Virginia Castro: Hello, everyone, and welcome to the 2021 Better Buildings Better, Better Plants Summit. Thank you for joining us today. We have a wonderful session prepared, and some fantastic speakers we're going to introduce in just a moment. Before we dive in, there are a few housekeeping points I'd like to cover. Please note that today's session will be recorded and archived on the Better Buildings Solution Center. We will follow up when today's recording and slides are made available. Next, attendees are in listen-only mode. If you experience any audio or visual issues at any time throughout today's session, please send a message in your chat window located at the bottom of your Zoom panel.

My name is Virginia Castro, and I have the pleasure of moderating today's session. I'm a project officer with the US Department of Energy's Office of Weatherization and Intergovernmental Programs State Energy Program.

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For today's agenda, I'll discuss what brings us here today, and ask the audience a few questions. I'll then introduce our four panelists for our featured presentation, and will conclude with Q&A.

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We're excited to announce that today we'll be using an interactive platform called Slido, for Q&A polling and session feedback. Please go to slido.com, by either using your mobile device to scan the QR code on this slide or by opening a new window in your Internet browser. Today's event code is #DOE. Once you enter this code, please select the session title in the dropdown menu at the top-right, "Pathways to Community-Wide Energy Resilience." If you'd like to ask our panelists any questions, please submit them in Slido any time throughout the presentation. I'll give everyone a few moments to open up Slido and select our session for the first poll.

The first question is: What sector does your organization represent?

Looks like we have a lot of state and local, contractors, government state, nonprofit – great. Thank you. Well, it's great to meet all of you, and now that we're acquainted, I'd like to take a few moments to share a little bit more about what brings us here today.

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The more we work, the State Energy Program operates within ERE's Weatherization Intergovernmental Programs Office, and provides formula, funding, and technical assistance to states, territories, and the District of Columbia, to enhance energy security, advance state-led initiatives, and maximize the benefits of energy efficiency. We support a wide range of projects, from state energy planning, building retrofits, to energy emergency planning, response, and resiliency. We're also part of a larger federal family that is working to promote innovative solutions, to strengthening our energy infrastructure, to protect our communities, and to combat the impacts of climate change.

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The US billion-dollar disasters event. This chart shows the increasing average cost of a variety of natural disasters over the past 40 years. The US has sustained 291 weather disasters, with damages and costs that have reached or exceeded $1 billion. Over the last 5 years alone, damage costs have exceeded $600 billion, and the total cost of these 291 events exceeds $1.9 trillion. As we all know, natural disasters are increasing climate risk vulnerabilities, not only across this country but across the world, and we're at a critical juncture. Building resilient communities to mitigate against future threats is of great importance, and in doing so, we should address energy and community resilience from an environmental justice and social equity lens, bring more technological innovation into this space, empower and work directly with our communities.

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In 2019, the Natural Hazard Mitigation Saves Report, which analyzes 25 years of public sector investments and mitigation, reports that for every federal dollar spent on mitigation activities can save $6.00 in future disaster costs. This totals $160 billion in savings that would've otherwise been spent on losses from natural disasters.

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Defining resilience. The resilience really differs in its application, but generally, it means the ability to prepare for and adapt to the changing conditions, and withstand and recover rapidly from disruptions. In today's session, we'll be showcasing state and local perspectives that demonstrate different approaches and applications of resilience, through pathways to community-wide

energy resilience. And now that we know a little bit more about what brings us here today, I have two last questions for you.

The next question is: What challenges does your organization face with respect to energy resilience project planning?

Funding. Number one. That's a challenge for a lot of state local governments, as well. Limited capacity. Great, thank you so much.

Now I have one last question: What kind of information would be most helpful for your organization to improve resilience? Please take a few moments to enter your response, and in the meantime, I'll introduce our panelists.

Joining us today, we have four distinguished panelists. Professor Robert Cox is an associate professor of electrical and computer engineering at UNC Charlotte, where he serves as the associate director of the Energy Production and Infrastructure Center, EPIC. Dr. Cox focuses on advancing EPIC's research in the areas of grid resiliency and energy utilization.

The next panelist is Beth Schrader. She is the director of recovery and resilience for New Hanover County, North Carolina. Her role sits at the intersection of social equity, climate change, and individual and community resilience. She collaborates with a diverse group of community stakeholders to identify and implement creative practical solutions that address the underlying issues impacting resilience. She brings 26 years of experience to this role, and prior to her public sector work, she worked in the pharmaceutical and financial healthcare sector. Fun fact: Beth currently holds eight US patents.

Our next speaker is Cherylyn Kelly. Cherylyn is a senior energy policy analyst for the Missouri Department of Natural Resources Division of Energy. She supports the department's legislative director by acting as a legislative liaison, and she's also an educator for real estate professionals on the subject of energy efficiency, and provides support for Region 7 Emergency Support Function 12. She was also the project manager for the SEP competitively-awarded project Partnering with Missouri Communities: Roadmap to Resilience, which will be discussed in today's presentation. I would also like to note that both Rob and Beth, our first two speakers, are key project participants for a case study that is under development, for the SEP competitive award Planning an Affordable, Resilient, and Sustainable Grid in North Carolina. This award is led by the North Carolina Department of Environmental

Quality.

Last but not least, we have Chris Castro. Chris is a senior advisor to Orlando mayor Buddy Dyer, and director of the Mayor's Office of Sustainability and Resilience. In his role, he develops cross-sector partnerships, policies and programs, to accelerate Orlando sustainability, clean energy, and climate resilience goals. Chris helped to create the Comprehensive Smart Orlando Initiative, an effort to better leverage data and technology to improve government operations. He also cocreated the Fleet Farming urban agriculture program, and is the founder and president of IDEAS for Us, and international NGO working to develop and fund environmental solutions around the world. Chris was named a Champion of Change by President Barack Obama, and recently named Public Official of the Year in *Government Magazine*. And not listed here, but I think the most important fact about Chris is that he is also a DOE alum.

Well, I would like to welcome all of our panelists and welcome all of you to today's session. Thank you for being with us. We will now end the Slido poll question, and Slido will be open for Q&A. You can enter your questions throughout *[audio cuts out]* and upvote any questions that you like, that you'd like to see answered as they come in.

Now we'll begin with our first two presenters, Professor Robert Cox and Beth Schrader. Thank you very much. And next I would like to welcome *[audio cuts out]*.

Rob Cox: Well, thank you, Virginia, for that introduction. I guess we'll go ahead and jump right in, here.

So, as Virginia mentioned in that introduction, our team is working as part of the project, whose title is given here, "Planning an Affordable, Resilient, and Sustainable Grid in North Carolina." And this is a project through the DOE's SEP program, a competitive award, and we have been working with North Carolina Department of Environmental Quality, who is the lead on that project. Our team in EPIC, at UNC Charlotte, is working on sort of the technical analysis that is part of this project. And then we have partners at the North Carolina Clean Energy Technology Center, who are helping us with stakeholder engagement, because as we'll see, obviously, stakeholder engagement is a critical piece of dealing with resiliency planning. Now, Virginia gave a slide there at the beginning, talking about billion-dollar disasters that have impacted the nation broadly, over the course of the last, or, since

1980.

And here specifically, if we look at North Carolina, we see, obviously, threats increasing here, as well. And in recent years, there's been a number of storm events, in particular, that have impacted our state. Hurricane Florence and Hurricane Matthew, Hurricane Michael, some of the major ones that have come through recently. And when we proposed this project, there was a lot of activity going around in North Carolina focused on how do we make the grid more resilient. And when we proposed this project, we really decided to focus specifically really on a lot of the impacts that come from storms, because this has really come on the heels of Hurricane Florence, which very specifically impacted the eastern parts of the state. And we elected to kind of focus specifically on kind of a case study, looking at the area around New Hanover County, which includes Wilmington, North Carolina, which is one of the largest metropolitan areas that is exposed to hurricane threats in North Carolina.

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So, in framing our analysis, one of the critical things that we knew we needed to do, from the outset, is to look at resilience from a different lens. One of the big questions is around creating metrics for resiliency, and how do you really value resiliency, and that's a challenge. Utility commissions have very good metrics that they use to look at how do you make a reliable power grid, and that really deals with everyday occurrences. But when we talk about major events like hurricanes, or cyberattacks, or other sorts of sort of low-probability events that have very high consequences, it's difficult to quantify the improvements that come along with being more prepared for those sorts of events. And one of the things that we knew we needed to do from the outset is to recognize the fact that electric power is the lifeblood of society, and it drives the function of our economy after an event, and drives our ability to be able to provide so many of the critical services that citizens require to be able to function normally.

And the image, here, you know, really tries to capture that, the fact that electric power is really kind of the keystone, if you will, that enables things like public safety and public health. So to really be able to look at valuing resiliency and valuing improvements in resiliency, we knew that we needed to look beyond measures that utilities typically think about, and begin to look at the impacts across different consequence categories. What's the impact on the economy, community wellbeing, emergency management? Could

we begin to quantify some of the impacts of not taking action, and begin to think about resilience improvement almost as sort of an insurance policy, if you will. That society should potentially socialize some of the costs of these things, you know, across society more broadly, to be able to, because of the critical nature of electric power and what it enables as part of this.

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So, that led us to look at, you know, how we could really begin to perform that quantification and valuation process, and we decided, at the outset, to utilize the Resilience Analysis Process, RAP, that has been developed by the Grid Modernization Laboratory Consortium, and is really led out of Sandia National Lab, and has been funded by DOE. It fit nicely with our project, obviously, but it's a good framework for trying to address this problem. Essentially, what we do, if we follow that middle chart there, as we go from left to right sort of specifying hazard scenarios, and then moving, ultimately, to the consequences. So essentially what we do is, we're looking at this from the perspective of saying, can we begin to, for a particular hazard, identify the specific threats to power infrastructure? And look at the effect that that might have, in a given scenario, on grid operations.

And then ultimately say, "Well, what's the impact on the power delivered?" And then, as I'll toss over to Beth a little bit later, "What's the consequence of that loss of power?" And it's very difficult to do this because this is a probabilistic sort of thing, you know, we don't know what types of storm vents might hit us, so we have to be able to sort of quantify the uncertainty that exists with any of the things that we're doing, here.

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So, essentially, the way that we are looking at this, here, just as an example, what you see on the right is the flooding map, looking at storm surge inundation in the New Hanover County region, with current sea levels, if we had a Category 2 storm event that came in. And we're looking at that type of an event, if I define that as a scenario and the rain that might come with that, the questions that we ask ourselves are: What's the threat to substations? What's the threat to distribution circuits? So basically, the powerlines that come out to those, to homes. And then, what's also the threat to backup power? Because that's an important element that Beth will talk about.

And that could mean, you know, if roadways are blocked, you may not be able to get diesel power for certain critical infrastructure, which could be really important. So we look at those threats to this type of infrastructure under different storm scenarios, and then we try to figure out, well, what could we do to improve that.

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So, as an example, what you're looking at here, this is a graphic that shows, after Hurricane Florence made landfall in New Hanover County, on September 13th of 2018, you see in that region basically go up to about 140,000 customers without power. And then, some number of customers are without power for several weeks after that. And so, what our team does as part of our analysis, here, is to say, "Well, you know, under different storm scenarios, you know, what's the threat to the power infrastructure? And in that given storm scenario, how long are customers without power?" So in other words, how long does this curve extend, how much critical infrastructure is threatened, where is that, but then the next question is what is the impact on customers.

Our goal, obviously, is to come up with solutions that reduce the peak number of customers outaged, and make sure that customers are restored faster. But one thing that we know that we need to recognize is that customers are going to be without power. You can't make a perfect system. And so the question is, how can you put in solutions that will allow you to be able to address that reality? And with that, I think it's probably a good time to let Beth kind of talk specifically about that reality.

Beth Schrader: Sure. Next slide, please?

It might be helpful if I give you a little bit of context in regards to New Hanover County and what we saw during Hurricane Florence. If you look at the picture on the left, what you'll see is that New Hanover County is located in the southeast portion of North Carolina. We are bordered, to the right, by the intercoastal waterway of the Atlantic Ocean, and we are bordered, to the left, by the Cape Fear River. During Hurricane Florence, we received 30 inches of rain over a 48-hour time period. Essentially, every single major roadway in and out of the county was washed out and flooded, and so, our pretty little peninsula became an island.

In addition, being a coastal community with low-lying land, and susceptibility both to storm surge and river flooding, we also had 193 miles of our internal roadways that were flooded, plus, all of

the powerlines that came down or debris, vegetative debris, that blocked roads. So, it really made logistics and resupply very, very challenging, both to our operations but also from an emergency response standpoint, but also from keeping our generators running. From our perspective, we had more than 80 generators running at critical facilities, at the height of operations during the event. And as you saw on the previous slide, some of those outages lasted in excess of 16 or 18 days. From a housing perspective, it's just helpful to note that we had significant damage, we lost significant damage to 2,000 low- and moderate-income homes.

And we had almost double that in terms of total homes that were damaged. We had 22 mobile home parks that sustained damage, and we also lost 1,200 low- to moderate-income apartments. In addition, two of our major hotels were significantly damaged. In terms of critical infrastructure, again, without having power, communication systems went down, inability to or challenges with getting the fuel to the generators meant that we had other systems that went down, or that we had to be very thoughtful about making sure that we kept the generators powered. In addition, there was no way to get any additional fuel into the county; the port was closed, so the only way in is airlifting. So, what we had to start with is what we had, until the floodwaters receded.

And then, the last thing I'll say is that, from an economic standpoint, it's important to note that 40 percent of our workers in-commute from other counties, surrounding counties. So, even when things were able to be reopened, they might not necessarily have had the workers that could get in to actually staff or complete the work.

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Rob talked about, when we think about systemwide energy robustness or resilience, that we're looking at reducing the number of customers that are impacted, and we want to have the recovery be faster. But implicit in that assumption is that the impact in total costs to customers are the same, and that all of the customers have the ability to prepare and recover in the same way. And what we're finding is that's just not the case. So we really have to look at resilience with an equity lens, and start looking at who is being most impacted and how are they actually experiencing that on the ground. What are the first-, second-, and third-order elements that are part of this. And when you start to look at intersections between systems and dimensions of resilience, what are some of the unique variables or some of the unique vulnerabilities that you

start to identify, that can either amplify or dampen the impact.

And then finally, you know, what resources might be necessary to address those gaps. When we looked at this project, we're doing this from three perspectives; the first is the energy system itself. The second is emergency management and what critical facilities are, but also, how do we begin to not only deal with life safety but what happens after. And then finally, from a community resilience perspective, the services that the community thinks are critical may be different than what we had necessarily thought were critical. They may not want the closest grocery store; it may be the family dollar store. And so, working with the community and those most impacted and affected, to begin to identify what they see as the critical resources, and building that trust and transparency so that we can help have improved outcomes.

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We talked about interdependencies, and what you'll start to see, when we show you some of the analyses are, again, that disruptions to the power system begin to cause disruptions in other systems. And the lack of those services create costs or burdens on both the folks who do not have the electrical power, but also on federal, state, and local government, in terms of responding to it. We are seeing that, when we talk about resilience, there are disparate impacts, and existing inequalities or underinvestment in certain communities can have direct and indirect implications. What we have found is that, you know, we talk about dancing with a different partner for every song? It's about identifying the unusual partners.

So, we're working with folks that are in the faith-based community, nonprofit community, the business community, you know, it's whoever has the best access and can be that trusted source. And finally, when we're talking about resilience, it's not waiting for the perfect solution or the multimillion-dollar solution. It's about sequencing and layering elements of resilience to address inequities immediately, in the medium-term and in the long-term. And how do you begin to look at that from a cost benefit basis, and how do you begin to scale scope and scale.

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You know, we looked at overlap between power outages and who was impacted. This is one particular circuit. If you look at the orange diagram at the bottom-left, that's, essentially, the CDC

vulnerability index, based on your census tracks. If you look to the right, what you're seeing are the actual circuit and circuit outages that overlay. This one particular circuit in north Wilmington is one where we have a very high percentage of participation of food and nutrition services. This is a food desert, there's not access to a grocery store, 30 percent of the folks in this location do not have access to a vehicle, and there's limited public transportation.

When you look at Hurricane Florence and you say the outage was 381 hours, that's almost 16 days. And so, you start to see how there are intersections between the transportation system, the power system, the food system, and our population and demographics, that could create additional burdens.

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In this particular community, there were a number of challenges that were observed during Florence, and how can we change that experience. And how do we begin to think about how we value the cost and benefits associated with those investments. From a communications standpoint, traditional and social media didn't reach the community that was most impacted, in part because they had no ability to recharge phones. There is very low landline usage in that particular community, and very high cellphone usage, so, they were not able to access the Internet or to be able to get information in or out. So how do we begin to look at leveraging the neighborhood and the local channels, in order to get information to folks in an appropriate way.

Also, can we create areas where there's the opportunity for cellphone recharging, which now restores a service that is no longer present just because they've lost power. From a sheltering and displacement standpoint, this was a fairly vulnerable population, and there was a large percentage of that population that needed shelter. When you look at resilience, if we had the ability to provide critical services or availability of critical services, fewer folks would need shelter, or the sheltering would occur for a shorter period of time. In terms of commodity distribution, obviously, there were – one of the things we didn't mention around infrastructure was that, due to generator failures, we actually had partially treated wastewater that was discharged into the Cape Fear River. Which, in effect, created a potable drinking water emergency.

So, it was critical to get water to these communities. What we saw is that we had initially set up three pods, the north, the center, and

the south; the center is the one that's in the middle of the city. But we failed to take into account that, when most of the folks don't have access to a vehicle, and when the public transportation doesn't actually go from where they live to the pod, folks are not gonna be able to carry liters of water and commodity supplies back up a long hill for half-a-mile to get home. And so, how do we begin to think about, you know, our pod was, large centralized pod, has staffing – it's a Type One pod, so it's essentially staffing of 88 individuals, and what we found was that it was very much underutilized. And so, how do you begin to scale that back and look at how we might do last – pairing it with last-mile distribution through some of these nonprofit and faith-based organizations that allow us to reach those most impacted, and do it in a timely way.

One hundred percent of the households in this community experienced food loss. Not surprising for a 16-day outage. However, which meant that there were – not only the food loss, but food stamp benefits had to be reloaded onto the EBT cards, and we also had a significant number of individuals who wound up receiving disaster food stamps benefits. And so, if we had had the ability to do ice distribution before and after, it would've minimized losses to that particular community, and would have also minimized expenses that are associated with DSNAP. And finally, there were mass feeding efforts that went on for over 28 days, for this community. And there were many different organizations that were involved, there were a number of different sites, each of them bringing two to three meals a day, trying to transport across the city.

A local feeding, having an option for local feeding, and having the community ability to reconnect, provides benefits, would actually help reduce the number of feeding elements that we'd need. But also, make sure that we're getting it to all of the right folks and there's no overlap or duplication.

[Audio cuts out], thank you.

We call these areas or this concept "Community Resilience Outpost." It's, essentially, locations that have access to reliable onsite power, and as I said earlier, it's different kinds of partners. It's who has the credibility, who's the trusted emissary in the neighborhoods, in order to be able to do that. And from an outreach perspective, it allows us to build that type of credibility. There are also additional services that can be offered in these types of areas, such as cooling as we're seeing more high-heat days, but also testing and vaccination. Prior to using some of these partners

and sites, we had centralized vaccination efforts that were occurring for minority candidates, and what we found is that we might have one to two clients come in per time slot per location per day.

When we went out into the community and worked through these partners, that number changed to 12 to 20 people per slot per day. And so, your level of effectiveness actually increased, and your avoided costs with folks who don't wind up getting sick wound up decreasing, as well. So, at the end of the day, this is a part of a solution, it's not the whole solution. But we've found that having access to these critical services that the community identifies, and leveraging those local leaders and volunteers, really allows us to better serve the community and save significant cost when you look at it overall, not just the power system but also looking at the societal costs that come with that, as well.

Virginia Castro: Thank you so much, Rob and Beth, for your presentation, and I think that's a great segue to our next presenter, here. I'd like to welcome Cherylyn Kelly from the Missouri Department of Natural Resources.

Cherylyn Kelly: Thanks, Virginia. Can you guys hear me okay?

Virginia Castro: Yes.

Cherylyn Kelly: Okay. All right, thanks for having me. I'm really excited to be here. And I apologize for being the only one without a webcam, but *[inaudible phrase]*. So, I am here to talk about a project that we just finished up in January called "The Roadmap to Resilience." Let's see, here – do I have control – there we go.

So, we're gonna jump in here with a little background information, and then I'll give you a sneak peek into the Roadmap contents. We're gonna finish up with a discussion about how we applied the Roadmap to our partner community. So, as Virginia mentioned earlier in the introduction, the Roadmap was enabled by a competitive DOE grant that we were awarded. It was a two-year project, and our goal was to create a resilience planning guide for small- and medium-sized communities that would ultimately result in greater energy security, economic growth, and the advancement of some diverse energy resources. We chose to focus on smaller communities because we were seeing some significant gaps in the grant planning in that sector.

Small towns tend to have fewer staff, wear more hats, less funding,

on the whole they're dealing with decreasing population, aging infrastructure, lack of investment – that's just how it goes, unfortunately. But smaller communities still deal with the same shocks as large communities, whether that be severe weather, natural disasters, what have you, so there's a definite need for resilience planning to mitigate those stresses, and improve the ability of these communities to recover and be stronger after *[glitch interferes with audio]*. So, the Roadmap has its roots in my beloved home state of Missouri, but it's definitely a tool that can be applied anywhere. We designed it so that the approach is replicable and provides actionable solutions without being prescriptive.

So, for the purposes of the project, we basically defined small- and medium-sized communities as having less than 50,000 residents. And one-third of Americans live in small- to medium communities, so obviously, that's pretty significant. In order to meet their needs, resilience planning should focus on the unique characteristics of small- and medium-sized communities, and really meet communities where they are. We partnered with three Missouri communities that fit of our definition of small- to medium-sized *communities* - Saint James, Rolla, and Stockton. They were gracious enough to give us a lot of unfiltered insight into the challenges, and really, the opportunities that our small communities are working with.

And we learned a lot from them. All three of them, at I think this is probably true of most places, all three of them have at least some degree of resilience planning in place. So even if it's not referred to as such, they still have some pieces a lot of the time. So, kind of sticking with the motivation to meet communities where they are, the project team created the Roadmap framework to set these communities up for success on their own terms, rather than developing an entirely new resilience plan. So, what we ultimately did was provide recommendations for the communities to take their existing plans further, really laying out the goals and connecting resources to create a clear path forward in terms of their community resilience.

So, one of the first things we did was establish a definition of resilience relevant to our smaller communities, to really kind of set the stage and frame up what we wanted to do, so, here you have it. The ability of a community to withstand, adapt to, and reduce the impact of acute shocks and chronic stresses, while preserving and improving its unique character, sense of community, and livability. And those acute shocks are the big shakeup events, right, the tornados, the earthquakes, the things that probably first come to

your mind when you're thinking about resilience planning. And we took a slightly different approach to defining resilience, compared to some of the more general descriptions out there, by including the concept of chronic stressors as an equation, as well. Which are, you know, the poverty, the population, things that weaken a community over the long-term.

And we felt it was important to consider these issues alongside the more dramatic events, because they can really impact the ability of a community to respond and recover effectively to those sudden shocks. So, you know, that concept was something that we kind of figured out pretty early on: a community really can't become more resilient just by throwing money at critical infrastructure, right? You really have to consider the health of the community on the whole, which is why we chose to take a broader approach to resilience planning, rather than just focusing on energy systems. Which was, honestly, really what I was expecting before we really dove into the project, but I think the Roadmap is a lot stronger for it.

So, I wanna switch gears a little bit and discuss what's in the Roadmap. The entire planning process was divided into these four phases, and they're meant to be iterative. It's pretty intuitive, you start by assessing your baseline conditions; you then envision where you want to be and start goal-setting; then you move into the implementation phase; and afterwards, evaluate how things went and then you keep doing it, and you just do it over and over again. *[Laughs]*

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These four phases are traveled through six action steps, and these are the real building blocks to resilience planning. I think one of the strong points of the Roadmap is that it's not recreating the wheel. It really does a great job of bringing together leading practices and resources that already exist to support resilience planning. So, you know, like most things of this nature we start with stakeholder engagement, and move through a baseline analysis process, and a lot of that can be done kind of tangentially. Many move on to leveraging partners and assets. I think this is a really important component for small- to medium-sized communities. It's really about filling the gaps and the holes that you find in the stakeholder engagement and baseline process.

Next step, finding funding. I think this is something Robert talked about, you know, funding is a big issue, and the polls that we took

earlier showed that for sure. You know, funding, there's no one-size fits all for funding community resilience, but what we have found is that leveraging a variety of sources is definitely key to getting those initiatives off the ground. Step Five in the Roadmap is to use federal and national lab resources. Again, there are just so many tools out there that already exist, it can be a little bit hard to find them. So, our list is not exhaustive, but we've got a lot in there and we provide some descriptions for what the tools do, making it really easy to find what you need.

And then finally, measuring success. Metrics, right, is another thing that came up. We collected a whole suite of them, and this is another one of those things where, you know, it's just so highly dependent on the goals and priorities of the community. So, true to Roadmap form, we set them up to be pretty customizable. And so, that was my brief – maybe not so brief – introduction into the contents of the Roadmap. So let's switch gears, one more time, to look at how we used the Roadmap in Saint James and Rolla, two of our partner communities, to develop our community profiles.

So, first up, city of Saint James. It's a sweet little town in the Ozarks, with a population of a little over 4,000. It's home to one of the largest wineries in Missouri, very appropriately called the Saint James Winery. It comes highly-recommended by yours truly, so, pay it a visit. *[Laughs]* And a significant portion of the community in Saint James is aging and not in the workforce, so, a lot of the critical infrastructure, there, is focused on serving those more vulnerable populations, the veterans and the elderly.

Saint James is served by a municipal utility with a staff of 11. And one very fun fact for us energy nerds, unlike a lot of smaller communities, Saint James has fully deployed advanced metering, which is very exciting. However, it's not seeing its full potential, and they're not yet providing any demand response or energy efficiency programs. But I think we were a pretty good influence on them, and they'll *[laughs]* get around to it, I'm sure.

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So, the baseline assessment that we conducted compiled information about Saint James' customer base, financing considerations, rate structures, *[glitch interferes with audio]* – it was pretty in-depth. We learned that Saint James is combatting two pretty significant resilience issues, and those are aging infrastructure, which is comparing their reliability, and a lineman retention issue, which I have since learned is pretty prevalent

anywhere you go. So, we focused this community profile on grid modernization. We applied the Roadmap to develop recommendations and propose metrics to improve their existing reliability improvement plans. *[Glitch interferes with audio]* people aren't hearing me too well.

[Side conversation]

All right, so, in terms of aging infrastructure, just to give you a frame of reference, my understanding is that the useful life of a transformer is about 30-40 years. Saint James' *[laughs]* transformers are about 85 years old. Their system average interruption duration index, SAIDI, you know, one of those indicators, is about five hours, which is significantly higher than the average of similarly-sized utilities, at about two-and-a-half hours. So, Saint James is dealing with about four times more outages, and they are about two times longer than other similarly-sized utilities. So, there's some room for improvement.

And when you think about grid modernization, you're probably immediately thinking about the renewables and the battery storage, but, you know, not all communities are ready for that. So in Saint James' situation, it's more about proactive and consistent system maintenance. And especially when coupled with energy efficiency, this can be equally as effective in improving system resilience and addressing grid challenges. It can also be an effective way to lay the foundation for those more advanced technologies, or renewable energy considerations in the future.

So, going through the Roadmap process, we identified several funding opportunities that Saint James could leverage to make improvements, such as those FEMA BRIC grants, and Division of Energy's energy loan program that works for public entities. And we made several recommendations, such as, you know, maybe implementing a stata system to get full use of that AMI. In terms of linemen retention, that's another pain point for Saint James, they find themselves acting as the training ground for new linemen, only for these folks to, you know, leave for other opportunities that are able to better compensate them. So we think a great way for Saint James to address this issue is by developing a job training program.

This can really shore up some of the skills and keep a consistent number of folks around to kind of compensate for that job turnover issue. It's really important to have these skills available, it's a very critical piece of improving community resilience. And there's just

so many partnership opportunities that Saint James could leverage to make it happen, such as with the Republic Utility Alliance, who I know is already kind of trying to address this lineman issue, so that's great.

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Rolla, Saint James' neighbor, was the largest of the partner communities, with a population of just over 20,000. Their median household income is significantly lower than the Missouri average, at $35,000.00 a year, so, a pretty decently high amount of poverty in that area. Rolla is home to the University of Science and Technology, which means they also have a higher renter population, and they're served by a municipal utility, as well. Something that I learned in our stakeholder engagement process, that I found kind of interesting, some local businesses there struggle with their energy burden. Like a lot of little towns, downtown Rolla is made up of some pretty old buildings, with let's just call it a lot of character. Prior to this experience, I was pretty familiar with the concept of energy burden in the residential sector, but I guess naively, it hadn't really occurred to me that businesses would be dealing with the same thing.

So, at the time we were starting to build out the application of the Roadmap to Rolla, Covid was really starting to ramp up, and these local businesses were hit pretty hard by the shutdown orders. And so that was really impairing their cashflow and exacerbating this issue of energy burden. So, because of these issues, we decided to take a more scaled-down approach with the Roadmap, applying it to a local business, and that ended up being the Three Sisters consignment store. This was a lot of fun. Krista Branson, the owner, is a really fun, quirky, engaging lady. She's already well-informed on energy efficiency concepts, so she was a really great partner for this. Krista rents her space, and even though she says she has a great relationship with the property owner, they still deal with the same tenant-landlord split-incentive issues.

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So, throughout this process, we surveyed the business community in Rolla, to identify their concerns as they related to resilience and energy burden. And we summarized them into these two categories, here.

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So, energy burden, decreasing that energy burden is really vital for protecting these small business, which can really mitigate the impact of the more chronic stressors like poverty. And it can help sort of generate some much needed job opportunities. So, we really want to encourage landlords and tenants to implement energy efficiency measures to reduce energy burden, just to improve economic resilience in the business sector as a whole. High levels of energy burden can make it harder for small businesses to keep their brick-and-mortar locations, especially since you can do so much online, now, which is not great from a local taxing perspective. Development of strategies and providing opportunities and incentives to reduce energy burden should honestly be a priority for local government and utilities.

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Trying to be quick, here – I know I'm about out of time. In terms of education and outreach, there's a lot of room to build awareness of efficiency opportunities for small businesses. And access to this information is pretty limited, right now, and makes it really challenging for small businesses and building owners to make decisions that could improve their economic resilience. So, definitely, looking at partnerships with local utilities and us at the Division of Energy can be a great way to get that conversation going.

Next slide.

So, our next step with the project is to take the Roadmap on the road. In addition to presenting at events like this, we'd really like to connect with more small- to medium-sized communities on a more personal level, so we're happy to do more customized presentations at townhalls and other community events, to get the word out. Missouri's Division of Energy is also undergoing a state energy plan update effort, where we plan to integrate the Roadmap and collaborate on a more state level, to share the Roadmap resources more broadly. So, I'm very excited about this resource, I think we can reap some huge benefits using it, so please help me get the word out, and definitely do not hesitate to reach out to me if you would like some more information.

So, I think that's it for me. Thank you so much. I'll give Chris a virtual high-five and pass it on to him.

Virginia Castro: Great, thank you so much, Cherylyn. And now I would like to welcome Christ Castro from the City of Orlando.

Chris Castro: Okay, thank you so much, Virginia. I'm just waiting on getting the screen-sharing capabilities, here, and we'll get started. But it's a real pleasure to be with you all and with my fellow panelists. And before I actually dive in, I just wanted to share how excited the city of Orlando is, specifically this week during the Better Buildings Summit, because of the fact that we've exceeded the Better Buildings Challenge goals, and we're one of the goal receivers this year in 2021, so pretty big deal on our end. So, today what I wanted to do was – hopefully, you're seeing my screen, here – I wanna make sure I'm showing the right screen – are you all able to see my screen, here?

[Side conversation]

So, yeah, in general, I am really excited to be here with you all, to kind of share a little bit more about the planning that the city of Orlando's been doing around resilience, in the midst of this pandemic, the resulting global economic hardship, the social justice crisis, and of course the climate change emergency that we're in. And I think just starting out, the city of Orlando has, for a long time, had an office dedicated to thinking about this and trying to get us to be future-ready, as a city, at the forefront of innovation and sustainability. I help to direct the Office of Sustainability and Resilience, as the mayor's senior advisor, and we really take a very comprehensive approach at this topic here, looking at everything from the clean energy electric grid to our buildings to local food systems, zero-waste, transportation, and other topics.

And regarding the planning process, we've really been on a pathway, the last number of years, to start getting us ready and cocreating what the city should be focusing on with our communities and with our stakeholders, starting out with the municipal operations, sustainability plan, our community action plan, the vision zero strategy. And in December, actually published the future-ready masterplan, which is our smart city initiative. We are currently undergoing our comprehensive wide resilience strategy, and some of that I'll be sharing with you today. Now, Florida, as you can imagine, is ground zero for a lot of the climate change impacts that many of our communities are facing globally. And back in 2007, we published our first climate vulnerability and risk assessment, as part of the Global Covenant of Mayors commitments.

And what we identified were, obviously, a couple of big extreme weather events that we needed to be preparing ourselves for and

making sure that we're resilient to those impacts. Including extreme storms and hurricane intensity, inland flooding, as well as extreme heat and urban heat island effects. And in that study, we also were not really thinking about this concept of climate migration, and back in the 2017 hurricane season, shortly after this was published, Orlando got a rude awakening of about 300,000 people from Caribbean islands and the coastlines of Florida that literally fled to Orlando to seek safe haven. It basically doubled our population within the city, and about ten percent of those individuals have stayed permanently since then. So we are understanding that we're a receiving community, and as we move forward in these uncharted waters, we may be, you know, seeing our population grow as a result.

The other thing that we're keenly focused on is equitable climate resilience, and we started to begin mapping our community and helping us to better understand challenges that vulnerable populations face as it relates to housing, energy burn, and water burn, and transportation, food insecurity, and others. And this mapping exercise, which we've done with a group called Green Link Analytics, has really helped us to pinpoint where we should start to focus our resources and attention. It geospatially looks at all of this information, overlaying with demographic data, and underscoring that we do have an issue as it relates to BIPOC communities, black, indigenous, Hispanic, and other communities of color, that are disproportionately impacted by a lot of these burdens.

So, we've started to look at ways in which we can make an impact, and starting out on the buildings round, many of us know, based on the studies of the US Department of Energy, that 20 to 30 percent of the energy that we're using in our buildings goes to waste. There's a real need for energy efficiency and improving overall utility consumption. And so, we've, as a city, been working on actually enabling financing options, to help our residents and our small businesses with addressing this. And those financing options broaden not just around energy efficiency, but they do include resiliency improvements, including high-intensity, you know, high-impact windows, storm shutters, new roofs, as well as your traditional things around heat pump, hot water heaters, and HVAC systems, and the like. The one on the left, Efficiency Delivered, provided by our utility, which is phenomenal, free assessments for residents, and then up to $2,500.00 of improvements without any out-of-pocket expense, that's paid for back on the utility bill.

And on the right side we have what's called SELF, a fantastic

nonprofit we've partnered, that provides low-interest loans to low- and moderate-income households, to help them go beyond that $2,500.00 that we're able to provide to the customers. So, thinking about those types of programs, in addition, the city has really stepped up to lead by example. We have a policy that requires all city buildings to be built to the LEED silver standard, and we know that, in addition to the importance of reducing energy use, these buildings are more resilient in times of grid outage or grid anomalies. And they're able to improve overall public health, as well, for the occupants.

So, everything from our Amway center to the soccer stadiums to our fire stations and any other admin buildings, they're being built to that standard. And simultaneously, we recently, just in January of this year, unlocked a new property tax rebate for high-performance buildings. And the idea is that, coming out of Covid, there are many improvements that buildings are looking to make to improve the health and wellbeing of their occupants, and at the same time, be more resilient and mitigate their impacts on the environment. So, we offer, now, a property tax rebate, offering up to 100 percent of the first year's property tax, to mitigate those upfront marginal costs to get your building to be more resilient and to be more energy-efficient.

And the other thing we're looking at is converting our neighborhood centers into this concept that we hear a lot about called "resilience hubs." And I was really excited to hear the Charlotte in North Carolina team talking about their community resilience outposts. This concept of a resilience hub is very similar. We just received about $2.8 million, at the state of Florida, through a CDBG grant, just a couple of weeks ago, to convert 6 of our neighborhood centers, targeting low-income communities throughout the city. And retrofitting those buildings to be more like resilience hubs. Those would include onsite renewables, we're talking with our utility on landing dynamic battery storage, as well. We're adding automatic transfer switch capabilities so that we can disconnect from the grid, as well as improving the air filtration, you know, adding ice and water and food pantry, as well as areas in which vehicles like electric vehicles can charge up.

And so, we're really looking at these hubs as a way for some of our most vulnerable communities, that are often hit worst by these events, to be able to come to a city facility like this and charge up their phones, contact their loved ones, get access to critical resources, and be able to weather the storm even further. So we're really excited to get started on that work. As it relates to, now

pivoting to clean energy and the electric supply, we just heard about a couple of stories of cities with municipal utilities. And here in Orland, we're fortunate to also have the OCU, our electric and water utility in Orlando.

And I think it's important to note that, although the city has made pretty bold commitments around zero-carbon economy by 2050, we just joined the Race to Zero campaign, we've also made a commitment to 100 percent clean and renewable energy sources. And often, cities are making these commitments, but not necessarily in the best relationship with their utility or control their utility. Here in Orlando, we have built an incredible relationship with OUC, and are now in direct lockstep. This is a graphic of the most recent integrated resources plan of our utility, and essentially we've committed, publicly, to net-zero carbon without offsets by 2050, ending coal fire generation in Orlando, at the latest by 2027, which is about 20 years for their useful life. And accelerating nothing but clean energy and renewable energy sources between now and midcentury.

And so, there's a really exciting, you know, pathway ahead of us. We're starting to really look at rooftop solar and distributed energy resources, and have leveraged a lot of the DOE tools. At NREL, we've worked with NREL and Google Project Sunroof and others, to really map the rooftop solar potential. And performed an entire dGen study with NREL, to really look at the economic probabilities of installing. And even for those buildings that we saw opportunities with, we've gone further and used the NREL REopt tool specifically to do technoeconomic analysis of some of our critical facilities, like the 911 call center and some of these emergency resilience hubs that we're thinking about. And ensuring that, you know, we're really analyzing the solar, but also the storage capabilities to ensure that those buildings are most resilient.

And this next short video that I'm gonna show you is actually some of the facilities that we've moved forward with actually installing solar, and some with storage, based on the analysis that we've performed with these tools. So you can see, here, this is a few of our fire stations. These were installed during this last year, during Covid, and so, we did not stop our progress in Orlando in moving towards these goals, and in fact, we just accelerated them and doubled down on moving *[glitch interferes with audio]*. Our utility is also starting to install a significant amount of utility scale solar; we now have over 130 megawatts, and another 150 in the pipeline. This is an example of a coal ash landfill that was converted into a solar farm.

And many of those, we're also starting to couple and think about how storage plays a big role in addressing intermittency. For residents looking to go solar, we've partnered with Solar United Neighbors to host co-ops, and we also offer a battery rebate through OUC, of up to $2,000.00 for systems that are looking to improve their resilience as they install rooftop solar, as well. And so, we've seen these solar co-op models start scaling all across the state of Florida. Here, we are challenged with not having third-party sale of electricity, so no third-party PPAs. And of course, now people have to purchase renewables to invest in them, and we've seen hundreds of residents go solar here.

And then, the other interesting thing around resilience and energy is the testing of floatovoltaics or floating solar. And actually, during the last couple hurricanes that came over Orlando, this array was installed and we saw absolutely no impacts. Because it's so low-lying on the water bodies, when you fly into Orlando, I always joke that it's almost like Atlantis in reverse. Because we have so many water bodies around us that are literally created to hold rainwater, and many of these, you know, retention ponds are perfect opportunities to land floatovoltaic. So, in partnership with NREL and the Florida Solar Energy Center and others, of course with OUC, we are testing, we're kind of a test bed for the nation on floatovoltaics.

And this is a high-res image of one at the international airport, so the next time you fly into Orlando, you will see some of this on display. And lastly on the energy side of the house is, really, storage, and we've been testing all types of energy storage, whether it's lithium-ion or vanadium redox flow batteries. But most recently, OUC and the city and FSEC, we received an H2@Scale grant from the US Department of Energy, and we're now testing green hydrogen in a nano grid. So, essentially, the floating solar has been expanded to 64 kilowatts, we have some EV charging stations that are bidirectional so they have V to G capabilities. And in short, you know, creating hydrogen, storing that, and using a fuel cell to help true-up the generation in times of intermittency for solar, and really preparing for a lot more renewables coming onto the grid in the coming years.

In closing, I just wanted to share that, in addition to the work we're doing in Orlando, we're starting to work regionally here in central Florida. And I'm happy to share that we have, now, a regional resilience collaborative, what we call the R2C, which has been created across 8 counties in central Florida, 78 cities, many of us

now who have joined together through formal memorandums, and are working on moving our community in a more resilient direction. We've broken out into various working groups, I actually cochaired the regional greenhouse gas emissions inventory working group, and, you know, we will be publishing, soon, that regional inventory, which would be one of the first in the country looking at that type of scale. So, we're starting to work not just in our jurisdiction but beyond our borders, and bring along some of our smaller cities and lagging counties that need a little bit more support to move this agenda forward.

And with that, I'll turn it back to the team, and we'll dive into some Q&A. Thanks.

Virginia Castro: Thank you so much, thank you. Okay, now we're transitioning over to Q&A. Attendees, if you haven't already done so, please go to Slido and enter your questions, under event code #DOE Pathways to Community-wide Energy Resilience. You can submit your questions, and I'm gonna go ahead and take a look at a couple of questions that have come through the queue already. And I think this first one, I guess I'll start with the North Carolina team, 'cause it was also part of your presentation. And then also to Chris, because it was mentioned in your presentation, as well. But are there public data sources that you've used for power vulnerability analyses?

Rob Cox: Yeah, so, Virginia, that's a good question. One of the problems is, there's only some of the key information probably publicly available. You know, so, certain aspects of the power system are kept under wraps, for good reason, because there's critical infrastructure that's there. You know, one of the key things is, we're focusing on really kind of substations and what sort of flows out from those substations. You can go through Google Maps and you can identify where substations are. But knowing where the distribution circuits lay out and all that, we've had to work quite closely with Duke Energy, in the case of New Hanover County, to get a lot of information from them to do a lot of historic analysis.

There's not really a lot of great public data sources for a lot of that. There is some, but not sufficient for being able to do what you need to do.

Chris Castro: I would concur with that, as well, and in our experience, I mean, we know that DOE has the sled and the slope tools, and those help kind of cities, from a pretty high level, understand some of their impacts, and maybe start to track GHG emissions, if they haven't

done so. But when it comes down to power vulnerability analysis, we really rely, especially OUC, relying on some of our key consultants to get their hands on that and to look into our specific infrastructure, to understand how that plays out for us here locally.

Virginia Castro: Thank you. The next uploaded question we have here is, "Where does a state and local government start with integrating energy efficiency and renewable energy into resilience? Energy office? hazard mitigation office? How have your organizations done so, so seamlessly, in looking at resilience with your city and communities?"

Chris Castro: Maybe I can start out, I mean, you know, our work, again, dates back to 2007, and it really centered around energy efficiency first and foremost, and then trying to optimize performance and reduce cost at the city, but also hit our environmental goals. And what has happened is, it's kind of naturally aligned with this concept of thinking about resilience more meaningfully and intentionally. And I think there's a lot of overlap and complement, right? The best watt is the watt we never produce. And, of course, as we're thinking about these facilities that need to be repowered once the grid is out, of course, you know, we wanna rely on as much of that efficiency as possible, of that resource of efficiency as possible, so we can minimize the amount of generation we need to get us back up and running. So, certainly, efficiency and conservation are kind of foundational to the work of resilience.

Rob Cox: Yeah, I would say that, you know, it's a great list of organizations that are there, because that's sort of the pathway that I know our team followed. You know, back in 2018, I mean, we knew that resilience in North Carolina was a big issue, our team here at the university, and started conversations with the state energy office, and then decided to pursue funding from EERE. And then, have worked with, you know, hazard mitigation, at the state level, worked with folks like Beth, you know, at the local level. And we have pursued some funding, some follow-on funding, potentially, through FEMA, as a result of some of this work. So, all of those organizations have kind of fallen into our process, at least.

Beth Schrader: Yeah, and I'd say, from a local level, it's also, you know, the business community has a real stake in this, your utility provider has a real *[glitch interferes with audio]* as well. And so, you know, looking at those intersections allows you to identify who some of these stakeholders are who might be the right ones to participate as part of it. So, from a large, you know, Orlando is a very large city with, you know, kind of the formal structure, but if you're in a

smaller city or a smaller community, you kind of have to start looking around and saying, "Who are the natural partners, and where's the natural home?" And just sort of look for who has the energy and who's willing to partner.

Virginia Castro: And I also wanna give Cherylyn an opportunity to speak, too, because I know her team was very much integrated into the communities they worked with, as well.

Cherylyn Kelley: I completely agree with that. You know, I think you have to start at a ground level, and take a look at what you already have at your disposal, and kind of work your way up from there. But I'm also biased, working for an energy office, so, please call me. Let's talk about it. *[Crosstalk]*

Virginia Castro: *[Laughs]* Exactly. The next uploaded question I see, here, is: "What do you think is most needed to get from plan to project?" Other than funding, right, how do we get over the hurdles with, you know, other than the funding for these projects? So I guess I'll start off with whoever – I guess maybe Chris or – I'll start with Chris for this one.

Chris Castro: Sure. I think, you know, plans to projects, one thing that we have really focused on is building the channels of collaboration and partnership within our community, so that we can really work on implementation. You know, we do a lot of planning, as governments, and often lack the implementation, and I think that, you know, in Orlando, the collaboration, I keep talking about with OUC. But also, with our academic institutions, our airport, our business chamber, our transit authority, the actual neighborhood residents, you know, creating those cultures of collaboration are, I think, the foundational element to move from plans to projects. Because, you know, we need everybody's support to address these issues.

Virginia Castro: I think, also, Beth had mentioned, too, a lot of trust-building, right? Trust-building within the communities themselves, and really reaching out to those partners that you don't usually reach out to normally on an everyday basis. It's more of, you know, other organizations that you don't work with every day, right, those are the ones that know the community, know the people, to make things happen. Okay, do we have – I think we have – oh, so maybe we could do one more question. Okay, so the next uploaded one is for Beth and Rob: "Great presentation. *[Laughs]* What is an example of a critical facility that has been identified following

Hurricane Florence, and what kind of energy resilience investments are being made at that facility?"

Beth Schrader: So, I'll jump in and say that one of them is a church, and we are currently seeking funding; that's part of the BRIC funding initiative that we have looked at. The proposed solution for that would be solar PV with storage, battery storage. And so, you know, we're still in process on that, but I think, kind of to the point earlier, that the relationship-building that's happening around that is enabling us to be able to have these kinds of conversations and actually get from that sort of plan to implementation.

Virginia Castro: Anyone else have anything to add, Rob or *[crosstalk]*?

Rob Cox: Yeah, no, I think Beth had that directly. I mean, one of the things that's really unique about what's going on here, I think, is critical infrastructure. Beth said a church, right? You know, and I think that plays to the trust-building and whatnot in the community that's really critical. And I think that gets a little bit at the next question, there, about FEMA, FEMA planning grants, 'cause that's a little bit of what we tried to play off of.

Virginia Castro: *[Crosstalk]* the last one: "Has anyone done this, before?" *[Laughs] [Glitch interferes with audio]* that's the last and we'll wrap up with that one. Yes, exactly, has anyone had experience with FEMA mitigation planning grants to develop resilience plan strategies along those lines, and to what extent can these be used to focus on resilient power planning? I'll turn it over to the panel, if you guys have had experiences, prior.

Chris Castro: We haven't, in Orlando.

Cherylyn Kelley: I don't have direct experience, but from my understanding of the FEMA grants, it's a perfect opportunity to start looking into resilience planning and strategies.

Beth Schrader: *[Glitch interferes with audio]* mitigation planning piece through HMGP. We do that – our state hazard mitigation office really identifies priorities and sort of how that's gonna happen *[glitch interferes with audio]* really moving to more of a regional planning perspective for resilience and hazard mitigation. So, those resources are ongoing and being allocated. We haven't specifically done it in regards to power, yet.

Virginia Castro: Okay, *[glitch interferes with audio]*. Well, thank you very much. I think that's all the time we have now for questions. We did wanna

take a few minutes just to highlight some additional resources that are available, and some new resources, as well, especially the one that's Federal Financial Assistance Program for Resilience Activities. This made its debut here this week at Better Buildings Summit. It is an interactive dynamic matrix of different federal grant programs, that is available for mitigation resilience activities. And also, please do visit the Better Buildings Solution Center: Resilience in the Public Sector – we wanted to shout out to that.

And then, our next slide, please?

I think this is the Better Buildings video. And so –

[Music playing]

Great, thank you so much. And we'd like to invite you to attend our Better Buildings summer webinar series starting in June. Partners will discuss some of the most pressing topics they're facing, share best practices and innovative new approaches to sustainability and energy performance. To register, please go to Better Buildings Solutions Center and click on "Events Webinars."

And now the final slide, our contact information.

We want to thank all of our panelists very much for taking the time to be with us today. And we have now launched a short feedback survey in Slido, and ask that you please take a couple of minutes to give us feedback on this session. Your answers will be totally invisible to other attendees. We rely on your feedback to design webinars and future summits. The poll will be open until tomorrow morning, and if you'd like to learn more about these resources discussed today, please check out Better Buildings Solutions Center, and feel free to contact me at the e-mail shown.

Again, thank you, everyone, for being with us today, and thank you to our panelists. This concludes our session. Thanks, everyone.

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