

*Adam Guzzo:*

Hello, everyone, and welcome to the 2020 Better Buildings Better Plant Summit Leadership Symposium. My name is Adam Guzzo, I'm a Senior Advisor with the Department of Energy, and I have the pleasure of leading our engagement with local governments involved in better buildings. Thank you all for being with us this morning. We have an exciting workshop prepared and some really fantastic speakers.

Before we dive in, just a couple of housekeeping points I would like to address with you. So, please note today's workshop will be recorded and archived in the Better Buildings Solution Center, and then we will follow up when today's recordings and slides are made available. Next, all attendees are in listen-only mode, meaning your microphones are muted. If you experience any audio or visual issues anytime throughout today's workshop, please send a message in your chat feature of Zoom, which is located on the bottom of your Zoom panel.

And then now it is my pleasure to welcome Maria Vargas, the Director of the Better Buildings Initiative and Acting Deputy Director of our Solar Energy Technologies Office to provide a welcome and introduction for today's workshop. Maria?

*Maria Vargas:*

Thank you, Adam, and welcome to everyone who's with us this morning. We're really glad you're here. I think we've got a great session planned for everyone today. You're going to hear from some real-world practitioners with hopefully good advice and ideas you can go home with, or be at home with.

Okay, next slide, please. So, just as a quick run-through of what's going to happen today, after just some quick remarks from me, we're going to have an overview of the solar project development process really based in real-world findings, what has worked, what hasn't, based on people who have planned and carried out solar projects. And we're going to hear a lot from the Director of EPA's Green Power Partnership on their role and their findings.

And then we're going to ask two Better Buildings partners, the City of Orlando and the University of Virginia to share some of their experiences and their lessons learned, so that you can take advantage of what others have done, found, and hopefully take advantage of their learning. And then we're going to talk about some resources and, of course, leave some time for questions and answers.

So, next? And today's speakers, we are thrilled to have three great speakers. I'm just going to quickly tell you who they are and then we'll give a little bit more of an intro as they start speaking. But first, James Critchfield is going to speak. James is the Director of the Green Power Partnership Program at the EPA, and as you know and will find out more about, Green Power Partnership is a voluntary program that supports organizational procurement of green power. So, we're thrilled to have James here and we appreciate him being here.

Ian Lahiff is the Energy Project Manager at the City of Orlando, and Ian does a number of things but not the least of which is he leads a team of construction managers and control specialists, and he identifies and implements energy savings projects and upgrades throughout the City of Orlando. And I've had the pleasure of knowing Ian for a number of years and he really does a great job, and I'm so glad he's here today.

And then we have Jesse Warren from the University of Virginia, and Jesse is the Sustainability Program Manager for buildings and operations at UVA. And he's responsible for the University's Electric Demand Response Program and the Sustainable Buildings Programs. And you'll hear more about his work.

I have to say I've had the pleasure of visiting both the City of Orlando and the University of Virginia and I can tell you the work they're going to talk about is even better to see firsthand. But it's a delight to have them both today and, of course, James as well.

So, if we can move on, I just want to spend one or two more minutes to just talk a little bit about what I think is wonderful about today's sessions, and that really is the confluence of a number of different agencies, different programs, different opportunities all coming together to help you as the customer really identify some opportunities that exist in your facilities in your portfolio of buildings.

I am currently the Deputy Director of DOE's Solar Energy Technologies Office. At the Solar Office at DOE our goal is to accelerate the development and application of technology to advance low-cost affordable and reliable solar energy in the U.S. Next slide. And the way that we've been working has really afforded the opportunity for not only DOE to work with the

National Labs, as it often does, on key things when it comes to renewable energy, but also our sister agencies within the federal family.

So, at DOE we have an interagency agreement with not only the lab but EPA, and EPA, through the Green Power Partnership has really been the conduit for a lot of the work that's been done at the labs, a lot of the information that we have to get that to the market. And so we are thrilled to have James here today and we're thrilled to be able to talk to you about some of the work that we have worked on with EPA that really addresses and wants to understand some of the key barriers to solar project development, such as financial, administrative, organizational, and technical.

Next slide, please. And just before I leave you, I want to just alert folks on the phone and on the video and on the Zoom that are joining us today, there are some other programs that DOE offers that try and target very specific needs in the marketplace. I'm not going to read this whole slide to you but I just want to make sure that folks are aware that DOE has a Solar Energy Innovation Network. There are opportunities to work with local governments to certify, if you will, and get national recognition around your city, your local government's ability and readiness to adopt solar. That's the Solar Smart Program.

We've recently just kicked off a new part of our National Community Solar Partnership, and that's quite a robust offering with resources and technical assistance available to organizations who apply to DOE. So, if you're interested, please look that up. And then we're also working on the Great Modernization Leadership Collaborative. So, there are some other opportunities and other resources for those of you today who are with us who might be interested in availing yourself not only of the Green Power Partnership at EPA, but with these other opportunities that DOE Solar Energy Office provides to the marketplace.

So, that's enough from me. We're delighted you're here, we are delighted that you are joining us to really take advantage of, again, these different parts of not only the federal family, EPA and DOE and the National Labs coming together, but then how it is that partnership is translating into real-world results and real-world partners who are doing real things, and willing to share those with us. And that is the University of Virginia as well as the City of Orlando.

And without further ado, I'm going to turn it over James Critchfield. As I mentioned, he is the Director of the Green Power Partnership at EPA and through Green Power Partnership, EPA is supporting hundreds of organizations that are committing to and interested in green power purchasing. With that, I'm going to turn it over James and say thank you again to everybody for joining us today. James?

*James Critchfield:* Thank you, Maria, it's really wonderful to be here with all of you today. Before we get started in discussing tell the solar project development process, I'd like to just take a quick second to introduce you to an interactive platform that we're going to be using today called Slido, which we're going to be using for the question and answer and pulling functions of today's event. So, if you could open up your mobile device or a new window in your Internet browser and find yourself over [towwwslido.com](http://www.slido.com).

You can enter the event code that you see here on the screen, which is #BBSUMMIT, and then you'll need to select on a drop-down menu today's session, which is titled Solar Process Workshop. This will be the venue in which you can answer, or ask questions, rather, of any of the panelists today. There's also an opportunity to review submitted questions and vote on them to up-rank them in the platform. So, we'll answer the questions that seem to have the most interest by people in today's audience. So, I'll give you a few moments here to open up Slido because we're going to start with a poll question right off the bat.

If you're having any issues, please take a second to message our technical support team by using the chat function in the Zoom interface. To reach the Zoom chat function, you might see three dots towards the bottom of your screen. Somewhere in there you'll see an opportunity to open the chat window. So, let's go ahead and move forward.

Next slide? We hope that during the session today and during your experience here at the Better Buildings Summit that you'll join us in a conversation around social media. And so you can see here today that the Better Buildings Twitter handles will allow you to feature your participation in this year's summit.

So, let's open up our first Slido polling question. What we would like you to answer is how familiar are you with the solar project

development process? And so you can hopefully find here or see some opportunities or answers for you to select from. Are you familiar with it? Have you done it before? Have you never done it before at all? We see people, 52, 59, we're seeing some numbers increase here. It seems like we have some familiarity, that's great. Okay.

So, as Maria noted in my introduction, next slide, I work at the U.S. Environmental Protection Agency and manage a program called the Green Power Partnership. For the past 20 years, the Green Power Partnership has been working with organizations across the U.S. to reduce the environmental impacts associated with electricity use by switching to cleaner sources of power. EPA partners with a wide range of organizations, including Fortune 500 corporations, higher education institutions, federal state and local governments, as well as smaller businesses and nonprofits.

So, I invite you to drop by our website or give us a call anytime to learn more about the wide range of resources, tools, and guidance we have available to help your organization reach its renewable electricity goals.

Next slide, please. Before we dive into the solar project development process, I thought it's also helpful to remember the roles that energy efficiency and renewable electricity have in reducing an organization's environmental footprint. While EE, or energy efficiency, helps you reduce the total amount of energy that you consume, renewable energy is all about fuel switching. Together, both of these actions are activities that you can undertake can play an important role in you're reducing your environmental footprint but they can also save your organization money on its operating expenses.

Next slide. So, in today's green power market, there are a wide range of supply options that organizations can buy green power through. These can be broken down into two primary categories of supply options, retail and project-specific. Next slide. Today we're going to explore only a subset of these available options and focus on self-supply, physical power purchase agreements, and financial contracts, also known as virtual power purchase agreements. Soon we will hear from our speakers about their own project development experiences across these various supply options. Next slide, please.

The process for developing solar projects is going to be unique to every organization and project opportunity. What you see here is a typical or simplified set of project development steps that your organization might take when looking at a solar project opportunity. It's worth noting, however, that not all organizations will follow these steps exactly and not all steps are needed for every type of project opportunity. As we will hear later, sometimes project opportunities may arrive to you unsolicited and so there's different ways that you have to deal with different types of project opportunities. So, over the next 15 or 20 minutes, we're going to walk through each of these steps at a high level and point out a very few key takeaways from each of these steps.

Next slide, please. First, when you're considering solar for your organization, knowing your stakeholder and decision-maker landscape is a critical element to successful project development. Most organizations have multiple decision-makers who must sign off on a project deal in order for it to go forward. Each decision-maker will have their own unique sets of concerns, challenges, or goals related to the solar project opportunity.

So, a key takeaway for you today is that successful project development requires that you engage with your stakeholders and decision-makers early in your process. One thing I would recommend is that you map out your organization stakeholder or decision-maker landscape. By graphing each stakeholder's relative power to hold up your project against that same stakeholder's relative interest in the project, you can start to get a sense of who you'll need to manage more closely and potentially meet with more frequently, as opposed to those that you just keep in a loop.

Next slide, please. So, Step 1 of the typical project development process often starts with setting organizational goals and then determining your desired project outcomes. Organizational goals are important for several reasons. First, they can help align decision-makers towards a common objective. Second, they can also help ensure adequate resources are available to reach those goals. I'm guessing that many of your organizations who are in attendance today may have already established renewable energy or greenhouse gas reduction goals. If done correctly, solar project development can be a means to achieve your goals.

Project outcomes are a little different. These speak to what you want to get out of a specific project opportunity. Project outcomes

can involve desires for economic, environmental, or societal benefits. They can also include safety, educational, or public visibility project objectives. So, the key takeaway is that your project outcomes must be clearly understood within your organization and communicated to project suppliers or developers who will ultimately build your project. A project developer will design a solar project differently depending on what your desired project outcomes are.

Next slide, please. So, let's take a second and go back to Slido and answer another question. So, which are the project outcomes that your organization is most likely to pursue? If you haven't done so already, please go to [slido.com](https://slido.com), enter #BBSUMMIT, and select Solar Process Workshop among the different conference sessions. You should be able to find the active poll, it is currently being voted on, you should be able to see it on the screen. Please indicate your answers. So, let's give it one second here and we'll see how things are going.

All right, not surprisingly, electricity cost savings is something that's a primary driver. We also have emissions reductions, saving on electricity use is also perhaps an interest area. And then there's also some of the other options that we detailed: economic development, education, job creation, and safety even. Great. So, let's go ahead and move on to the next slide.

So, Step 2 of the solar project development process involves identifying possible site opportunities. You may have building sites, open ground area, parking lots and garages, or brown fields such as capped landfills available to you. You will want to develop a comprehensive list of all the project site options without any consideration for whether they're feasible or not as an initial starting point. After evaluating your own site options, it's not also uncommon for an organization to decide that siting a project on a third-party site might be the best path forward. So, in the case of offsite PPAs or virtual power purchase agreements, these are often on third-party sites.

Next slide, please. After developing a list of potential sites, it will be necessary to collect information and data for each of your sites. There's a wide range of data elements that you'll need to collect, but only a few are going to be needed to do a project feasibility assessment for the site, which we'll talk about here in a moment.

The rest of these data points are going to be used to inform bidders through the Solar Request for Proposal solicitation process.

So, what you see here on this screen is a short list of some of these data elements. Some are going to be specific to type of site under consideration. For example, ground mount projects would require information around the soil and subsoil conditions perhaps. Later when it comes to assessing each site for feasibility to support a project you will need to know at a minimum the site's location, the electricity rate of the building that perhaps you're serving with the project, the building type plus the annual energy consumption of the building, if there are any alternative utility rate schedules that may be available to you, and then how much area do you have to put a solar array at that location? Later we're going to discuss a place you can go to find some tools to help you organize all this type of site information into a consolidated resource.

Next slide. So, we're going to turn back to Slido here and ask another question. We'd like to get a sense for our speaker's benefits of what types of project sites might your organization be expecting to consider for developing solar?

So, we'll give you a second here. Again, if you go to [slido.com](https://www.slido.com), if you enter in #BBSUMMIT and select Solar Process Workshop, you should be able to find this open poll, I'll give you one more second here, it looks like we got plenty of people participating. And it looks like the consensus by quite a bit is people are interested in building integrated or rooftop projects, which is fairly normal. But there's also a fair number of alternative site locations that also seem to be of interest.

So, let's move on to the next slide. So, now that you've essentially collected quite a bit of information about individual sites, you'll also want to do some research into your local market or policy environment. This slide shows a list of the most common policies and market areas that you'll want to look into in terms of the things that'll influence your ability to access solar, finance it, and other issues.

I won't go into any of these specific policies or market issues in great detail today, however, depending on what you find out, your research will influence how you finance your project, the eventual economics of your project opportunity, and potentially what claims you can make after your project is built. So, this is a pretty key,

important piece of the project development process. And most of the policies in the U.S. that influence project development are based on a state level perspective.

Next slide, please. So, the next step now that you have a good sense of the sites, what's the site's criteria or data-points are, as well as the market information that you'll need. You'll want to turn to the activity of, essentially, assessing each site for financial feasibility. The objective of this step is to whittle down your long list of sites that you've collected across your entire operational footprint to a subset of only financially feasible site options. Essentially, when we move to the solicitation process to get project bids from the marketplace, we don't want to include sites in that solicitation and receive proposals from developers that ultimately will be for project sites that are not deemed financially feasible as a first assessment.

Next slide, please. To do this, NREL has a tool called REopt Lite. It's a very easy-to-use online resource that allows you to assess the feasibility of project sites through a financial optimization model. REopt has two different modes that you can leverage in your analysis, the first is a financial mode, which evaluates the site based on several simple site data inputs to determine what size of a solar project you would need for it to be financially optimized.

Unlike other tools that might project the output of a project based on certain project specifications, REopt Lite seeks to identify whether your identified site has the necessary space to accommodate a project that would be optimized financially, which turned out to be one of the key functions of cost savings based on one of our previous survey poll questions.

The second mode is the resilience mode. This mode allows you to also look at storage systems in order to provide resiliency benefits. This could be of importance if you are trying to serve critical infrastructure or have power quality requirements. To learn more about REopt, NREL has developed some very good instructional videos on how to use and interpret the results of this online tool, indicated at the website on this slide.

Next slide, please. So, once you've whittled down your total universe of sites into a set that are determined to be financially feasible, the next thing you're going to want to do is think about your project financing. At this point, there are basically two

options or pathways on which to finance a project.

You can internally finance it yourself, which means you pay for or provide the upfront capital to build the system, and then you would own the system yourself. Or you can also have a third party pay the upfront capital cost of the system, and instead, what you'll do is agree to buy or purchase the output from the system through a purchase contract.

For many organizations, finding the upfront capital to internally finance and own a system may be challenging. However, owning a project will often translate into greater potential upside for the customer.

And each of these financing pathways offers a different risk and reward trade-off for your organization as the customer. Third-party financing can be attractive to many organizations, particularly in the nonprofit sectors, such as local government and higher ed., simply because the initial capital investment will be borne by a third-party and the ability for that third-party to take advantage of tax-based incentives will also be possible.

It's also possible through the third-party financing to push the performance risk of the project as well as the ongoing maintenance and operations responsibilities onto the third-party builder. The trade-off is that the third party will require some of the benefits produced by the project to cover their own risk on taking these project elements. We could spend a few hours talking about this topic alone so we're not going to dive into too much more depth on this in today's discussion.

Next slide, please. This brings us to the next topic of renewable energy certificates. This is a topic that pertains to both financing as well as consumer claims and goal achievement. Renewable energy projects produce two distinct outputs: physical, electricity, and energy attributes. Renewable energy certificates are the market instrument that allows for energy attributes to be conveyed between sellers and buyers of renewable electricity.

Each REC represents the energy attributes of 1 megawatt hour of physical power produced by a renewable resource and delivered to the grid. Because the physical power we all consume tells us very little about its origin or source, in the U.S. as well as other countries around the globe, we have developed parallel instrument-

based systems to track, allocate, and substantiate ownership of renewable electricity on a shared grid.

Next slide. As it applies to project development, most states gives owners of projects or generators ownership of the associated energy attributes or RECs generated by that project. This is important for a couple of reasons. From an organizational goals perspective, if you want claim that you're using a certain percentage of renewable electricity, you need RECs in order to substantiate this claim. The U.S. Federal Trade Commission has established guidelines for renewable electricity use claims through their Green Guides, which is a good resource to check in on if you're wanting to understand claims more specifically. If you have a goal to reduce your organization's greenhouse gas footprint, the energy attributes or RECs are also used in greenhouse gas accounting to substantiate an emissions reduction associated with your Scope 2 purchased electricity use.

So, RECs are a key requirement for goal attainment for many organizations. However, RECs are also used by states to track, allocate, and substantiate compliance to state mandates that are placed on load-serving entities such as utilities. Utilities who are held to these mandates may be willing to pay a significant amount of money depending on the state policy framework for a project's RECs to meet those mandates and for the utility to avoid penalties called alternative compliance payments.

Thus, RECs can also serve as a source of revenue for your project and reduce the cost of the delivered physical power if you choose to sell the RECs. But of course, the trade-off of that is your ability to substantial usage claims and greenhouse gas footprint reduction claims. Next slide, please. In some states, it's almost impossible to develop a project without consideration of selling the RECs or energy attributes associated with the project.

There is a credible practice in the market called REC arbitrage that allows an owner of renewable energy certificates to sell them from their project and then ultimately buy replacement renewable energy certificates. Arbitrage is a common practice in many commodity markets where there are market inefficiencies, and it allows you to consider developing projects and also meeting your targets in commercial marketing claims.

Next slide, please. The only point I want to leave you with here is that you're not actually using renewable electricity unless you have both the REC and the electricity. And so this is an important point to just end our REC discussion on. If you have any questions in the future about renewable energy certificates, the EPA's Green Power Partnership is available to answer any questions you have.

Next slide, please. So, next, moving into request for proposals. This is Step 5 of our simplified process and involves soliciting project proposals from project developers in the market. RFPs are a common way for many organizations to receive competitive bids for all types of products and services including solar. Solar RFPs have a few unique elements to them. The next few slides are going to detail a wide range of informational elements that are unique to solar requests for proposals. Several key takeaways you should consider include making sure that your RFP is clear about your desired project outcomes.

Also, have a plan in place for how you will manage bidder questions and how you will socialize your answers more publicly across all bidders so that all respondents will be using the same information when providing project proposals. Also consider doing site visits or bidder orientation meetings as part of your RFP process. These are considered a best practice and, remember, boots on the ground is always better than doing things through paper or through the Internet.

Next slide, please. Rather than being overly specific in your RFP about design or technical requirements, try to focus your RFP on the desired performance you wish to get out of the project. This ensures that the bidder will have flexibility to bring their best technologies and design elements for the lowest cost. For major solar project components, it's also common to list a range of industry performance standards, warranties, and workmanship guarantees.

And as you see on this slide, there's quite a few here that you could consider listing. Consider development of a bidder response template that provides a standard response format and structure for bidders to follow. This ensures that you can compare bids on an apples to apples basis once you receive them through this RFP process. And also consider defining which tools bidders should use when developing their proposals.

This would include things like defining NREL's PVWatts calculator for defining how much a project's output will provide. This can help ensure that bids are using the same tools and coming up with comparability estimates.

Next slide, please. And last, one of the things that is other overlooked in the solar project development process is the operation and maintenance of the project after it's been developed. In many cases, operations and maintenance can be handled internally if your organization has the resources. Or else, you might want to consider including it as an option within your RFP and seek third-party coverage of these responsibilities.

Next slide, please. So, here on the last slide is the development of project evaluation criteria. The project evaluation criteria is how you're going to actually score the different project proposals. The development of the project criteria actually starts back when you're engaging with different stakeholders in your organization and determining your project outcomes, but ultimately, the application of that criteria occurs at the end of your RFP process. So, one thing that is useful to know is that bidders to an RFP want to know whether they've won or lost.

And they also want to know how they'll be evaluated, so including the criteria that you develop is a key element of the project development process. There are a number of criteria you may find useful to include and that might include evaluating bids on their cost competitiveness, aspects of the bidders project team and their relative experience, or the proposed technical approach that they proposed, or the bidder's ability to meet schedules and timeline requirements related to your project.

So, next slide, please. So, at this point, we're going to move on to our two other speakers and their case study examples of their own solar project development experience. Our first speaker, as was briefly introduced earlier, is Ian Lahiff. He is an engineer with the City of Orlando and he is leading a team of construction managers and control specialists, and implements energy efficiency upgrades through the City's wide portfolio of buildings.

He has more than ten years of design and construction experience with a focus on sustainability. He's worked at the U.S. Department of Energy before joining Orlando's Green Works team in 2013. He's an active member of ASHRAE and a member of the U.S.

Green Building Council since 2014. He has a degree in mechanical engineering and he is a licensed professional engineer. So, Ian, please take the floor.

*Ian Lahiff:*

Good morning, everybody. First off, I want to say thank you for joining us, I certainly appreciate everybody that's RSVP'd and attended and, of course, is sticking out with us throughout these presentations. That was a great presentation so far, James, thank you.

I'm going to kick it off and start off with a little bit about the City of Orlando and the process that we're going through right now. The picture that you have in front of you is a 25 megawatt solar farm that OUC, the Orlando Utilities Commission, our municipal utility, built just a few years ago. And one of the exciting things about the solar farm is it's adjacent to a coal-fired power-plant, and in fact, the solar farm itself is built on top of a coal-ash landfill. So, I'd really like to start off the conversation because this really exemplifies how we're moving from a fossil-fuel-based economy within Central Florida towards a renewable energy, locally grown energy source for the City of Orlando.

Next slide, please. For today's presentation, I'm going to touch a little bit on the City of Orlando and where we are now and our path forward. Of course, I'll talk about procurement. Our strategies, we have some unique opportunities and some creative obstacles to overcome here with the City of Orlando and within Florida state statutes for renewable procurement. I'll share two case studies and, of course, I'll share some lessons learned as we've gone through this process.

But first, I want to make sure that I'm not going over on time so I'm going to go ahead and click on my timer. Slide please? Thank you. So, for the City of Orlando – next slide – a few years ago, our Mayor, Buddy Dyer, is the longest-running mayor in the City of Orlando history and we're very fortunate to have him at the helm really driving forward energy efficiency and sustainability overall.

It's one of his big tenets to be the tip of the spear when it comes to sustainability and we're working on an overarching goal within our Facilities and Engineering Group to drive 100 percent of our municipal energy to renewable sources by the year 2030, which is coming up pretty quick actually. One of the unique things about the City of Orlando, besides having the most visitors of any other

city in the country, 74 million visitors a year, is we have a fairly small incumbent population. About 260,000 residents living within the city proper.

So, that presents some challenges for resource management and, of course, we manage a lot of different buildings as well, over seven million square feet of city buildings managing three large wastewater treatment plants as well as several stadiums and arenas. So, there's a lot of energy consumption there and a lot of opportunity to move forward on energy efficiency and renewables. The way that we're doing that is utilizing onsite solar as well as offsite solar with our municipal utility.

To date, we have already prevented almost six million pounds of coal being burned from working with our local utility, subscribing to their OUC local solar farm, and making sure that we are capturing 5.2 megawatts currently of solar energy from that farm.

We're going a little quick through the slides here. Thank you. So far, we have subscribed City Hall, the police headquarters, and the fire stations. These are buildings that were not applicable for onsite solar in the beginning or we didn't have capital funding to be able to land onsite solar, so we've opted to use a local offsite opportunity to get solar energy for these facilities. And I'll talk a little bit more about that process in a few minutes.

Next slide. Moving forward for the City, we are working out some really cool pilot projects. This picture that you have right there in the bottom, that's the facility that I work in. It's a ten-acre complex, covered with 420 kilowatts of solar that was engaged in third-party PPA with our municipal utility. We're also going to be expanding this array to utilize a V-to-G or V-to-X opportunity, where we're going to be landing a solar car port.

You've probably seen those being done before. But what's interesting about this, hang on, is that it'll have a 36 – we're blowing through the slides here. Thank you. It's going to have 36 electric vehicle charging stations that will be able to power share and use solar plus storage for this facility. So, that's a really cool opportunity and that's going to be a great expansion of our array.

Looking into the next fiscal year, we'll be moving from 10 percent renewable energy towards 20 percent. Oh, okay, the slides started advancing on their own, got it. We'll keep that under control. All

right, next slide, please. How are we moving forward, right, with pathways to solar? Next slide? When I first arrived to the City of Orlando, there had already been some opportunity to utilize the American Recovery Reinvestment Act to do some initial energy conservative measures.

And this is really the foundation, like James said during his presentation, of where we want to start. It doesn't make sense to put a new motor on a boat that has holes in it. You want to make sure the buildings are built and operating as efficiently as possible as you drive towards energy efficiency improvements, and then finally, utilizing renewable energy to make that building as net zero as possible.

So, that's been our effort over the past several years and it's just really been with the last 18 months that we've received some capital funding to start landing onsite solar for our facilities.

Next slide, please. So, where do we land with solar? How do we do it? We've been lucky enough to work with some of the leading experts and scientists at the National Renewable Energy Laboratory.

We were one of the first organizations to win a grant to be part of the Solar Energy Innovation Network, and that allowed us to be part of this larger cohort, traveling up to the NREL Headquarters in Colorado several times and working with them to really take a broad look at the City of Orlando portfolio and understand where the opportunities are to land solar, get the best bang for the buck across the board, and also look at some of the interesting resiliency options and solar-plus storage opportunities.

That grant opportunity has now passed, we've submitted our final report, and now we're moving forward after using that information to capture some funding from our internal leadership, and now we're landing solar across the city.

Next slide, please. As part of the outcomes of that experience, we've really developed two pathways towards solar at city facilities. That's onsite installation and community and subscription. The City of Orlando is not going to be utilizing RECs if we can help it, we're not going to be utilizing out of state solar. We really want to create local jobs, have homegrown electricity.

There's plenty of opportunities working with the municipal utility to expand solar farms. In fact, they are now working on a 175 megawatt farm right now that we're going to be an anchor tenant and a part of. And of course, we're landing onsite solar where it makes sense across city facilities as well that's going to be self-funded and managed by my team here at the City of Orlando.

Next slide, please. In order to understand where to put all of this solar and whether to do offsite or onsite solar, we utilize the full-blown tool of REopt with the scientists over at the National Renewable Energy Laboratory.

Now, there is a REopt Lite that I would encourage everybody to take a look at, but really understanding the tool, it's helpful to have an expert on hand and have that technical support. They were able to give us some feedback and provide us some analysis assumptions.

Next slide, please. That helped us develop a map that was helpful for sharing with leadership and capturing some of the funding that we needed to move forward. Next slide. Great, going back one slide there. Yep, too many. So, the Orlando Municipal Rooftop potential, great, this was the output of the REopt tool working with the NREL team, and we were able to really develop a heat map and drill down where to put solar across the city.

The big oval building to the left in the top-left corner, that's our arena where the Orlando magic basketball team plays. Just to give you a scale of what our downtown core is, we were able to understand that with out municipal demand for electricity, we had almost double the potential of rooftop solar space available, which is a huge win and a great understanding of where we are with solar and renewable potential. But of course, it doesn't make sense to land solar on all of those buildings.

Next slide, please. So, we had to develop an evaluation process. This is a simple version of our larger decision criteria but really helped us understanding do we land solar and did it make sense for a newer, existing building? Does the size and impact make sense? What's the total cost? What's the payback?

If we answered no to any of those questions, it drove us to working with our municipal utility and to subscribe to our community's

solar farm that's still within the city limits. Now, of course, if we answered yes and it made sense, we went ahead and pursued funding for onsite rooftop solar.

Next slide. So, great, we have funding, how do we now go out and procure that solar and get it on our city rooftops? Next slide, please. We want to make sure that we're utilizing the tools that we have in the toolbox to begin with. It's a lot easier to utilize what you have and start to get some points on the board with quick turnarounds rather than trying to put out competitive solicitations from the get-go.

So, we use this two-part approach. For some of our smaller buildings, like our fire stations, we're using term contracts. So, a lot of cities and local governments have annual electrical contracts, maybe a job order contract for general construction work, and then also continuing professional services through architects and engineers.

So, for the projects that were below, say, a \$200,000 threshold, we were able to turn on those existing contractors and start putting together the plans and specs, and then being able to utilize our general contractors and electrical service providers to get those installed, which is what we're working on right now for three fire stations this summer.

For the larger projects, we have to utilize the competitive solicitations, and there's two that we're looking at there. It's the invitation for bid, lowest price wins it, or the request for proposals which I prefer but it takes a little bit longer, it gives the team a little bit more flexibility with the scoring criteria.

So, how did we use those? Next slide, please. For the next two case studies, next slide, we utilized the onboard contractors that we already had for a building that recently was constructed last year. It was a new code enforcement and public record facility. So, this is a simple two-thirds of the building was a warehouse space, another third of the building was office space that supported our public records.

So, air conditioning, storage, as well as code enforcement, folks that would come in in the morning, get their work orders, then go out in the field and enforce the city codes across the municipality. We realized during construction, and it's interesting to know that in

the City of Orlando our new construction team is a totally different animal, it's a totally different public works team with a different hierarchy, so we really need to coordinate closely with whoever's building those new construction buildings.

As we saw the construction going up, we started to talk with the engineers and realize that there's a great opportunity for beautiful flat rooftop to maximize some solar on the site. In fact, as we were going through the construction process, we were able to understand more that we could even make this building a net zero facility, and that's why I said net-zero-ish.

We landed 114 KWF solar utilizing our annual contractors, and even shoehorning in a larger main disconnect panel during the construction process, which allowed us to land an even larger solar system. Now, we're not even totally maximizing the entire roof but we are able to show a couple of months this past spring that we're already producing a surplus of electricity versus what the building is consuming. Now, the building is still fairly young in its operation cycle so we're still tweaking some of the building operations controls, and we hope that moving forward, this building can be net zero into the future.

So, the next slide shows just some of the elevations of the building, tilted wall construction, highly insulated, awnings covering the windows, and of course, with all city facilities, we meet LEED silver at a minimum for all of our new construction. So, this really gives us an opportunity for a win-win. If we're going to land solar or make it solar-ready, that's also going to help us reach those LEED certification guidelines.

Next slide. So, moving forward onto what we're working on right now, these onsite solar projects are going to expand the rooftop solar that we have across the city. We're working on three fire stations that have been built in the past ten years at a large community center, and our emergency operations center, which is a former navy building.

So, what's unique about these buildings is they weren't actually designed with solar in mind, but throughout our Facilities Operations team, we've been able to investigate the roof structure, the roofing material, and the ability of these buildings to withstand onsite solar. We also worked with the NREL and the REopt team to do that further analysis to make sure that these buildings were

the best buildings to support onsite solar with the funding opportunity that we had. Next slide, please.

So, besides just the financial payback of having solar on these buildings, unlike that warehouse building that I just showed you that's in an industrial part of town, it's on a rooftop covered with a parapet, nobody's ever going to see it. There is a huge not only return on investment for fire stations and community centers but there's a great what we call return on visibility.

Our fire stations are in every community throughout the city, serving over 110 square miles of the City of Orlando, and they're a great opportunity for students to go on field trips, for parents to take their kids and learn about the fire service and EMS. And we also want to make sure there's an opportunity to capture some of the renewable energy and sustainability attributes of these buildings as well.

We want people to be exposed to it, to understand that it makes sense, and that the City is leading by example and helping to transform the market. We also have a slew of other funding opportunities for small businesses and residences as far as pace financing and Solar Energy Efficiency Alone funds. I don't have time to talk about those today but this is a great opportunity to start that conversation with our local community members.

Next slide, please. So, these are the renderings from our solar contractor for the three fire stations in question. One of the things you'll know right off the bat is we're not getting that energy power density that you would see from a flat roof.

So, this is really one of the lessons learned that from working with REopt and the NREL team, we devised these buildings as really prime candidates for solar, but as we got boots on the ground or boots on the roof, if you will, we determined that there's a lot more limited possibility because of some of the clearance and national electric code issues.

These buildings were built with a beautiful standing-seam metal roof where you can clip a solar panel rack right onto it without having to penetrate the building, which is fantastic. But because of all of the different facades of the roof pitches, every time you change a roof pitch, you have to have an additional clearance for electrical equipment. So, that actually prevented us from putting a

lot more panels in a more dense configuration on this roof.

You actually have to have firefighter access, a three-foot clearance around each array, and each of these facades is considered its own array under the electric code. So, that was a big lesson learned for us. We're still moving forward with these facilities but instead of getting 75 or 80 percent energy offset, we're looking at more 45 percent, 50 percent offset.

So, in this application we're going to look back to the Orlando Utility Commission and try to balance an onsite solar and offsite solar combination to totally make these utility buildings run off renewable energy.

Next slide, please. Great, next slide. Okay, so to recap, we want everybody to learn from our successes as well as our mistakes, and modeling of the PV systems really need to minimize generic assumptions. If you can get boots on the ground to measure and verify while you're doing the larger-scale modeling effort, even though it can take more time at the front end, it's definitely worth it.

We did a combination of that but, of course, as you're putting together those models to get the funding, having that funding will then allow you to do more of the boots-on-the-ground investigation. So, it is a little bit of a circular loop there but I would highly encourage people to add to the software analysis with an onsite analysis.

One of the other things that we were surprised to engage as the lessons learned was working with our IT Department. So, I didn't touch on that in the presentation but a lot of the inverters that capture and transfer the energy from the solar panels and put it back into the grid or into the building are now smart inverters, which is fantastic.

You can monitor energy consumption, look at the energy generation of each panel, and all of that information goes via CAT 5, CAT 6 cable back to the server and onto a beautiful dashboard that we can do some further analysis on.

Of course, that rides on the city network, where we also have police and fire communications and criminal evidence, and all sorts of different things. So, there is an opportunity for bad actors

to try to jump that bridge and try to get into our servers. So, we wanted to make sure that we're working with the IT department and I encourage everybody else to, to make sure that those servers are either partitioned or that there's some firewalls and blocks to make sure there's no issue with that.

Additionally, make sure that you're looking at the code clearances if you're landing some rooftop solar. Rooftop production modeled versus onsite actual can vary wildly when you get to the rooftop measurements.

And also, these things are changing constantly. We're finding that if we did models six months or a year ago, the solar panel production that's on the market now has already eclipsed what we are modeling. So, there's definitely an opportunity to have an enhanced ability to create more solar versus maybe what you drafted in the RFP or the solicitation six months ago.

So, as James said, make sure you're not restricting yourself when it comes to that and put in some performance metrics, but necessarily pigeonhole yourself in to a specific KW generation. Now, as a caveat to that, at least where we are we're not able to overproduce. We can't act as a utility or make a surplus of electricity and sell it to our neighbor or sell it to other buildings.

So, we need to make sure that we're not producing more than 105 percent of the average energy consumption of the building that we're landing solar on. So, basically, striking that balance as far as what our proposed generation is going to be versus what our proposed consumption is going to be is really important, and of course, working with our utility to get that bidirectional charger and that approval in there – excuse me, bidirectional meter, and the approval to make everything happen is very important.

That wraps up my presentation and I'll hold for questions at the end of the presentation. Thank you.

*James Critchfield:*

Great, thank you, Ian, that was wonderful. And I just want to give a little shout-out to the City of Orlando. EPA has a local government solar project portal which has a number of resources, and one of those is a solar project development plan. The plan that Orlando has produced is actually broader than just solar but it is really a great example of the organization that Orlando has gone to and the strategy they're employing to develop their solar

capabilities.

So, we're going to move to a quick Slido poll. If you could open up Slido once again, what we're asking you to do is to type in a few words, one or two words that sort of encapsulate what some of the high points of this presentation have been so far for you, we're interested in seeing what stood out, what kinds of things are you hearing that resonate with you? Also, once you do that, if you have any questions I want to encourage you to switch over to the question function and submit questions. We're going to hold off on questions until the end.

And so while people go ahead and submit some of those high points, I'm going to go ahead and start introducing our next speaker. Jesse Warren, who was previously introduced, is with the University of Virginia and Jesse is responsible for the University's Electric Demand Response and Sustainable Buildings Programs. He leads a team of energy engineers who identify and implement energy efficiency and delta-force retro commissioning projects across the grounds of Virginia's campus.

Previously, Jesse worked as a consultant doing energy conservation, HVAC design, energy modeling, and LEED project coordination. He has a bachelor's of science in mechanical engineering from Virginia Tech and he's a licensed mechanical engineer in the State of Virginia. He's also the proud father of three, and a rain or shine, two-wheeled commuter. So, Jesse, why don't you go ahead? The floor is yours.

*Jesse Warren:*

Thank you, James, I appreciate it, and thank you everybody for tuning in. I'm going to share some of our best experiences here at UVA – can I get the next slide? – as we talk about how we've procured renewable energy and met our goals. Next slide, please. So, UVA is a pretty big institution, we're about 550 buildings, close to, now exceeding, 17 million square feet but we've got kind of a unique campus.

We're a UNESCO World Heritage Site, Thomas Jefferson founded the institution and was the original architect of that, and described the campus architect as an aesthetic and planning body who would help us realize our facilities vision. With that said, we do have central utilities on our campus so we own and operate our central utilities infrastructure, including our electrical. So, we have three main substations where we peak around 60 megawatts and we have

a contract with Dominion Energy, who is our electric provider, and that is negotiated outside of the state corporation commission contract.

So, we're what's called the non-jurisdictional customer. We peak around 60 meg, that allows us to exceed our solar production on our buildings because it's all our grid. We have a strong energy and utilities enterprise that owns and operates that infrastructure, and they're the ones who have really funded our investments to date.

Next slide, please. So, our first goal was around greenhouse gases. We decided in 2010 that we wanted to be 25 percent below our 2009 levels. We have met that goal in 2019 with a 27.4 percent reduction. You will see that in 2018 to 2019 we saw a significant drop and the reason we saw that drop was because we brought online our offsite solar farms.

Next slide, please. So, in order to achieve this goal, we started thinking first about our stakeholders, students being the biggest ones. So, we held a series of events, town halls and things like that, in order to have them show that they wanted real, tangible, transparent, aggressive action. We talked about the difference between action on grounds versus action off grounds. I think it's preferred for things to be on our campus and very real, but they want solutions faster than that. So, offsite became a very real opportunity for us.

Next slide, please. So, we've got three deliveries of solar here at UVA, the first is an on-grounds roof lease, which I'll talk about. The next is owning and operating our solar panels, that's what most people do, that's what I did on my house. I bought solar panels and now I own them. And the third is an off-grounds power purchase agreement. We've talked about on-grounds power purchase agreements, but what we have done is the financial vehicle that James was talking about earlier.

Next slide, please. So, the first thing we tried was what we called a roof lease. We wanted to test solar on grounds and we were approached by our provider to see if we could house some solar panels for them. So, we decided to host about 365 KW on two of our roofs. These are flat roofs and they are not particularly visible from anywhere. Now, we talk about the return on visibility. For better or for worse, in our historical grounds, we are looking for flat roofs and minimal visibility, but once we get up above the

ground plane, we have opportunities to see and celebrate these projects.

Now, they have paid for our roof space. This was an opportunity for us to host solar panels and Dominion brings the renewable energy credits and the carbon benefits to their side of the grid. It greens the grid for everyone, which is great. We got to explore the development process on somebody else's dime, which is great. We did not keep the renewable energy attributes, which is not great, and so as a result we probably would not do another agreement like this unless we could keep all the RECs. If we kept all the RECs, I don't know there would be an attractive roof lease for someone else.

Next slide, please. The next thing we did is we bought a bunch of solar panels, right? But that was expensive, that required us to make capital investments every time we were retrofitting a building in order to achieve our goals. So, you'll see at the bottom of the screen a series of projects that I highlighted – Alderman Substation, Clemons Library, Skipwith Hall, and Ivy Stacks. Each of those comes with their own stories about why we achieved solar there. Clemons Library needed a new roof, it was a very high-profile roof in the center of grounds and we just couldn't pass up the opportunity to put solar on that flat roof.

Skipwith Hall was the home of the Office for Sustainability and we decided to make a statement about our commitment to solar energy with 15 KW on the roof. Not a big commitment but a commitment. Ivy Stacks is where we keep our books and deep storage, so imagine a giant concrete beer cooler that's 55 degrees that holds old books. They couldn't meet their LEED energy requirements without doing something impressive, so what they chose to do is retrofit the old Ivy Stacks building and the new renovation with solar panels, and that allowed them to achieve their LEED energy efficiency numbers.

My favorite of these is Alderman Substation. I know it's the smallest but that is a project that our Facilities Management team designed, procured, installed, and are monitoring themselves. So, we believe that solar is part of our long-term future, so that's one of the core competencies we in Facilities Management desire to incorporate. We did that with leftover panels from Clemons Library. We have to buy them by the pallet, so we had half of a pallet left, we added a pallet, and we had a project.

Now, the challenges include we're a nonprofit so we can't realize the tax incentives. If I put \$1 million worth of solar on grounds, somebody else could do that for less. The good part about it is that it reduces our electricity consumption at the building level. We put solar panels on our buildings, our buildings draw less from our grid. And we received all the environmental attributes because we own and operate the whole thing.

Next slide, please. But the big impact came from our offsite power purchase agreement. The power purchase agreement is a virtual power purchase agreement, it's what's called a contract for differences. We did two separate contracts with Dominion Energy, who is our provider. They approached us and they desired to do more projects like this and we desired to meet these goals. So, they approached us and were able to offer us, frankly, the best price of anybody that we had discussed with.

Because we were already a customer of theirs, we already had a contract in place so we made an amendment to the State Corporation Commission Contract between the – sorry, the Department of Mines, Minerals and Energy Contract between the State of Virginia, the Commonwealth of Virginia, and Dominion Energy. That was challenging, so that took our legal department, that took our general counsel, that took buy-in all the way up the chain to achieve a project of this size. So, our Senior Vice President for Operations took it to our Chief Operating Officer, and it was circulated across our Board of Visitors. Although this is an operations decision, we felt that their feedback was important.

So, the result of this is 32 megawatts across 2 facilities, 20 percent of UVA's electricity is now carbon-free. We buy kilowatt hours at a fixed dollar per kWh rate on each of these sites, and that fixed dollar per kWh rate escalates annually according to our contract with Dominion. Now, we extensively modeled this, we took the escalator that was provided in the original contract that is the same escalator that was used in Dominion's integrated resources plan.

We looked at other escalators, we looked at our historical escalator that we've seen, we looked at the EIA numbers, and each of those numbers determined a different breakeven for us. We weren't going to break even on Year 1 but we were going to break even in the future. If we don't, then we have seen a significant savings on

our fossil fuel footprint. So, it acts as something of a hedge but that hedge will go away as we achieve more aggressive goals.

Now, these 50 megawatts sell into the PJM grid at the locational, marginal price. So, that means that we buy it at a fixed Kwh but now we've bought it twice, so we have to sell it back into the grid. We do that depending on what the grid values electricity at. So, that is what gives us a slightly speculative position, but we are collecting all of the environmental attributes that come with this. That was our big negotiating point with Dominion Energy – no Arbitrage, no funny business, pure solar RECs that belong to us.

Next slide, please. So, I mentioned that the students want transparency so we tried to connect these offsite projects back to grounds and we do it through things like our renewable energy tracker that you or anybody else can see, but also our building energy tracker because it's also an opportunity for engagement around the impacts that people's choices have on the environments around us.

Next slide, please. So, I think my lessons learned on best practices are quite similar to others. We want to prioritize energy efficiency first, then onsite solar, then offsite solar. We're going to keep renewable energy attributes, renewable energy credits, and we want to engage more stakeholders next time. I feel that if we were to do another power purchase agreement, we would want to understand the sites involved and that brings us to our sustainability outlook. We're both interested in how we steward our resources, how we engage our population, and how we learn new things about sustainability that are going to help solve the challenges of the future.

Next slide, please. So, now that we've achieved our initial carbon neutrality goal, we've set stronger ones. As of December, we committed to carbon neutrality by 2030 and fossil-fuel-free by 2050. We also want to work with our community and work with our teaching and research partners to understand how these can lift all boats. Next slide, please. But you can see that our greenhouse gas footprint is going to go right back up. We're going to exceed our goal numbers next year if we do nothing. So, we need some aggressive emission strategies.

Next slide, please. And for us, those aggressive emission strategies are around renewable energy, so undertaking additional

onsite and offsite contracts as well as decarbonizing the grid from I'll say a policy level. Next slide, please. And with that said, what's next for us? Our state has entered into a 30 percent renewable power agreement with Dominion so by 2022, we will be served by power purchase agreements involving both wind and solar. So, that takes a cut out of our greenhouse gas emissions.

We're also interested in physical power purchase agreements. Because we can't monetize the tax benefits, on-ground PPAs can save energy and save money. But there's going to be more offsite because we can't do it all on our grounds alone. I think we need to engage that community, that's not just our community here in Charlottesville, but the community where these facilities will be located. I think we would not achieve our goals if we felt this was dumped into a community that did not desire it. And that's where programs like SolSmart and things like that help pave the way for us.

Next slide, please. And the final thing that I'm very proud of is working together with our community, Charlottesville, and the County of Albemarle and UVA through a program we call Climate Action Together. We all realize that we need to set new climate commitments at the same time, and our community didn't want to share three times over their interests. So, we decided to do shared communication, shared listening sessions, shared engagement. But now we've set goals and our goals have the same milestones, so what I'm hoping for is shared milestones, shared reporting, and eventually shared successes. And so our Office for Sustainability and our subject-matter experts worked directly with their offices and their subject-matter experts to help us move not just the university footprint but the entire community at the same time.

So, with that said I'd like to hop back to James, who's going to tell us a little bit about some of the resources that are provided for us.

*James Critchfield:*

Great, thank you, Jesse. I really appreciate that presentation, very detailed, and it's particularly interesting given the virtual power purchase agreement that you've all entered into, which is increasingly becoming a popular way for larger institutional and corporate buyers to engage with green power. So, let's go ahead and go to our next poll question. If you could go back to your Slido screen, what were some of the things that stood out to you in the UVA presentation? Anything that resonated with you as you were listening to Jesse's presentation?

So, it looks like some of the different supply options were interesting, the collaborative elements between utility and institution. Yeah, really good stuff here. Okay, we're going to move on. As Jesse indicated, we are going to conclude our presentation portion here with some resources or some information on how you can get some resources for your next solar project opportunity. There's a couple of things here that I want to highlight for you.

The EPA has a couple of online resources. One is a toolbox for renewable energy project development, and there's a searchable database in here that allows you to select different elements that are sort of part and parcel to the solar project development process and try to find resources.

We've worked with the Department of Energy, the National Renewable Energy Labs, and other stakeholders over the years to consolidate a bunch of different resources in a lot of different areas. And so I would recommend, if you are looking for a solution to a question you have or a challenge, stop by the toolbox here and see if you can find something. We also present the materials pretty easily through different major topic areas as well.

Next slide. You also, as a registrant to today's webinar, should have received an email that also includes links to the toolbox resource in particular, but there's also an attachment that came along with that. And that attachment outlines a wide range of resources as well, many of which are included in that toolbox. But it breaks it down by the simplified solar project development steps as well as a couple of the ancillary items that we discussed regarding policy and renewable energy certificates and ONM concerns and things along those lines. And so I encourage you to take a closer look at that. EPA is always available to help identify new resources and find them for your use, so please reach out to us at your earliest convenience.

Moving on to the question and answer session. So, at this point we want to go back to Slido once again. We just want to remind everybody in order to submit a question for consideration, please open your browser or open your mobile device and go to [slido.com](https://slido.com) and enter event code #BBSUMMIT and then select the room or the session that we're currently in, which is the solar process workshop.

You can also review the questions that were previously submitted by others and if you like those questions or they're similar to what you were interested in, you can simply vote those up the rankings and we will try to answer a few of these based on their specific hierarchy here. So, I guess going to our two speakers, there's a question around a certain type of RFP focused on community solar or aggregate net metering. And I'm kind of curious, given the states that you operate in, is this something that you've had exposure to at all?

*Jesse Warren:* I'll say not really. I don't know exactly how that works in our monopoly, for lack of a better word.

*James Critchfield:* Which is an interesting element. Both you being in Virginia and Florida. Maybe one of the better questions there is what kind of market environment were you operating in that essentially determined which pathway you could take?

*Ian Lahiff:* For our municipal load, we're working closely with the utility, who is moving to shift some of their energy production portfolio towards more renewable sources. And a part of that is offering community solar, and we want to encourage that. So, even though for us at this point we're paying a premium for the buildings that are on the community solar rate, it's just slightly higher than we would be paying for fossil-fuel-based energy.

And that's the case for anybody who wants to tie into that community solar farm. I'm doing it with my house. When I lived in an apartment I was doing the same thing, getting my electricity from the solar farm for maybe another \$8 or \$12 a month. It's a nominal fee, right? But as more people buy into it and they build out the farm, it'll come down to that neutrality level, where it won't have a price premium associated with it.

*James Critchfield:* Yeah, I think with respect to community solar, it sort of depends on whether you're the buyer or the developer of the project as to whether an RFP would be something you would be concerned with. Many community solar projects in our experience are managed a lot like programs, essentially, where consumers, as you mentioned, can sort of subscribe and there's different models for how those community solar projects, essentially, avail themselves of benefits and values for the customers or the sponsors of the project who participate in those programs.

I think I can do a takeaway, if you're interested in reaching out to us. We can try to figure out if there are some RFPs. I'm thinking the National Renewable Energy Lab has done a lot of work on model RFPs. They might have some ideas on if there are any examples in the market. So, I think some follow-up on this question might be useful. So, moving onto the next question, did either of you in your particular context consider battery storage through your process, whether you ended up doing it or not? And what was your experience with resiliency considerations?

*Ian Lahiff:*

I can kick that one off, actually. With only 20 minutes to talk, I didn't have an opportunity to tap into a grant that we're going after right now, which we're calling Orlando Resiliency Hubs. In fact, we modeled as part of the Solar Energy Innovation Network, our team was called Orlando Renewable and Resilience. So, this is a big thing for us. We're bombarded by hurricanes every year, there's power outages, there's definitely some societal inequality issues when it comes to people that can afford to have a back-up generator and others that can't.

So, we wanted to land, solar and storage, or at least land, solar, and then provide the electrical infrastructure to host storage in the future at several of our buildings. So, we're pursuing funding to do just that, which entails upgrading the electrical service, providing both a disconnect or automatic transfer switch for our roll-up generator, or potentially supporting land storage capacity, as well as the valves and the piping that would be needed for an auxiliary chiller to supply air conditioning to, say, a community center. All of our critical buildings already have backup generation for the fire station and police station, so it doesn't make sense to land storage there, but moving forward, we want to set the table for the utility to be able to capitalize storage opportunities. It doesn't make sense for the City to do it just because of our electricity rates being so low compared to other cities and states across the country, and the fact that a lot of our buildings aren't on that demand rate.

Even though it was cost more if we were on a demand rate, that would show our rationale for landing storage to have some demand load shedding. So, not having that financial backing kind of shifts us towards the resiliency aspect and really just landing the infrastructure to have a future solar and storage installation makes the most sense for us.

*James Critchfield:* Interesting. Jesse, have you looked at UVA with any sort of storage applications yourself?

*Jesse Warren:* We've done thermal energy storage to manage our ratchet and provide some resiliency to our hospital and such, but to be honest, our substations, even at their low point, are always pulling more power than we could generate. So, we are not in a position where we need storage in order to keep from overproducing.

*James Critchfield:* Okay, and Ian, with respect to the storage interests that you have, what can you talk about in terms of the controls elements? Is that a big piece of what you're thinking about in terms of how storage and solar will integrate in current building systems or with the grid in certain ways for economic or other benefits? Have you gotten into that level of detail yet?

*Ian Lahiff:* We've actually spoken with some of our partners and folks that have experience doing this. We looked at Pena Station in Colorado right down the street from NREL as a model for that because they are utilizing an excel energy capitalized battery bank to balance the load in that community. But it's shared to manage the grid resiliency with the utility first and foremost. So, we like that model, of course we like it because we don't have to capitalize the funding for the storage and we're hoping that the utility sees that as an opportunity to have some grid resiliency as well. We do have plans for a solar-plus storage installation. That was one of the first slides I showed you for that solar electric car port with the electric vehicle charging stations, coupled with the 500 Kwh battery storage. So, from a controls perspective, we'll be monitoring the consumption and the charging of those electric vehicles paired with the battery and solar. If we run into a situation where we lose power to this facility, we can utilize an onsite generator to provide the sine curve that will tell the inverters to align the power factor and then start up the solar panels and feed power into the battery to be able to charge the electric vehicles. So, we have a control schematic, we're working through that right now and that should be going out to bid in the next month here.

*James Critchfield:* Interesting. I'd love to learn more about that after you guys get through that process. I guess one question we got here, what are some of the greatest barriers higher education institutions face in implementing solar projects? What do you think is unique, Jesse, about who you are and how that influences what you can do or not?

*Jesse Warren:* I think our students demand broad action and sometimes, from an operations perspective, it's harder to translate that into fast action. I do think that we're really more interested in the community aspects of this as well as the environmental aspects of it. So, that, again, drives us past the strictly financial desire into changing our environmental impact. I guess what I'm saying is they give us the power that I think we need in order to be a leader in that space.

*James Critchfield:* Great. It looks like we had one other question here wanting a little more context around how REopt and the PVWatts calculator are similar or different. Ian, I might kick that to you. You said you had some experience with probably both, I imagine, but certainly the REopt tool. I can also riff on that after you have a chance.

*Ian Lahiff:* So, PVWatts is great to be able to just get a quick understanding of what the potential generation is given your latitude, longitude, address, what have you. I believe it's changed recently where it doesn't have the same Google Maps support as it once did. But when you compare and contrast that to REopt full-blown version, which takes the NREL personnel to be able to operate, there's a lot more depth of analysis that you could be providing. I worked with the NREL folks to provide years of energy consumption utility bills, both for our existing buildings and what we think are new proposed fire stations the community centers would use, and they were able to model a lot of different scenarios, escalation of electricity prices, cost of solar, cost of storage, are we at the right tariff that we're paying for the facilities? And I just think there's a lot more capability in REopt. I believe REopt Lite has a lot of those same features, whereas REopt Pro I guess you would call it has a little bit more in-depth analysis ability.

*James Critchfield:* Great. Yeah, I think that's well said. I think that's a good way of explaining the difference. I think we might have time for one more question. Let's see, have any of you considered development of project on water reservoirs on some of the floating solar technologies that are available. This might be a quick answer, I don't know, but maybe you have.

*Ian Lahiff:* Yeah, we actually have one installed. We have a grid-tied 31.5 KW array, that's a floating solar. It was installed back in 2017 at the OUC Headquarters. So, it was one of the first, actually, grid-tied ones in the state or even the country. I know it's pretty rare to have it tied into the grid, whereas other places have piloted it and

shown it on a microgrid. But it's really cool, it went together quickly. I don't know if it makes sense to – now I can't share my screen. But you can find it on YouTube, there's a time-lapse of it going together and it's pretty interesting, all done in one day.

*James Critchfield:* Interesting, that's great. Let's see, moving on, Jesse, do you have any thoughts on escalator rates in PPAs? Are they common? What do people need to think about when they're considering how you structure the value of solar in these kinds of third-party arrangements?

*Jesse Warren:* Yeah, I've spent a lot of time looking at this and what I can say is escalators are important, they're more important than the price you start with because the price you start with dictates your viability on Day 1, and then from there the escalator will dictate how much you're spending in Year 25, and that's important.

The other thing that I would mention is to think about whether or not you can reduce your demand. An onsite PPA can result in a reduction in your demand ratchet that pays for additional kWh, right? If you do that in a virtual PPA way, it never touches your original bill.

*James Critchfield:* Interesting, that's a great insight. I think we're going to have to wind things down here. I want to take a moment just to recognize both of our speakers, and thank you both for sharing your insights across particularly the local government and higher education sectors. I think we're going to move on to the next slide, I believe there is one.

Just a heads-up, there's a video that we normally would have played here that we can make available, obviously, as part of the slide deck. But moving onto the next slide, we just want to remind each and everybody on today's webinar that we'd like you to attend any of the Better Buildings Summit webinar series that are going to be starting in July.

Additional partners will be discussing some of the most pressing topics that you're facing and share some of their best practices as well as innovative new ways to approach sustainability and energy performance within their building environment. So, to register for those Better Building Solution Centers you can find some information out on the Better Buildings website, and once you get this presentation, click on the Register Now button.

Next slide. So, here, in conclusion, I would like to thank you all for your time today and certainly look forward to the next time we have the opportunity to talk about solar project development. I'd like to thank our panelists again for their time and their insights into their own experiences and learnings.

And again, if you'd like to learn more about the resources discussed today, please check out the Better Building Solution Center or feel free to contact me in the EPA or the National Renewable Energy Lab at any of the contact information you see on this slide. And so with that, I'd like to conclude today's session and we look forward to seeing you hopefully in person next year.

*Ian Lahiff:*

Thank you.

*[End of Audio]*