Brooke Holleman: Hello, everyone, and welcome to the 2021 Better Buildings Better Plants Summit. We really appreciate you joining us today. We have a wonderful workshop prepared and some fantastic speakers that we're going to introduce in just a moment. My name is Brooke Holleman, and I am a fellow in the Weatherization & Intergovernmental Programs Office at the US Department of Energy. And I will be your moderator today.

Our goal with this workshop is to demonstrate how to freely available renewable energy optimization Tools can be used for resilience planning at critical facilities as well as highlight funding opportunities accessible through the federal government. So before we dive in, I have a few housekeeping points that I'd like to cover. Please note for today's session it will be recorded and archived on the Better Buildings Solution side and we'll follow up when today's reporting and Slides are made available.

Next, attendees are in Listen-Only Mode, meaning your microphones are muted. 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. So in terms of our agenda, I'll start us off with a quick introduction to get us oriented around the idea of energy resilience. And then, we'll dive into demonstration of the Tools – first DER-CAM with Nicholas DeForest from Berkeley Lab.

And then, REopt Life with Emma Elgqvist from the National Renewable Energy Lab. Finally, I'll close us out with federal funding opportunities highlighting one in particular and nothing other ways you can stay connected. We hope you'll participate in our Q&A session at the end; made possible by our use of Slido. So speaking of questions, we will be using an interactive platform for Slido for our Q&A Polling and all of our session feedback.

So please go ahead and go to slido.com using your mobile device or by Opening a new Window in your Internet Browser. Today's code is #doe. And once you enter the event code, you Select today's workshop title – Planning For Power in the Drop-down Menu at the To-Right. If you'd like to ask our panelist any questions, please submit them on Slido at any time throughout the presentation and we'll answer them at the end of the session.

And be sure to Like any questions that you'd also like answered. I will give everyone a few moments to Open up Slido and Select our session. And again. If you're having any issues, please Message our tech support team by using the Zoom Chat function. Okay. To start us off, I'd like to give a little more context about my office and how my team has approached resilience planning. As a part of the weatherization and

intergovernmental departments office, we work to enable strategic investments in energy efficiency and renewable energy in the public sector.

In addition to the administrative state energy program and weatherization assistance program, our partnerships and technical assistance team supports state and local governments and K-12 school districts by developing Tools and solutions to specific barriers, convening and creating peer exchanges to showcase public sector leadership and providing information for reading technical experts such as our speakers joining us today. Next Slide.

And as we are seeing, more and more Americans are affected by great adages from the increasing frequency and intensity of natural disasters, which as we know has a disproportionate impact on low-income communities. And I'd imagine some of you are either familiar with this map put out every year by NOAH either by the image or through your own community being impacted. This map shows the 22 separate billion-dollar weather and climate disasters that occurred in 2020. A number that broke the previous record of 16 individual billion-dollar disasters set in 2011 and in 2017.

And though the average annual power outage in 2018 was around six hours, we know that some places face much lower outages; including nearly 30 hours in North Carolina thanks to Hurricanes Florence and Michael. The recent winter storm in Texas this past February put the threat and consequences of grid outages into even clearer focus. Next Slide. So resilience is a broad topic that requires a holistic approach beyond just the scope of DOE's work.

But for our part, we focused on the roles, energy efficiency and distributed generation can play in helping ensure critical infrastructure can remain online when it's needed most. Communities define for themselves what facilities are critical for them but may included any of the ones listed here; from nursing homes, fire stations or water treatment facilities. And I'll say quickly that this year's summit has two other sessions, both focused on both critical infrastructure and community resilience that we hope you'll tune into later this week.

This is a photo of the Montgomery County Public Safety Headquarters in Maryland, which integrates 2 megawatts of solar PV arrays and 800-kilowatt combined heat and power system and electrical vehicle charging station and a cybersecurity system. And this micro-grid allows the facility to island off from the grid in the event of an outage, allowing the operation center among other services to remain online. Next Slide.

I also want to call out the important role of energy efficiency, which can dramatically reduce energy bills during normal conditions but also reduce the cost of the investments needed to supply critical energy loads during a grid outage. Here, we have quantified that value. For example, analysis that can be completed with limited information about a facility using publicly available online Tools such as REopt Light; many of the Tools we'll be exploring today. K-12 schools are frequently used as emergency shelters.

And in this model example of a high school in Orlando, Florida, pushing energy efficiency measures that reduced electricity use by 20 percent could save nearly $400,000 on the cost of solar and battery storage system, large enough to power the school at 50 percent of its typical load for 48 hours. Next Slide. This idea is explored further in our guide which introduces readers to the benefits of integrating other energy efficiency with other DER's for resilience. It summarizes analysis of potential distributed energy resource investments at critical facilities operated by state, a local government and a K-12 school.

And each have already made public commitments to energy efficiency reductions through their participation in the Better Buildings challenge, and we're able to share building-level energy data with those types of facilities they identified. Next Slide. The analysis for these case studies in the guide for relied on two public renewable Tools we're showcasing today; REopt Light, which is maintained by the National Renwable Energy laboratory and the Distributed Energy Resources Customer Adoption Model, or DER-CAM, which is maintained by Berkeley Lab.

You'll see how each of these Tools works in a moment. But both use information about specific facilities; its location, utility-type information and electricity usage to provide site-specific analysis estimating what optimal investments of distributed generation or storage are needed to meet resilient energy cost holes. The REopt Light Interface is a Website that allows analysis to be performed quickly with basic information. Site location, site electricity rate, building type, I'll say new energy consumption or a custom load profile.

And we're excited that this Tool now includes a feature to consider consumption reductions from energy efficiency in addition to CHP and thermal storage. DER-CAM offers a broader range of technologies to Select from, including flexible loads. And this Tool has historically been accessible by downloadable software, focusing feature a more User-friendly Browser-based access that automates these complex technologies. Next Slide.

All right. At this point, I'd like to invite you to Open up slido.com to participate in a few quick Polls we have for our audience. As a reminder, our access code is #doe. And simply Click on the Planning For Power workshop and then Navigate to the Polls Tab on your Right in the Q&A to answer the question. So our first Poll is, "At what stage is your organization and resilience planning for critical facilities?" And this can be an approximation.

But we're curious what steps you have taken so far. And if you haven't yet, that's helpful to know as well. I can see a lot more Selecting Interested In Pursuing But No Plans Yet, next followed by Collaborating With Other Departments, And Community Organizations. And then, some of you are also estimating your backup power needs. Great. Okay. Sounds like you're in the right place, then, for today's workshop. And I think we're reaching a critical mass here. All right. We can go ahead and Close this Poll and go to our next one.

All right. Our next question is, "How would you rank your organization's motivations in pushing distributed generation? And clearly, each of these options is for a commendable reason. And for many folks, it's probably some combination. But we're curious if there's one reason in particular that's especially motivating for your organization. Yes. A lot of clean energy goals and cost savings, plus emissions reductions. Yeah. The Top ones, for sure. But glad to see a lot of your prioritizing critical services in vulnerable communities as well.

Great. So a good mix across savings and energy goals, resilient backup power. Probably about what you'd expect. Okay. Thank you. If we can go ahead and Close this Poll, we'll move to our last one. So this one is a little different. It's an Open Text Poll. Our question for you is, "What information or Tools do you need to overcome challenges or barriers to pursuing energy resilient functions for your own critical facilities?" So this is an open question.

And your answers may be able to tell us a little more about what barriers you're facing and what you might need to overcome them. I expect funding will come up as it is already. Data collection, funding. Yeah. Yes. Absolutely. Great. Well, luckily we have Tools we're discussing today, and then we'll also – our funding discussion as well. Consequences of not pursuing. Absolutely. Staff training. Yes. Absolutely justifications. Definitely. This is really helpful. Okay. Great. Awesome. All right. We'll let it flow in for a little bit longer.

But as you're filling this out, I can switch to introducing our panelists. All

right. Yeah. Feel free to continue those conversations either in the Chat or in Slido specifically. All right. So without further ado, we have Nicholas DeForest who's a Senior Scientific Engineering Associate with the Grid Integration Group at Berkeley Lab where he is a core developer for the planning and analysis Tool, DER-CAM. His work focuses on developing models and Tools to guide the design and operation of distributed energy systems that integrate diverse DER's and leverage multiple value streams.

He also works in the area of micro-grid control algorithms and advanced micro-grid deployment and demonstration projects. Emma Elgqvist is an engineer at the National Renewable Energy laboratory in Golden, Colorado. As part of the Reops team, Emma's work provides technical assistance and employment guidance on distributed energy technologies to meet aggressive energy goals, conducting renewable energy streams, evaluating renewable energy in storage deployment control and resilience benefits of integrating renewable's in Micro-Grid designs.

Emma also leads, enrolls efforts with the Federal Energy Management programs, technical assistance programs in Portal which provide agencies with the support in the most critical areas of renewable energy project development. Emma holds a master's in Industrial Engineering from Georgia Institute of Technology and a master's in Engineering management in the Colorado School of Minds. We're grateful for both of you being here today. Nicholas, we will start with you. Take it away.

Nicholas DeForest: Thanks, Brooke. So I appreciate you guys taking the time to learn about our Tools and offerings. If you go to the next Slide. I think one of the Poll questions that was just brought up really helps highlight one of the key questions when you're thinking about deploying behind-the-meter energy resources or micro-grids. And thinking about these values broadly, they might align with cost savings or environmental performance or resilience.

And in a lot of cases, different systems can contribute to multiple value streams. But in some cases, if there's different prioritization of these values there's going to be an impact on the way the system was designed and operated. Next Slide, please. So thinking even just within the economic value streams, there's a pretty big diversity of the different value streams that you might want to pursue with your system; whether that's trying to save cost relative to a retail electricity tariff or to provide grid services or to reduce your consumption...how these rank as priorities within your individual system matter. Next Slide.

And even, again, within resilience there's a fair degree of diversity in terms of the different value streams. "Are we talking about providing short-term reliability or seamless operation for whatever you're currently

doing within the building. Are we talking about loss mitigation? You know, if you have downtime? Or do you envision your site as something that's going to operate only for sort of critical load purposes or for an emergency shelter in the event of a long-duration outage?"

So the type of system that would deliver value in each of these different cases is going to be different. And if you go to the next Slide, you'll see that generically the process for developing and deploying a micro-grid system is pretty long and involved; starting with early-stage design conceptualization, getting into progressively more detailed stages of modeling and then doing approval with the utility, getting financing, doing the construction, commissioning and operations.

And it's only once you get to the operations phase that you really realize the benefits that have previously just been on paper. And so, these risks involved with that, obviously. You really need to engage in a lot of early-stage what we call exploratory design to basically understand, "What are the factors that matter to my system, and how do I make sure that even if there are changes in either the operation of the building or the economic landscape" – for instance, if tariffs change – "that's not going to produce a design that no longer works for me."

So if you go to the next Slide. This is precisely the problem that we've developed the software Tool DER-CAM to develop. We want to give folks Tools in this early-stage to basically flesh out their ideas; to take the desire for a micro-grid or distributed energy resources and get it out of their heads and onto paper and give them the Tools to basically de-risk this process and move it further down the pipeline. And indirectly, that helps us...or, that helps customers think about getting utility approval.

You know, making sure their design confirms with utility requirements; flesh out cost versus benefits, which is going to help secure financing; and then, you know, in the operations phase feel confident that the design you're Selected is going to deliver the operational benefits that you're expecting. Next Slide, please. So DER-CAM is a Tool that's been around for ten years or more. And it has a lot of features that are fairly complex.

You know, a large diversity of generation technology is in energy storage technology as well as demand side control strategies that can all sort of work in concert to deliver this optimal system that maximizes benefits. But if you go to the next Slide, historically DER-CAM has been a fairly complex piece of software. You know, it's very comprehensive, and that means there's a bit of a learning curve to being able to take advantage of all of the features that it offers.

And I think for some customers, this level of complexity isn't compatible with the time or resources they have available to be doing this early-stage energy design. And so, this challenge is the motivation that we have for developing a new interaction of DER-CAM. So if you go to the next Slide, we want to...we're in the process of developing a Web-based – what we call a resilient design Tool, which is an Interface into DER-CAM that provides specific functionality related to this question of planning for power.

So this is going to be a Web-based Tool. It's going to help you do automated scenario analysis related to outage and resilience. In particular, focusing on the tradeoff between investing in resources to provide different levels of resilience and the cost needed to do those. We'll also considering energy efficiency investments as an option to support those goals. It's in the sort of final states of development. We expect it's going to be available to the public to use later this summer.

So definitely keep an eye out on that, and we'll be doing some announcements when things are available. Next Slide, please. So I just want to quickly walk you through what this Tool looks like. This isn't final. This is kind of some Mach-ups on where the Tool is right now. It's probably going to be a little more refined once it's released. But the goal here is to really streamline this process, make it easy for people who have limited time, limited data or limited technical expertise to basically start a project ad get an idea of what's feasible and what's not.

So this Interface is going to give folks an easy Portal to build and manage their projects. You know, if you have different buildings or different scenarios that you want to model, you can do that here easily. You know, not having to worry about tracking things and whatnot. Next Slide, please. So the process for building projects – the goal, really, here is to minimize the amount of data required from a User to get started but also give you the option to customize different inputs so you can match the model to your specific site and increase the relevance of data that it produces. Next Slide, please.

So we provide – it's tailored for the US. So, you know, we provide data for 16 US climate zones, which is pretty diverse, and hundreds of US locations for solar data so you don't need to provide any measurements related to solar data. That's all going to be available from data libraries. Next Slide. And also building loads. So in a lot of cases, getting the building loads is a challenge, especially if Tools require sort of time series data; you know, not all utilities make that easily accessible for customers. So what we do here is, we have 16 different reference-building types.

And you can use those reference-building profiles and then scale them to either your building size or your annual electricity and natural gas consumption to get a load profile that closely matches what your building is likely to exhibit. Next Slide, please. And then for energy tariffs, we tried to create an Interface that allows you to create an energy tariff that matches the wide diversity of rate structures that are available from utilities in the US.

So you can Select different components to that tariff; whether that time of use, energy rates, demand charges, tiered rates, different fuel structures. Whatever. And then, just populate a few text boxes in terms of, "What are the actual rates associated with those," to essentially customize your utility tariff to match what your building uses. Next Slide, please. Then we also give you the ability to define existing DER assets.

So for instance, if you have an existing solar array that you might be looking to expand, or if you have backup diesel generation that you want to include in some of your scenarios, you can add those existing resources so they can contribute to your resilient performance without their costs being included in the sort of cost calculations. And then likewise, you can enable new investments. So you basically are telling the model, "I'm interested in solar PV. I'm interested in battery storage. I'm interested in CHP generation." And these are the costs and performance data associated with those different possible investments.

And then the model will consider those and Select the ones that satisfy your objectives in terms of cost or resilient performance. Next Slide, please. In conjunction with those more active energy investments, we also give Users the ability to define efficiency investments. So the idea here is, you can define these different efficiency investments based on data you might've collected from energy audits to get a sense of, "What are the impacts of these different investments on different end uses like cooling or heating or general electricity use," and define a cost associated with them.

So then, the model will consider both investing in DER's and investing in energy efficiency looking at where there's sort of synergies between the two or where there's competitions and Selecting the portfolio that's optimal for you. Next Slide, please. And then finally, we give you the option to define outage scenarios. So the idea here is, you can define, "When did these outages occur?" If they're related to certain seasonal events like hurricanes or if they're, you know, more distributed throughout the year, you can define that.

You can define, "What's your value of loss loads?" If you lose operation in the building and you're not able to support all your loads, "What's the cost

associated with that?" Likewise, if this is like a critical facility and there's loads that absolutely have to be served, you can define that as well. Which means that the design you get is going to be compatible with that type of operation. And this resilience scenario is also where we sort of allow you to define different scenarios related to different levels of critical loads.

You get a sense of, "What's the tradeoff between investing in physical infrastructure versus serving different levels of load?" Next Slide, please. And then finally, once you've built this model and the Interface, you can Send it to our Server where it's optimized by our DER-CAM optimization engine. You're given a Portal that allows you to examine the high-level metrics but also Download the raw data or Download a report PDF with data and graphics that you can use outside of the model itself. Excuse me. Next Slide, please.

So just quickly, I want to highlight an example of how this Tool can be used. There's a lot of data here, but this is basically – it's an office building. We're looking at investing in potentially PV and battery to support seasonal 24-hour outages. We've put an outage in each month or season. And then, we're also considering energy efficiency investments. So we're looking at HVAC retrofits, control retrofits and lighting retrofits. And we've found data online to scale the costs of these investments to our particular building.

The Tool itself will provide some guidance on starting points for energy efficiency investments. But you can customize those to your needs. And then, the scenarios we're doing is, we're doing five outage scenarios. The first one, we're calling Blue Sky. So not outages. Just looking at, "What's the best investment here if the grid is always available?" And then, we're looking at for the outages that we've described in these seasons supporting 25 percent of the load as critical load, 50 percent, 75 percent and 100 percent.

So this particular case site seems pretty complex, but it can essentially be run in our Tool using two separate models. One with energy efficiency investments and one without. So if you go to the next Slide, I've taken some summary results and just made graphics here. So starting from the Left and going to the Right, we have these different outage scenarios. So we have the Blue Sky and then increasing levels of critical load. And then paired within each of these plots is – on the Left, the current loads; and on the Right, the loads with the energy efficiency investments available.

So they're not forced. We're letting the model choose whether or not to invest in them. And we see here that the big difference is...oh, sorry. The values plotted here are the capacities of the PV and the batter systems that

are being deployed. So we see here that as you increase the number of outages and the critical load that needs to be supported, obviously the amount of DER capacity that's needed is going to go up. Right? Because you're supporting a higher level of the load.

But within each of these scenarios, the capacities needed when you have energy efficiency is quite substantially lower than when you don't have the energy efficiency. Next Slide, please. And likewise...so this is the cost to invest in those different capacities. You see that the costs go up as the critical load that you need to support goes up. But the cost is substantially lower when you have energy efficiency available. And that little Gray sliver in each of the energy efficiency scenarios – that's what you're investing for efficiency.

So it's clear here in this scenario, at least, that efficiency is an investment that pays off for itself, but it also helps support resilient performance. And then, next Slide. And then here, we've lumped all of our costs together to look at, "How does this perform overall?" So this includes your financing costs for new investment but also your annual energy costs for buying electricity and natural gas from the utility operation and maintenance for your infrastructure and all of that.

And so, there's a couple takeaways here. Obviously, energy efficiency pays off. So we see that that's Lowe when that's available. But we also see, when comparing the no-DERs case to these different levels of critical load, we see that we're actually able to...sorry. Go to the next Slide. I have these points highlighted. You see that you're able to invest in these different technologies and produce overall savings while also delivering resilience.

So this sort of like synergies of effects going on here where you're saving, when you're connected to the grid and you're operating when the grid is down. So it's basically a win-win situation as it relates to investing in these technologies. And that's made even stronger when energy efficiency is part of the equation. That's a lot of data that I've thrown at you, I realize. And I just want to highlight the Tool itself will allow you to essentially replicate these into two simple runs.

Now, just to close here, this Tool is in the final stage of development. We hope to have it ready soon. If you have any questions – or, in particular...this is a Tool developed for this type of audience. If you have suggestions for functionality or features that you didn't see in this presentation but you think would be critical for this Tool to be useful to you, definitely reach out to us. You can reach our team at der-camandlbl.gov.

And then if you're interested to learn more about this Tool or DER-CAM in general, you can go to our website der-cam.lbl.gov. And then also, this isn't available yet. But on our Website there is a Web Form to sign up for access to the full DER-CAM. IF you want to be on our mailing list and you want to hear as soon as this Tool's available, just sign up there. Enter your information. You don't have to Download the full Tool itself. But if you do enter your information into that Form, you'll be our mailing list and you'll be the first to know when it's available. So thank you.

Brooke Holleman: All right, Nicholas. Thank you so much. And thanks to a few of you who Sent in questions. Remember to Like the ones you've seen and also we'll answer those at the end during our Q&A session. We'd like to turn now to Emma Elgqvist who will discuss REopt Light. Go ahead, Emma.

Emma Elgqvist: Thanks, Brooke. So today, I'll give an overview of the REopt Light Web Tool, which was first launched in 2017 but that we are continuing to kind of make updates and improvements and add new functionalities too. But sort of the core concept of the Tool is figuring out kind of renewable energy and storage, distributed energy technologies...which ones will work for a given site.

And so, there's lots of different independent factors to take into consideration when thinking about these systems for your site. That includes the renewable energy resources, the cost of various technologies and incentives that may be available to reduce those costs, what your goals at a given location is...so is it around resilience and backup power, providing cost savings, achieving certain emissions reduction targets.

I think we saw all of those are kind of important to stakeholders. "What's the current utility cost and consumption that these distributed energy technologies will be offsetting? And what are some of the financial parameters that impact the overall life cycle cost?" And so, there's all these different factors to take into account, and it's important to think about them all concurrently. If you just looked at the renewable energy resource at a site, you might not get sort of a holistic picture of what the best technologies may be. So you can go to the next Slide, please.

So REopt Light considers these factors in one problem statement, starting with the loads here at the Bottom. So the User inputs the electrical and also optional thermal loads at a given site, and then those loads need to be met in every time step. So it's a time series-based model by some combination of the technologies listed on the Left-hand side there. So that's renewable energy generation, conventional generation, energy storage and combined heat and power.

The factors or drivers that impact which combination and sizes of technologies make it more suitable for a given site, includes the goals of that site. So cost minimization, resilience or emissions reduction; economic drivers and the utility costs that are being offset. Finally, what the Tool provides us in output is listed on the Righthand side there. That's the minimum-cost solution, which includes the technology mix and sites recommendation; how to operate or dispatch those technologies in each hour of a year and what the associated capital cost, O&M cost and net present value are. Put on the next Slide, please.

This Slide just shows a snapshot of kind of that operations or dispatch of technologies and how that's related to the system sizing. So we're looking at the electric load at a site here that peaks at about 27 megawatts and drops down to a little under 15 megawatts at nighttime. That load is being matched by solar PV in Dark-Blue, storage in Light-Blue and then a fair amount of it is still being mapped by the electric grid, in this case shown in Gray.

And so, the PV generation here is offsetting a lot of the area under the curve. And so, it's providing a lot of energy savings to the site by offsetting utility purchases. But if you look at kind of this third day shown here at the Wednesday, the solar generation is starting to decrease in the afternoon while the load at the site is still pretty high. And so, the battery storage system here is being used to complement the solar PV system by dispatching for just a couple of hours and is able to lower that peak demand from 27 to 23 megawatts.

On the next day, Thursday, the peak load here is not as high. And so, the battery storage system here is instead being used to shift electricity usage from high to lower cost of time spent throughout the day. And so, you can imagine that if we built a larger PV and storage system here you could offset more of these energy and demand costs. But it would come at a higher capital cost. And so, the models making those decisions in tradeoffs between the costs and the savings define the system sizes and associated dispatch that provides the overall lowest life cycle costs of energy. You can go to the next Slide, please.

So that's kind of how REopt Light works; what happens behind-the-scenes. Next, I'll go through a few Slides that show you some Screenshots of what the Tool looks like and how you sort of interact with it. So REopt Light has a User Interface. It is a Web Tool that you can access through the Website. It's a no-cost publicly available Tool. There's two modes, if you will, to operate the Tool. The first one is the Financial Mode which optimizes the distributed energy technologies to minimize the life cycle

cost.

Or Users can choose a Resilience Mode, which – again – optimizes these technology system sizes and dispatches while also sustaining a critical load during a grid outage. Some of the key inputs shown here is that focus area, financial or resilience, which technologies you'd like to evaluate. And then, information about your site which includes the location, electricity rate and then the typical electric load profile. You can go to the next Slide, please. Thank you.

So the key outputs here are shown in a few Screenshots. So the first one is that optimized system size in combination along with the net present value. The User also sees the hourly dispatch of these systems in an interactive chart and then also provides a detailed financial output that compares sort of system sizes and energy costs, capital costs and lifecycle costs in the business as usual case with the optimal scenario. This is not a focus of the presentation today, but I wanted to mention that there's also an API available where you can programmatically access REopt Light. So not through the User Interface Web Tool but through an API.

And this allows researchers and other users to evaluate, instead of maybe one site at a time, hundreds and thousands of sites more national scale analysis and see how changes in technology cost restructures, et cetera kind of impact economics of various distributed energy technologies. So then, that stuff we're looking at here is – on the Lefthand side, the life cycle savings from deploying just behind-the-meter battery storage or on the Righthand side highlighting areas where battery storage couple with solar PV can provide savings to a site. Next Slide, please. All right.

So the next set of Slides here are some Screenshots highlighting the resilience, inputs and features of REopt Light. So you'll see in this Screenshot here for the focus area we've Selected resilience. And when the User does that, there's a few additional required fields that are shown. So the first one is the critical load. So there's three different ways that the User can specify the critical load profile that is either a percent of the typical load – so here, we are showing a 50-percent critical load factor, which means that in each time step throughout the year the typical load will be reduced by 50 percent during the outage period.

You can also choose to Upload it. So you can Upload either an hourly or a 15-minute load profile that is completely separate from your typical load; or, finally, you can build the load based on end use application. So HVAC and office equipment, et cetera. The next piece – oh. Sorry. Could you go back to the previous Slide? Yeah. Below that, you'll also see the second piece of required information which is the outage information.

So the User will need to specify the outage duration – so how many hour the grid outage will last – the outage start date and time. So when the outage is expected to start. There's also an option to auto-Select the outage start time based on the highest – or the peak load of the year. And so, you can plan for kind of the worst-case scenario. Right? Now you can go to the next Slide. Thank you. Okay. So in Selecting your technologies, you will also get the option to evaluate a generator should you Select this resilience focus.

And so, it's a backup generator. It's assumed to be a diesel generator. There's defaults for cost; both installed cost of the technology and of the fuel cost. And then, the User can specify a fuel availability. You can choose to either model an existing diesel generator or have REopt size one for you. And so, consider kind of the tradeoffs and benefits between diesel generation and other distributed energy technologies that can also operate while grid connected.

So this Slide shows one of the key outputs of the resilience focus. So this is the dispatch of the technologies during a grid outage. And so, the outage period Selected here was between January 4th and January 11th. And so, you can see those days shaded in blue on this graph. You can see the estimated electrical load in the thin Black Line kind of going up and down throughout the day. During this grid outage, it's lower than before and after the grid outage.

So here, we specified that the critical load is 75 percent of the typical load. You can also see that during this grid outage this load is being met solely by PV and battery storage. But then as soon as the grid outage ends on January 11th, not only does the load increase back to its kind of original magnitude but the grid is also now being used to serve the load. So we can go to the next Slide. Okay. So I told you that the User needs to specify one outage for the year.

But of course, you don't typically know exactly when grid outage is going to happen. And so, after we've optimized the system sizes to sustain this one specified outage, we also simulate to get a sense of how these system sizes would perform for an outage starting in each hour of the year. And so, you know, we get a green check mark here because the system survived the specified 168-hour outage.

But then, we say, "Okay. For each 168-hour outage throughout the year, what's the probability that these technologies can survive that?" So in this case, that's 72 percent. So of the 168 outages throughout the year, 72 percent of those could be sustained with these system sizes. And that is

varying not just because the load is varying but also because the resource availability varies throughout the year as well. That's shown a little bit more detailed in the chart at the Bottom here.

So here, we're looking at probability of surviving an outage of a certain length for each of the 12 months throughout the year. And so, on the kind of furthest Lefthand side, you have January and February which has the highest load and the lowest solar resource. And then as you move out to the Right, you'll see in the Spring and the summer months you're able to survive outages of much longer duration because you have additional solar resource, and also the load might not be as high. Next Slide, please.

All right. So while this Tool has been around – well, REopt's been around for close to 15 years now and the Web Tool for four years, we are continuing to add new features. And so, something we've been working with and Brooker and her team over the past several months is adding a feature to allow Users to explore energy efficiency or load changes and what impact those may have both on the most cost-optimal system sizes but also on technologies required for providing power to the critical loads.

And so, we've added the Slider, which allows Users to explore either the reduction of energy efficiency measures on the load or new construction that may increase the electric load. So if you enter a value greater than 100 percent here, that will increase the load profile, or the load, in each time step. And if you enter a value less than 100 percent, that will decrease the load. So in the example here, we have the Slider at 62 percent. So we'll see 62 percent of the kind of original load in each time step. You can go to the next Slide, please.

So here's a graph just showing you what that would look like. So the Black Line here is the original load. And then, the Blue Line is the adjusted load that has been reduced based on that Slider. Okay. So next, we wanted to do a quick demo or case study to just kind of show the impact of this new feature. And so, we're going to be looking at a building in New York. We're going to assume it's subscribed to the SC9 utility rate. It's a medium office building, and we're looking at PV storage and then backup generation here. And we're assuming a grid outage that is four days long starting at the peak load time.

And we're going to look at results from three different scenarios here. So first, the financial scenario. So, "What's the cost optimal mix of PV and storage to minimize the life cycle cost of energy to this site?" Next, we'll look at our resilience scenario. So, "What's the cost-optimal mix of PV storage and backup generation to sustain the specified grid outage?" And then finally on, "How is reducing the load, presumably through energy

efficiency investments, going to change these results?" So I'm going to share my Screen here. Maybe. *[Laughs]* Are you able to see my Screen?

Brooke Holleman: Sure can.

Emma Elgqvist: All right. Wonderful. Okay. So this is the REopt Light Website and Web Interface. So you can see I've entered reopt.enroll.gov/Tool here. So there is access to a healthy annual if you are interested in that API. You can access information about that here. I should also mention that this code is Open Source, which allows developers to kind of add and also push back two developers the additional features. So anybody can sort of access the code behind this.

You can Send cool feedback and also Log in and register. You don't have to Log in, but if you want to you can Save all of your evaluations. You can create custom electricity rates. You can build and Save critical load profiles and manage that data. And then, I spoke a little bit about this earlier. But if you are doing a financial-only run, you'll just need the location, electricity rate, load and then fuel cost if you're looking at CHP. And if you are interested in the Resilience Mode, you'll also need the critical mode assumptions, outage date and start time. All right.

So here's that Focused Area button. So you can either choose Financial, which is the default, or Resilience. You can see when I Selected Resilience here I also got access to this Generator button, which I can Select or not depending on if that's a technology I want to evaluate. And then, you'll have to enter just a few key pieces of information. So I think we were going to look at New York.

And once you enter your location here, the Tool does two things. One, it grabs the renewable energy resources for that location so you don't have to enter anything about the wind or solar resource. The Tool will sort of handle that on the back end. It also Enables or Populates this Dropdown Menu of electricity rates. So it looks at your specific location and then, you know, 30-mile radius, "What are the available utilities and utility rates?" And so, you can Scroll down and Select the rate that you are on.

And so, this information comes from a data set called the Utility Rate Database. I'll just Click on it here really quickly because it's a pretty powerful resource that – Tools; but also, just End Users can access to look at information of thousands and thousands of utility rates across the country. So just by Selecting that name of the rate structure, I have access here to the demand charges, how they change. You can see here in different months there is different demand charges. There's also a tiered structure where anything below 5 kilowatts doesn't have a demand charge

associated with it.

And then, energy charges – in this case, they don't vary by month or by time. But if they did, they would be displayed there. So it's a really useful resource. If you're in a rate that you can't sort of access through here, then you also have the option to build your kind of custom electricity rate. So next, we'll have to enter the load profiles. So I think I said we were going to look at a medium office building here. The electricity consumption is pre-populated based on DOE's commercial reference buildings.

But you could override this number if you knew what your annual consumption was. And then, we have this load adjustment Slider here. And so, you can see when I move the Slider that also changes that annual energy consumption. We can chart this data in Zoom in here. So you'll see sort of the original load shape and the adjusted load shape. And so, again. These are model commercial reference buildings. But if you had access to interval data for your site, that's something that you could use. And then finally, you'll also need to enter the sort of resilience information.

So that includes the critical load. So here, we have a box where you can enter the critical load factor. You can also Upload it or build it. But in this case, we're just going to use the critical load factor here. And then, the outage duration. So you have to enter the duration in hours here. And then, like I said, you can Auto-Select the start date based on the critical load. And so, it will find when the outage – or, excuse me, the load peak here is. So January 17th is our peak. So I can just Click the Start Outage On Peak button.

And so it's at 6:00 AM that's when our outage will start. There's also several optional or default inputs that you can access. They're all populated with default values, but they are easy to override. So for example. Our default analysis period is 25 years. But I could enter 20 years here, for example. You can always keep track of what the default value was here as soon as you change a period or an input. For each of these sections, there's generally kind of the key inputs highlighted, but then you also have access to additional kind of even more advanced inputs.

Perhaps the PV system is a good one to showcase those. So we've highlighted here the capital cost input. And then if the User wants to specify a minimum or maximum system size to consider...but then if you enter the – or show here at the advanced inputs, there is a lot more that you can override; incentives, degradation, O&M costs, et cetera. I'm not going to Click on Results now. I have some results preloaded. So here's the first scenario looking at just the cost-effective technologies.

So the Tool is recommending 5 kilowatts of solar and 83 kilowatts of battery power. The batter power and capacity are being sized independently based on the capital costs and also the value that they can provide. And we'll see here that the life cycle savings is $81,000 over the 25-year period. We can go Down here to the Results Comparison Table and you'll see a little bit more detail about grid purchases, CO2 emissions, demand and energy costs, et cetera.

And then, the total life cycle cost is sort of what that Tool is optimizing on. All right. So I think we can go back to the Slides. And I summarized the results of these three runs that we did in this Table here. So the first row is what we were just looking at in the Web Tool itself. So you'll see the system sizes here, capital cost, life cycle cost and NPV or life cycle cost savings. In scenario two, we are – everything is the same about this analysis except we're now assuming that there's a grid outage these technologies have to meet.

So you'll see that results in a larger PV system size, a larger battery size and the addition of a backup generator of 110 kilowatts. Our capital costs are almost doubled. So they go from 162 kilowatt – $162,000 to $307,000. And you'll also see there's a slight increase in the overall...or, there is an increase in the overall life cycle cost. So what that results in is, instead of $81,000 in savings over the analysis period, these systems are now going to cost an additional $6,000. Though generally, that's sort of pretty close to 0, you're kind of getting this backup generator for free. So you're getting the additional capital cost, but then that's sort of balanced out by the savings that the systems are able to provide.

So finally, in Row Three we've reduced our load by 25 percent assuming that there's some efficiency measures implemented. Now, to meet the same grid outage we need a smaller PV system, smaller battery size and smaller generator size. The capital cost is also a lot lower. And the savings are still sort of relatively close to 0. And so, just wanted to stress and highlight the importance of considering the effects that energy efficiency measures will have sort of in conjunction with installing distributed energy both to provide resilience but also to provide cost savings. And with that, I think I will hand it back to you, Brooke. Thank you.

Brooke Holleman: Emma, thank you. That was fantastic. Really appreciate the thorough review. I know there's been a lot of questions in the Chat. So I will be brief, but I wanted to make sure to highlight a new funding resource before we jump into our Q&A. The new Federal Financial Assistance Page is a list of Selected federal financial assistance programs compiled by DOE to assist with state, local, tribal and territorial governments with

natural hazard mitigation and energy resilience activities.

So this includes grants, loans and cooperative agreements for pre and post-disaster mitigation all in one location. And as you can see, it's searchable by agency or type of applicant. So to quickly provide an example from the list, we're grateful to our colleagues at FEMA for helping us highlight a new grant program that takes the transformational approach to risk reduction. And that is BRIC. And I'll describe what this program is and then tell you where you can go for more information.

The 2018 Disaster Recovery Relief Act authorized FEMA to create a new pre-disaster hazard mitigation program known as Building Resilient Infrastructure and Communities. And this program replaces the legacy grant program, pre-disaster mitigation, and establishes capacity and capability-building at the community level to help communities become more resilient while investing in projects that proactively reduce the risk to natural hazard events and in turn making the nation more resilient.

For its inaugural lunch in FY20, the BRIC program made $500 million available for mitigation activities, which was funded by 6 percent set aside from federal post-disaster grant funding. Pre-award Selection notices for the first round are anticipated this Summer. And FY21 funding opportunity cycles will be posted to grants.gov later this year. Next Slide. So through BRIC's guiding principles, FEMA supports communities in considering changes to infrastructure that reduce damages caused by storms and encourage and enable more innovative ways to do it.

Since not all projects need to be highly complex or even expensive, BRIC's six guiding principles are the foundation of the program and positions FEMA to fulfill its mission of helping people before, during and after disasters. Next Slide. So as we know, mitigation lessens the financial impact to state, local, tribal and territorial governments and federal agencies, and every dollar spent on mitigation can save $6 in future disaster costs. BRIC encourages public infrastructure projects, especially those that mitigate risk to one or more critical lifelines in corporate nature-based solutions and incentivize the adoption of modern building codes. Next Slide.

So who is eligible? As you can see, all 50 states, territories, tribes in the District of Columbia are eligible and can submit applications on behalf of said applicants, which can include local governments. For more information, we'd love for you to contact your state hazard mitigation official or equivalent representative or visit BRICs before you apply Page-directly. Next Slide. So as we mentioned before in discussing resilience improvements at the building level, energy is one lifeline of many that

makes up an interdependent system of critical services.

And when planning energy resilience or pre-disaster mitigation projects, it's important to consider how to protect these community lifelines to reduce the need to stabilize that lifeline after an event and prevent cascading impacts. BRIC mitigation grants can go towards projects that help improve these systems and their priority and receive points in the technical criteria of national competition. Next Slide.

So when considering elements of good mitigation projects, FEMA considers not only how risks to these critical community lifelines – such as energy – are mitigated but also how they tie to BRIC's guiding principles such as innovative project planning and involving strategic partnerships. The Blue Lake Rancheria Tribe leveraged public/private partnerships to invest in the low-carbon community-scale micro-grid shown here. It is 1 of 3 that the tribe has pursued after recognizing the need for resilient infrastructure in a geographically isolated area in Norther California where power interruptions and outages are frequent.

So after making investments in energy efficiency, the tribe invested in solar PV and battery storage. But it not only allows them to isolate from the grid, it saves the tribe about $200,000 a year in electricity costs and lowers greenhouse gas emissions by 200 tons per year. It powers a six-building campus of the tribe's most critical infrastructure, including government offices, water and waste water systems and an event center.

And during the public safety power shutoffs for the wildfires that occurred in October of 2019, this site provided emergency services such as Internet access, ice, food and device charging to approximately 10,000 people in the county, including individuals in other response agencies. Next Slide. It's a very helpful resource that includes example projects FEMA has put together that guide to expanding mitigation, making the connection to electric power which shows how community officials can work together to support housing mitigation in the power sector. Next Slide.

And you can also check out two Webinars hosted by our state energy program and FEMA on leveraging federal hazard mitigation grant funding for energy projects to build resilient communities. Part one focuses on examples of federal and state-funded projects including a deeper dive of the Blue lake Rancheria micro-grids. Part two discusses how to value these projects within the benefit-cost analysis Tool, which is a required component of the FEMA hazard mitigation grant applications.

And as mentioned, for more information we have these resources listed at the end of the Slides. But if you're interested, we encourage you to visit

the FEMA Website for more information about BRIC and the federal financial assistance Resource Link to Browse what funding options might be available for your organization. All right. We're now to the Q&A portion of today's session. If you've not already, now is your chance to go to Slido and enter #doe, Planning For Power. I know we've got quite a few here. So Nicholas and Emma, whenever you're ready I think we're just going to dive in. Nicholas, I'm going to toss the first question to you.

Nicholas DeForest: Sure.

Brooke Holleman: How can folks use DER-CAM for cold climates such as Canada? Could Alaska be used for similar data?

Nicholas DeForest: Yeah. So I think this touches on a general question. And actually, there's a number of questions in the Queue that I think are related. So the full DER-CAM is much easier to customize. So you can use non-US climates and loads and things much more easily there as well as, you know, other futures people have touched on. I think for Canada, the building stock is probably pretty similar.

So you could definitely use like a cold climate zone. There's like two or three US climate zones that are pretty cold that might make sense for different Canadian locations. So yeah. I would say you could probably use this Tool pretty incredibly for Canada. For other international places, it might not be as easy to apply. But the full DER-CAM itself might be relevant to those types of problems.

Brooke Holleman: Great. Thank you. And this next question is technically for both Emma and Nicholas, and I will definitely give you a chance to weigh-in. What are the main differences between DER-CAM and REopt from a high level? And I can certainly say from our perspective, you know – and as you're able to see – REopt Light is just incredibly User-friendly. That's got a really easy-to-follow User Interface. You're able to consider different technologies really quickly by turning them on and off and also using site-specific data.

You can also Select different outages for resilience really quickly and get answers back in just under like 15 minutes, it seems like. So the other piece is that you're able to see in some of the resilience outputs how the different systems could perform in different months. Which if you're thinking about what threats you're facing versus Summer versus Winter, that's a way to Select that as well.

On the other side, as Nicholas described, DER-CAM was a really power, complex Tool that is actually becoming more User-friendly through these

improvements. And with DER-CAM, you're able to Select really specific energy measures to consider as part of your overall package. So as you mentioned, lighting and HVAC improvements. Nicholas and Emma, I don't know if you want to add any of that. But that's at least I think from our perspective what we're seeing.

Emma Elgqvist: Yeah. I'll just maybe chime in to say that I think both these Tools have been around for kind of a long time. And when they started out, we're maybe looking at very different problems And as they have become more complex in integrating, there are some areas of overlap. And so, maybe with the launch of this new online DER-CAM version, we should sort of get together and make sure that those similarities and differences are really clear to users to help them understand when one Tool might be beneficial.

Brooke Holleman: Absolutely. Nicholas, anything to add?

Nicholas DeForest: No. Not really. I think that's fair. I mean, I think for the particular problem we're discussing today, they do have a lot of overlap and similarities. So, you know, if you're asking yourself, "Which Tool should I use," obviously REopt Light is available right now and DER-CAM will be available in the future. So I'd just say try them out and see what you like and go from there.

Brooke Holleman: Absolutely. Speaking of differences, Nicholas, I want to jump to this question at the Bottom. Could you talk about how demand flexibility can be included in a financial analysis?

Nicholas DeForest: Yeah. Sure. So currently, that's not part of this resilience design too. This Tool is envisioned as being a very simplified, somewhat limited version of DER-CAM to help people get started. In the full version of DER-CAM, you can do demand management, which includes different like load shifting strategies, load curtailment strategies; those types of things that you might want to or need to do in different circumstances with costs associated with them.

So there's a fair degree of flexibility there. But it's not part of the Web app version. I think, you know, we're in the process of modernizing the full DER-CAM in addition to building this Tool. And so, I think if that's an important part of your equation, I would say stay tuned to what we're doing; maybe get on our mailing list, and there should be a much more User-friendly version of full DER-CAM available in the future.

Brooke Holleman: Great. I'll jump to the next question 'cause this issue of carbon came up quite a bit. "How do each of the Tools consider carbon emissions?" We know that's a driving factor for a lot of folks.

Emma Elgqvist: Sure. I'll maybe start. And so, that's actually one of the more recent updates or editions we've done to the Tool. So we have someone who's noticed as I was Scrolling through...there is an emission section. I probably should've expanded upon that a little bit. But we allow Users currently to calculate emissions reductions from these technologies by either looking at an hourly data set – which comes from EPA Avert Annual – which I think is kind of more traditional greenhouse gas accounting has used these annual factors.

Or you can Upload your own sort of hourly greenhouse gas sort of emissions associated with the grid in your region. What we are – so report kind of your current and your optimized system. And it's more of a calculation. What we're working on adding right now is allowing users to enter constraints around those so that you can tell the Tool, "I want to achieve a 50-percent reduction in carbon. What technologies would I have to install to make that happen, and what are the associated costs?"

Brooke Holleman: Great. Nicholas, do you want to weigh-in on...?

Nicholas DeForest: Yeah. Sure. Again. I think this is an issue where full DER-CAM allows you to essentially do an optimization on carbon itself so you can develop a carbon-minimizing system design or do a multi-objective where you're sort of weighing both carbon and cost together and optimizing that. For the Web Tool, we don't – you can't optimize for carbon. But the results will report carbon savings from reductions to consumption or import. So that'll be part of the report, but you won't be able to sort of tune it or impost constraints.

Brooke Holleman: Great. I'm going to jump to this other question. What energy efficiency recommendations are included? Are these recommendations climate zone-based for HVAC, as an example?" I have some thoughts, but I don't know if either Nicholas or Emma, if you want to take that first.

Nicholas DeForest: Yeah. I can mention what we will be providing. I mean, I think the cost and performance of energy efficiency measures are highly – building specific obviously climate zone specifics. So, you know, we'll do our best to provide starting points for generic energy efficiency investments. But to be useful, I think they'll probably need to be tuned a little bit. I think some genetic climate zone recommendations will probably be part of what we include in our starting data. But I don’t think it'll be by every climate zone. It might just be like hot/cold climate binary.

Emma Elgqvist: Yeah. And likewise, I think the purpose and intent here is not to sort of recreate detailed building models to recommend specific measures. The

intent of this Slider is more to allow Users to at a higher level sort of explore how changes to the load would impact your investment decisions in distributed energy technologies.

Brooke Holleman: Absolutely. And if I recall, underneath that Selection there is a Link where you can go to the Better Buildings Solutions Center to see what other folks have done in pursuing different energy efficiency solutions by sector. That is at least a place to start with more to come. Great. Another REopt question. "Does REopt have or will you in the future offer energy inputs or offsets from geothermal and fuel cells both electrical and heat?"

Emma Elgqvist: Yeah. Good question. So one of the technologies we are adding to the Web Tool this year in collaboration with DOE's geothermal program office is ground source heat pumps. And so, that should be Live by the end of this fiscal year, so hopefully beginning of October. Fuel cells is something that we have kind of modeled as part of research projects with various entities. We currently don't have a specific plan to add it to the Web Tool, but I could see that being sort of a next technology to take a look at integrating.

Brooke Holleman: Great. And then just to tag onto that, any load flexibility features or things to add?

Emma Elgqvist: Yeah. So we've done some work in this space, primarily around electric vehicle...or, electric buses and seeing how managed charging as dictated by REopt can help minimize the increase in costs; in electricity costs from electric vehicles. And then, the other area we've done a decent amount of modeling around is for residential homes. And so, "Looking at if you can invest in a Smart water heater or AC within certain set points and thresholds around comfort bands, what additional savings can you unlock there?"

Especially in locations where net metering is going away or has gone away or where they have some residential pilot restructures either with demand charges or with sort of significant time of use components. We are working on but haven't quite figured out yet how to make the concept of flexible load sort of generic enough to apply to large commercial buildings, for example.

So that's a much more complex and interconnected system. So we're thinking about maybe training some of the RC models on the commercial reference buildings and allowing Users to kind of – with the commercial reference buildings explore that. But we haven't figured out quite yet how exactly the end product will look such that it's a feature that can be integrated into the Web pool and easily used by the end User.

Brooke Holleman: Great. Thank you. I'm now going to switch over to Nicholas for hopefully these two DER-CAM questions we could knock out. "Does DER-CAM have an API?" And, secondly, "Is there a way to custom-program partial shading, time of day and season and incidence angled to adjust model PV availability for a site?"

Nicholas DeForest: Yeah. Sure. So we're in the process of releasing an API. It's a pretty generic API. So if you're a researcher, if you know your way around HTTP requests, we will have an API available to send models to our Server. That's the full version. So as of now, I don't know that you would use the sort of resilient functionality for that. But if you're comfortable with DER-CAM, then there will be an API available. For partial shading – so yeah.

So the PV data that we provide in the Tool is pretty generic, and it assumes sort of like no shading or anything like that. But you can – if you're using full DER-CAM, you can customize the PV profile. So for instance. If you have data from modeling for your particular site, there's issues related to shading or whatnot, then you can overwrite the generic library data with your specific data and then get a model result for that. So yeah. That's something you can do in the full version.

Brooke Holleman: Awesome. Okay. Emma, back to you. "How does REopt account for energy efficiency as part of the resilience strategy?" I know we talked about this a little bit in terms of how energy efficiency can reduce the overall investment cost. But is there anything else we'd like to add there?

Emma Elgqvist: No. I think, again, we're not trying to replicate much more sort of detailed and complex building models that are out there. So right now, it's just looking at sort of reducing that critical load in each time step to allow for, you know, smaller investment in backup generation. I guess I will say if you're thinking about resilience planning more holistically, obviously that's a very important factor that should be taken into account. And so, there's other sort of Tools and resources to provide that more holistic approach. And then, REopt Light fits into the larger resilience planning in the kind of load...meeting the critical load with on-site assets.

Brooke Holleman: Absolutely. I can bring Nicholas into this Tool as DER-CAM is considering really specific energy efficiency measures as you're looking at one in particular that can reduce critical loads – lighting and HVAC and other plug loads, things that you're going to want to definitely incorporate as part of your resilience strategy. I don't know if you have anything to add.

Nicholas DeForest: Yeah. I mean, the goal for what we're doing with DER-CAM is to basically consider but not force efficiency options. So if you have a set of different efficiency options that you're considering and some maybe have really low price points and others have higher price points, the model will adopt the ones that make sense. So it's really supposed to be providing guidance about which of those investments make the most sense, and, "How do they complement other strategies that are being considered?"

Brooke Holleman: Great. My question for both of you. This question was asked around if there are experts available to talk through REopt Light. But if Users were to go to either of your Tools, do they have access to experts if they have any questions?

Emma Elgqvist: Yeah. So a good place to start for REopt Light is, there's a set of seven now, I think, short – kind of two to five-minute videos and demos that will walk you through some of the key inputs and outputs for the Tool. There's also a complimentary kind of factsheet again; just a few pages on different sections of the Tool that are pretty easy to scan through. There is a technical User manual, but it's at least 100 pages and maybe focused more sort of towards advanced Users. But then, absolutely. There is – if you go to the Web Tool kind of Send Tool feedback, it's reopt@enroll.gov. We'd be happy to answer any questions that you may have.

Nicholas DeForest: Yeah. And it's similar for DER-CAM. We do our best to provide guidance in terms of like documentation and videos. And then also if you have specific questions, if you Send those to the DER-CAM E-mail address, we do our best to address those in a timely manner.

Brooke Holleman: Awesome. I have one more question that I will ask before we wrap up. There's some discussion in the Q&A about incentives and, you know, other credits. Do those – are those pulled into the analyses whenever you Select the turf?

Emma Elgqvist: Yeah. So short answer, no. They're not. I think that would be really fantastic to have a resource similar to the utility rate database for incentive. There is the desire Website, and we've kind of made some attempts at accessing some of that information programmatically. But there's just such a breadth of different options and nuances to the incentives. They're often changing quickly, are being subscribed to rapidly and really dependent on a lot of different factors.

And so, it's hard to jut base kind of on a location get the complete set of incentives that would be suitable for a specific building. And so, we encourage Users to go onto the Desire Database and figure out – or, Desire Website and figure out which incentives are applicable. And then, there's

lots of different ways to sort of characterize those economic benefits in the Tools.

So you could do percentage-based, capital cost-based. You can do production incentives. And then, you can stack and couple all those. And then, I think the second part of the question was the sort of net metering or wholesale rates. And so, again, that's something that the User can enter both the net metering limit, what the – whether the generation above the site load is credited at kind of retail or a different rate. So it's not automatic, but it is in there.

Brooke Holleman: It is possible. Great. All right. Well, I think we'll wrap up Q&A there. Thanks, everyone, for all of your great questions. I want to be sure to flag our Additional Resources Slide where you can refer back to the Links that we discussed today that contains Links to those Tools and also the funding resources that we talked about earlier. All right. Next Slide. And last but not least but perhaps most importantly, you can stay connected to us by Browsing our State and Local Solutions Center of more than 400 Tools, resources and best practices to keep up with the latest Tools and resources.

And you can also subscribe to the State and Local Spotlight. Our monthly newsletter will deliver our latest activities to your Inbox. If you have questions about any of the resources discussed today or you want to stay in touch, please contact us directly at state and local at ee.ue.gov. And finally, the Better Buildings Solutions Center has over 3,000 solutions to help you find proven and cost-effective strategies to help you reach your energy, water and waste production goals. And you can check out this video to learn more. *[Video plays] [No conversation, 1:27:15 to 1:28:04]*

All right. And with that, I'd like to invite you to attend our Better Buildings Summer Webinar series. Starting in June, partners will discuss a little more pressing topics folks are facing, share best practices and innovative, new approaches to sustainability and energy performance. To register, go to Better Buildings Solutions Center and Click on Events and Webinars. And with that, I'd like to thank our panelists very much for taking the time to be with us today.

We've launched a short feedback survey in Slido and ask that you please take a few moments to give us feedback on this session. Your answers will be totally invisible to other attendees. We rely on this feedback to design Webinars, future Summits and more. And this Poll will be open until tomorrow morning. I'd also like to thank our colleagues John Agan, Virginia Castro and Jane Roshen, our colleagues at FEMA and our support staff Chris and Allie for making this all happen today. Thank you all and have a great rest of your week.

[End of Audio]