Solar Technical Assistance Team (STAT) Summer Webinar Series

Do-It-Yourself Solar Market Analysis: Top Solar Tools

Transcript

May 14, 2014

*[Courtney Kendall]* **Slide 1:** Good afternoon, my name is Courtney Kendall from the National Renewable Energy Laboratory and I'd like to welcome you to today's webinar, "Do-It-Yourself Solar Market Analysis: Top Solar Tools." We're excited to have you with us today!

We'll give folks a few more minutes to call in and log on. So, while we wait I will go over some logistics and then we'll get going with today's webinar.

I want to mention that this webinar will be recorded, and everyone today is on listen-only mode. You have two options for how you can hear today's webinar. In the upper right corner of your screen, there is a box that says "Audio Mode" – this will allow you to choose whether or not you want to listen to the webinar through your computer's speakers or a telephone. Select either "Use telephone" or "Use mic and speakers".  If you select "Use telephone" the box will display the telephone number and specific audio PIN you should use to dial in.

We will have a Q&A session at the end of the presentation. You can participate by submitting your questions electronically during the webinar.  Please do this by going to the questions pane in the box showing on your screen.  There you can type in any question that you have during the course of the webinar.  Our speaker will address as many questions as time allows after the presentation.

Today our speaker is Erin Nobler. Erin is a project leader in the Integrated Applications Center here at NREL. She focuses primarily on solar policy work and is the task lead of the Quick Response Technical Assistance program.

Now I would like to go ahead and introduce Erin.

*[Erin Nobler]* Thank you, Courtney, for the introduction. My name is Erin Nobler and I am an NREL Project Leader working on Solar Technical Assistance here at the National Renewable Energy Laboratory

**Slide 2:** During the presentation today, I would like to briefly talk you about the Solar Technical Assistance Program, or STAT, as we call it – and the type of assistance we're able to provide

I'd also like to tell you about the rest of the DIY solar market analysis series and the upcoming webinars this summer – all of which will be on tools and resources

And then the largest chunk of the presentation today will be going through the various solar tools we have here at NREL, where you can find them, how they work, and how you can use them to make decisions. Those tools are: MapSearch, Renewable Energy Atlas, PVWatts, System Advisor Model (SAM), Scenario JEDI, Community Solar Scenario Tool (CSST).

**Slide 3:** So what is STAT? STAT stands for Solar Technical Assistance Team. This project is funded by the Department of Energy Solar program in coordination with NREL and Lawrence Berkley National Lab which also provides assistance. The purpose of STAT is to offer current, credible information to state and local government decision makers on policies, regulations, financing and other issues that states and localities are currently facing.

As we like to say, STAT offers 3 different flavors of technical assistance: Education, which includes webinars and fact sheets on various topics, quick response, which is one-on-one technical assistance that requires fast turnaround, and in-depth one-on-one technical assistance for longer term requests.

To learn more about the broader effort of the STAT, please visit the website on the page where you can find a webinar with more detailed information on the Solar Technical Assistance offering here at NREL.

**Slide 4:** So, more on this year's series. You are currently listening to the first of four webinars in our summer series for DIY Solar Market Analysis. These webinars will be occurring through the summer once per month on the second Wednesday from noon-1 MST. As you can see, today we're going through the top solar tools, then the following three webinars will be deep dives into a few of those. Please join us for the remainder of the summer and learn about the great solar tools NREL has to offer.

**Slide 5:** So here you can see a glimpse of the tools we will be discussing today and how they all "play" together – they run the gamut from basic resources all the way up to complex analysis and policy application.

So going through them, as you can see in the lower left, MapSearch and RE atlas provide basic solar resource information by location. MapSearch provides static maps that display resources. RE atlas also explores basic resource data, however with the added bonus of having dynamic maps.

Next we have PV Watts and SAM which fit into the ANALYSIS category. PV Watts estimates electricity production using a few very simple inputs, the system advisor model shows performance and cost estimates for a project using more detailed inputs. These provide system performance and techno-economic analysis. As you can tell, these have a bit more detail and actually analyze the resources.

And finally, we have policy application tools like CSST and Scenario JEDI. Scenario JEDI looks at the economic impacts of a solar deployment scenario across market sectors. The Community Solar Tool offers a first cut analysis of the potential to implement a community solar program in a specific location. These tools are capable of evaluating implications of markets, financial instruments and economic factors. These allow us to analyze energy scenarios and/or the benefits and impacts of energy plans, programs, portfolios, or policy options.

So now that you can see the breadth of the tools we are discussing today, let's take a deeper dive into each of these to understand them a bit more.

**Slide 6:** We're going to start at the basic resource analysis end of the spectrum with MapSearch. This is a tool developed by the geographic information system (GIS) team here at NREL. The easiest way to access this feature is to go to maps.nrel.gov, and it's listed under the General heading. There are currently 1,215 maps available through MapSearch. These are static maps, created for a specific location and technology, which are housed within a searchable database. The value of this tool is that you can easily find specific map types by filtering by technology including biomass, geothermal, hydrogen, and of course wind and solar. You can also filter by country or continent, by US state, and even by the year the map was created.

Now we are going to take a look at the site so you can get a feel for what's possible.

And as I go, there may be a slight delay, so I'll try my best to talk slowly while the visuals catch up. If you hear me pause a few times, that's just to make sure that oyu can see the screen that I'm currently looking at.

So, I want to start by taking us to maps.nrel.gov. The reason I am starting here, instead of directly at Mapsearch, is to show you that three of the tools we will be discussing today can be reached from this site. So clicking on Mapsearch now, can see, it's a pretty simple interface. Since we're all PV people here, I want to start by pointing out that several solar map types exist which you can see on the left hand side. To capture all possible solar maps within your jurisdiction, start by filtering by location. There are several options, I'll select one, and from here you can see more details about the data source, creation date, and so forth. I'll use my home state of Colorado as the example. So I'll filter by the state of Colorado and you can immediately see all of the Colorado specific maps available. Since we're talking about PV here, I will open the PV Resource map which displays the Colorado PV Resource with county lines and latitude and longitude lines visible. You can see that on your screen now.

OK so now that you've seen the tool, let's talk about what these map really do. A solar resource map tells you how much sun is available in a particular location. This is important when designing a PV system because it enables you to begin the process of determining whether a PV system will perform the way you expect it to. You need to know if the sun will shine sufficiently to produce the amount of electricity you would expect for your project. What these resource maps can also demonstrate, however, is that there is more to the decision-making process than just solar resource. For example, by simply looking at this map of the solar resource in the US, Spain and Germany, it becomes very clear that solar resource alone does not make a successful solar market so you must dig a bit deeper.

**Slide 7:** So going off of that, it's also important to remember that you have to look at additional reference data as well as the resource data. Another resource, the Renewable Energy Atlas, can help with that. The RE Atlas is an interactive spatial application which allows you to layer different maps on top of each other to provide you with information you need. These are very dynamic maps, as opposed to map search, which only has static maps. Again, this resource can be accessed through maps.nrel.gov, so let's go there again and have a look.

OK, we're here. The default view is actually a few maps layered over each other, showing a range of renewable energy resources throughout the United States. We would recommend clicking on the Help tab here at the top of the page before getting started—it contains lots of useful information, like how to find the hidden Baselayers tab that allows you to choose map, satellite, or hybrid view.

The RE Atlas leverages the use of dynamic maps and tools to allow the user to investigate data by renewable energy resource category. Most of you will start by selecting solar using the one-click filters on the left hand side of the page (just like map search). However, this tool allows you to dig a little deeper. You can see data details by right-clicking on your selection, even altering the look of the map to suit your preferences.

This tool is useful for determining, for example, what the solar resource looks like for all of the federal lands with state and county-level details. Decision makers can use to gauge more accurately where they would like to consider PV projects based on the resources available.

The RE Atlas online application also provides links to other sites, tools, and applications from NREL, U.S. DOE, and their partners to assist users in exploring other publicly available data and resources.

RE atlas lets you get information for your region on various renewable energy technologies. For more advanced analysis on a specific technology, there are additional tools off of the maps.nrel.gov page. Important to you, is to take note of Solar Prospector, which allows you to do more detailed analysis specific to solar technologies.

**Slide 8:** So diving in a bit deeper, we get to the analysis tools, including PV Watts. PV Watts is a tool that calculates the estimated electricity production of a PV system. To get started using this tool, you only have to input the address you're interested in and the size of the system. From there, you can get more specific by adding the array type, the tilt angle and the azimuth angle, however, if you don't know this information, you can simply use the default data that's already in the tool.

So here we'll punch in an address to show how the tool works, I'll use a famous location as to not offend any nice private citizens. So here we are at 1600 Pennsylvania Avenue and when we enter, it tells us the recommended weather data for the area which we will accept in the analysis. For simplicity I am going to keep all of the default data, including system size of 4 KW.

So, using simulation over a period of one year, PVWatts estimates the annual and monthly electricity production of a PV system, as well as, the cost and value of the electricity produced by the system. The cost of electricity estimates are based on whether the PV system is on residential or commercial property, its installation cost, and the retail cost of electricity (again, this information is pulled based on the location you entered so it's automatic!)

The tool will provide you with the next step of analysis in determining potential locations for PV systems or projects. Also, for policymakers out there who don't know, it's important to acknowledge that this tools is used extensively by solar installers to qualify for subsidies. For example a utility may require a PV Watts analysis in order to qualify for their incentive. So, you might find yourself using PV Watts, especially if you have a subsidy or incentive program.

It's a very simple tool to use, and can be understood by non-Solar experts so don't be afraid to try it! We will be doing a deeper dive webinar on PV Watts later in the summer series, so please feel free to tune it to that webinar to learn more!

**Slide 9:** Moving on to the next NREL solar tool, let's talk about the System Advisor Model or SAM. Sam is a performance and financial model with the goal of helping people in the solar industry make informed decisions. This is a free computer program that calculates a renewable energy system's hourly energy output over a single year, and calculates the cost of energy for a renewable energy project over the life of the project. It has twelve performance models that run the gamut of solar electric technologies, including both PV and CSP technologies, and its eight financial models cover the range from single-owner systems to more complex multi-partner financial structures. SAM also includes a simple fossil-fueled power plant model to use in studies comparing renewable technologies to fossil fuels.

This tool, as I mentioned, is primarily used by people in the industry, including engineers, policy analysts, and developers. It's definitely more technical than PVWatts in terms of output – but is still very user-friendly. Let's take a quick look at this tool online at sam.nrel.gov.

The first step in creating a SAM file is to give it a name, then you can choose a technology and financing option for your project. SAM automatically populates the input fields with a set of default values for the type of project. You can modify the inputs to provide more information about your specific project, so you will get the best results when you are further along in the process of developing, or potentially developing a PV project. Once you are happy with the input values, you can run simulations and examine your results. A typical analysis involves running simulations, examining results, revising inputs, and repeating that process until you understand and have confidence that the outputs match the expected system.

For example, you could use SAM to compare the savings of a residential rooftop solar water heater to those of a photovoltaic system. Or, for a large utility-scale project, you could compare the power purchase price that would be required to make a wind, a photovoltaic, or a concentrating solar power project profitable at a given location.

This tool helps you understand the differences in financing options, utility rates, incentives, cost of the equipment, and other factors when designing a project. SAM is available for free download. To download the software, you must register for an account on the website.

A policymaker may not use SAM directly, but it is an opportunity for you to better understand and become exposed to performance modeling. Really, to be able to "talk the talk."

Because SAM is a more detailed tool, I only briefly went over it without getting in too deep. If this tool looks like the one for you, we have plenty of additional learning resources to help you better understand how to use it. You can just head to the SAM Website and click on learning to get a HUGE amount of additional webinars that will teach you everything and anything you want to know about this model.

**Slide 10:** The Jobs and Economic Development Impact (JEDI) models are user-friendly tools that estimate the economic impacts of constructing and operating power generation and biofuel plants at the local (usually state) level.

Based on project-specific or default inputs (derived from industry norms), JEDI estimates the number of jobs and economic impacts to a local area that could reasonably be supported by a power generation project. For example, JEDI estimates the number of in-state construction jobs from a new wind farm.

The intent of the Jobs and Economic Development Impact (JEDI) models is to construct a reasonable profile of investments (e.g., solar plant construction and operating costs) to demonstrate the employment and economic impacts that will likely result during the construction and operating periods.

While most of the JEDI Models look at a single project, say a small commercial rooftop PV installation, Scenario JEDI looks at a deployment scenario over time. For example: What is the impact of 10 MW of solar installed over a 5 year period that is split between utility, residential and commercial installations?

The type of analysis offered by scenario JEDI is particularly interesting to state and local policymakers, as it offers information on how a deployment scenario may impact your community in terms of jobs and economic development. We are careful to say that the estimates derived from JEDI are not guaranteed.

So, as you can see in the Scenario JEDI tool, you can provide inputs based on a hypothetical or real solar scenario for your community: what your deployment goal is, and what the distribution of the goal is, based on market sector. That is, how much of the goal is from residential installations, commercial installations, and utility-scale installations. From this, you can see the results on the summary results page which gives you estimate results for total cumulative jobs, earnings, and output for each sector.

You can see from the results, how this tool could Assist governments and policymakers in Planning and evaluating and Community development

We also have an entire webinar dedicated to Scenario JEDI, how to navigate the tool effectively, and how to interpret results and understand its limitations. Should you want to learn more about this tool, please visit the NREL STAT webinar page and click on the DIY Solar Market Analysis link.

**Slide 11:** The community solar scenario tool is one of the newest solar modeling capabilities developed here at NREL. The STAT team started seeing several requests for information about analyzing shared solar programs, so we built this tool for a specific request from Michigan, then modified it for a request from Columbia, Missouri, then worked to make it a more general tool that could stand alone.

This model allows smaller municipal utilities, electric cooperatives, and state and local advocates to see how various inputs--such as system size, location, and project costs—will impact the economics of a project and from both a potential customer's perspective as well as the sponsoring utility's. This tool really provides a "first cut" analysis of different community or shared solar program options, so anyone looking for more complex financial modeling options should turn to SAM.

You can access this tool on NREL's website from the "Deployment" tab in the top navigation. Then, select "Models and Tools" on the left and you can find it in the renewable Energy Technologies section of the page. As you can see, it is available as a downloadable Microsoft Excel file. I will just flip through the tabs quickly since using the tool is pretty straight-forward. If this is something you are interested in, please plan to attend our in-depth webinar covering what you can learn from this tool on Wednesday, August 13.

Again, I want to emphasize that this tool is really meant for small municipal utilities who are doing a first-pass analysis. With that in mind, we are certainly open to suggestions for improvement, so if you do spend some time with this tool, please let us know your thoughts.

**Slide 12:** So, before I open it up for questions, I'd like to make sure you're aware of our technical assistance map that is available online. This map provides information on many of the assistance projects we have provided to states and localities in recent years. This is a great resource if you would like to see what types of assistance we provide, what the outcomes are, etc. This will give you great examples of the types of questions we answer, and the work we are able to offer under the technical assistance program.

**Slide 13:** While I'm on the subject, I'd like to discuss how to apply for assistance. Our quick response effort is provided on a rolling basis and can be applied to at any point during the year. To apply, you need to fill out an easy one-page document that asks for basic contact information and a brief summary of what the request is and how it will help lower costs or move the market. Once completed, you can send this document to stat@nrel.gov and we will get back to you as soon as possible to move forward. This document is available at the website listed.

**Slide 14:** OK then as for In-Depth, this application is going to be available on a bi-annual basis at the same website as the Quick Response application. The in-depth assistance is complete for the fiscal year, but we will have another round ready to go in Fall of 2014. Please consider coming back and applying for a larger effort then.

And further, if you would like to receive information about STAT please sign up for our State and Local list serv and we will make sure to notify you as soon as the application is available and you'll also find out about our upcoming webinars.

And keep in mind that while we will offer more detailed webinars on many of the tools you heard about today, we also have folks here at NREL that can provide you with analysis using the tools mentioned—they can actually help you out with this. So if you would like to receive assistance using any of these tools, please don't hesitate to contact us.

**Slide 15:** So with that, I want to thank you for your time during this presentation – I hope you found it useful and informative and have a wonderful day!