Susanna Murley:

Any questions? Thank you.

You will all be muted throughout the event. But if you have any questions, please type them into the chat box on the right hand side of your screen. We'll pause for questions throughout the presentation and we'll have time for questions at the end. If you have any technical issues, please don't hesitate to reach out to me, Susanna Murley, via the chat function. And lastly, we will be publishing the slides and links to more information on our website Energy.gov/solar-office. And this meeting is recorded. So please be aware of that. Now, without further ado, I'll turn this over to Becca Jones-Albertus, the Solar Office Director.

Becca Jones-Albertus:

Thanks, Susanna. Hello, everyone. Happy holidays. Thank you for making time during this always busy season to spend some time with us. We enjoy having our quarterly webinars four times a year to give you an update on what's going on in our office, our recent announcements, and a deeper dive into some of our exciting programs.

So for those of you who maybe aren't is familiar with our office, - can you proceed to the next slide - we... our office focuses on funding research and development for photovoltaic, concentrating solar-thermal power, as well as great integration technologies. We also provide relevant objective technical information, to stakeholders and decision makers related to solar energy.

Our priorities are really to drive innovation with a goal of making solar affordable and accessible for all Americans. So we do this through technology innovation and soft cost reduction. We're also very focused on enabling solar technologies to support the reliability, the resilience and the security of the grid, as well as creating a sustainable energy industry that can support jobs, manufacturing, and deal with life cycle concerns related to solar technology.

Our office has five different teams. We have a Photovoltaics Team, which is really focused on advancing the performance in the lifetime of the solar panel technologies and systems themselves while reducing costs. Our Concentrating Solar-thermal Power Team, which looks at using solar first, the heat, which can be efficiently stored in thermal energy storage systems to produce power or to use the heat directly for industrial processes. Our Strategic Analysis and Institutional Support Team, which focuses on providing objective and relevant information stakeholders doing the analytical basis that provide the foundation for guiding the future of our research as well as working with a diverse set of stakeholders to drive down the soft costs related to solar energy. Our Systems Integration Team is focused on integrating solar with other technologies and into the grid; focused on how solar can support grid stability through advanced iverter functionality, how solar could be a resource for enhancing grid resilience, and how solar can also ensure that our grid is secure. And our Manufacturing Competitive Team, which is our focus on what we're highlighting today, focuses on supporting US businesses who are developing innovative solar products, especially products, which have a strong potential for supporting manufacturing growth in the US.

So today, in addition to myself from our office, we have Victor Kane, who's the Acting Program Manager for our Manufacturing Competitiveness Team. We're very excited to have three guest speakers who are awardees from three of our different Manufacturing Competitiveness programs, so they'll tell you that's a bit about their work. So excited to have Bill Nussey from... he's Co-Founder and CEO of Solar Inventions, Catlin Mattheis is the Co-Founder of Fracsun, and Leila Madrone, Founder and CTO of Sunfolding. We'll hear from all of those a little later in the presentation. And I think as a Susanna mentioned, you'll be able to view a recording slides and the links afterwards on our website with specific Web address here. Energy.gov/seto-webinars. We'll start with some updates before we get an overview of our Manufacturing Competitiveness program and then hear from our awardees.

And before we do those updates, just a little bit of fun, we encourage you to use your chat box to give an answer of when you think this feature article on solar energy was published in popular mechanics, citing that "Sooner or later we were going to have to use the sun to get our major supply of power." Is it the 1930s, 40s, 50s, or 60s. We encourage you to go into the chat and type in your answer.

Here we go. We're seeing some 1930s, 1940s. Alright, so, in fact, it is the 1930s. Thanks to those of you have who put your guess in. This was... this point nearly 90 years ago and this article was actually focused on selenium, an early solar cell material of interest before the rise of silicon in the 1950s.

So going now into our updates starting with some highlights from the past year. So it's the end of the calendar year. A nice time to try to bring some highlights up from the entire year. So this year we announced $200 million in funding. We selected 67 new projects and across our four quarterly stakeholder webinars. We had over 700 attendees and as just one of the many ways in which all of us have adapted our lives throughout the coronavirus epidemic. We transitioned our peer review, which had long planned to be in person in early April, to a virtual format which had 800 attendees. Attendees joined for our opening plenary. Our awardees got three R&D 100 awards this year. Our PV Fleets Initiative, which is gathering PV system performance data to help create a better understanding of PV system durability and performance over the lifetime of the system. It has gathered 2.5 gigawatts of PV system data with an average system life of each of those systems of five years to this initiative. So that's exciting data set for us to be to be looking to. We supported the revision of an important standard IEEE 1547 which is provided a testing standard for smart inverter capabilities. We initiated the development of a Power Electronic Tested as part of the Advanced Research on Integrated Energy Systems, or AREIES effort led by the National Renewable Energy Laboratory, which will be where we begin to test out some of these smart inverter functions and other exciting work going forward. We selected a project to demonstrate a full concentrating solar power system using a supercritical CO2 to cycle. So a first of a kind that we're really excited about. Andwith DOEs Office of Electricity and Wind and Water Technologies Offices, we launched the North American Energy Resilience Model.

Other things from some of our programs are National Community Solar Partnership really kicked off This year. We have now 353 members from 230 partner organizations taking part in the National Committee Solar Partnership. Over 30 of these are receiving technical assistance, and 20 of them are part of collaborative working groups. It's really excited about the work that's going there to expand the access of community solar to all Americans. Our Solar District Cup, which is a collegiate competition helping college students to take a look at how we can best and most effectively integrate solar energy - high amounts of solar energy - at a kind of district or community based level. We had the class of 2020 which finished this year and had over 500 students from over 50 institutions, and the class of 2021 is shaping up to be a little bit larger. And we're excited that about a fifth of the institutions who signed up are minority serving institutions. Our SolSmart designation program, which doesn't recognize these communities, were taking steps to make it easier and faster to go solar in their communities reached reached almost 400 communities. We have over 380 that have been designated as of 2020. And our American-Made Solar Prize, which we'll we'll hear from one of our first winners today to talk a little bit about their work in that program. Our American-Made Solar Prize, which helps innovators with new ideas accelerate progress and get to the point of testing those innovations. In about a year's time, we completed the 2nd and 3rd rounds of those programs. We launched our fourth round, which is underway right now, and across the four rounds we've funded 80 teams with $11 million cash and over $3 million in vouchers to use with our American-Made network. But another prize competition, the Solar Desalination Prize, which launched this year and selected its first 19 competitors. There just a few little snapshots into some of the really exciting work that we've had go on this year.

Last month, we announced the selections for our large fiscal year 2020 funding opportunity. We selected 67 projects across 30 states for a total of $130 million to advance solar technologies across the whole portfolio in which we work. You can find more information at all of those projects on our website. We, also, just yesterday, released our first funding opportunities for the 2021 fiscal year. So focused on Systems Integrations of integrating solar technologies into the grid. And our Hardware Incubator, which supports the development of new, innovative products. This is going to be a $45 million FOA with 14 million focused on innovative hardware product development and $25 million to support a Grid-Forming Technologies Research Institute to really accelerate progress and research on how inverters for solar and wind and batteries can be used to form a grid to support the stability of a grid. The $6 million focus on integrating Behind-the-Meter Solar Resources into Utility Data Systems. We'll have a webinar on the funding opportunity on January 6th, which is just five days before the first deadline. If you want to participate for the Mandatory Letters of Intent, that's just stating that you intend to apply the for the FOA. It's very helpful for our planning, and it is a requirement if you want to be able to submit an application.

Other announcements. In the last quarter we held our CSP Research and Development Virtual Workshop Series. We also worked with the General Services Administration and branch of government as part of their Proving Ground. So where we opened that up in addition to building and other technologies that includes an opportunity for demonstration of solar energy technologies and government buildings. What we'll hear more about in a little bit is our SBIR - Small Business Innovation Research Phase 1 Funding Opportunity and, in partnership with our Building Technologies Office, the Office of Electricity, and Vehicle Technologies Offices, we released the Connected Communities Funding Opportunity.

So I wanted to share that we have a fellowship opportunity, which is great for recent graduates as well as others later in their career who are looking to step back and take an opportunity to think big, think across solar technologies and develop new strategies for impact. The fellowship opportunities are in our office. They support a whole diversity of work across our office and applications are due in January 15th. So there's going to be a lot of exciting work that happen over the next year, the next two years, which is the length of our fellowships, and we really encourage anyone who might be interested to look at the posting here to reach out if you'd like to learn more, but it's a really exciting opportunity to join our office and to get involved with the national level to drive forward solar technologies and solar soft cost reduction.

So one more fun quiz for you that, again, you can write your answers in the chat. How many solar cells are used to power the international space station?

Go ahead and enter your guesses in the chat or hold them in your head. Oh, good. Several answers of 262,000. And I think number that we're not seeing popping up on the screen. Here we go. A few different sets of answers. So go ahead, Kristie.

The answer is 262,400 which was the was the most popular answer of the responses that I was able to see. And here's a picture of these cells right here. Wings cover an area of more than 27,000 square feet. So half the area of a football field.

Alright, so we're going to pause here and take any questions you have about anything I've spoken about or our office in general before we dive into the focus on our manufacturing and competitiveness program and hear from our guest speakers today. So any questions? You can send those to Susanna in the chat. Susanna Murley?

Susanna Murley:

Yes, we have. A few questions here. First one is, "Have there been any COVID-19 effects on our program?"

Becca Jones-Albertus:

We have certainly seen a number of projects that have had to slow down due to COVID-19, as I'm sure you expect - or may expect-, overall has been very pleased at the progress that so many of [unintelligible] have been able to make during this time and the major impact are just delays in some of our projects, which again is completely expected.

Susanna Murley:

And about the funding, was the R&D by a private company qualified for grid forming technology innovation funding?

Becca Jones-Albertus:

So private sector partners are all, you know, are very much valued on our research projects. Either as applicants themselves or as partners to two other applicants. Our Grid-Forming Inverter Research Institute is envisioned to be a collaborative effort with many team members. And so those who are interested can look to the Teaming section that associate with our FOA on a year are FOA posting should find a link to Teaming section. If you would like to list yourself as a central team member for that FOA, but that is that is envision to be a collaborative effort.

Susanna Murley:

We are getting other questions about whether or not we're sharing information on our website. You can find information on the FOA on our website as well as we will be posting the link on recording other webinars there as well. Another question on the funding: "Does our office fund or incubate non-hardware ventures? For example, new business models around finance."

Becca Jones-Albertus:

We have historically funded new business model development through our funding opportunities. The particular funding opportunity that I just discussed is focused on hardware, but there may very well be other funding opportunities that comes in that there are more open to business model development.

Susanna Murley:

And last question and we will save your questions and try to answer more towards the end of the call. But the last question here is, "Any indication from the Biden team about increased funding or new initiatives to grow solar through DOE?"

Becca Jones-Albertus:

There are a lot of ideas coming out, but I think we really have to wait until the teams in place and wait until we have appropriations from Congress before we really know what those those new directions and the ideas will be.

Susanna Murley:

Okay, Thank you.

Becca Jones-Albertus:

Alright. So now I will turn it over to Victor Kane, who's going to introduce our Manufacturing and Competitiveness Program.

Victor Kane:

Alright. Thank you, Becca. There we go. Yeah, you can go ahead to the next slide. Okay.

So what this chart is trying to show is that when we think about our Manufacturing and Competitiveness Team and, specifically and also in general, what we do in the office at SETO, we try and take the relatively high amount of funding and work that's being funded through early stage, government investment and kind of foundational technology development, and then our office starts funding things in the more applied research area, trying to get them to a Proof of Concept. What we found is that, in general, in that area, it's too risky for private investment, but also a little bit too far along to really justify for the research funding and so that's where our office comes in - where our team comes in. We try and work with private businesses to take impactful technologies and bring them to market so that they can impact the market. And the main goal here is that they're impacting, hopefully domestic manufacturing competitiveness and also generating domestic value across the solar value chain. Next slide.

So I think about what is the goal when we're making decisions about what to fund. You can keep... kind of click through this. So the research we fund doesn't reach the market as an office, then it has very little impact on what we're actually trying to do as an office. So our team trying to solve the problems about why things don't get the market and the other thing we like to think about is if the funds that we're putting into this are not changing the outcome of the work, meaning that it would have been done anyway by being funded by private groups or other mechanisms then our funding doesn't really matter in that case either. And in terms of what types of innovations were looking for, it's not just the radical breakthroughs that significantly change the outcomes of things, it's also the small, component level improvements that on their own or small. But when you take them as a whole across hundreds of awards and hundreds of projects and businesses, they can have a transformational effect on the industry. And when we think about failure, there's creating something perfectly to spect on time and on budget. But nobody wants it in the end. So we work really hard trying to make sure our authorities are doing a lot of customer discovery, making sure that what they're developing is really what the industry wants. We also want to make sure that if we're hearing about a market need and it's not being addressed, that we developed programs to help incentivize the development of a solution in that area. And then again, we want to make sure we're funding things that are gaps in the private sector funding that were... the private sector isn't quite developing this at all or as fast as we would like to see. Next slide.

We try to be flexible on how we're designing our programs so that we can have many people working on solving them as possible. And that's all the way to early as an individual with an idea that we can fund via VR Solar Prize to more, further along small businesses, working across trying to build - trying to bring Proof of Concept prototypes and then commercially [unintelligible] prototypes that can if the market and all three of our programs address that area and we also... two of our programs are large. Businesses are also eligible to apply to try and help spur innovation in that area. Next slide.

First, we'd like to talk about the Solar Prize as one of our major initiatives in the Manufacturing and Competitive Team. Next slide.

And this program is really broken down into two main areas. We have a three phase where each phase is worth $1 million prize competition and the development of what we're calling the American-Made Network, which is comprised of over 100 organizations dedicated to trying to help our competitors succeed. And the way that it works is we have an open call and we select 20 of the highest potential groups that apply with high impact ideas and give them each $50,000 in a cash prize and then those groups compete to develop their Proof of Concepts and making much progress is possible. And just a few months later, we award 10 of them $100,000 and $75,000 dollars voucher to work with our National Lab partners. And then those groups go on to develop their prototypes to the point that they're commercially relevant. And hopefully they have identified a legally binding commitment with a commercial pilot test partner to try and get this out into the market and to the groups to do the best job there. They get $500,000 and a $75,000 voucher work for the National Labs. Next slide.

And to talk a little bit more about that experience, I'll hand it off to Bill Nussey.

Bill Nussey:

Hey, thanks, Victor. It's... I'm excited to be a part of this. You guys have put together a great program, and my company, Solar Inventions, was a tremendous beneficiary. Were the first company to actually win it. And I was asked to talk a little bit about our experience and what we do. So if you'll go to the next slide.

So just to give you a quick sense of our history and then I'll tell you what we do. Yeah, we started the company before the Solar Prize existed, and we had basically are my partner, who is a scientist - solar scientists - had some breakthrough ideas on how to improve solar, every kind of solar and every factory. It was a really amazing idea, and we had funded it ourselves with the help of some friends, and we were moving at a reasonable pace. And then I heard about the Solar Prize and, for probably everybody on the phone, you're familiar with these programs. But I'm not from the science industry. I'm from the software space, and I was really skeptical that the program like this could exist, that you just win money and you can put it towards your company. But it certainly did we applied. We won the first round; the first ready phase. We went on to win the set days, and ultimately we used some of that money to start making a larger production runs of our technology and then finally won the main prize in about a year ago. And it was really transformative for us, and I'll talk a little bit about what we did. But in a sense we are off to the races, and it's difficult to overstate how much the Solar Prize matter to us. We're now in the market, and I'll tell you a little bit about what we're doing. Next slide.

So the my partner is a scientist, Ben Damiani, and he came up with a way using the medicalization step in traditional silicon solar. Whether it's perk or by facial, HJT - really aluminum BSF - any kind of solar cell by making some very small changes in the medicalization that required no change in equipment or materials, we're able to create an incredible... improvements - actually very modest improvements. But they're very easy to make, and they work everywhere. So next slide.

They break down into three categories. The price of silver has gone up and silver is used in every solar cell we can produce reduce between 3%. We just got a test data backed, producing more than 8% of the cost of silver in a cell. But the part that everyone gets excited about, as well as we actually increase the efficiency. And then when you put those cells into a panel further efficiencies emerge. They're called the cell-to-module ratio. We improved that. And today there's probably 100 to 150 gigawatts of solar cell manufacturing across the world. And per gigawatt were able to save millions of dollars; improve the profits of our manufacturing partners when they make cells using our C3 technology. So the response has been amazing where, in conversations with virtually every major manufacturer in the world, and hopefully in the next year or two as people start to buy solar cells and solar panels, almost all of them will have the C3 technology. That's certainly our benefit. Our vision and the underlying idea actually creates a whole bunch of additional new inventions beyond C3 that are even more game changing, which we hope to bring the market on the back of the C3 success. So last slide.

Just a really quick... a couple of thoughts for everybody. The Solar Prize was a real game changer for us. For me personally, I was really skeptical, having come from outside the world of science and outside the world of government supported initiatives like this. I was skeptical that this could be a value added as it was, and I am completely converted a huge fan of this of this program and the others now. One of the things that did is that really helps us accelerate our efforts. We didn't have a timeline other than we were slowly burning through the cash we had raised. But the three tiered pricing structure really made us move very, very quickly and make difficult tradeoffs that we might not have. And in hindsight, I don't know that we could have gotten to where we are now at the pace we started at. I think the second big thing is the money itself was also really important. Having the cash and having the access to the National Labs through the voucher program basically allowed us to move a bunch of things in parallel that we could be a tiny bit less cautious, no less thoughtful, but just a little less cautious. And what happened was we moved several experiments together simultaneously, all of which cost us a lot of money - a great deal of money actually - to make solar cells of a custom type on to validate them and ship them and all that. So we did. Several does it once, and the result was that we made much more progress. I think we'd still be a year to away from having commercial discussions had it not been for the money and allowing us to move in parallel. So if there's anybody on this call that's not from this industry is unfamiliar with this, I can tell you that the government programs that Victor's talked about and the ones that they're going to talk about shortly are nothing like venture capital. The biggest difference for me is I'm not sure they're easier or harder to get. But the biggest difference from a having raised lots of venture capital and other industries is that the DOE folks, the NREL folks, everybody involved with this when the money is given to us are awarded to us. those folks feel like they're entirely on our side. It doesn't feel like we've now arm wrestling with our investors going forward there feel like tremendous partners, and that's been my experience. So I'm a huge fan, obviously and it has made all the difference in my company, Solar inventions, appreciate everything you guys are doing to push this forward to make it available to more people.

Victor Kane:

Alright, thank you, Bill. For our next program, we wanted to talk about the Small Business Innovation Research Program or SBIR. Next slide.

And so this program is specifically focused on small businesses. There's actually some laws that were passed about this program and it would be required. So we run it every year, and it has two main phases. The first phase is for $200,000 and is nine months long. It's really focused on feasibility studies. Hopefully, companies have good ideas, and they're trying to see if it's viable. And if it's going to work, and if that's the case, they can compete exclusively for the Phase two. So you can only compete for Phase two if you receive Phase one, and that's for $1.1 million to really develop something into a Proof of Concept and then a prototype. And in addition to that, there's also the Small Business Technology Transfer Program that's part of SBIR where small businesses can receive funding to work with a lab to try and license technology and get it out into the market. Yeah, next slide.

And to talk more about that is Catlin Mattheis and I'll hand it off to you.

Catlin Mattheis:

Okay, great. Thank you, Victor. And also, you know, thanks to SETO as well for putting this on and all of you for joining. My name is Catlin Mattheis. I'm the Founder, one of three founders of Fracsun. And we've developed PV Soiling Loss Management Solution. And I'll kinda talk about where we started and show you guys the technology as well, so you can go to the next slide here.

Essentially, we started this company back in 2011. It was really kind of a passion project between three founders identifying the problem in the market that no one really had good, soiling loss data. And so no one was making informed decisions about when they should clean and whether or not they were actually making a wise financial decision when to clean. I came from an industry that was just scheduling everything in April and knowing that it had just rained a bunch in California. So that's kind of how we started. We were awarded our first award. Phase one FBI are in 2017. So six years after founding, by that time, we had done a lot of work into developing prototypes and the like. And so we really focused Phase one on really getting a broader prototype base to really test the technology so you can go to the next slide here.

So in phase one, because it's more a Proof of Concept phase, you're really trying to figure out if your idea works. Our goal was to build on what we had already built just in our backyards, really. And create kind of a semi manufacturer ready prototype that we could deploy with a several commercial partners and to 10 locations across the US. And the goal, also, being in this first rollout was too cover a lot of climate zones so that we could kind of start to validate what we had already seen in the marketplace in terms of people's assumptions on what soiling loss look like. One other note about phase one was we partnered with... it was five major players in the industry. I can't name names. I promised I wouldn't. But I think in this first phase, our partners combined had about six megawattsm - or six gigawatts - sorry, of operating solar assets under either their ownership or management. You can go next slide here.

And so in phase two, our goal was to obviously you want to exit phase two with a market ready device and your first commercial partner or customer. And so what we did here was we took what we learned in phase one with all of our commercial partners, and we wanted to create a market ready product, you know, commercialized product that we could start selling into the markets. So we redesigned the entire hardware set. And then, as part of a pilot program for this phase, we rolled out 40 units to an even broader network of partners. A couple key factors of this development. We the hardware you can see here. There'll be a couple more pictures as we go on. We turn this into an IoT device, because we realized getting Internet access is very difficult out in the field and especially when you want to measure things at multiple points throughout an array. So we created this IoT device you're seeing now that is self cleaning. It has what we call the wash extension. A reservoir tank that cleans the device every day, itself powered, it installs in - my personal best of 15 minutes- but generally around 30 minutes for location., and then it uploads that all automatically to our data portal, where we have a lot of other analytic tools that's very helpful for calculating when to clean and whether or not it makes financial sense. So you can go the next slide here.

So here's a few images from our phase two pilot. Just because this is... I'm a visual learner. And so this first picture is really interesting to me, because one of the things that we set out to prove is, you know, everyone has an assumption about soiling. It's the steady build towards losing money, but acute events do happen. And here in California, we had one of the worst wildfire seasons ever, and you can see this device on the far left here is actually experiencing some of that ash fall and this particular site saw, I think it was about 8% increase in soiling loss over the course of three or four days. Some other sites here throughout the... this phase two pilot as well. So you can see the wash extension there in the ground. And all these sides generating really, really, really great data. You go the next slide.

So kind of where we're at now, post award, after our 40 location pilot, we're now up to 100 device... over 100 devices - excuse me- deployed across the... across the world really. My new saying is that the sun never sets on the ARIES fleet because with Southeast Asia, which is not shown in this map because it made it really ugly, we always have a device that's in the sun reporting data today. So yeah, I think that's all I have.

Victor Kane:

Alright. Thank you very much.

Catlin Mattheis:

Yeah, I thank you again.

Victor Kane:

So before we close the conversation on SBIR, I did want to mention that the current iteration of SBIR - again, this has run every year - it's open for application. It opened on December 14th, and the Mandatory Letter of Intent is due on January 4th. That's typically just 1 page, very, very low barrier there. And then you'll receive a notification if its compliant and of general interest. So I would encourage you if you're interested or relevant to any of these research topics, to take a look at the link down there in the bottom right, and hopefully we'll see your application. Next side.

Right, for the last program, we're going to talk about our Incubator Program Excite. So this program has been running since 2007, and its primary focus is to think about an award technologies that have a clear pathway to commercialization. But they're generally just too risky for private investment. There's an obvious value proposition, but there's some things that are preventing private investment that could hopefully be worked through over the program. And so that's how we've structured the development of the program and expect, I mentioned, this iteration is particularly focused on hardware solutions. It also is exclusively for for profit teams, but they can partner with other entities like [unintelligible] and nonprofits. The period of performances 1-3 years. This one does have a cost share. It's either 20% or 50% depending on if it's focusing on development or deployment. Any award size range from anywhere from $500,000 to $3 million. Next slide.

Like I said, we've been doing this since 2007. We've made over 266 awards for $323 million and we were able to track, via public resources, that there's been $8.3 billion in follow up funding to our awardees. And so we really think this model of targeting things that show a clear value proposition. But are just generally a little bit too risky for private investment and working towards driving out that risk is a great use of government funds in a way that we can really impact the industry. Next slide.

Alright. And to help talk about that experience with the program is Leila Madrone.

Leila Madrone:

Great. Thank you. Hi, everyone. I'm Layla Madrona, Founder and CTO of Sunfolding, and I am here to talk to you about our experience with Sunshot. Next.

The next slide. Thank you.

So Sunfolding is building solar trackers. Solar trackers are the machines that move the panels to follow the sun to make the most energy possible. Nearly all plants... power plants in the US use solar tracking as the underlying infrastructure of solar. Sunfolding is building, a new kind of tracker as you can see here. And the way it works is as you change the air pressure on either side. You change the position. Next slide, please.

And what's so exciting about doing it this way is that you can replace dozens of components that are currently in the solar power plant with a single part. So by replacing all of these dozens of components with air, you could make solar cheaper, easier, and faster to install. Next slide, please.

So I'm not going to go too deep into all the reasons why Sunfolding is interesting to the industry. But just briefly being able... look at the... this modular and have this few parts means... So you have impact in all different aspects of the solar power plant. So from a land usage perspective, you could get more capacity out of the same land. And you can also get more efficiency out of the same sites. On the construction side, because we have so few parts, we install far, far faster. We're actually the fastest installing tracker in the world. And because we're so modular as well, we have a lot less grading that's required for construction, which means that you can leave a lot of land features intact. And thirdly, for the long term maintenance of the plants, we have about 95% less O&M locations than other trackers, which means that that long term maintenance is easier and cheaper. Next slide, please.

So with these value propositions, The industry has been excited to have some uptake on us. So over the last couple of years, we were deployed about 100 megawatts of projects, mostly all over the US. So that we've just done our first international project. I'm really looking to keep really scaling up over the next couple of years. Next slide, please.

But this didn't happen overnight, so we started at the concept stage nearly 10 years ago. And in 2012, we were fortunate enough to receive an ARPA-E award to do the first phase of work, which I'll call the Technology R&D, where we figured out the first prototypes and did the lab and field testing. And then the next phase, which we did with SunShot. I'll call this Manufacturing R&D, and the reason I do that is I think that when most of us think about doing R&D, we're thinking about just the science lab part of it. But what part of what I've really come to understand through my experience was Sunfolding is that when you're building technology at the level of infrastructure where it needs to scale up rapidly and last for decades, you also need to engage in Manufacturing R&D with the same level of rigor and honestly, for about the same level of time, as a Technology R&D in proportion that precedes it. And so DOE funding... and honestly is not really just about the cash. It's about being able to open up that timeline so that you can properly do the Manufacturing R&D section. If you were just to use private sector funding for this, but what happen is you get that early Technology R&D prototype, and then the investors will say, "Great! Now go scale that up to three gigawatts." And you throw it over the fence to it and manufacturers and you'd be missing one of the most critical parts of developing infrastructure level of technology. Next slide, please.

Right. So note, about our technology: We started with not just a cool idea of how you make a cool, new type of machine, but really, we started with the question of how do we leverage existing high volume techniques and manufacturing infrastructure to move the needle forward? So the idea of leveraging existing manufacturing infrastructure was really baked in at the Technology R&D phase, which is why I think it makes our Manufacturing R&D phase even more successful. Next slide, please.

So before we started with SunShot, we've been working with DuPont and we honed in on the best materials and manufacturing approaches for what we needed to build. And so the material that we're using has already been used for decades and industries as harsh or harsher from that of a solar power plant. Next slide.

And then with SunShot, we entered this phase of, "How do we use this approach and understanding to make something that can truly scale that has the reliability, quality and the cost structure to make impact on the solar industry?" And the key to this was the US Automotive industry. So our SunShot work was Manufacturing R&D in partnership with the US automotive industry. So we had the idea and we had the prototypes. But they're the ones who had the expertise and the infrastructure to make this really work and what we obviously could really owned to understand, mostly analytically, the manufacturing industry understood it inherently. They lived and breathed all the things we needed to do to this idea to make it as optimal possible. And that combination meant that what we made was greater than the sum of its parts. Next slide, please.

We are one of the only trackers - maybe the only one, actually, that builds nearly everything in the US. And honestly, that's not because the DOE forced us to do it through our contracts. It's because it is literally cheaper and easier for us to manufacture in the US, because we're taking advantage of infrastructure that's already there. And we're relying on decades of automotive know how and infrastructure instead of cheap overseas labor to bring this technology to scale. So next slide, please.

So by connecting with US manufacturing know how, an existing manufacturing infrastructure over these years of partnership we now have next generation solar infrastructure that's based on US manufacturing. I believe that's my last slide.

I just should say here... We would not be here without daily funding, both from the Technology R&D phase and then this Manufacturing R&D phase and the level of quality and also just the level of where we're able to achieve in terms of where this products able to go in terms of service to the solar industry and to clean tech infrastructure at large is due to being able to take that time to do it right in those early stages. So thanks to everyone in DOE, that helped make us happen.

Victor Kane:

Alright, Thank you, Leila.

And before we close out the conversation here, I do want to mention that yesterday were very excited to announce. Our latest generation of our Hardware Incubator program has two topics one on Product Development and the other one focused more on demonstration. Where these are sizeable awards where you can win anywhere between $1 and $3 million. And the key date here is the Mandatory Letter of Intent on January 11th. And as Becca mentioned, the concept papers are due shortly after that. So if you are interested, please go to this link here or shoot us an email if you have questions. So and, you know, we're really excited about seeing your applications to that. And with that, I'll hand it off to Becca.

Becca Jones-Albertus:

Thank you so much, Victor. Thank you to our three guest speakers as well and to all of you for joining us.

There's a number of links here that will be available if you check out the slides from our webinar. And these are also available on our website that we hope will be resources for you; how to apply for funding opportunity, list of our current funding opportunities and our existing funding programs, how you subscribe to our newsletter, how you can get in touch to ask questions and events and webinars you you can stay in the loop. I'll also mention that if you are especially excided about the work you heard about today, we're also hiring for the Program Manager who will lead this team in this portfolio of work that Victor's been describing. So please do reach out if you have any interest in talking more about that opportunity.

So with that, I think we have time for just a couple more questions before we go.

Susanna Murley:

Yes, Thank you. And please do add your questions to the chat box on the right hand side of your screen. So, Leila addresses in her talk, but one question we got here was around, "Who your manufacturing partners are? And were any of them American?" I'm not sure if you can share that information, but maybe you can talk to about how... what made you decide where to manufacture your products?

Leila Madrone:

Susanna, I assume that was directed at me. Am I right?

Susanna Murley:

It's for you, Bill, and Catlin. Whoever wants to answer.

Leila Madrone:

Yeah, I could just go first and just say that we had we knew that we wanted to use blow molding is our underlying manufacturing method. And so a big part of this was just finding the right ones in the automotive industry. And then, we knew that the best chance we had of success was to find really strong automotive manufacturing partners. But I will just say that is much easier said than done. One of the reasons it's so hard, I think, for companies to get involved with US manufacturing, it's not really just about a cost barrier. It's also that there's not a lot of incentive for the automotive partners who want to take on a small company. So the DOE funding was helpful in that it helped really help us forge that bond and show that we were, you know, something that was really worth taking on. So there's a lot of steps along the way, but I think, you know, we went through a lot of conversations to get there, and we also solicited outside supply chain expertise in order to find the right partners.

Susanna Murley:

Catlin. What about you with Fracsun?

Catlin Mattheis:

Yeah, sure I would actually dovetail on what Layla was saying as well, is we explored really all options for manufacturing, even doing some overseas work, but at this point, our manufacturing is and our supply chain is 95% in the US. And the reason is it's cheaper. I mean, especially for us. We're pretty low volume comparatively, you know. We're not building hundreds of thousands of of pneumatic baffles like you guys are, but it's still much, much cheaper to manufacture in the US.

Susanna Murley:

Thank you. And Bill, did you want to add anything here?

Bill Nussey:

You bet. There is... one of the sad part about the story of solar in the world is that cell manufacturing is no longer done in the United States. So we were able to use some of the university labs to create the first large, you know, hundreds of cells that use our technology, but ultimately, we had to work overseas to get the cells made in very high volumes. But fortunately, there is a growing manufacturing a industry for panels here in United States and in North America. So we were able to put... Our first large batches of panels used, the cells were imported back in the United States had made here so. But I would agree with what was discussed earlier that finding manufacturing was maybe one of the largest challenges. We had some misses with early manufacturers and that burned through some of our resources to figure out that they weren't the right partners. So getting your manufacturing right is very, very hard and something that DOE and the program really helps with.

Susanna Murley:

Thanks you. And I think this question is for Catlin, but the question is, "Have things this year, such as the California wildfires brought to light any new areas that would require additional research?"

Catlin Mattheis:

Yeah, certainly. I think that I mean, number one, the wildfires created a good amount of soiling loss that we were able to measure directly all over the state. And a lot of great data came out of that. But I think potentially there is space for modeling the true loss of the wildfire season and getting a better hold on what that looks like. Because not only do you have ash falling on arrays themselves, but you also have air quality issues that are cutting out up to 30% to 40% of the sunlight that would also be reaching the array. So that's kind of a nebulous loss that definitely deserves it's day in the sun to make a bad pun.

Susanna Murley:

[Laughter]

Becca, this question, I think, is more broadly for our funding of the whole which is, "Would failure include a product that no one wants in the US, but there may be a market outside the US?"

Becca Jones-Albertus:

Absolutely. Well, not not failure, but we're certainly interested in products that would be designed primarily for export to other uses. You know, most of what we fund and support has a lot of relevance and interest for domestic use. But we're certainly open to supporting products that have a very compelling case for an export market abroad.

Susanna Murley:

And for activities in cold climate region, which have a tough cost benefit analysis consideration. What sort of activities do you see needing to happen? Or research areas in that space?

Becca Jones-Albertus:

Not sure. I fully understand the question, but, you know, in cold climates you tend to have a lot of snow and so how to control snowmelt? There are certainly technologies out there that are developed to help melt the snow off of the panels so that you don't have high losses due to snowmelt. There are operational challenges and lifetime - different lifetime considerations for the PV systems in some of the colder climates as well. We have that, you know, supported some research in Vermont and elsewhere in our office that has been looking at some of those challenges to date and especially with Sandia National Laboratories. And they have some, you know, results. So as we look at both the performance and cold climate and how you, you know, hardened and have a more robust system.

Susanna Murley:

This question came in as a follow up to the discussion about the wild fires. This is from a person that actually works with wildfires and that, here, she says, "One of the outcomes is that the utilities in California called for the Public Safety Power Shutoff which forces customers to have backup power systems. So larger clients are looking at renewable power backup systems. Is there any research in this area that is interesting, Becca, for you or anything else that has come up because of the wild fires in general in our research?"

Becca Jones-Albertus:

Yeah, so I mean, big picture, we're seeing a larger number. You know, recent years of all kinds of resilience events, related events that drives the desire to have options for local power for backup power. And, you know, we're seeing that become an increasing priority. So longer term big picture research, we're funding quite a bit that's looking at how we can utilize the 2.5 million and growing number of PV systems and energy storage systems that are on the distribution grid to provide backup power to critical infrastructure and other resources when the main grid is down or is out or, you know, taking down intentionally. So that's definitely an area of increasing interest. What we're looking at how solar can be most effective. Rooftop, solar community, solar for resilience need, you know, as another example of a specific technology, our Solar Prize around three winner Maxout Renewables has a very exciting [inintelligible] technology that enables you to take... if you have rooftop solar and use that while the sun is shining when you're when you're rooftop is out. So there's also, you know, exciting technologies related to how individual homeowners who have solar on the rooftop can take advantage of that solar backup power.

Susanna Murley:

We have a lot of questions here about whether a certain idea or technology might qualify for some of our funding, which I'm hoping maybe Becca, you can stay with us a little bit after three o'clock to answer some of those. But let's end this with just one final question and then we ask that people will do a survey for us. But to close it out, what are the top three technical challenges You see that the industry faces?

Becca Jones-Albertus:

well, one significant challenge, I'll say, is truly harnessing the capabilities. We have first solar energy systems to support the reliability and resilience of the grid. We know that smart inverters, grid forming capabilities exist and that they can be used to contribute to the grid's reliability. But we're not using our solar power plant today to contribute to the grid's reliability. So one major challenges getting to the place so that as we continue to scale up solar, solar is contributing as much as other generating sources of keeping our good reliable.

Second challenges: We need to continue to innovate and drive costs down. Solar energy is not available at all times and hours of the day. And so while solar in many parts of the country is today's cheapest form of electricity, it's not the cheapest form of electricity 24/7. And for it to be the cheapest 24/7 and not just when the sun is shining, it has to be paired with storage, paired with demand flexibility. And in essence, all of those things become more economical the cheaper and cheaper that we make solar. And so, you know, I think a third - or the second challenge is again continuing to innovate. Drive costs down.

I think a third challenges is we look at things. It's how the solar industry can, you know, from our US-centric perspective and create as much benefits to the US economy to the environment as possible. So how we can really, you know, set up solar for recycling like lifecycle considerations into effect: How we can get a much of the value chain manufactured sustainably in the US as possible? How we can support job creation as we grow the solar industry.

Susanna Murley:

Thank you. And thank you to our guests for joining us today. Christie, if you want to put the survey we have up; we would love to hear from you on that. And please, also, sign up for our newsletter. But, Becca, if you have a few more minutes to answer some of these detailed questions. And to our audience, if you have asked a question, we will try to get to as many as possible.

Okay. So... okay. "Are there any funding opportunities for solar thermal technology that is not associated with concentrating solar power?"

Becca Jones-Albertus:

We have not recently funded non-concentrating solar thermal technology. It is something we're taking a look at again for the future. It does fall under the domain of our office. And, you know, we'll certainly be interested in talking further with any of you who have, you know, innovations in that space. I would like to talk to us about how government funding could make a difference.

Susanna Murley:

"We want to build an automated factory for inverter manufacturing around our new smart inverter. Will this fall under DOE Support category?"

Becca Jones-Albertus:

Potentially. Yes, a lot depends in the specifics, of course, but we do have some funding opportunities that come up at times that could be relevant. And the loan guarantee program may also be a resource within the Departments of Energy, depending on your technology.

Susanna Murley:

"I'm an inventor that had been working in on a harsh environment, turnkey, solar robot. I'm 2 to 3 months from making the first commercial unit. Would the..." I believe this person is talking about SBIR. "Would... since I am past phase 2 is there a way I can leverage the Solar Prize for other ways to help advanced this technology?"

Becca Jones-Albertus:

Victor, you want to take that? Or I could.

Victor Kane:

Sorry. Could you repeat it? The...

[crosstalk]

Becca Jones-Albertus:

I can jump in. So, yeah, I think, you know, the Solar Prize is designed to be at the early stage of the cycle. I'd encourage you to take a look at our Incubator program and see if that, which was just released yesterday and we have been talking about today, and see, as you read through that funding opportunity if that appears, you know, relevant to your goals and the next step there.

Susanna Murley:

"For the Hardware Incubator. What are the requirements on the cost share structure? Does STTR grant count as cost share?"

Victor Kane:

I could take that one, Becca.

Becca Jones-Albertus:

Yeah, go for it.

Victor Kane:

You can't use government funding for cost share, as a general rule. And SBIR and STTR don't have cost share requirements, but the way it works is if you're focusing on applied research and development, that's a 20% cost share by law. And then if you're working on things that are geared more towards employment, that's a 50% cost share requirement.

Susanna Murley:

"For the Hardware Incubator product development. Would this be one step beyond an SBIR are or along the same lines in terms of TRL?"

Victor Kane:

I can take that if you want, Becca.

One of the sides I showed is there is some overlap between the programs we run. And we like to be flexible. Typically, there are structured with topics of interest, as well as a sort of an open area where anyone with a good innovation can apply. Incubators mostly geared towards our later stage work, where those awards are in the $1 million to $23 million range. And so it is not uncommon to have groups go through the prize. Maybe also get an SBIR and now we're seeing some of those pop up in our Incubator program. But that is not a tall A requirement, so you can enter any of those programs as long as your product has not yet reached kind of the market yet, and we can try and help you get... develop that further and get it into the market.

Susanna Murley:

And last question, I believe. And again, if you have questions, additional questions, please... You can email us at solar@energy.gov.

The last question here is: "Is there space for nonprofit solar education R&D partnership for funding opportunities?"

Becca Jones-Albertus:

I'm not sure, but an education R&D opportunity... I'm not specifically sure what that is is referring to. Nonprofits are eligible for our funding opportunities. We do have workforce training programs. We do have R&D programs that are focused on different topic areas. We don't typically fund pure education and outreach through our funding programs. But it has to be focused on, you know, addressing a research challenge or a need of the industry.

Susanna Murley:

Okay. Thank you all for attending. And we will share this, the recording of this webinar on our website and in our newsletter. And we hope you'll join us for our next one.

Becca Jones-Albertus:

Thank you all!

Susanna Murley:

Thank you.

Becca Jones-Albertus:

Happy holidays!