

Modeling PV Uncertainty in SAM Webinar (July 30, 2024)

Question and Answer Transcript

Could you tell us more about the Freedman-Diaconis Formula and the other options listed with it?

The Freedman-Diaconis' Rule: Number of bins = $(2 \cdot \text{IQR}) / 3 \sqrt{n}$ where IQR is the interquartile range.

Can i use SAM to calculate monthly energy uncertainties or is it only possible to calculate an anual estimate?

As discussed live, the uncertainties are currently on the annual energy values only.

I am unable to download the NSRDB fie for a particular location in Indiana and it give me a JSON error when I input the Lat and Long. Is the system currently not working?

As far as we know it is working. If you continue to have trouble, please email us at sam.support@nrel.gov with details.

Can you edit the name of an uncertainty or add additional uncertainty if we want to model a different uncertainty in addition to what's listed?

At the moment, the names and number of categories are not editable, but we'd be happy to add that to our list of feature requests for future funding. We track requests for new features on our Github site, <https://github.com/nrel/sam>. I'll go ahead and add a new issue there for this request, and you can add additional details if you wish, although note that our ability to make improvements to these models is dependent on funding availability. We do work with private entities to fund improvements to SAM, however, and we also love open source contributions!

How often is the data updated?

Can you clarify what data you are asking about? The weather data from the National Solar Radiation Database (NSRDB) is updated annually (approximately).

Do you consider the uncertainty as random factors?

Each factor can be assigned a distribution of uncertainty that the user chooses, as Matt will show in his demo, except for the weather uncertainty, which is handled separately as Matt will show.

Could you link the 2020 report used for distributions you mentioned?

<http://www.nrel.gov/docs/fy23osti/84993.pdf>

Hi. What version is Matt using? I don't see the checkbox in my version. Thanks for the webinar.

Matt is running a pre-release version of SAM 2023.12.17 r2. The uncertainty feature is available in the current version, SAM 2012.12.17 r1, but without the check boxes. We plan to release Revision 2 in the next week or so.

Is the uncertainty feature turned on by default?

No, just pressing simulate by default will not run these uncertainty calculations. You have to navigate to uncertainty below the simulation to run the analysis. This is currently only enabled for the detailed PV model, other models calculate P50/P90 based on weather only.

Will there be a certificate generated for the completion of the webinar?

No, we don't have a way to determine who participated completely.

I am doing research works on Probabilistic modelling in power system with integration of renewable energy. Is it possible to run a probabilistic modelling

NREL has other tools that may be more suitable for a power-system level analysis, such as <https://www.nrel.gov/analysis/pras.html>

I receive an error that says NSRDB Data Query did not return valid JSON String: 0. The file however pops up on the NSRDB website when I add the same lat,long

OK. This might be a problem with the interface in SAM, or with the string you used to request the file. We can discuss this further by email.

How can this uncertainty be accounted for in an economic analysis of a potential or existing PV system?

One approach would be to use the PV Uncertainty simulations to determine the weather file that represents a desired P-value, and then use that weather file for a system simulation (on the Location and Resource page) to explore the financials for that case.

When modeling a ground mount or rooftop commercial pv system, we typically use SAM to determine the maximum Voc (overall max) and Isc (3hr avg. max) values over multiyear weather files with Bifacial modules. This is to lean on NEC 690.8(A)(1)(2) We have not seen a significant difference with Albedo factors and are relatively surprised is this normal? Many times we only see a 3-8% increase in Voc and Isc, what do you generally see? Typically we don't see site specific albedo values in the imported weather files, so we typically enter our own site specific values.

Please post this question on the SAM forum at <https://sam.nrel.gov/forum> or send us an email at sam.support@nrel.gov. We'd also be happy to discuss it at a SAM round table, which you can register for from the Events page at <https://sam.nrel.gov/events>.

Follow-up from my previous question about what the denominator in the percentage of losses is. From your answer, it's not clear, is the nominal POA the denominator in the ratio for ALL of the losses, or is it that for certain losses, the denominator is something else (i.e incoming energy prior to that loss taking place)?

The denominator depends on where in the loss chain the loss is calculated (the incoming energy). Explanations for each individual loss are documented on the page Detailed Photovoltaic Time Series Results in the help.

There is an option to see the data in hour scale time?

The graphs on the uncertainty page are of the total annual energy in kWh. You can see hourly and other results from the base case simulation. You can choose the weather file that represents the desired P value of annual energy for the base case simulation to see hourly results. For example, to see hourly results for the P50 case, you would choose the weather file for the year indicated on the Uncertainty page that represents the P50 case.

Clarifying the question: Updates to weather, module, inverter and financial parameters data in model.

The inputs are defined on the input pages and depend on the values you enter on the input pages. The weather data available from the NSRDB is updated by NREL every year or so.

What module/inverter is the uncertainty annual energy using?

The inputs for the uncertainty analysis are the same as for the base simulation, so the module and inverter are defined on the Module and Inverter input pages, respectively.

What if you want to measure the annual energy for just one year of weather data? ie I want to estimate how the system performed in 2023?

The NSRDB provides single year weather files that you can run via the single case simulate button. These are available on the location and resource page with the choose year feature or the advanced download feature.

Do SAM work better for Africa

The NSRDB released METEOSTAT data for Africa and Europe early this year which SAM can download automatically for simulations.

Hello, i am actually working on the optimization of hybrid systems, do you have any files about how using SAM for studying such systems? Thank you.

We added new features for hybrid systems in our December release. We will conduct an upcoming webinar on this topic and you can sign up at <https://sam.nrel.gov/events.html>

Just to double-check, the losses are a percentage of the total incoming POA energy?

Yes, the losses are calculated relative to nominal POA. The losses diagram also includes additional steps such as nominal DC electricity, net DC electricity, and gross AC electricity to evaluate subsets of losses.

Is there the possibility to simulate PV-battery system in which water pumping system is embeded as well?

Yes, the water pumping system could be included as load for a behind the meter PV-battery system. We recorded a webinar on this here: <https://www.youtube.com/watch?v=eURDJucc-Jg>

I'm still not sure how to use the uncertainty results. Can you run an example of a 100kW system?

Yes. The first step before you run the uncertainty simulations is to design the system using the input pages. The resulting uncertainty analysis is based on the system design defined by the input pages.

Are there any aspects in the system design phase that accounts for a system using optimizers?

Yes. You can design a system that uses optimizers using the inputs on the System Design and Losses input page. SAM does not have an explicit model for optimizers, but you can account for them by adjusting the loss inputs. If you have

questions about that, please follow up either by email to sam.support@nrel.gov or on the SAM forum at <https://sam.nrel.gov/forum>.

Are the axes editable or rescable?

You can make some adjustments to the graphs by right-clicking them or dragging their borders. To have full control of the graph formatting, you could right-click a graph and export the data to a separate program.

Can we generate the report from SAM?

You can right-click the graphs to export them from SAM to use in your own documents. SAM does not generate an uncertainty report.