Solar Technical Assistance Team (STAT) Summer Webinar Series

Webinar #1: What a Successful Solar Market Can Do

Transcript

July 18, 2012

*[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. We’re excited to have you with us today.

Before we get started, I have a few items that I would like to cover.

First, I want to mention that today’s webinar will be recorded and everyone 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. As a rule, if you can listen to music on your computer, you should be able to hear the Webinar. 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. If you select “Use mic and speakers” you might want to click on “Audio Setup” to test your audio.

If you have a question, 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 speakers will address as many questions as time allows.

And now I would like to introduce Liz Doris. Liz is the Team Lead for the Solar Technical Assistance Team for the National Renewable Energy Laboratory. Go ahead, Liz!

*[Liz Doris]*Thanks, Courtney! Hello and welcome to the first webinar in the U.S. Department of Energy SunShot Summer Webinar Series. Today’s presentation, “What a Successful Solar Market Can Do,” provides an introduction to the series and gives an overview of the benefits of a solar market might be to your jurisdictions – for example: Green jobs, air quality, reduction in grid congestion. The presentation includes examples of jurisdictions that have used policy to leverage markets as well as an overview of opportunities for prime locations for solar development.

**Slide 2:** The DOE SunShot Initiative is a collaborative national initiative to make solar energy technologies cost-competitive with other forms of energy by reducing the cost of solar energy systems by about 75% between 2010 and 2020. You can get a lot more information about the broader initiative at this website, [www.energy.gov/sunshot](http://www.energy.gov/sunshot).

The Solar Technical Assistance Team (STAT) is a team of solar technology and deployment experts from DOE and the national lab system whose goal is to share the best available information on policies, regulations, financing, and other issues with state and local government decision makers whenever they need it. Elected officials, regulators, and their staffs can request specific assistance through [STAT@nrel.gov](mailto:STAT@nrel.gov), and requests are reviewed on a rolling basis.

**Slide 3:** The U.S. Department of Energy (DOE) Solar Program, in coordination with the National Renewable Energy Laboratory (NREL) is hosting the SunShot Technical Assistance summer webinar series for state policymakers and staff.

The will be a total of 6 webinars held between July and September. We are aiming to provide policymakers with the best information on policies, regulations, technologies, resources and financing mechanisms necessary to support increased adoption of Solar PV and reduce the cost of solar energy systems.

**Slide 4:** Today I am going to give a brief overview of the benefits of solar by way of introduction to the series. We really wanted to start the series with WHY policymakers or staff such as yourselves might be interested in development of a market, before we dive in to the relatively more complex issues of WHAT you need to know and HOW to go about doing that. In order to get to the benefits, I will give a brief overview of the solar market, the basics of solar technology, and the general cost of solar PV. That part of the webcast really aims to provide an introduction to what the rest of the series that will go into in-depth, so I’ll reference those more in-depth webinars when relevant.

In order to gain a better understanding of our audience and inform subsequent webinars, we’ve included a couple of attendee polls within the presentation. These polls are brief check-the-box polls that allow active attendee engagement and real-time feedback. We know this is a little new but we would really appreciate your participation.

**Slide 5:**  In terms of learning objectives for the session, we hope you’ll walk away with more familiarity with some of the basic terms used surrounding solar technologies and costs and a better understanding of the benefits of developing a market, along with some reference-able examples of how other state and local jurisdictions have done it.

During the presentation we’ll be talking broadly about solar; and that means a lot of things to different people. This series is focused on the use of solar for electricity generation, so we will not cover solar water heating here – but that is not an indication that it isn’t an important part of many state and local policy portfolios. Mostly, we’ll talk about distributed solar photovoltaic (or PV) applications, because that is of primary interest to people that come to STAT with questions. However, we will also touch on utility scale PV and concentrated solar power (or CSP) as many important state policies have helped stimulate the market for utility-scale grid-connected systems.

**Slide 6:** Here is our first poll – How familiar would you say you are with the solar market? Please check the box on the screen that best fits your level of familiarity with the solar market.

It looks like the majority of our audience is pretty familiar with the solar market.

**Slide 7:** Let’s start with the basics (or, if lots of familiarity – we’ll quickly cover the basics), where is the solar resource? Solar resource is measured in kWh/m2/day – that is, the amount of sunlight that can be transformed to electricity over a square meter every day. The greatest solar resources in the US are in southwest (6.8), and the least are in the northwest (3.5). From this map you can see that while there is a range of solar resources in the U.S., the continental U.S. range isn’t that large – with a difference of a factor of 2 between the best and worst regional resources.

**Slide 8:** Let’s talk for a moment about the state of the solar market. The solar market is big (~$100 billion), growing rapidly, and reaching cost parity in certain geographies. Since 2000, the solar market has seen a remarkable increase in the number of solar installations (for both PV and CSP), while the cost of solar installations has decreased during that same time period.

Solar energy electricity generation has grown by a factor of over 5 between 2000 and 2010, but still represents a very small part of overall U.S. electricity generation portfolio. In 2010 in the United States, wind and solar PV were two of the fastest growing generation technologies. Cumulative wind capacity increased by 15% and cumulative solar PV capacity grew by 71% and CSP grew by 18%. (Source: US DOE EERE, 2010 Renewable Energy Data Book, 2011)

That growth can be attributed to many things: Technological advances, increasing competitive electricity costs and volatility risks, federal and international policies, and, what we primarily talk about when we talk to you all, which are state and local policies and programs. The market is complex and changing and understanding the impacts that policymakers can have on it is an important element to accessing the benefits of solar market development.

**Slide 9:** The solar market has also seen a steady decrease in price since 2000. In 2012 we are seeing solar system prices around $4.39 per watt. This is down from an average of $5.71 per watt for residential PV in 2010.

(Plummeting cost of solar PV graphic – Source: NREL, Solar Technologies Market Report, January, 2010)

The July 25th webinar, “Solar Economics for Policymakers” will cover the solar market and technology costs in a lot more detail.

**Slide 10:** Based on the solar market’s growth over the last few years, policy supports (such as renewable portfolio standards with a solar carve out) and continual R&D – the solar market is forecasted to grow considerably. This growth offers opportunities for both states that primarily import energy as well as those that primarily export energy, as demands for energy generated from renewable sources continues to increase.

This graphic shows regions with the largest solar markets are projected experience considerable growth over the next five years. California is expected to continue to lead market growth during the period, followed by New Jersey and Pennsylvania. Other growth state markets include those of Arizona, Colorado, and Nevada. These states vary in resource availability and economic characteristics, but all of them have in common extensive policies – both financial and non-financial incentives - to help support the market. (Source: NREL, Solar Installation Labor Market Analysis, December 2011)

We can look to New Jersey for a more specific example of the role of state policy. NJ is ranked second in grid tied PV capacity only behind the much more populous California, and it provides a notable example. The state enacted an RPS and net metering standards in 1999 as part of a comprehensive strategy to increase the use of renewable energy. That strategy also includes financial incentives, such as rebates and tax incentives. Despite lower solar resource availability, New Jersey has expanded from less than a megawatt of capacity in 2002 to nearly 260 megawatts by the end of 2010. (Source: NREL, Strategic Sequencing for State Distributed PV Policies: A Quantitative Analysis of Policy Impacts and Interactions, 2012)

**The August 22nd webinar will give a lot more detail on the development of policies for the development of solar markets.**

**Slide 11:** Here is another poll for our audience before we discuss solar technology. Do you understand how PV panels work? Please check the box that best describes your familiarity with solar PV panels.

It looks as though everyone in our audience knows how solar PV panels work. While you certainly don’t need to be an electrical engineer to help develop markets, it is helpful to have a basic understanding of the technology and certainly the language that’s used to describe it.

**Slide 12:** A basic Alternating Current (or AC) PV System with Inverter is shown here. This type of system converts sunlight into direct current (DC) electricity, which is then converted to alternating current (AC) through an inverter. This system does not have moving parts. These systems offer high reliability with little maintenance and warranties of 20 years or more. There are also tracking systems, which track the sun as it moves across the sky to capture more of the available sunlight, and because those have some moving parts, they can require a little more maintenance of their lifetime, but they typically still come with warrantees of 20 years or more.

PV modules are designed and installed in a series to meet the voltage and current requirements of the connection site (grid-tie in or directly connected to a home/building).

**Slide 13:** As you can see, a solar PV cell is made up of layers which include 2 semiconductor layers and a front contact layer which is the layer responsible for collecting and converting the sun’s rays to electric alternating current. These “working layers” are surrounded by protective layers that include an antireflection coating to ensure the cell collects the sun’s rays rather than reflecting them back, as well as a front and back cover.

The typical efficiency of crystalline silicon PV is 19%. All of the solar technologies are becoming more and more efficient to meet market demands and become competitive with the efficiency levels of conventional electric generation. DOE is agnostic to any particular solar technologies and supports research, development and deployment across all solar technologies.

(The Power output of a system is rated at Standard Test Conditions of 1000 W/M2 and 25 C (77F).)

**Slide 14:** These are a couple of examples of concentrating solar power (CSP). The three main types of concentrating solar power systems are: linear concentrator (which includes both the Parabolic Trough), dish/engine, and power tower systems. CSP works by focusing and concentrating sunlight onto a receiver or fluid-filled tubes, which absorbs and collects the heat and transfers it to an engine generator.

CSP offers several advantages: It can be easily integrated into conventional thermal power plants. CSP is not affected by abrupt changes (such as cloud passage) into the output power (very common in PV plants) so it is sometimes considered more grid-friendly.

However, unlike PV, CSP isn’t great in many geographic regions. It requires direct beam solar resource, and so, in the US, it’s primarily limited to development in the Southwestern region. Also, the economics indicate that it’s really only viable for utility scale plants.

More detailed information on various types of solar technologies will be provided during the August 15th webinar “Solar Technology Options and Resource Assessment”

**Slide 15:** So, we’ve talked a little bit about what solar is and what the market is looking like now, and before we discuss WHY you might be interested in increasing solar in your jurisdiction, we’d like to do another quick feedback question. We’ve listed here the most commonly cited benefits of solar – economic development, environmental, energy security, and self-sufficiency. We’ll talk about each of these, but which one is most appealing to you?

This is interesting! Most of the audience is split between economic development and self-sufficiency, along with environmental benefits and fourth place with energy security.

**Slide 16:** There are a wide range of economic development benefits for solar, as listed here.

One of the most commonly cited benefit is price stability. Solar is still a premium cost product in most jurisdictions, but it offers something that traditional fuels can’t offer in terms of stability – once the high costs of solar are paid for, the price for output is fixed over the life of the system. That’s a high value in jurisdictions with limited access to fuels for electricity (like rural areas and Alaska) as it protects consumers against price shocks in the long term.

In addition, solar installations are now cost competitive in certain high cost electricity markets (like California, Hawaii and a few northeast states) making energy cost reduction via solar a driver for market growth in those areas.

Phoenix, Arizona has relatively high electricity costs and great solar resource, and the city has taken advantage of this with Solar Phoenix, a solar leasing program. The program combines two economic benefits by giving consumers long term price stability, and even saving money from the beginning. The lease payment plus the electricity bill combined are typically lower than the utility bill homeowners paid before they installed a PV system, saving the average participating Phoenix homeowner 15% on monthly electricity costs.

San Francisco, CA **provides a good example of some of the other benefits: green jobs, revitalizing underdeveloped areas, and developing locally owned assets.** The San Francisco Public Utilities Commission administers the GoSolarSF Incentive Program which targets environmental justiceareas, encourages residents to hire installers who employ graduates of the city’s workforce development program and installers whose headquarters are located within city limits. The program has paid $7.4 million for completed installations, and seen 4.4 megawatts of solar installed or committed. In addition, 40 green jobs that are local have been created.

**Slide 17:**  Speaking of jobs, the growth of the US solar market (both in manufacturing and installations) results in an increase in US job creation and retention (both direct and indirect jobs). There are currently over 50 U.S. Solar Manufacturing Plants – the majority of which are located in Western states with a growing number located in the northeast.

Federal Buy American policies have helped drive solar system purchases from US-based companies and provide reasonable incentive for new solar manufacturing companies to develop or stay within the US.

**Slide 18:** Manufacturing generally offers more jobs than installation, however, in today’s global economy there are more jobs being created in the US through solar installation, sales and distribution. According to a study conducted by the Solar Foundation, over 52,000 Americans worked in the solar installation business last year with an additional 17,722 in sales and distribution, while about 24,000 worked in solar manufacturing. You can see from the last slide that the US manufacturing market at the moment is hotly competitive between locations as well as competing with international interests. The development of installation and contracting jobs is less competitive because it is necessary to have those jobs locally.

**Slide 19:** In addition to economic benefits of solar markets, Solar PV offers a range of environmental benefits.

We measure the environmental benefits of renewable energy technologies by accounting for all life cycle stages to evenly compare RE systems to conventional systems. The majority of environmental emissions from renewables and solar in particular, are in the component manufacture. Construction, operation and decommissioning impacts are generally found to be small for solar technologies, including concentrated solar power (CSP). [Source: See Garvin Heath’s results on life cycle assessment (LCA) for CSP] That’s a difference from the vast majority of environmental emissions from conventional systems that occur in fuel combustion and operation.

One of the primary drivers for Boulder, Colorado’s Climate Smart Solar Grant fund is the environmental benefit. Since 2008, the city has offered grants for installing PV or solar water heating(SWH) systems on housing for low- to moderate-income families and on the facilities of nonprofit entities. The program is funded by the partial revenue from a sales tax the city charges on solar technologies. As of September 2010, a total of over $154,000 has been awarded to nonprofit organizations and homeowners. The grant funds have resulted in 22 solar PV systems, 206 kilowatts of installed PV capacity, and two solar thermal systems, which reduced carbon dioxide emissionsin the area by approximately 275 metric tons per year, that’s equivalent to removing 55 cars per year from US roads every year, equivalent of emissions from the electricity use of 34.3 homes for one year OR emissions from 30,830 gallons of gasoline consumed. Those aren’t huge numbers – but remember that we are only talking about a $150,000 investment from the tax revenue. In addition, annual energy cost savings exceeded $25,000. (Source: http://www.nrel.gov/docs/fy11osti/47692.pdf)

**Slide 20:** There are also a wide range of energy security benefits for increasing DG.

The DOE Office of Electricity and the National Association of State Energy Officials (NASEO) have been working to facilitate the updates of state energy emergency response plans. In this effort there is a specific desire to incorporate renewable energy systems with solar in particular, in state emergency response, contingency planning and system resiliency efforts to capitalize on the energy security benefits of solar.

On the local level, Boston, Massachusetts, is incorporating solar into their transportation and emergency planning. Solar Boston (initially funded by the DOE solar program) is incorporating solar PV battery backup systems at traffic intersections along one of the city’s major evacuation routes. These systems will ensure that if the grid fails, the transportation infrastructure at those intersections will continue to function long enough to allow for evacuation. These systems will have the added benefit of feeding solar power into the grid during nonemergency situations. The city’s Office of Environmental and Energy Services working with a cross-departmental team that includes the Mayor’s Office of Emergency Management, the Boston Transportation Department, the Public Works Department, and the Boston Police Department to develop the solar evacuation route concept. The city is also in the process of developing a long-term energy assurance plan that will incorporate solar power resources. (Source: http://www.nrel.gov/docs/fy11osti/47692.pdf)

**Slide 21:** Related to energy security, there is the benefit of solar self-sufficiency. When we talk about this, we are really referring to communities being in control of their electricity costs. We talk about reduced grid congestion that hedges against price spikes and peak demand reduction, which can reduce the need to purchase high cost, or possibly unavailable peak electricity. This graphic is a representation of how solar can contribute to that. It’s taken from a DOE solar program report we did here at NREL for San Diego – a solar America community. It shows how solar generation coincides with peak energy demand and can assist utilities in meeting peak electricity demands without adding additional baseload power.

**Slide 22: So that’s a review of the benefits of solar markets, with** examples from a variety of jurisdictions. Of course, your jurisdiction has a whole different set of issues and complexities to deal with in the development of solar markets. So, how can you get to these benefits from where you are, playing the role you do as a policymaker or regulator?

The role of policy is important in overcoming institutional barriers and, currently in markets where solar is still a price premium, the provision of niche incentives to catalyze the specific markets you want to develop are important. For example, our current policy work, which will be published in the next few months, is quantifiably finding that if you are looking to get the benefits of distributed generation, low cost (to policymaker) policies, such as strong interconnection and net metering policies are not only critical to the development of early markets, but also tend to lend toward increasing the impact of more expensive policies such as RPS and incentives. That’s good news for jurisdictions suffering from these tough economic times – the benefits of solar can be reaped by setting up the market and letting private investors come in to help develop it. Policy and incentives don’t have to be the only player in that game.

**Slide 23:** Another way to look at how policy matters is to look at the impact of financing options on the cost of installations. NREL did this in a recent report and the results indicate that allowing a wide variety of financing mechanisms to flourish can lead to installed cost reductions, as it allows flexibility to homeowners and larger scale developers.

Source: NREL, Impact of Financial Structure on the Cost of Solar Energy, April 2012, https://financere.nrel.gov/finance/content/new-nrel-report-impact-financial-structure-cost-solar-energy-PV-CSP-trough-tower-levelized-cost-of-energy)

**Slide 24:** The development of innovative financing has stimulated the creation of new solar integrators. We’ve seen new solar companies move into (and develop markets and create jobs) in states with open solar markets and supportive policy environments.

This is data from NREL and LBNL’s installer survey. This graphic shows that a large percentage of the residential DG systems being installed are still done with cash. However, you can see here that the flexibility offered by multiple financing mechanisms – such as third party ownership, are allowing people into that market – like renters or people in areas of poor solar resource, or people without cash reserves – and low cost policies, just by allowing that option, are allowing jurisdictions to reap the benefits of DG and solar without a large public investment in development.

More detailed information on policies and regulatory strategies to support distributed solar will be provided during the August 22nd webinar “Policy for Distributed Solar” and the September 5th webinar “Regulatory Strategies for Driving the Distributed Solar Market”

**Slide 25:** And that concludes the first of our six webinars in the SunShot Summer Webinar Series. We hope you’ve found it helpful in outlining the current solar market and technology options and prices, the potential benefits of the development of a solar market, and some options and roles for policy and policymakers in reaping those benefits. I also hope that is peaked your interest in getting more detailed information for the remainder of the series.

**Slide 26:** Our next webinar “Solar Economics for Policymakers” will be held next Wednesday, July 25th from 12:00-1:00 MDT / 2:00-3:00 ET.

To provide feedback on this and what other presentations you’d like to see, please fill out the short feedback form that will pop up when you exit the webinar – we would really appreciate it, and we will respond to the feedback.

For more information or to request technical assistance on technology, programs, and policy options through the solar technical assistance team, please email us at: [stat@nrel.gov](mailto:stat@nrel.gov).

**Slide 27:** Finally, all of the presentations from the SunShot Summer Webinar Series will be recorded and posted online at this link, [www.energy.gov/sunshot](http://www.energy.gov/sunshot).

We also wanted to provide you with some additional resources and other related upcoming webinars:

* NASEO provided a webinar on May 24th on third party power purchase agreements (PPAs), which can be accessed by participants at: <http://naseo.org/committees/renewable/index.html>.
* NASEO will be hosting a webinar on state streamlined permitting initiatives for renewable energy on August 9th at 3:30 pm ET. Please contact Julia Friedman ([jfriedman@naseo.org](mailto:jfriedman@naseo.org)) if interested in participating.

Again, I want to thank you again for your participation today and welcome you to ask questions through typing them in the appropriate window on the webcast software. Thanks so much.

*[Courtney Kendall]* **Slide 28:** Thank you, Liz! We would like to thank Liz Doris for her time today, and we will be posting the presentation slides, and audio within the next few weeks on the Meetings and Workshops page of the SunShot website at [www.energy.gov/sunshot](http://www.energy.gov/sunshot). This concludes today’s webinar. Thank you again, and goodbye.