on input pages reorganized.

Generic Fossil

- Allow generic fossil input variables to be parametric variables.

Version 2009.10.2 October 2009

General New Features
<ul style="list-style-type: none"> • Significantly faster model runs and smaller project file sizes. • Both Windows and Mac OS X-Intel versions are available. • A SCIF file importer for opening files saved with previous versions of SAM. • A new graphs page can display up to four graphs simultaneously and has new controls for creating and modifying graphs. • Tornado-chart type analysis is built-in as a specific Sensitivity analysis. • Optimization allows you to maximize or minimize a metric with respect to inputs. • Multiple sub-systems allows you to model systems made up of two or more subsystems. Weather model reads TMY3, EPW, and TMY2 files. • Scripting and batch-mode capabilities with Excel and other programming languages.
PV
<ul style="list-style-type: none"> • Update CEC module database (10/2) • Simple Efficiency Model allows for multiple radiation level/efficiency pairs (Flat Plate & CPV) • Incorporated PVWatts model
Dish-Stirling
<ul style="list-style-type: none"> • No updates.
Parabolic Trough
<ul style="list-style-type: none"> • Update HCE library. • Improvements to thermal storage dispatch strategies. • Can accept custom HTF fluids using a table-lookup mechanism.
Power Tower
<ul style="list-style-type: none"> • Improved heliostat layout mechanism and optimization wizard. • Can accept custom HTF fluids using a table-lookup mechanism.

Version 3.0 June 2009

New Features
<ul style="list-style-type: none"> • Power tower model.
PV
<ul style="list-style-type: none"> • Simple array shading model. • Add energy flow graph to standard graphs on Results page. • Update Sandia inverter database. • Update CEC module database.
Dish-Stirling
<ul style="list-style-type: none"> • No updates.
Parabolic Trough
<ul style="list-style-type: none"> • Update HCE library. • Tracking of backup boiler fuel cost in cash flow and cost of energy calculations. • Improve calculation of backup boiler fuel usage.
General
<ul style="list-style-type: none"> • Updated help system and user guide, including topics for power tower model.
Minor changes
<ul style="list-style-type: none"> • Update and rename sample files. • Improvements to user-defined variable implementation. • For cases using Excel optimization (utility financing model), Excel file runs in background by default. • Improve handling of SCIF files. • Show incentive tax details by default on Incentives page. • General improvements to speed up run times.

Version 2.5 November 2008

New Features
<ul style="list-style-type: none"> • Parabolic dish-Stirling engine model. • Time-of-use utility rates. • User documentation available as both context-sensitive Help and PDF file. • Automated optimization of power purchase agreement (PPA) price escalation rate and load fraction for projects with IPP and Utility financing.
PV
<ul style="list-style-type: none"> • Revise inverter and array sizes in sample file. • Update Sandia inverter database. • Update CEC module database. • Change module and inverter database format to Excel from MDB. • Display voltage and capacity variables on array page to facilitate inverter and array sizing.
Dish-Stirling
<ul style="list-style-type: none"> • Add dish-Stirling sample file. • Implement dish-Stirling model.
Parabolic Trough
<ul style="list-style-type: none"> • Remove unused variables from user interface: number of receivers per SCA, HTF flow control, HTF night flow control, and turbine start-up time. • Rename "time-of-use" variables to "time-of-dispatch" and move them from Utility page to Storage page.
General
<ul style="list-style-type: none"> • Remove Utility - IOU option from list of financing types on Financials page, and rename "Utility - IPP" option to "IPP and Utility". • Improve graphing options. • Change utility rate units from cents/kWh to \$/kWh. • Add Excel-based optimization of PPA escalation rate and debt fraction for IPP and Utility financing. • Improve installation on Windows Vista. • Improve sliders interface.
Minor changes
<ul style="list-style-type: none"> • Fix time format issue with parabolic trough time of dispatch schedule. • Improve file compression to minimize file size. • Allow long variable names in parametric analyses. • Revise WACC calculation. • Read all significant digits from linked spreadsheets.

Version 2.0 June 2008

Version 2.0 was released initially as Version 2.0.0.0. In early July, a minor update was released as Version 2.0.0.2.

PV

- Implement new inverter performance model: Sandia Performance Model for Grid-connected PV Inverters
- Removed previous curve-fit inverter model
- Implement new photovoltaic module performance model: California Energy Commission Performance Model.
- Update Sandia PV Array Performance Model with additional modules. (Was King Model in previous versions.)

CSP

- Implement dry cooling capability for CSP systems.
- Add new Solel UVAC3 HCE to CSP model library.

General

- Add generic technology option: The simple heat-rate model allows comparisons between solar technologies and conventional fuel-based technologies in all markets.
- Add Third Party Ownership option to commercial projects.
- Allow operation and maintenance costs and annual degradation rates to be entered on a year-by-year basis.
- Add new results workbook that stores complete set of calculated metrics, hourly data, monthly averages, and annual averages to facilitate reviewing results in Excel.
- Improve display of results page: Move results button to bottom of navigation menu; replace single button with three, Results Summary, Spreadsheet, and Time Series Graph; implement new Run Analysis button to replace "results pending" status. Also add new Results menu.
- Replace LCOE stacked bar graph with stacked cost graph to correct error in LCOE cost breakdown under certain conditions.
- Add several new standard graphs, including monthly output, monthly inverter efficiency (PV only), and energy flow (CSP only).
- Add new graphs that are available when one or more Independent parametric groups are defined.
- Create new compressed file format (SCIF) that stores only inputs in small files for easier file sharing. Cases can be imported and exported from SAM files in the SCIF format.

Minor changes

- Minor bug fixes
- Reduce required disk storage space by deleting workbooks and other files from temporary folder when closing SAM.
- Add transformer derate category to Array page for PV systems.
- Display weighted average cost of capital (WACC) on Financials page.
- Improve internal rate of return (IRR) calculation for utility and third party ownership projects.
- New Fixed (per year) operation and maintenance category.
- New folder (Samples\Financial_Spreadsheets) contains sample workbooks illustrating Solar Advisor financial calculations. Workbooks are also posted on the Solar Advisor website.
- Solar Advisor opens with an empty window instead of automatically opening previous file.
- Add close file button to menu bar.

Version 1.3 October 16, 2007

General

- Add capability to use EnergyPlus Weather file format (EPW) files for weather data.
- Add capability to add weather files to the collection of built-in files.
- Add weather data viewing tools, links to weather data web sites, and Help button to the Climate page.
- Add ground reflectance with snow input variable to Array page for PV systems. SAM Applies the snow ground reflectance value during hours that the weather data indicates there is snow on the ground.
- Fix a bug in the inverter model for low part-load operation.
- Add waterfall graph capability in DView on Results page for CSP systems.
- Update user guide.
- Improve overall performance of model.

Other changes

- Add start up mode settings (File, Settings) and change tab names in Settings window.
- Add help button to Climate page that opens a help page describing weather file options.
- Improve search algorithm that finds a solution for systems using utility financing.
- Improve calculation of number of TRNSYS runs displayed in information message.
- Change hourly output buttons on Results page for CSP systems.
- Improve handling of files created by different versions of SAM.
- Improve automatic graph scaling.
- Improve message for users attempting to run SAM when the Windows language setting is not English.
- Improve automatic scale on sliders.
- Improve file navigation for File, Open and File, Save As commands.

Version 1.2

- Version 1.2 was an internal release. The Version 1.3 description above includes all changes since Version 1.1.

Version 1.1 August 10, 2007

General
<ul style="list-style-type: none"> • <i>Photovoltaics Array</i>: Add detailed derate factors. • Results: Add Slider column to results summary table that displays output measures based on the position of visible sliders.
Results
<ul style="list-style-type: none"> • Change the units of ITC and IBI incentives that appear with sliders and in graphs from % Max to %. • Improve the functioning of the Notes box. • For utility systems with IOU financing, remove first year PPA from the results summary table. • For utility IPP financing, improve the LCOE calculation algorithm.
Incentives
<ul style="list-style-type: none"> • Cursor changes to an hourglass while resetting default market values. • Correct default settings for tax details to show that for residential systems, all utility incentives are taxable, and that utility incentives do not reduce the ITC basis.
Photovoltaics Array
<ul style="list-style-type: none"> • Changed default total derate factor in sample files to 84% to match PVWATTS.
Costs
<ul style="list-style-type: none"> • Correct the way the sales tax rate and module cost per unit values are displayed.
Parametrics
<ul style="list-style-type: none"> • Fixed a bug related to incentives. • Fixed a bug related user-defined variables.
External Spreadsheets
<ul style="list-style-type: none"> • Improved handling of missing workbooks. • Fixed a bug related to working with external spreadsheets.
Menus
<ul style="list-style-type: none"> • Add the Release notes command to Help menu to display a list of version numbers and the new features and fixes associated with each version number. • Reorganize the list of commands on the Case menu.