Operator: Broadcast is now starting. All attendees are in Listen Only mode.

Rois Langner: Hello, and welcome to the first installment of the Better Buildings Summer Webinar Series. In this series, we are profiling the best practices of Better Buildings Challenge and Alliance partners and other organizations working to improve energy efficiency in buildings. We hope you all join us twice a week for the remainder of the summer and stay tuned for more information on our 2020-2021 webinar series launching in the fall. Next slide.

I'm your moderator, Rois Langner. I'm a Senior Research Engineer at the National Renewable Energy Laboratory in the Communities and Urban Science Research Group. My research has focused on energy efficiency, demand flexibility and resiliency in commercial buildings. Next slide.

I'm also the Technical Lead for the Better Buildings Alliance Renewables Integration Technology Research Team, which is dedicated to providing our Better Buildings members with resources, information, and guidance on the strategic use of renewables, building load flexibility, and great coordination. If you're interested, please feel free to contact me and join our team. I'd also like to mention that we have Theo Kassuga on the call today. He's from Guidehouse. Theo has been supporting our Renewables Integration Team, and he will be helping us with Q&A at the end of the call. Next slide.

So, I'll take a brief moment to thank you all for being with us today. We have a wonderful session prepared and some fantastic speakers we're going to introduce in just a moment. This webinar, although the first of the Better Buildings Summer Webinar Series, is actually a part two of a two part webinar series that the Better Buildings Alliance, EMIS, and Renewables Integration Teams are jointly hosting on "Behind the Meter: Distributed Energy Resources." Part one was held on May 6th with Hannah Kramer from Lawrence Berkeley National Laboratory. I provided a link to the recorded webinar in the slide deck if you're interested in learning more about the current market landscape of distributed energy resources and the value to owners. Next slide.

So, with that, our agenda will then include a brief recap of the first part of this two-part webinar series from Hannah Kramer, and we are thrilled to have Gary Mullaney from Kaiser Permanente speak on methods, best practices, and lessons learned that Kaiser Permanente has experienced in integrating and optimizing

distributed energy resources into their building portfolio. Lastly, we will have Q&A at the end of today's session. Next slide.

We're excited to announce that today we're going to be using an interactive platform called Slido for Q&A. Please go to Slido.com now, using your mobile device or by opening a new window in your Internet browser. Today's event code is #DOE. If you'd like to ask our panelists any questions, please use Slido to submit them any time throughout the presentations. We will be answering your questions near the end of the session. You can also select the thumbs up icon for questions that you like, which will result in the popular questions moving to the top of the queue. I'll give everyone a few moments right now to open up Slido and we're gonna be launching a poll here shortly. So, please also reach out to our webinar organizers through the GoToWebinar chatbox if you run into any issues.

So, let's just take a brief moment to open Slido. Again, the event code is #DOE, and hopefully, you all are logged in. And with that, let's launch the first poll, here.

Great. So, we're just kinda getting a feel who's in our audience, what industry are you from—and you'll notice this word cloud poll coming up and the more popular industries are going to show up in these larger texts on the screen, here. So, we've got a lot of state government, higher education, ESCOs, energy consultants, NGOs, manufacturing. Just so everybody knows, we had about 450 registrants for this call today. So, this is helping our presenters, and hopefully you guys know who's in the audience today, and we really appreciate you joining and it's great to see all of these different industries attending this webinar.

So, great. Let's close the poll and move onto the next slide.

So, we have a great lineup of presenters today. Our first panelist is going to be Hannah Kramer from Lawrence Berkeley National Lab. Hannah is an affiliate to the Building, Technology, and Urban Systems Division at Lawrence Berkeley National Laboratory. Ms. Kramer holds a Master's degree from the Energy and Resources Group from UC Berkeley. Her research focuses on building energy performance monitoring and diagnostics and supporting how owners implement monitoring based commissioning. Ms. Kramer has been the author of numerous studies and resources on commissioning and building performance.

After Hannah, we will have Gary Mullaney from Kaiser Permanente. Gary is a Senior Energy Consultant at Kaiser Permanente, an integrated health care system where he supports affordability and environmental stewardship goals. He works on a wide range of projects in energy and water management from distributed energy resource deployments to efficiency and conservation efforts across the country. Prior to joining Kaiser Permanente, Gary served on active duty in the U.S. Army where he deployed multiple times in support combat security operations. Gary earned a Bachelor of Science in Mechanical Engineering from the United States Military Academy and an MBA from the University of California at Berkeley. He is also a Certified Energy Manager and is married and the proud father of two little girls.

So, we're excited to have both Hannah and Gary be our speakers, presenters today. And just another note that we do have Theo Kassuga from Guidehouse who will be on the call to help moderate questions at the end of the hour.

Again, a reminder, please send in any questions through Slido by going to Slido.com and then typing in the event code #DOE. We will try to get to as many of these questions as we can. This session will be archived and posted to the Better Buildings Solutions Center for your reference as well.

So, at this point, I'd like to hand things off to Hannah Kramer. Hannah? We'll go to the next slide.

Hannah Kramer: Thanks, Rois. Next slide, please.

Well, it's great to be here, and it's really excellent to have so much interest in distributed energy resources. So, I'm gonna be very brief in going through kind of an overview to set the stage for our feature presentation with Gary. Next slide, please.

So, to kinda set the stage, we're gonna talk about what do we mean by distributed energy resources. It's maybe a review for many of you. We include all these resources on the right hand side in these bubbles—solar; PV; battery storage; thermal storage; cogen; flexible building loads, so the ability to change your demands when called upon; and flexible ED charging.

So, there's all these resources out there that an owner might invest in, and one common theme in installing these resources is a need for integrated control, so you're not operating, necessarily, these things in a silo and they're co-optimized together. So, we have in

the middle in the blue a DER optimization software, which can take a number of forms. It can optimize your battery storage with other resources, it can put everything all together. This is kind of an emerging area for how to optimize at the whole level for all your DERs.

So, some research we did in the part one webinar where we go into what vendors are out there that have DER optimization software, how they integrate things, and what you can expect when you go and look for vendors in this area. And so, I won't go into all that, but I just wanted to set this landscape here.

In the graphic, we also have an overlay of EMIS. So, EMIS is Energy Management and Information Systems, which would provide the data, the integration layer for data visualization, analytics, fault detection. So, EMIS has generally been focused on HVAC systems, but having EMIS also bridge from HVAC into DERs is an emerging area that we're keeping an eye on and we'll be updating folks over time with how that progresses.

So, the industry currently is more of a siloed control phase. There may be a separate control system for each of these DERs. But then again, as I mentioned, that's starting to change as the technology advances and integration becomes easier to achieve.

I'll mention a couple things about grid-tied versus microgrid. So, grid-tied means that you'll use a power from an electric grid when necessary but you'll be using your DERs when you can, and it also means you can export to the grid when your generation exceeds your load at the site. But if you want to go to a microgrid, you have to design the system for a microgrid. You have to design it so it can isolate from the grid, operate when the grid is down and, you know, most DER systems today are not microgrids. It takes a little more effort to make them able to be a microgrid and island from the grid.

So, there's lots of benefits. We're gonna talk about that in a second for why you would care about fighting DERs on your site. Next slide.

I'll just say a couple more things first about the optimization control and why those are important. So, what is being optimized is kind of summarized on this slide, here. There's lots of inputs into DER optimization. As you might suspect, there's utility rates, there's your solar forecast. This goes down to the hourly level with cloud cover and so forth. You have the financial value of the

backup power—so, do you need to keep power in reserve, do you need to keep a certain amount of storage in your battery and reserve in case the grid goes down. You might have a high value for backup power and want to keep that in reserve. You want to know your state of charge for your battery and thermal storage, your load forecast so you can forecast how much peak demand reduction you're going to need, on site generation, and of course, what kind of market rules you're operating in. The optimization strategies then put when you should charge or discharge your battery, how you should control your EB charging or flex your building loads.

So, it gets—as you add more DERs, these optimization strategies get more complicated and harder to do without algorithms to make that happen. Next slide, please.

These value streams, Gary's gonna go into examples from Kaiser Permanente on the benefits to Kaiser. In the big picture, the ideal environment for DER economics is high peak demand charges and the ability to achieve multiple of these DER value streams to make the cost effectiveness the best possible. These value streams aren't rank ordered. It depends where you're located and what your utility rates are, what programs you participate in. And in general, though, this first value stream saves a lot of costs for owners in reducing your monthly peak demand charges using your storage or your flexible building loads.

So, really managing that peak demand, reducing it to the minimum as possible can save a lot of money. Owners can also do what's called energy arbitrage, where you're using your stored energy during times of high energy crisis, so you're on time of use pricing, you can save money that way. And of course, there's resiliency benefits, there's other revenue opportunities beyond just energy arbitrage and peak demand charges. There's, you can be a part of demand response programs or other grid services programs and then, you know, the ability to use more of your own energy on site. If those are renewables, you can have carbon reduction benefits as well. Next slide, please.

I just wanted to show some of the results of your research. This was summarized in part one of the webinar. We interviewed DER solution providers to understand their products and services as well as interviewing owners to understand what their needs were. We talked with two main categories, the solar and the storage folks, and multiple DER vendors, which were beyond just solar and storage, as you can see from this chart, here. This is a snapshot, of

course. These industries are evolving, the players are evolving. But it's interesting to see that the building automation system vendors are focused on multiple DERs. They're already in the building control space, which includes combined heat and power and thermal storage and flexible building loads, so they're adding solar and battery storage and then optimizing those things together.

And then the solar and storage vendors have a real focused solution for owners that already have solar or want to put a solar storage package together, and they often finance that package together, so it's an easier lift for owners that want that package of solar storage.

So, more information on this is in the market brief that we just published. The link will be at the end of this presentation. And so, Gary's gonna talk about how Kaiser relates to all these categories of DERs and I'll hand it over to Gary, who will describe all those great details. Thanks.

Rois Langner: Hey, thanks, Hannah. And actually, before we pass the mic to Gary, just a quick reminder to our audience to send in any questions you may have through Slido by going to Slido.com and entering the event code #DOE. We are collecting those for our Q&A period at the end of this session, and we actually have one more poll for the audience before we dive into Gary's presentation so let's launch the second poll, here.

Alright, everyone. This one is about DERs itself. So, which DERs do you have on site? And we'll see—a lot of people have solar PV, electric vehicle charging is winning second in the race, here. Got it. Battery storage, flexible building loads, thermal storage and combined heat and power—so, great, kind of in the order that we have these listed. Wonderful, that's interesting to see what's happening in all of your buildings on the attendees to this webinar.

So, great. Let's close the poll now. Thank you, guys, for participating and with that, we'll transition over to Gary at Kaiser Permanente. Gary?

Gary Mullaney: Thanks. Next slide, please.

Thank you, everyone, for joining. Thank you for the time to present here. Hopefully what I can share will be helpful. We have certainly done a lot in the DER space, and I think we've definitely learned a lot along the way, so hopefully, I can share some of our lessons learned so you don't have to learn kinda the hard way as

we did—unfortunately, in many cases. Alright, next slide, please. Next.

Alright, so, Kaiser Permanente, for those that are not familiar, Kaiser Permanente—and I'll admit before I joined, because I grew up on the East Coast, I really didn't know much about Kaiser Permanente. Then I went out there and interviewed and joined the team on the West Coast and realized it was kinda ubiquitous if you're on the West Coast. We're an integrated health care system, a large system, almost 12.5 million members, and 80 million square feet. Large presence on the West Coast, particularly in Northern and Southern California and up and down the West Coast, but we also have a presence here on the East Coast in Georgia and the Mid-Atlantic states, Maryland, Virginia, and D.C., and Colorado as well, so. Next slide.

So, why are we doing it? Why is distributed energy resources important to a health care provider? So, number one is cost and affordability. Our mission is to provide affordable health care. We're a nonprofit system. So, delivering affordable health care, while energy may not be the largest cost we have, it is still a cost, not an insignificant cost, and the more we can cut down on our expenses, the ones that we can manage, the more affordable the health care we can provide, the better the health care we can provide. So, that's our number one driver.

And second is our environmental stewardship goals. We've set ambitious goals. We're actually, our first one is to be carbon neutral by 2020 and then carbon net positive by 2025, taking more carbon out than we are putting out. So, we should be able to announce our carbon neutrality and will achieve it later this year, which is exciting. So, that's kind of the second driver, and those two things have gone hand in hand for years.

More recently, resiliency has really been a driver and that has, I think, come to the forefront with the wildfires in California and then more recently, now, the kinda proactive public safety power shutdown that the utilities can implement. So, that has impacted quite a few of our facilities, I think took some folks by surprise. I think we saw it coming, but it just was hard to get out in front of everybody. So, that's really shifted a lot of our focus now, so I'll talk a little bit about that. The vast majority of our DERs, as Hannah mentioned, we're kind of aligned with the industry. The vast majority of ours are not deployed to provide resiliency. They do not, they all have to shut down when the grid goes out. But we are trying to move in the direction of providing solutions that

provide resiliency as well as cost savings and a sustainable approach. Next slide.

So, I'll start actually on the right—I know it's a little counterintuitive. So, what I did was, I took the chart that Hannah had and I had overlaid which of the distributed generation DERs that we have in our portfolio which are mostly EV charging PV battery and for combined heat and power, we have both traditional cogen units as well as a pretty large portfolio of fuel cells. And then what I did next was kind of put an icon that should, in my mind, symbolize the, what is the driver associated with it. I couldn't come up with a good icon for resiliency, so I put a little flame, since it, the wildfires are really most pressing for us in California. So, that's on the right side.

Our general approach to tackling this has been just kinda building a strong team and at the executive level, that involves having the executive sponsorship to really help drive this and get the buy-in at the C-suite to get these projects approved, especially when we're getting these portfolios pushed through, they often are going in front of the board to be approved since they end up being 20 year power purchase agreements for maybe upwards of 30 sites. So, your dollar value goes up there pretty quickly and ends up requiring at least CFO if not CEO or board level approval to get these projects through. So, having the executive leadership in alignment has been really critical.

We have a strong procurement team that has worked with us from day one and it's the same team that works on all of our projects, so they're able to help us navigate and put in the right contractual terms to protect us and to navigate the exceptions from bid as necessary or run the RFPs.

And then the third one, which I think has really been one of our kinda secret sauce is, we have a really strong advocate in our Treasury team, who has taken—sometimes, it can be challenging through financing, but he is so good at going through the terms and making sure that we get the best possible financing, and coming up with some really innovative and creative approaches to getting these projects through, I think that's really helped. And then when they do need to get go through, he is the right champion who can talk to all those CFOs at the regional level as well as our national CFO to get these projects through.

So, I think at kind of a national level, a strong team to get these through, and then locally, we really leverage a lot of our

construction and facility operations teams to execute the projects. Like I said, we do leverage a lot of third party financing on most, if not all—EV charging, not as much, but for the rest of them, we pretty much always use third party financing. As a nonprofit, we can take advantage of all the tax incentives or our tax, the ITC. So, by using a PPA approach, we can kinda indirectly take advantage of those deals.

Third, the way we approach things—and this is a lot, this has to do with the way our organization is structured. We developed the programs kinda nationally, and then we'll execute them regionally or locally. That allows us to put kinda the right minds to it that have the bandwidth and the expertise to get the projects up and running under contract, get everything set up, and then after that, the idea is that they should be either plug and play, kinda like EV charging ends up being more plug and play where we're less driving that, but more as the need's there, it's a program that exists and people can just plug into it as they have a need or an interest, or it can get pushed down if there's more of a top down approach, then the regions can drive the projects through completion because they have the local relationships to do a lot of the—probably one of the most important parts of getting these projects done is disruption planning, because in most cases, these are projects going in on active sites, so you've got hospitals going on and I think parking with solar is always a challenge, especially in places like California if you're in some of these cities that parking is such a premium.

The fourth piece is, I'd say the team has taken a really, a broader long-term financial approach in evaluating the program. So, I'll give you two examples.

One is, there's been cases where individual projects might not pencil out, but because they're part of a portfolio, we're able to get a larger set of projects at a lower rate and better overall savings, because the leadership was able to look and say, "Look, individually, some sites might be underwater, but we're gonna, this is gonna look good regionally. Look at"—it's gonna be a better option at the regional level and they're able to take that and deal with kind of the challenges locally if a site doesn't look as good. Whereas, I think some folks are more like, every individual project has to stand on its own. And that's allowed us to do some larger scale deployments.

And the second one is, there's been cases where, I'll say for one of our portfolios, our treasury team really pushed for a flat towing

rate versus an escalation, which definitely made it more challenging to get projects to pencil in the first few years, but in the long-term, it will definitely provide us much greater savings. It's just, it definitely took some finagling to get people through understanding that the first few years these projects might be more like break even and then the savings were really long-term. Because we really look at a lot of these projects as a hedge against grid costs that are continuously going up. Next slide, please.

So, for solar, our goal for a while has been around 70 megawatts at 100 sites and we're about on track. We have 44 megawatts deployed to 65 sites so far with another 26 megawatts, 32 sites in the pipeline. We did start about 10 years ago, so I've been involved since 2015, and four out of five of those years, I've been deeply involved in the program. So, we've really got a lot more acceleration the last few years. I think as we, our first effort to scale it definitely had some challenges. And now we've, I think we've kinda figured it out, so, some lessons learned along the way, and I'll share that.

Again, leverage the power purchase agreement. With the solar, we have a buy-out option and financially, it actually makes sense for us to, generally, to buy out these projects after the ITC benefit has been exhausted, and at that point, we just have to enter into an O&M agreement. Lessons learned—so, a couple things. One, capital project integration, we thought that'd be easier than it was, so for putting in a new MOB or a new medical office building or a new hospital, why don't we put in the solar as we're putting in the project. There's already construction, things are torn up, let's just do it at the front end.

And it does make sense in theory if some of the challenges are, you end up with essentially two GCs on the ground, you've got a GC doing the project and then you've got the EPC that's delivering the solar, and just that coordination certainly caused some challenges on our first few. Now, we've kinda figured it out and a lot tighter coordination needs to happen, and if you can do that, then you can get a lot of benefits, because you end up not having the disruption of working on an active site and have to deal with parking disruptions. So, it's certainly harder than it looks, but it definitely has been valuable, so pretty much every new construction project going up across Kaiser is evaluated for solar and we will go forward with solar as long as it makes sense financially.

Second, value the good EPC developer. Like I said, our second—so, we did a first portfolio in 2010, which was before my time.

When we did our second one, it was right as I was coming on board, and there was definitely a bit of a bit off more than we can chew on that one, or the developer did, anyway. We certainly had some challenges with that. Their financing ended up falling through, which ended up leading to our treasury choosing to be involved in all financing going forward. So, that's that third bullet of involvement in financing.

But we ended up later picking out that portfolio, the projects that didn't go forward, in a new iteration where we actually used their EPC who was, Amaresco has been our partner for solar since, and now we've really got a good partnership going on and they do a lot of things that are pretty open book and we've been pretty creative in the way we've done the financing.

The last thing I'll say on solar is that now, with the financing we do now, we actually do a lot of prepaid, which is allowing us to drive the price down even better and it makes more sites look good. So, it's a little bit of almost a hybrid of a PPA and a capital. We actually co-own the project company for the solar systems going forward, so that's kind of more recently what we've been able to do to be creative about it. Next, please.

As far as fuel cells go—so, we use solid oxide fuel cells from Bloom Energy has been our partner on these. We've deployed 29 megawatts with another 11.5 in the pipeline, which should be done in the next couple years, and that's covering 40 sites. The picture here is actually our Napa Data Center. That's 4.5 megawatt fuel cell deployment. I think at the time it was the largest, it was Bloom's largest deployment, and by far our largest deployment. Again, we leverage the PPA style financing, here. A little bit more creative, and so, in 2012, we did our first round of projects which was a smaller portfolio. One of the challenges, we did more of a pure PPA where we just paid the all in price of electricity and Bloom procured gas for those.

The problem was, at the time, gas prices were high. They suddenly drooped, and all of a sudden, we were kinda underwater. On the second portfolio, we said, "You know what? Just charge us for the electricity that your fuel cells produce. We will go out and procure gas on our own," which has generally worked out better, because now we can choose our strategy for procuring gas. We procure enough gas already, this is just one more set of devices that we need to get gas for. The challenge on that is, it does create some additional volatility. So, if gas prices go up and we don't have a hedge in place, we are more exposed to those, so we have seen that

in a couple of our projects. I would say last year when gas prices spiked in the winter, we saw, it definitely hurt our economics on those projects, but it's still manageable.

Now, what we're looking for, especially with our fuel cells, is we're looking to deploy them in more of a resiliency configuration. Bloom has familiarity with doing this. We just, until now, hadn't been able to make the case, the business case to do it. So, now we are working on getting a couple projects to, we have a few that are pending approval. And so, that's pretty exciting, and that's where we really see the future. So, I think, at this point, we don't want to deploy any more fuel cells unless they're being deployed in a grid in a resiliency capacity where they can be serving, like, a microgrid.

The last one I'll say about fuel cells is, one of the challenges—and this should be pretty obvious, but it's something we kinda learned the hard way is just sizing the systems is particularly important. If you size them too much, you're gonna be exporting a lot and you really don't want to deal with fuel cells, because you're not getting that you're gonna be upside down if you're exporting too much, but you want to size them kind of as aggressively as you can, because that's gonna reduce your peak, but you need to account for all the different things going on there and I think sometimes there were some sites where we had solar plans and we had fuel cells, and in one case we actually had a cogen unit that was already there that we actually didn't know about, and somehow, that got over—was overseen and Bloom did not account for all those loads and they oversized the fuel cells on one end. So, now, we're working to relocate extra capacity at a couple sites. Next slide.

EV charging—I won't spend as much time on this. We have been successful in deploying quite a few chargers, mostly across California, but we are expanding outside of California as well. We did RFP back in 2014, awarding EV Go as our provider. They do Level 2 chargers for us. I know they mostly do fast charges. Level 2 generally make more sense for kind of our usage patterns. We just have a master service agreement that kinda covers the whole gamut, so this is pretty turnkey lessons learned. I think it's been beneficial having two installation options—we have a turnkey option or we have kind of a Kaiser led option where we do the project and they just procure the chargers and install the chargers for us, but we do the rest of the work, which is what we've done more of now. But early on, I think having turnkey was helpful and folks weren't familiar with these projects.

While EV charging doesn't save us money and it's not—sometimes not as much of a focus, it really is a much, a very member and employee facing sustainability effort. So, even though you could be doing great work, maybe, on the energy efficiency side, nobody sees that, but they will see if you have EV chargers or not. So, EV and solar are probably two of the most kind of in your face, we are doing sustainability. So, it really helps to have them in there to kinda maintain consistency.

Third piece—leveraging incentives. We definitely, I have to look at my notes, but I think we leveraged well over $1,000,000.00 of incentives to get a lot of the projects in, especially early on with EV chargers. Now, they're pretty much just going in as—as new construction goes in, the chargers will go in. And then we've integrated it with our capital program, so this is just—it's just a part of the program now. We've kind of, as a new medical office building is going in or a new hospital or any building is going into Kaiser, they kinda know, here's all the different—so, if we want solar, here's who we need to contact, and they can just plug into the program there. If we want EV charging, just plug into the program there. So, we try and make it as easy as possible for them so that each project isn't reinventing the wheel, and instead, they're just plugging into what we have set up as a master agreement. Next slide, please.

Battery storage. This is where I could probably share a lot on lessons learned. And this is where we have, it's probably newer for us. So, we did—let's see, back in 2017, we did an RFP aimed at the, I think it was a round of California SGF funding was coming out. And so, we did an RFP and we selected two vendors initially and we had quite a few projects that we thought we were gonna go forward with, and then one of the vendors, all of the projects ended up dropping not necessarily for their fault, there's a lot of reasons they dropped. In many cases, we had a lot of other things going on at the same time, so trying to layer solar and fuel cell and battery all at the same time by different vendors can really be challenging. It probably makes more sense to have one do it if you're gonna look at putting in multiple DERs having one developer give a more holistic approach would make more sense, because the load is changing and trying to model what the load's gonna look like before and after.

These were for demand management. We ended up having five projects go through. Four of the five are complete; the last one will be done later this year. These are all down in Southern California

in the LCR program, so they're part of this virtual power plant concept that SCE set up.

So, we have—so, that's been pretty exciting. Because it's part of that program, they ended up being larger batteries. All of them are six hour batteries, so they're pretty good sized batteries. The financial performance has been mixed, to say the least. One project definitely—and I'm showing our numbers in this case—one of them looks pretty good, pretty close to what was predicted. One is obviously upside down, and that's where a lot of the lessons learned come from.

So, what I'll say for us, we're grateful for is, we had a good contract in place. We had a shared savings model, so we only paid the vendor if they could demonstrate that they saved us money. So, these sites that weren't saving money or were underperforming, we weren't paying them some fixed amount, that we were the ones taking it on the chin. And then we also had a true up provision. So, at the end of the year, if they perform poorly—like, in this case at Bellflower—we're actually gonna get a check cut from the investor to make us whole on that. So, that was well done on the contracting side.

So, lessons learned. With batteries, what we found was, there was definitely a lower life cycle savings in margins, especially compared to solar and fuel cell, which made development more challenging. There wasn't any room to—so, solar, we'd come in and there was a certain planning factor and then the site really pushed back on parking and then we had to negotiate what the disruption might look like. There were some extra costs. Quite often in the project, there would be margin in the avoided cost to absorb some of that cost in the PPA and we would just adjust the PPA price. That was much harder to do with this model and with just what the savings were, and that's why a lot of the projects fell through with the first, with one of the vendors.

Also, achieving consistent savings, like I said, it was kinda more challenging than it looks, for a variety of reasons. One, load variability. We provided all our load data, gave them what we had. They wanted historical, but historical loads is not necessarily always a good indicator of future load, and we saw in many cases that the actual load for the first year or the first, in some cases, half a year of performance of operations was different than the modeled year.

Solar forecasting. So, I know this is—and there's some reasons for this—solar and battery have always been sold as a really good fit and a good…and I see it and we're definitely still in favor of that. But there are some challenges with it, especially when they're not paired together by one developer. So, in this case, Bellflower is actually this case, they have—they were one of our first projects for solar back in 2010, so they had one of the early solar projects, which then was bought out. And then later last year, we put in battery storage. The solar forecast—the solar performance was so varying, it made it really hard for the battery system to, the optimization system to appropriately forecast it.

And that's really why they ended up costing us money, because they would think that—they were expecting the peak to be X, it ended up being Y, and they ended up, because they charged up to a certain amount, they ended up causing that peak, and causing us, they were creating peak themselves in charging the battery. Another factor on that was, they had, because of the contract they had with LCR, they are restricted, and when they can charge the battery, they cannot charge during the day at all, they have to charge at night. So, you actually don't get the same benefits of solar plus battery. It's basically solar and battery, but in no way connected.

And I guess the third piece is, this was—in this case, AMS was our initial vendor, they developed these projects and they put them in and they had their Armada platform. The problem was, AMS, when we started it, was kind of in the startup mode, and they've since shifted away from kinda the behind the meter work and they're now doing more, I think, large scale kinda utility scale projects, and so, they really shifted a lot of their support away from this effort. And so, we just didn't have, they didn't really have the data science support team behind them. So, really make sure that, whoever is gonna be the operator of your battery, the optimization system, you really do your homework. You make sure you've got good contract provisions in place to protect yourself, because the investor has actually moved away and now that these projects are all being moved over to STEM for, as the operator. So, the same investor, but they've just, they've moved from AMS over to STEM for, to operate the projects going forward. So, we're hoping we'll see some better performance in the next year. Next slide, please.

Cogen, I won't speak too much on this, and I know we're kinda short on time, so this has never been done, this has always been done locally. As far as construction projects, we haven't had any national effort around cogeneration. I'd say the two things, two

comments I'll say—performance and O&M have been a common issue. A lot of our cogen units have just either bad O&M providers or just, they've gone down. Until they got that figured out, they just haven't quite been as beneficial.

We are exploring the opportunity to try to move some of these to reconfigure them and add resiliency. So, I'm not sure how much opportunity there is, but at this point, we're looking at, I figure all chips are on the table to look at opportunities for resiliency, so that's all I'll say on cogen. Next slide.

Microgrids—like I've said, so, we had, our first microgrid was originally from the hospital, that was done through a California Energy Commission grant, and a lot of excitement around it. It's the first one at a California hospital. It's got some limitations, it's not terribly large. It's only backing up the life safety branch and it's really a backup to the backup with a manual transfer switch, so that's what we could get through OSHPD, which was great, and we're hoping to build off of that.

What I will focus on, we have a challenge with valuing resiliency as an HMO. We don't, it's not easy for us to tell you how much we're gonna—how much we're losing or what the value of resiliency is. So, that's really been a challenge because, in this case, we had CDC funding, but in other cases, we don't have CDC funding, so how are we gonna get these projects to pencil out? We need to be able to value resiliency.

The cost of isolating critical loads—so, this goes to existing buildings, and so, we were looking at some MOBs that were interested in it, but they didn't, their loads weren't configured to isolate their critical load, so the cost of going in there and reconfiguring them so that we could isolate critical loads and then add a battery or add something that would provide resiliency was definitely challenging. So, now we're trying to put that into our design standards, so all new medical office buildings are required to be what we're calling microgrid ready and have these critical wards isolated so that it won't be so expensive to reconfigure them down the road.

And then just getting alignment on resiliency goals. This has been, it's a little—microgrids are definitely more complex than some of these other options. They're less plug and play, so you really gotta understand what the needs are at the site, and then getting alignment between the needs of the site and then the needs of maybe the regional leadership. We've definitely seen cases where

the regional leadership says, “We need to make sure that we can keep surgeries going, so we need to make sure we're backing up the critical loads so that we have redundancy on those loads and we can keep hospitals going.” So, it would be, say, the microgrid plus the generator would give you redundancy to keep surgeries going, whereas the local site’s like, “I don’t care as much about that. I wanna make sure that our supporting MOB or the parking structure, some of these other buildings can stay running, or that we can have the cooling that we need, because what’s required to be backed up by OSHPD does not actually give us what we need to really operate effectively.” So, that’s been a challenge. Next slide.

I think I've mentioned most of these along the way—recording and integrating with multiple vendors. I think that’s where we've had a lot of challenges is when we started, when these programs started overlapping. So, I'll give you one example was, our San Leandro site, we had solar coming in, they already had cogen that we didn't really know about because it was done when the project initially was—when the hospital was initially constructed, and then we were trying to add fuel cell and we were actually trying to add battery as well and trying to put all three assets in development stages at various, and trying to coordinate between all those vendors just made it really challenging. So, really, that challenging, if you're trying to do multiple DERs simultaneously, I think it would be better to have one vendor try to do it if you can.

Construction coordination—early on, that was a bit of a challenge, but we've kinda figured that out. We've leveraged our own internal construction expertise under just how to get them paid effectively under a PPA can be challenging.

The last thing I'll say, because I know I'm over on time, is around performance and bill monitoring. Now that we have a lot of assets up and running, we'll definitely be asked how are we doing, are the systems performing well, are they financially performing well? And sometimes, that’s been, you're relying on the vendors and sometimes there’s challenges. So, with fuel cells, effectively knowing how much they're net metering, we have learned that their amount of net metering is a key factor in their financial performance, and sometimes a plan for them to net meter that saves 3 percent, and if it turns out they're net metering at 8 percent, that has a material impact on your financial performance.

And solar—is it underperforming or is it overperforming—there are some provisions in place, but just kinda keeping track and monitoring all this stuff is, I think, something we didn't put as

much attention to on the front end as we should've. And then even auditing bills and PPAs, standard utility bill monitoring payment system. So, we use ENGIE Insight, formerly Ecova. They're used to doing utilities—well, these solar and fuel cell battery are not the same as utilities, so they have challenges sometimes in handling them, so we've definitely…and how to properly audit them is also challenging.

Alright, I think that's it. I was probably a little over on time.

Rois Langner: Thanks so much, Gary. That was a great presentation and really interesting to get Kaiser Permanente's perspective on DERs and integrating them into your portfolio, especially on the lessons learned. That was really helpful.

So, at this time, we will be taking your questions. So, we'll transition over to Slido. Again, please go to Slido.com. The event code is #DOE, and you can enter your questions there or you can like or click the thumbs up icon. If you like one of the questions, then that will move that question to the top of the queue.

So, Theo, are you ready to take it from here?

Theo Kassuga: Yes. Hello, everyone. Thank you, Rois, and thanks to everyone who already submitted questions. Even if you don't have questions, if you log onto Slido with the #DOE code, you can also up vote or thumbs up the questions that you like the most, which will prioritize them. We're kinda short on time, so we're gonna try to hit them in order of most up votes here.

So, with that, I will try to direct the questions to the speakers according to when they came in, but for the other speakers, if you wanna chime in, of course, please do so—don't worry about interrupting me.

So, we'll start with the most up voted here, which also led to a very interesting kinda back and forth between our audience, which is, "Have you conducted an analysis on the tradeoff of storing excess energy versus immediately exporting the excess energy to the grid to offset the carbon on the grid?" I believe that question will be for Hannah.

Hannah Kramer: Yeah, so, there's lots of factors in, you know, first of all what you're optimizing for. Are you trying to minimize carbon in your carbon planning, or are you trying to financially optimize the system, and what kind of net metering laws you're involved with,

what time of day that demand is. So, there's lots of variables. I think the answers to that question were—maybe I'll just leave it at that so we can move on to questions for Gary.

Theo Kassuga: Alright. Thank you, Hannah. Okay, so, we'll move on to a question for Gary, here. So, "Does the DER optimization software integrate with BMS for a complete system optimization at the building level as well?" I believe it pertained to your examples provided in your presentation, there.

Hannah Kramer: I think that was based on my presentation, that—yes, for some of those, so based on the chart in the presentation of those control vendors, they're integrating the DERs with the building loads, so, with the HVAC—so, you're optimizing the whole building level for all the systems. Oftentimes, lighting is not a part of that system, but you know, technically, you could have lighting systems with it as well.

Theo Kassuga: Alright, perfect. Thank you, Hannah, again. So, we have a question specifically about a slide in Gary's presentation, here. So, Gary, I believe it was the slide that showed the various areas that you tackled in your DER efforts, and the question is, "Can you explain the reasoning for the areas that are not included, so not circled in your slides? So, specifically, flexible building loads and thermal storage, and can you give a little more background into why those are not circled? Is that challenging economics, limited products, and so on?"

Gary Mullaney: So, thermal storage—I feel like it occasionally has come up, but it just has not come up often and has not, there just hasn't been a lot of interest around it, so I don't have a good answer as to why we haven't pursued it on the thermal storage side.

Flexible building loads—actually, early, a few years ago, when I rejoined our team, that was one of the first things I was asked to look into was, "Hey, should we be taking advantage of demand response?" And mostly because my boss had learned that one of our—I think it was one of our data centers had saved a bunch using demand response, well, as I dug into it and learned further that site had been using their generators to do that, which was later changed and not allowed, so that's definitely not something we wanted to start advocating for and we really couldn't do just due to air resource, all the permitting issues around that, and it wouldn't be something we want to do from a sustainability standpoint.

But the other aspect of it is just, it requires a lot more kinda active involvement on our local teams, which I think would be more challenging. We'd have to have a lot more interest from our Facility Operations team to do that and willingness to do that and the skill set to do that, and a lot of them are just…adding one more thing is just, it's challenging to do. And I work with them a lot on our energy management, so this has kind of occasionally come up, but we're so, they're struggling with doing some of the other stuff that they just don't have the bandwidth. I think automating it would be helpful.

The other piece is just, as medical office buildings and hospitals, shifting loads is just not easy. Like, we're not gonna just suddenly start running surgeries at night. It's different than manufacturing where you can just shift operations to whatever is most financially beneficial.

So, I think there is—we're kinda keeping an eye on it. I think there is opportunity as it moves towards being more automated, and especially if we do storage, like, batteries or thermal storage so you can obviously take advantage of that demand response.

Theo Kassuga: Perfect. Thank you, Gary. I'll fit in one more question very quick, here. "How much expense is there to build the sites with microgrid capabilities? What's the added cost there?"

Gary Mullaney: Short answer is, we don't have an exact—we haven't done it yet. We've started kinda looking at it and from—I don't work on the design standards side of the house, but I've been, we've been working with our team that manages our design standards and, from what they're looking at, they don't think it would be a significant added cost to kinda segregate those loads and have that ability to be microgrid ready, but I don't think we have a good answer for it yet.

I think we're gonna—I think the plan is, we're gonna basically put something in our standard and we're gonna try it in a couple and then, based on feedback and either people saying, "That wasn't as hard" or when the designers come back and yell and scream at our team that they can't meet our standards, then we'll adjust accordingly. The way our team likes to push things is, our design standards are where we just have a massive capital program and we just, most of the design engineering is done outside our team, so it's done externally. But the way we drive a lot of this is through our design standards, so it's been very effective, but it's definitely a push and pull.

Theo Kassuga: Perfect. Thank you. Thank you, Gary. Thank you, Hannah. I apologize we can't cover all the questions today because we're pretty short on time, so I'll pass it back on to Rois for a few wrap up slides, here.

Rois Langner: Great. Thanks, Theo. So, as a reminder, the slides and the recording will be archived on the Better Buildings Solution Centers. Please revisit the slide deck to access the resources we discussed today. We provided a number of links, here. Next slide.

And as previously mentioned, this is the first installment of the 2020 Summer Webinar Series. In this series, we are taking on the most pressing topics facing energy professionals with new experts leading the conversations each month. All previously recorded webinars are in the On Demand Webinars library. Next slide.

We hope you join us tomorrow for the next webinar in the summer series titled, "Program Design with Everyone in Mind." This webinar will showcase successes from two DoE programs—the Solar and Your Community Challenge and the Clean Energy for Low Income Community Accelerator. Next slide.

And in addition to our On Demand Webinars library, the Better Buildings program recently launched its E-learning Center, a collection of webinars, courses, and other e-learning resources covering a range of areas relevant to Better Buildings and Better Plants partners. Check out this helpful collection of resources on the Solution Center. And last slide, here.

With that, I'd like to thank our panelists very much for taking the time to be with us today. Feel free to contact our presenters directly with additional questions or if we couldn't get to your questions during the Q&A period. I know we had a short time period for that. I also encourage you to follow the Better Buildings Initiative on Twitter for all the latest news, and lastly, you will receive an e-mail notice when the archive of the session is available on the Better Buildings Solution Center.

Thanks, everyone.

[End of Audio]