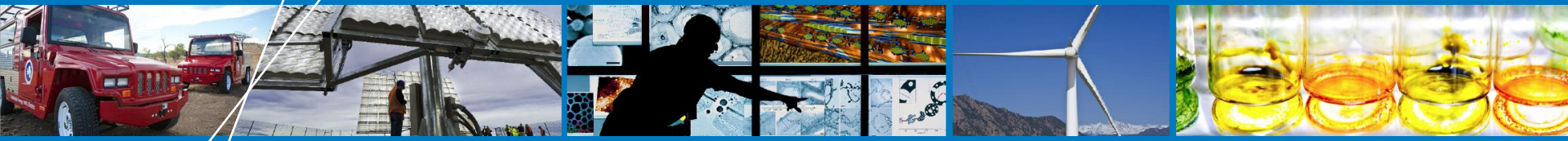
NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Third SAM Virtual Conference Introduction



2015 SAM Virtual Conference

Nate Blair

July 9th, 2015

Overview

- Review Agenda for the Virtual Conference
- New Release of SAM
- Where SAM is headed

*Becker, Gerd, et al. "An approach to the impact of snow on the yield of grid connected PV systems." *Bavarian Association for the Promotion of Solar Energy, Munich* (2006).

Conference Agenda

System Advisor Model

Introduction — 8:30 – 8:45

8:30 – 8:45	**Welcome and Opening Comments**	SAM Team	NREL

Early Morning Session: Special Topics — 8:45 – 10:25

8:45 – 9:05	**The use of NREL's SAM to approximate the performance of Bifacial PV Installations**	Mike Barker	Building Physics
9:10 – 9:30	**A SAM Proxy Model for Optimization of Hybrid Solar-Gas Power Generation**	Phil Brodrick	Stanford University
9:35 – 9:55	**PV Simulation in Excel. Integration of SAM SDK into spreadsheet using Add-In**	Igor Koshkin	Renewable Energy Systems Americas Inc.
10:00 – 10:20	**Estimating PV losses due to Snow Coverage in SAM**	Severin Ryberg	National Renewable Energy Lab

Break — 10:25 – 10:40

Late Morning Session: System Design and Optimization in SAM — 10:45 – 12:00

10:45 – 11:05	**Optimizing PV for complex rooftops with SAM**	Jeremy Berke	RainShadow Solar
11:10 – 11:30	**Life cycle production and costs of a residential solar hot water and grid-connected photovoltaic system in humid subtropical Texas**	James Sweeney	Texas A&M University
11:35 – 11:55	**Using SAM to Re-calibrate Estimated Energy Production from Solar PV Array Based on Actual Electrical Energy Data**	Kenneth J. Anderson	TheEnergyGleaners

Lunch Break — 12:00 – 1:00

Conference Agenda (cont.)

Early Afternoon Session: CSP Modeling — 1:00 – 2:15

1:00 – 1:20	**SAM for CSP cooling analysis**	Ana Dyreson	University of Wisconsin - Madison
1:25 – 1:45	**Life cycle production and costs of a residential solar hot water and grid-connected photovoltaic system in humid subtropical Texas**	Rounak A. Kharait	Leidos Engineering
1:50 – 2:10	**Modelling a competitive CSP plant in Brazil: the role of biomass hybridization**	Rafael Soria	Federal University of Rio de Janeiro

Break — 2:15 – 2:30

Late Afternoon Session: Application of SAM in Large Scale Analysis — 2:30 – 4:10

2:30 – 2:50	**Using SAM to demonstrate the value of solar PV**	Kate Daniel	NC Clean Energy Technology Center
2:55 – 3:15	**Lessons learned from SAM simulation core application development**	Joseph Ranalli	Penn State Hazleton
3:20 – 3:40	**Innovative approaches to Identification of Distributed Solar PV Potential**	Nathan Clark	Black and Veatch
3:45 – 4:05	**Interactive Renewable Energy Network planning using SAM's SDK**	Angus King	Sustainable Energy Now Inc.

Final Remarks — 4:10 – 4:20

4:10 – 4:20	**Thank You and Closing Statements**	SAM Team	NREL

New Release!

- Version 2015.6.30 June 2015
- This is a major release that introduces several new models:
  - PV with battery energy storage, including simulation of the whole system lifetime.
  - Third party lease or PPA financing for distributed systems.
  - Simple LCOE calculator based on a fixed charge rate.

New Release! (cont.)

Photovoltaics

- A new battery model for lead-acid and lithium-ion batteries in grid-connected photovoltaic systems with storage. The model accounts for storage capacity, terminal voltage, temperature, and capacity fade.
- A detailed manual dispatch controller allows custom tailoring of how battery energy is discharged to meet a building or facility's electric load. We hope to add automated and optimized dispatch controller strategies in future versions of the model.
- A new lifetime analysis mode makes it possible to run year-by-year simulations over the analysis period at hourly or sub-hourly (down to one minute) time-steps. This mode is particularly important when analyzing battery systems to properly account for the effect of cycling on battery life and battery replacement costs.
- A battery macro which allows quick financial comparison of lifetime costs between a PV system with batteries, a PV system without batteries, and no PV system.

- New options to apply degradation to the array's DC output and run simulation over the entire analysis period.
- New input for DC power optimizer loss, associated new buttons to overwrite defaults with appropriate losses for central inverters, dc optimizers, and microinverters.
- Added model for predicting energy lost due to snow fall on a PV system. Requires snow depth data in the weather file.

New Release! (cont.)

PPA Financial Models

- Improved metrics describing project term debt to make clear the relationship between size of debt and net capital cost.
- Enabled single owner cash flow send-to-Excel with equations for debt percentage debt sizing option.
- Improved cash flow to show net capital cost calculation.

Residential and Commercial Financial Models

- Revised net metering calculations: One bi-directional meter where sell rates are equal to buy rates except for monthly energy rollover with year end sell rate. One can expect the renewable system to offset peak demand and energy charges.
- Revised non-net metering (gross feed in tariff) calculations: Two uni-directional meters: a) system to grid where utility buys renewable system energy at specified sell rate, b) grid to load where property owner buys electricity at the specified buy rate. One can expect system specified outputs to be the sum of the two meters and that the renewable system will not offset peak demand or energy charges but will be compensated at the corresponding sell rate.

New Financial Models

- Third Party Ownership model for a photovoltaic system installed on residential and commercial property with a third party that owns the system and sells power to the residential or commercial customer under a lease or power purchase agreement.
- LCOE Calculator uses a simple fixed charge rate method to calculate the levelized cost of energy for market-level or very preliminary project analysis.

SAM Planning

- Several proposals into DOE for SAM funding in the following broad areas:
  - Ongoing Support of the SAM User Community
  - Additional development in the battery model
  - Open Modeling Platform
  - Create automatic battery dispatch storage algorithms
  - Extend model for other chemistries (NiCd/NiMH/Na-S/flow), ultracapacitors,
  - Replace steady-state PV models with transient behavior
  - Stochastic Electric Load Profiles
  - Directly link OpenDSS with SAM PV+Battery models.
  - Improve SDK usage materials and usability
  - Various enhanced CSP technology options

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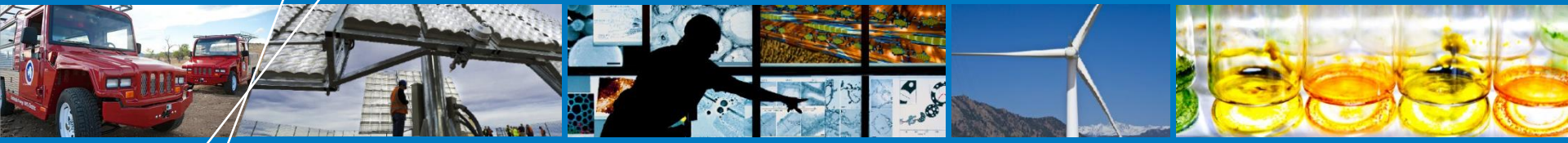

Thank you and enjoy!