Becca Jones-Albertus:

Alright. Good afternoon and good morning - depending on where you’re located through us. Welcome to the SETO Quarterly Stakeholder Webinar. I’m Becca Jones-Albertus, the Director of DOE Solar Energy Technologies Office. I’m very happy to be here with you today.

First, just introduce my team members who will be speaking as well during the call today. We have, all four of our program managers: Lenny Tinker, Avi Shultz, Gouhui Yuan, and Garrett Nilsen. As well as two of our technology managers we’re contracting into the office: Michele Boyd and Andrew Dawson.

As most of you probably just heard, as we got things started, but this webinar is being recorded so that we can post it on our website. And so, for your information, if you would like to not be then you can avoid having your voice or your writing in chat.

So with that, what we’re going to cover today is just a real quick overview for any of you who are new to our office: some updates on what happened in our last quarter, as well as what we’re expecting for the next couple of months, and then we’re going to go through the questions that were submitted for our “Ask an Expert” webinar. And if we have time, we will take some questions that you submit… during this webinar if we have any time afterwards. We do have a number of questions to go through, but I hope we’ll still have time to take a couple. And you can use the Q&A feature of the webinar to upload any questions you have. So with that we’ll go into a quick overview of the office. For those of you who are not familiar with us, our vision as an office is to be having solar energy become a really central important part of the US energy system. And today we had a rapid change and growth over the last decade with solar being 3% of US electricity today and as much as 20% in other areas. We see our mission being to continue to accelerate this development and application of technology that’s enabling low-cost, reliable solar deployment in the US. We have three sets of principles that we operate by, and it is that:

Solar energy needs to be affordable and accessible for all Americans,

It has to support the reliability, the security, and the resilience of the grid – like typical electricity generation technology,

And we also want solar to maximize its domestic benefits – supporting jobs, US manufacturing, and the circular economy in a broad range of applications.

We enact this mission and - [inaudible] - by funding early stage research, development, and demonstration projects working to advance two main technology types: photovoltaic technology as well as concentrating solar-thermal power. And this is to support US innovation and support that technology transitioning to the market. We also focus heavily on grid integration technologies that are designed to support the reliability of the grid in many different ways and to pair solar with energy storage and other distributed energy technologies to enhance community resilience. Christie, you can continue to click through - and as well we focus on providing relevant and objective technical information on solar technologies to stakeholders and other decision makers.

At this point we will give an update of some of the … these are the five teams of our office; as we’re organized and we have representatives from all five of our teams here with us today. And then, well give a quick update of some of the main activities we’ve had in the last quarter to ensure that all of you are aware of some of the bigger things that have gone on with the office. And then we’ll talk about a few things coming up.

So our Solar Energy Innovation Network, which is run by the National Renewable Energy Laboratory in partnership with Rocky Mountain – [inaudible] – Lawrence Berkeley National Laboratory. The Innovation Network is a collaborative research program that supports multi-stakeholder teams as they’re working together on real word challenges associated with solar energy adoption. We announced eight teams at the end of March that were selected to participate in the second round of this network. And these teams are focused either on increasing solar energy adoption and resilience in rural communities or tackling challenges related to solar energy deployment in the commercial sector. We’re really excited about the work that these teams are kicking off in the beginning with us in their little over a year in the program.

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We’re also underway in the American-Made Solar Prize. We have both rounds – 2 and 3 – active. In the last quarter, we selected 10 teams to be the finalist competing in the last phase of Round 2 of the Solar Prize. Each of these 10 teams – that are doing some really exciting work- they each received $100,000 in cash as well as vouchers to advance their prototype as they prepare to compete at their final demonstration day on August 27th to be one of our two winners. These two winners each get $500,000 cash and another $75,000 in vouchers to use with the American-Made network which consists of national labs, incubators, and other supportive facilities and advisors that help our team accelerate their progress as much as possible.

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On April 6th we announced a $4.5 million funding program with the acronym EMPOWERED which is focused on training programs that can support first responders, safety officials, and building managers and owners in managing new energy technologies on a distribution system safely and effectively. This is a collaborative effort by our office with the DOE Buildings Technologies Office and Vehicles Technologies Office and we’re really excited about the work we’ll be able to support through the funding opportunity. The concept papers that are the first stage in the application process for this funding opportunity were already due and we’ll be making announcements about encourage/discourage decisions of those applications shortly.

In April, we opened the Solar Desalination Prize which is a $9 million prize competition focused on low-cost solar-thermal systems that can produce clean water salt water. This prize has a $1 million grand prize for successful testing and demonstration of a solar-thermal desalination system prototype. And applications for the first round of this prize are due on July 1st. You can find more information on our website.

Last highlight from the past quarter is our National Community Solar Partnership which held its first meeting for partners at the end of April. The National Community Solar Partnership is supporting teams and partners that are working to enable community solar adoption in underserved communities. Supporting them in developing models to reduce energy bills for community solar that is structured on multifamily affordable housing units and is working towards utility partnerships that can expand solar access using community solar models. So if you are interested in becoming a partner, you can email [community.solar@ee.doe.gov](mailto:community.solar@ee.doe.gov) and you can also, again, find more information about the partnership and the exciting work that they’re going forward with on our website.

So coming up over the next couple of months, we on June 15th is the application deadline for the fellowship that provides recent graduates and others opportunities to work for 1 – 2 years in our office, learn the work we’re doing, get big picture opportunities to support new strategies and new funding ideas. And we really encourage people to take a look at that.

On June 18th is the full application deadline for our large FY 2020 office-wide FOA. Concept papers were already due for that FOA so this is – full applications are due for folks who are still in the - [inaudible] - of a cycle.

On June 18th there’s a webinar for our Solar Desalination Prize. You can learn more in advance of how to apply for that July 1st deadline.

June 9th is Demo Day for Round 3 of American-Made Solar Prize for the second stage in that three stage competition.

And as I mentioned before August 27th is the final Demo Day selecting the winners for the American-Made Solar Prize Round 2.

That’s what’s coming up and we encourage you to visit our website, you can see at the bottom left corner and also sign up for our mailing list, if you are not already on it to continue to stay informed with what’s going on. And now we’re going to move into the primary focus of our webinar today. Where the theme is “Ask an Expert”. We have a set of questions that we’ve revived ahead of time that people submitted. We’re going to try to address all of those today and hopefully we’ll have a little time at the end to try to address any other questions that those of you have added coming in. So we’ll be rotating through these while other questions come up on the screen and different folks on the team will provide their answers. And so, with that we’ll jump in.

The first question’s related to… Does our office cover energy storage technologies and will we have – yea, basically around whether we cover storage, I – [inaudible] - focusing on reducing energy storage costs. [Inaudible] – very important… Yea, go for it Avi.

Avi Shultz

Sorry, I apologize on that little issue on muting myself on the webinar. This is Avi Shultz, I’m the Program Manager for Concentrating Solar-thermal Power Team. We had these couple of questions on energy storage. So the Solar Energy Technologies Office is, like I explained in our mission, is really focuses on sola-specific technologies. Our mission is to focus on the solar generation as – [inaudible] – thing. We primarily work on energy storage technologies as they are integrated specifically with solar generation technologies. What that means primarily is 1) we certainly work on concentrating solar-thermal power that is integrated with thermal energy storage. So we have a target of achieving CSP systems specifically with thermal energy storage incorporated with at least twelve hours of thermal energy storage. We have a target of lowering the cost of those systems to about 5 cents per kilowatt hour electric by 2030. And again that is a system with thermal energy storage that is integrally part of it, because we really believe that’s where the value proposition for future CSP technologies are.

For PV systems we work on energy storage as the specific system is, as some systems are, specifically integrated with batteries. We don’t work on the battery chemistry themselves, but there are opportunities where we can look at designs, for example, that use dual inverter systems or where there are opportunities to reduce shared balance and system cost by designing systems with the PV and battery system from the beginning. We have a target from those systems as well, that we’ve developed by, in the next several years, by 2023, we’re hoping to achieve $1.45 per watt DC for a nominal 100 megawatt PV system that has 60 megawatts and four hours of battery storage for that system.

In addition if you go to the next slide, Christie, we worked closely on other energy storage technologies with other offices in DOE. In fact, just recently DOE launched the Energy Storage Grand Challenge which is a holistic effort to from the entire department to really push forward US’s leadership on a variety of energy storage technologies. So as you see in the corner there, that figure shows that we’re really looking, at a department level, at all of the different energy storage technologies that can be technologically developed including:

Bidirectional electricity storage,

Chemical and thermal storage,

and flexible generation and controllable loads – which really are just another way of storing energy.

So in the Solar Office we work closely with our colleagues in other offices like, the Office of Electricity, the Water Power Office – which – [inaudible] – hydro, with the Vehicles Technologies Office – that are really working to develop a lot of those key energy storage technologies.

Becca Jones-Albertus:

Great! So the next question we have submitted was on specific types of projects that would fall under the Coronavirus Aid, Relief, and Economic Security Act; also known as CARES?

So the CARES Act is $2.2 trillion economic stimulus package to provide to provide financial and emergency relief to the US economy and the American people amid the COVID-19 pandemic. It provides the Department of Energy with $127.5 million of funding that includes nearly $100 million for DOE’s Office of Science and the National Nuclear Security Administration to the core operations of the National Laboratory Scientific User Facilities for R&D efforts related to the coronavirus. So our office is not directly involved in that funding opportunity and so it is DOE’s Office of Science and National Nuclear Security Administration that who are – [inaudible].

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Andrew Dawson:

Alright so these questions deals with perovskite photovoltaics. And the first question is, how far away is perovskite solar cell technology from commercialization? And the second, which is pretty closely related is, with durability issues of perovskite materials not fully addressed, what is the reasonable lifetime a customer can expect out of these modules?

So, I’ll say that the answer to these slightly vary quite a bit, depending on whether we can maintain the current R&D trajectory and what specific market we might be discussing. Some really commercial products have been announced already for perovskite solar technologies, but so far they’re relatively small format devices intended primarily for off-grid applications. So if trends in performance that we’ve already seen in the last few years in this technology space continue, I would expect to see more products on the market within the next five years or so. In terms of the durability issues and lifetime, this is a pretty difficult question to answer. With any new technology, the testing protocols used to evaluate performance, need to be reevaluated. You can’t just utilize ones that were developed for other photovoltaics or similar technologies. So the community in this case has developed a very specific test for silicon and cadmium telluride technologies. These protocols need to be sort of translated and adapted to perovskite photovoltaics before we have a clear indication of long term field performance. We need to establish whether those tests generate an essentially representative results that can be used to infer long term behavior.

So we’ve seen lifetime of perovskite photovoltaics increasing pretty rapidly. The R&D community has published a number of results that show a retention of more than 90% of the initial performance after a thousand hours. And a number of groups are targeting greater than 10,000 hours survivability in the lab. The challenge is that these tests, while are certainly generating valid results, its not clear that the results are directly transferrable to field performance. So we’re going to need to do a reevaluation and revalidation of test protocols before we really have a good handle on what the expected fielded life of these technologies would be.

Garrett Nilsen:

Alright! My name is Garrett Nilsen, I am the Program Manager for our Manufacturing and Competitiveness team. Diving right in, will there be a Solar Prize Round 4?

Assuming congressional appropriation provide adequate funding, we do plan on running a Round 4. The exact date of launch and application due date and et cetera are still being determined. And those will be shared publicly once we are able to announce the launch of the 4th Round.

Another question was around, how are we dealing with plug-and-play and moving that forward?

As SETO continues to invest in a variety of different components which enable such kinds of products, whether it be from the power of electronics to the module architectures themselves to the racking. Again, SETO works in a variety of different ways that organizations across the permuting spectrum and looking at looking at other instillation rest factors with might be applicable to pug-and-play products in the future. Our incubator program is open enough in nature that applications with methods, to integrate all of these components into a potentially commercializable plug-and-play product would be acceptable and would be reviewed by our office.

Guohui Yuan:

So my name is Guohui Yuan. I lead the Systems Integration group here at SETO. So this question is, given what we’ve seen with COVID-19, does the DOE expect to create a “resiliency” function cutting across all sectors?

Well I would answer this question this way: So even before COVID-19 security and resilience has been the highest priority research area for our office and in fact across the DOE. We have collaborated with many colleagues in different offices, in particular Office of Electricity, on developing technologies and solutions for resilience. I'll give you some examples: One is after Hurricane Maria in Puerto Rico, we have collaborated with OE and multiple national labs to develop a model analysis to support the rebuilding of Puerto Rico power system in a resilient way. As you know, Puerto Rico has a 100% renewable target for the future and a lot of that is solar generation, so we contributed a lot in those discussions. Another example is the North American Energy Resilience Model that is looking at the interdependency between the different infrastructures. In particular, the natural gas, transportation, communication, and the bulk power system, where one infrastructure may have a disruption one instructor will have an impact in a different infrastructure. So that is a very ambitious initiative that is ongoing. And the third example is, a few years back we have collaborated with the National Labs and the demanded a – [inaudible] – consortium. [Inaudible] – distribution – [inaudible] – by using – [inaudible] – you know solar is a – [inaudible] – to enhance the resilience of the things in the local power system. So these are good examples of what we've been working on. So – [inaudible] – more detailed information about the resilience – [inaudible] – in the DOE in our office.

Ok, so I’ll take this one as well. The question is: What can be done to get better integration for the electric-vehicle makers such as Tesla and the Rivian?

So obviously EV and PV adoption – [inaudible] – of these technologies have been the main driver for grid modernization. And in the past we have been looking at these technologies individually in terms of how to integrate them into the power system as we know… is as the penetration level increases looking at them in isolation is not sufficient. So we're, in the DOE, are looking at the integration of a different technology; - EV/PV the new building technologies and other technology - in a holistic way under the grid modernization initiative. So we have a lot of good examples to tackle this problem. One example is a program that we launched a few years ago called SHINE, where we look at the integration of energy storage, PV, and building load to optimize the efficiency and the value of those – [inaudible] – assets. [Inaudible] – is also a part of the mix in terms of optimizing collaborating these different resources not only to maximize their value but also to provide the growth services.

Lenny Tinker:

Ok, so this is Lenny Tinker here and I'm going to cover this question: Are there environmental concerns of scaling up cad-telluride production?

And so i'll start off by saying, first of all that cad-telluride is very stable so it does not easily release toxic free ions like cadmium. So it's a very stable compound most uh cadmium – [inaudible] – are currently sort of mined as side products of other metals. So for example, tellurium is now coming from copper refining and cadmium is coming as a byproduct of the zinc ores. So my point there is that we're not, sort of at the moment, just specifically trying to mine those materials so as much as being created for those materials and it may not even be feasible to do so. Mines obviously do have environmental impact, but depending on how they're run that that impact can vary greatly. And so if the mines are well run then the impact can be very well controlled.

Michele Boyd:

This is Michelle Boyd. We got a question about how SETO is working with states and local governments to advance solar deployment.

We have a number of programs that provide technical assistance to states and local governments to advance solar. Two of these programs were highlighted earlier in this webinar: the Solar Energy Innovation Network and the National Community Solar Partnership. The multi-stakeholder team that Becca mentioned in the Solar Energy Innovation Network can include states and local governments and these teams as was mentioned earlier, research and share solutions to real world challenges that they're facing in their communities. And the eight teams that are currently in Round 2 are focused on commercial scale solar and solar and rural communities.

The states and local governments can also sign up to be partners in the National Community Solar Partnership. The goal of the partnership is to expand access to affordable communities solar to every American household by 2025. NCSP provides partners with tools, information, and technical assistance to help them design and implement successful community solar models.

Another program that we have is SolSmart. This is a national recognition and technical assistance program for local governments to help them streamline their processes to make it easier for residents and businesses to go solar. Communities can receive designations of SolSmart gold, silver, and bronze. SolSmart provides technical assistance to local governments in areas such as permitting, inspection, and construction codes among other topic areas.

And then finally as part of the DOE’s Grid Modernization Lab Consortium that Guohui mentioned, SETO it supports a project that will provide technical assistance to state public utility commissions to support their grid modernization or energy infrastructure initiatives. You can sign up for SETO's newsletter to get up-to-date information on these programs as well as any other new programs that we have that work with states and local governments.

Becca Jones-Albertus:

Thank you Michele so our next questions are related to our cost targets for residential utility scale and their aggressiveness.

Chrissie you can go to the next slide and pull those costs up – [inaudible].

And DOE Solar Office, we've had two sets of Cost Targets the eleven announced the SunShot 2020 targets. Which were really set at that time for what was needed to be cost competitive with alternatives. So this means what was thought to need to be the cost to match conventional generators at the utility scale and kind of retail electricity rates at the residential scale. So those targets are shown in this figure in blue for the three different sectors that we track for solar energy systems, which are residential rooftop systems - so 10 kilowatts or less, commercial energy systems that are more in the 10 kilowatt to 1 megawatt size and then utility scale systems that are 1- 5 megawatts up to hundreds of megawatts. Today we recognize that the further we can drive costs down the more we can unlock solar deployment and support greater energy affordability for all. So we set our 2030 Cost Targets a few years ago. We set those in order to continue to drive really aggressive cost reduction across the industry. Again with the goal of trying to really excel cost reductions and make energy more affordable.

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Because our Cost Targets, one thing that's important to note about them, is they assume average climate in the US. So they're set for what we mark in blue here as like Kansas City, Missouri is kind of an average climate. When we think about some of the cheapest announcements that you see of costs in the market for the US, those are in the southwest. And the same system that's installed in Kansas City, if we're targeting 3 cents a kilowatt hour, that system installed in Kansas City at 3 cents a kilowatt hour would actually be 2 cents a kilowatt hour in the southwest US just because there's that much more sunlight over the course of the year; the climate's that much more favorable for solar energy.

And so our cost targets are also said to be without subsidies in the – [inaudible] – specifically the 30% now scaling down Federal Investment Tax Credit. So we benchmark costs today in Kansas City without Federal Investment Tax Credit about 4 and a half cents per kilowatt hour. So we are not yet at the three cents a kilowatt hour target. However we have seen things happen in recent years even faster than we expected as well as external factors like interest rates becoming record lows and so we do feel that our 3 cents a kilowatt hour utility scale target may be more appropriate now for 2025 rather than 2030 which is exciting.

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Avi Shultz:

Yeah. So this is Avi Shultz again. So we had a question about: What storage technology does SETO anticipate seeing the greatest advances in over the next decade?

So the first thing I want to say here is that we are intentionally technology agnostic in what we do. We're working typically on developing early stage technologies that are not yet significantly commercialized. So we're we're interested to a large degree in hedging the risks of technology development and we're interested in investing in a number of technologies that we think are potentially plausibly commercially relevant. That being said, obviously recent years have seen a greater and greater uptick of deployment of lithium-ion batteries especially for let's say the 1 - 4 hour duration range on the grid. So as I mentioned earlier, we’re very interested in looking at working on the integration challenges of PV with lithium-ion batteries as it seems that there is a significant market for that. However, we're also interested in looking at storage technologies that are differentiated from lithium-ions for being more applicable to longer duration storage markets. That's a much less well-developed market, so there's still a lot of opportunity for us to investigate a number of different technologies on relevant long iterations. Obviously in our work with Concentrating Solar Thermal Power, we do a lot of work looking at various kinds of thermal energy storage technologies including advancing the continuing to develop the current molten salt technology that's currently used in CSP plants as well as other kinds of either phase change or thermochemical energy storage systems for those longer duration. We also, of course, work closely with our colleagues in other offices that are working on longer duration storage technologies.

So again, my colleagues in the Water Power Office - that are working on pump storage hydro, the DOE’s Hydrogen Fuel Cells Office - which is working on developing hydrogen as a chemical fuel which is another way of energy storage, as well as our colleagues in ARPA-E - who recently launched a program called DAYS focused on long-duration energy storage for the between 10 - 100 hours of storage. So we stay in close contact with all of them and are always looking for opportunities for research that is focused on the integration of those technologies with solar energy.

Becca Jones- Albertus:

Next question we have here is related to solar-thermal technologies for building scale as opposed to the concentrating fluorothermal technologies that are a major focus of our program and why DOE is not focusing more on those technologies as well as PV coupled to building those technologies?

So solar-thermal technologies for buildings, like solar-thermal water heating, have historically been funded primarily by DOE’s Buildings Technologies Office. However we are taking a fresh look at opportunities for solar specific innovation related to technologies that may be incorporated into future funding programs. We do have funding for PV coupled with building technologies that can include water heaters, HVAC units, and other building loads. They fall more generally into our look at how PV couples with energy storage and flexible load control to be a more efficient and economical integration and enable greater solar penetration and greater matching of solar generation supply and energy load. And so in these cases, we're looking for how the coupling of these technologies together can provide higher value to the building owner and or the grid operator.

Gouhui Yuan:

So this question is about green hydrogen: Do you see any role for green green hydrogen in expanding the role of solar electricity?

The short answer is potentially. So we have done some preliminary analysis in collaboration with the Hydrogen Fuel Cells Office within the EERE just to look at if there is a good opportunity here using solar energy electricity and electrolyzer technology to generate hydrogen and other type of gas natural gas nicely to see if they can be competitive to the other alternatives. And so, it's still very early and there are some challenges both economically and technically. So the main challenge is the cost; right now its very expensive compared with natural gas, for example. And the other challenge is the infrastructure for hydrogen and natural gas. Whether its the transportation or using pipelines to transport them from one location to another. So these are uh obviously very big challenges for the technologies and we're actively looking while still looking at some problems to solve here maybe some solutions to solve this problem.

Andrew Dawson:

Alright, so Andrew Dawson again. How does SETO measure the lifetime of new PV module technologies? And: How do you know module reliability is increasing?

So this builds on the prior comments I was making around perovskite technologies; verifying that you have the test protocols that will produce high confidence in long-term performance for new technologies is a very challenging problem. So our office supports programs that are developing and validating accelerated life test protocols for emerging technologies. This frequently looks like utilizing a test protocol from other technologies as a starting point and then iteratively refining those protocols as you generate data that shows either new degradation modes in the new technology or limitations of the current tests. So this is a loop that will kind of go between lab and field testing model development and then to analysis and then changes to the actual devices themselves and materials, architecture, and fabrication approaches.

So SETO is interested in accelerating this process as well as ensuring that the results that come from any protocols that are developed can be accepted and trusted by the off takers, the finance and development communities. A lot of what we're looking for is efforts that will accelerate or will refine the accelerated life test protocols and in a way that can be used to establish the bankability of the technology.

And in terms of module reliability increases: I would point the audience to two major papers from NREL looking at the distribution of lifetimes in fielded modules. So those papers show an increase in fielded life for commercial technologies and we're also seeing that evidence be supported by an increase in warranty lengths being offered for these systems.

Becca Jones-Albertus:

Our next question is: What grants or programs are available for 501.c.3 organizations?

The vast majority of our funding is our cooperative agreements that come as part of our funding opportunity announcements and most of the topics in those funding opportunity announcements are open to all sorts of entities which include 501.c.3 organizations. So we very much encourage anyone who's interested in our funding to sign up for our newsletter and that way you will not miss news of upcoming funding opportunities and can see topics that are most relevant to you.

Andrew Dawson:

Alright so perovskite-silicon tandem solar cells have 29% efficiency and are progressing rapidly. Shouldn't they be a bigger part of the discussion?

So I do want to say that this is certainly an active area within the SETO portfolio these perovskite tandems both the hybrid perovskite-silicon tandems mentioned as well as perovskite-perovskite tandems have demonstrated very high performance and could be very competitive in the market.

There are some unique challenges with combining dissimilar absorbers and cell structures. So it isn't entirely clear that this is the most viable path forward, so the way that SETO looks at this is to establish a robust portfolio. There are a number of approaches pursued. So perovskite-silicon tandems are certainly a big part of what we're considering as are perovskite-perovskite tandems; single junction perovskite devices. And sort of all of the above produced using a range of fabrication approaches.

Avi Shultz:

We had a question specifically around CSP deployment asking about the future of CSP and particularly given some challenges that the industry currently has, “Will US utilities want to take a chance on either generation 2 which are current molten salt-based power tower technologies or gen 3 technologies which are the higher temperature systems that are currently a focus of our research portfolio.

So uh this is a interesting question. There certainly are challenges with with CSP right now. There are the lack of deployment, especially in the us, really is it has a lot to do with the function of the rapid decrease in cost of PV technologies and other renewable technologies over the last several years. In particular with a early entry of those technologies there's really been a lot more valuation of the energy produced rather than the time of day which these produced. Which means that CSP which again has the value proposition of thermal energy storage and being able to produce power when the sun goes down, up till now has not been significantly valued in procurement and so it has been difficult for it to compete with lower cost technologies like PV and wind. However, we believe that that is starting to change

If you go to the next slide Christy.

If you look at the plot on the left side of the screen, we commissioned a study by NREL, the National Renewable Energy Lab, last year to look at the potential deployment of CSP if we are able to hit our Cost Target of 5 cents per kilowatt hours electric for a system with at least 12 hours of storage. And we do see a pretty significant opportunity for deployment so the central red line in that plot is kind of the baseline assumption that NREL modeled showing that CSP does have a potential deployment of in the more than 100 gigawatts and actually with a relatively high capacity factor translating to nearly 15% of electricity generation in the US. However of course that is subject to a lot of different sensitivities based on what may potentially happen on the future with other technologies. So you do see a wide range of uncertainty around that and based on the assumptions you make on future scenarios.

The other thing I’ll mention here is that since CSP is still relatively nascent technology relatively new in terms of the number of deployments worldwide CSP is still learning in terms of best practices and increasing plant reliability and performance. And so another study we commissioned from NREL is a study to actually document CSP best practices, so this team actually went around to the operators and engineering firms behind the global fleet of CSP plants - not just in the US, but also plants in Europe, North Africa, South America, China, all over the world - to actually collect best practices and do a study to really quantify and qualify the issues and the successes that have been seen in the fleet around the world. That report is currently being finalized and we actually expect that report to come out extremely soon and we really expect that to help accelerate high performance and cost decreases in future CSP plants.

Guohui Yuan:

I’m not sure I’m not sure if I’m supposed to answer this question, but I’ll give it a try. So the next question is: How does the increase in residential PV affect the electric utilities supplying residential communities?

So there are two parts of the equation here. One is obviously the utilities will lose revenue, because part of the residential energy usage electricity usage will be supplied by their own PV system. So that is a… you know first impact. And the other impact is because the generation of the electricity at the residential houses may flow back to the utility so there might be some reliability issues in terms of managing the voltage and some other protection schemes on the utility side. So those are the impact, but I would say that there are manageable impacts and we are actually in this office working very actively on resolving the issues in terms of improving the reliability and also resilience of the grid with high penetration for distributed solar energy. So I just want to add one more thing for this question, the residential PV system in combination with energy storage can provide – [inaudible] - and this is actually a good solution when the utilities do have some issues and challenges in a stress environment and this is actually uh you can look at the – [inaudible] - and a lot of people are buying PV and storage too as a backup solution during those CSP events. So that's an area that we're very much focusing on in our research.

Hopefully that answers the question.

Garrett Nilsen:

Alright this is Garrett Nilsen again.

The question was: How to better increase manufacturing across the supply chain in the United States?

So SETO continues to look for opportunities to manufacture components across the supply chain in the US. So you don't find the cost modeling efforts at the National Renewable Energy Lab to illustrate what competitive advantages entities in the US might have for given products such as PV modules to help those companies understand that opportunity of commercializing it domestically. However SETO provides funding for R&D and innovative new products are only one of the ingredients needed to spur domestic manufacturing growth. Significant capital is needed to scale technology to from manufacturing to manufacturing levels and that has been challenging for the US solar industry. To address this, SETO engages a variety of private and public actors to see what resources, financial physical, or otherwise could be brought to bear for companies that are trying to scale domestically and trying to figure out creative ways to connect those resources with those that need it.

Garett Nilsen:

This is Garrett again. Some kind of a follow-up to the earlier plug-and-play question. There continues to be interest in plug-and-play AC modules. SETO continues to think about this space. As I mentioned previously, we continue to evaluate uh technical barriers, so component level and how do we bring those together into commercializable products, permitting, and other barriers that would be need to be resolved to deploy these kinds of solutions. However, one important point is that ultimately the deployment and market potentiations of such products and these will rely on individual authorities having jurisdiction and safety officials at the local level and their comfort with such products and how that they can ensure that space installation takes place both for the homeowner and for anyone else that might need to engage with that energy asset in the future.

Guohui Yuan

The question is: Monte Carlo may be a really useful methodology for integrated system analysis. Is this an area of current research or interest at SETO?

So actually we have been using Monte Carlo method for hosting capacity analysis for many years. You know some of the key researchers, NREL, Sandia National Labs – [inaudible] – partners. They have done excellent research in terms of looking at the different PV – [inaudible] – distribution system. Looking at the weather conditions, looking at the low profile… different low profile, looking at the different deployment scenarios - both in terms of the size and the location of the PV systems, along with the different mode of the PV inverters. So each typical hosting capacity or Monte Carlo simulation would consist of many combinations of permutation of these different parameters and our study will probably include a thousand different Monte Carlo simulations to come up with the hosting capacity result for the utilities. So, yeah. We have been using this for a long time. For those who are interested in this technology you can look at some of the reports published by every NREL or Sandia or just to send us a note and we'll connect you with those researchers.

Becca Jones-Albertus:

Thanks Guohui. So that was the end of our previously submitted questions. And so we're going to move to the questions that folks have been submitting during this time. And again you can use the Q&A feature and we'll get to as many as we can in our our last 10 minutes.

So the first one I’ll give to you Garrett. It is someone who's developing an affordable housing project in Oregon: Who can you talk to for more specific information about the National Community Solar Partnership?

Garrett Nilsen:

Yeah, sure. That's a great question. So the National Community Solar Partnership is open to partners of any kind of variety I think. The first step I would do is potentially sign up as a partner in our portal so that way you'll be integrated into the platform in the broader community. Inside of that there is a collaborative under Multi-family Affordable Housing. If you reach out to the email address provided with the program, we'll be able to put you in contact with the appropriate people who are working in this space and hopefully we can figure out a way to get you integrated into that world. But the first step is to become a partner in the program which is a very low lift. It's basically filling out a brief questionnaire and then we can figure out how to get you more deeply engaged.

Becca Jones-Albertus:

Thanks Garrett.

Next question I’ll take and ask Guohui what he – [inaudible]- wants to add on to – [inaudible] – after: What are SETO’s plans for addressing DER Distributed Energy Research resource and storage integration for grid resiliency?

I'll start off and say that we have… we are looking both at how solar coupled with storage and other DERs can be used for Black Start capabilities. So we have a lot of power electronics investments that are focused on Black Start capabilities from microgrids or other usage. And we're also looking and really interested in how we can broadly the many ways we can leverage the over 2 million solar assets that are on the distribution system, the increasing numbers of storage assets, and enable those to provide power to critical energy resources in the event of an outage.

Guohui, what would you like to add to that?

Guohui Yuan:

I think the only thing I want to add is in one of the other RDS projects that I mentioned earlier, we're also looking at resilience node concept where the PV and storage are paired together to provide the critical electricity service during an event and this is trying to provide that critical services the community. So for people who are interested you can look at the Sandia Regions project.

Becca Jones-Albertus:

Thanks Guohui.

Next question is: Hydrogen is getting the attention in the energy world as an alternative fuel. In fact Nikola Trucks went public today which will manufacture heavy fuel trucks and the question is: Solar – [inaudible] - solar panel to convert seawater to hydrogen?

Avi, do you want to take that one?

Avi Shultz:

Sure! So that's a challenging application - seawater directly to hydrogen – so the Hydrogen Fuel Cells Office in DOE has a very active program on hydrogen production and delivery. And in that program they're looking at a number of different technology pathways for cost-effective hydrogen generation including conventional low temperature electrolysis, high temperature electrolysis, as well as actually high temperature solar thermal chemical water splitting technologies. All of those technologies are relatively challenging in and of themselves to be cost effective and typically the more successful technology pathways - especially the cost effective - the potentially cost effective technology pathways are focused on preserving the lifetime of the electrode or the key catalytic functionality which is often the most expensive part of that. A lot of the lifetime of that electrode has to do with potential contaminants in the water, so most of those technologies are primarily focused on using as pure of a water stream as possible for those systems. So they usually want to use desalinated water not directly using seawater. Therefore there may potentially be opportunities for desalinating that water before putting it directly into an electrolysis system. But in fact there are a number of applications for desalinated water beyond hydrogen generally and, as Becca mentioned earlier in this webinar, we just recently launched the rules for and opened up the competition for our Solar Thermal Desalination Prize. So we're very interested in looking at applications for solar thermal driven desalination, but that is a bit of an indirect pathway towards the specific question that was asked for - hydrogen generation from seawater specifically.

I think you’re on mute, Becca. We can't hear you.

Becca Jones-Albertus:

Ah! Thank you, Avi.

All right, so a fun question here us to end on: Now I’ll ask for maybe three of you to jump in. The question is: Do you have an example of a recent successful project?

So for context, we have about 400 currently active projects. All of which are described on our website. Many of our projects you can find… do we have descriptions of all the projects on our website? We have more details about many of them there as well. So I encourage folks who are interested in getting a better understanding of what we do to look at that and coming soon we will be posting he outcomes of our recent peer review which will also include one place to go for descriptions of those projects. So I encourage people who are interested to look there and to know that the couple of examples you're going to hear here are just a small sampling of what we do and the many, many pieces of exciting work.

So with that, I’ll ask for a couple of our panelists to jump in.

Garrett Nilsen:

Sure, I can start with one. Maybe – [inaudible] - kind of the… it's still an ongoing program, but it's reaching towards the end of its current life. There's a program we've been running called SolSmart which has been focused on addressing permitting and other local zoning and other related issues to try and, you know, smooth the future deployment of solar energy at the local level. And what's been really exciting about that, you know we launched this program about five years ago. We were hoping to get about 300 communities on to be registered as SolSmart. We’ve far since surpassed that. And now I believe it's about 20% of the US that is living in a SolSmart community. And we're trying to think about how we might be able to continue that momentum and think about getting into a broader swap in the US. It's exciting to see something… to see this kind of thing grow on and kind of catch on across the US and different areas move forward with their local goals.

Guohui Yuan:

So I hope I can jump in here. So recently uh this is a few years ago and, you know, there's a SHINES program which is looking at the coordinated control of PV flexible building load and energy storage. I mentioned this a little bit earlier. So there are several processes - not one single process - that I can just point to.; they all are successful. [Inaudible] - community great project. Austin Energy has often shined and – [inaudible] - has been needing a few utilities to develop a technology for the quality control and optimization for these technologies. Energy, again, PV energy storage and flexible building load control. So they have been very active in disseminating their results and different values at the conferences workshops. So I’d like to point you to maybe look at those projects. Thanks.

Garrett Nilsen:

Hi! This is Garrett. I have one more that I think is fun. So this is an older project, finished a few years ago was through a company called Enki Technology. They developed a new method by which to put abrasion-resistant anti-reflection coating on PV nozzles that was relatively low curing temperature which works well for some different module architectures than silicon and so a few years ago they were actually purchased by First Solar. And now that material is going on many of the First Solar models that you see deployed today. So it's kind of exciting new technology that we've seen a lot of people work on years and years ago and it slowly made its way to the market over the course of… with some support from the DOE. It was certainly a lot of blood sweat… or sweat and money from the private sector as well. So it's exciting to see those kind of innovations actually make it into the market and impact on the products of very large players.

Becca Jones-Albertus:

Thanks Garrett. Sorry we had a couple of questions we didn't get to, but we got to most things here. I’m going to end here since we're right on our 3:00 time and just thank all of you who joined us. I really appreciate the opportunity to connect with you. Thanks for those who submitted questions. Please do sign up for our newsletter if you haven't yet so that you can know about what's going on with us and when we have our next Quarterly Stakeholder Webinar in a few months. Energy.gov/solar-office is our website. And thank you again. Thanks to the fellow panelists and we will hopefully chat with all of you sometime soon.