Rachel Shepherd: Hello and welcome everyone to the 2020-2021 Better Buildings Webinar Series. If we could go to the next slide to our intro slide, you are in the right place if you are here to learn How to Make Your Data Center Better from Stories from the Field. In this webinar today as well as in the Better Buildings Webinar Series we're profiling best practices of our Better Buildings Challenge and Alliance partners and other organizations working to improve energy efficiency in buildings and then today specifically data centers. Next slide please.

So my name is Rachel Shepherd and I'll be your moderator for today. I led the Better Buildings Data Center Challenge and Accelerator for the past 3 years and I'm excited to share with you results and lessons learned from that effort. Next slide. So today we'll be talking about data centers and in 2015 the Better Buildings program launched a Data Center Accelerator, which was a 5-year effort where DOE partnered with organizations that had data centers to do deep dives into infrastructure energy opportunities. For this particular webinar and for this effort when we talk about infrastructure energy we're talking about all energy end uses in the building except for IT energy use. But we're excited today to announce the results of our 5-year effort and so on average the 21 partners that participated in the program saw a 36-percent improvement in their data centers infrastructure energy intensity and that realizes about $3.9 million in annual cost savings so we'll talk about some of the strategies that some of those partners did to get those accomplishments. Next slide please.

As I mentioned before, the Data Center Accelerator was a 5-year effort with 21 partners that made a commitment to that accelerator. However, Better Buildings still has a targeted effort to help partners with their data centers. Data centers as I'm sure you all know are packed with a big punch because when you're looking for energy savings there are potentially a lot there with some short paybacks. Typically we see data centers could improve their infrastructure energy use by 20 to 40 percent and so if you aren't a Better Buildings partner but you're interested please come and join Better Buildings and we can help you improve your data center and if you are a Better Buildings partner that's awesome and please feel free to reach out to your Better Buildings point of contact to ask for some assistance on how to improve your data center, especially if you're inspired today by some of the things that we're talking about. Next slide please.

So when you reach out to your point of contact or if you join you can get some assistance from some of our data center experts at

DOE that can help you and your organization figure out some of the barriers that you may be facing around data centers because they are really complex, we can help facilitate discussion with stakeholders such as with your IT group that's going to be key for helping to improve your data center, and also help review project design and specifications and other recommendations for resources that you can use, which we'll be talking about in a few minutes. So I just want to put that in there in the front of this webinar. Once you go through things if you are inspired or interested feel free to reach out and we are here to help. Next slide please.

So if you aren't familiar with – if you haven't attended a Better Buildings Webinar before they are very interactive and we're excited to use an interactive platform to hear from you all. The platform is called Slido and we'll be using it for both the Q&A as well as some polling. So if you all could take a minute and go right now to www.slido.com, S-L-I-D-O.com, and you can use it on your phone, you can use it on a new window browser on the internet, and then put in the event code with #DOE. So just put DOE; it should be at the top of the browser. If you'd like to ask any of our panelists questions please submit them through the Q&A section of Slido and then there's also a polling question, which is another section that will pop up. You can also give a thumbs up, you can click the thumbs up icon if you like somebody else's question and you want to make sure that it's answered. So again please make sure you're in Slido.com #DOE because we're going to be using it right now.

So if you could go to the next slide, which will pull up our first poll question. So we'd like to learn a little bit more about you and we are – the first poll question that comes up is on a scale of 1 to 5 how familiar are you with data centers, 5, very familiar, 4, you have a role to play in a data center, 3, you work in a data center, 2, you're around it, or 1, you're new to the sector. It looks like the most popular answer is 3 so somewhat aware so that's really good because I think we'll be covering some advanced topics in here that could be helpful but then also a range of somewhat familiar and then very familiar so that's great. It looks like we've gotten most of our responses so let's actually go to our next poll.

We've got several polls. The next poll that's going to come up is what type of data center that you work in. Is it that you don't work in one, a small one, enterprise so a larger scale, maybe a co-location like multiple tenant, high performance computing, or hyperscale data center? I'm seeing the main response at this time is not working in one but excited to learn more. That's great, you're in

the right place because we'll be talking about all different types of data centers, and then some enterprise size, which makes sense for a lot of organizations. I'll give a few more minutes – or a few more seconds to see if anybody else will respond. Awesome, all right. Well you're in the right place to learn more about data centers and we've got 2 more polls before I introduce our panelists and our first speaker.

So the next poll question is which of the following departments or business units best describes your roll in an organization? So it could be are you in the IT group, facilitates, sustainability, finance, leadership procurement? Awesome, so I see a lot of sustainability, which is appropriate for Better Buildings, but I think we'll be sharing a lot about how you can work with other stakeholders within your organization, especially your IT group; that will be important. I'm also seeing facilities and other popping up high on the list. All right, well thanks for responding to that.

We've got 1 more poll question so thank you guys for being so interactive. The last poll question is have you ever been a part of a team that has implemented an energy efficiency project in a data center or otherwise? The immediate response is yes, a few no, which is good because we'll be talking about a lot of opportunities today with data centers that maybe you could get involved in your organization. Awesome, well great. It sounds like there's a great group out there for this webinar and I'm excited to now talk about some of our presenters and introduce our first speaker for today. Please remember to keep Slido open so that you can put in your questions at any time that you have for any of the panelists.

So I want to – so I'm excited to introduce today our 2 speakers, Hannah Stratton and David Giusti. Hannah is with Lawrence Berkeley National Lab and David is with the Maryland Energy Administration. So our first speaker Hannah is a Program Manager at Lawrence Berkeley National Lab's Energy Technology Area. She supports a number of programs within their portfolio conducting research and analysis and providing programmatic management, development, and support. This includes the Center of Expertise for Energy Efficiency in Data Centers as well as eProjectBuilder, both websites and tools that can be helpful for you all to use, and then also DOE's Energy Efficiency Standards. She has an MBA with a focus on energy from UC Davis and a BA in Political Science from UC Santa Barbara. Welcome Hannah and take it away.

Hannah Stratton: Thanks Rachel. Hi everyone. Thanks for joining us today and I guess next slide please. So today I'm going to be talking a bit about the Data Center Accelerator Toolkit that was a big outcome of the Better Buildings Data Center Challenge and also a resource that we've recently developed here at the Center of Expertise at LBNL. Next slide please.

So the Data Center Accelerator Toolkit has a few different components, all geared around helping organizations of course improve the energy efficiency of their data centers. So the first are a series of web pages that explore different barriers and opportunities to data center energy efficiency based on different data center types and I'm going to get into each of these in a following slide in a little more detail. It also showcases our interactive Business Case Module that we recently developed at the Center of Expertise. And lastly there's also a series of sector-specific fact sheets that are also for barriers, needs, and opportunities for energy efficiency in data centers within those specific sectors and explore dynamics that are going on in higher education and government and commercial sectors among others. So really the toolkit gives you kind of a comprehensive way to slice and dice your energy efficiency and look at it from different angles by the type of data center that you're operating, by who you are in the data center, which stakeholder you are, and also by sector. Next slide please.

So here's a look at the sector – or sorry, the data center type toolkit so you can see we have small data centers, co-lo's, enterprise, HPC, and hyperscale and you know the reason for developing these resources based on data center type is that depending on what types of data centers your organization is operating the barriers and energy efficiency opportunities are going to vary. Opportunities in a small data center are probably going to be quite different from those in hyperscale and HPCs and the barriers will also be different. And likewise when you're working with a co-lo facility and you have certain contractual agreements and you have different stakeholders than you might have if it's an enterprise-owned data center. So I encourage everyone to check out the toolkit on the Better Buildings website and you can look, poke around, see what types of data centers your organization has, and look at the barriers, solutions, and there's also some great resources, many of which are targeted to those data center types and also some partner examples of how they have successfully implemented energy efficiency in their data centers. Next slide.

And additionally there are the sector fact sheets as well as a bunch

of other resources, some of which are from the Center of Expertise here at LBNL and others from other organizations and also related to the accelerator. Next slide. So yeah, look at those sector fact sheets. We explored the state and local, federal government, higher education, commercial, and industrial sectors and really explored what are the trends that are going on in each of these sectors that are driving the demand for data. I think just 1 example, you know we all can, especially with COVID, we can understand that higher education there already may have been a move towards online learning but now that's even more amplified and so the need for data is growing rapidly in all of these sectors but depending on the organizational structure and dynamic, the data center types that organizations in these sectors have, they're going to face different and unique challenges. Next slide please.

And so now I'm going to talk a little bit about the Business Case Module that we've developed at the Center of Expertise but before I get into exactly what that module does and what the content of it is I wanted to talk a little bit about why we felt we needed to develop the module in the first place. So I know we have a lot of sustainability managers or people who work in sustainability on the call today and also people who sound like they have experience in energy efficiency projects and you know then a range of people who are very familiar with data centers and maybe less familiar, so I think there's a lot of resources out there about how to implement an energy efficiency project and even sort of taking it through a business case lens, but data center energy efficiency is really unique to other energy efficiency projects because data centers are mission critical operations. And the primary focus is always going to be making sure that the data center is ultimately able to meet the needs and objectives of the organization, uptime is very important, and this mission critical nature and the severe costs both monetary and also reputation-wise potentially from outages really can create a sense of risk aversion when it comes to data center energy efficiency.

And additionally because of the way that a lot of data center energy bills are paid there can be quite a big split incentive problem between IT and facilities or if you're working in a co-lo maybe you're not even actually footing your energy bill. But I think as Rachel mentioned data centers are quite energy intensive and so they really are well positioned to deliver substantial savings and in many data centers, especially in small data centers, there is a lot of low-hanging fruit. And as I kind of present our Business Case Module I want everyone to keep in mind that of course the individual context of an organization is going to influence you

know the experience that a project champion may have. So we tried to create something that we felt was really reflective of what's going on the data center space but not every organization has the same list of stakeholders that we developed and things can vary a little bit. But yeah, hopefully it will be a helpful resource in helping you or others in your organization advance energy efficiency projects. Next slide please.

So here's a look at how we developed the Business Case Module. So it is an interactive web resource that enables stakeholders to identify the drivers and the motivating factors that could help – could motivate them and also others in their organization to pursue a data center energy efficiency project. It also looks at what – who the key stakeholders are that need to be engaged. It also helps them anticipate and overcome barriers that may be encountered during the planning and implementation of their data center energy efficiency project. And we really felt that it made sense to take a stakeholder-centric view. On the left-hand side we have the drivers that we developed, so what are some of the main reasons why people would want to pursue energy efficiency in their data centers and some of these are obvious but some are – you know you may not realize that it is a driving factor or maybe the stakeholder who benefits from that driving factor didn't actually know that that was a benefit of data center energy efficiency. And you can see that we have matched the barriers and the drivers to stakeholders specifically because we felt that it really starts with the people that you need and/or want to engage in the project. So taking this view of not just what are the drivers, what are the barriers, and who are the stakeholders but why specifically are these drivers and these barriers important for say a facility manager, an IT manager, or you know any of the other stakeholders that we have down on here including sustainability managers. Next slide please.

So yeah, as I mentioned before the goal is to help project champions shepherd projects through their organization by identifying drivers, winning over stakeholders whose buy-in is critical to advancing the project, and also identifying those stakeholders early on in the project development process, and lastly overcoming barriers. Next slide.

So getting a little bit into the drivers, you can see here that we have quite a few and they were developed based on our own research and discussions as well as some input from a focus group. So you know for the drivers we want to understand what are the motivating factors and of course realizing that the importance of these drivers is going to vary depending on your organization and

also the stakeholders that you're engaging. So just if we can maybe talk through a few of these, we don't have to go through all of them, but the first one is pretty obvious: reducing operating costs. That's a lot of – that's a big reason why people pursue energy efficiency projects generally, not just in data centers. But the interesting thing about reducing operating costs in data centers is that they're most often but not always the data center energy bill is footed by your facilities department but maybe not by IT. So you know your IT department may be really or probably is prioritizing making sure there is adequate capacity so that they can do their jobs and meet the needs of the organization, but at the end of the day if they're not paying the energy bill they're not going to be particularly concerned potentially about the operating costs. They're more interested in making sure that everything is reliable and that uptime is continuous and so that can really engender some risk aversion, especially when they're not the ones reaping the benefit of those reduced operating costs.

Thinking about the fact that we have a lot of sustainability managers on the call here, saving energy in accordance with organizational values, that may be a big one for sustainability managers, right? I think you may be looking to market some of the improvements that you've made in your data centers. That also could be an interest to say a CEO in the organization. And so we really get into what are these drivers, why do they motivate certain stakeholders, and we look at it not just from how is this generally a driver but why specifically is increasing reliability and resiliency for example a driver for an IT manager. Next slide please.

And then similarly looking at the barriers, so we looked at institutional, technical, and financial barriers and I think it's important to think about these things well in advance of beginning your project so that when you are potentially pitching a project to somebody in a C-suite or a cross-functional project team that you've already considered these things and have taken them into account as you have developed your energy efficiency proposal. If you know that you have a particularly risk-averse CEO maybe you want to choose these ECMs that are well proven or if you have a third – if there's some internal guidance from your finance department about payback maybe you need to choose an ECM that has proven short payback. So there are just these types of considerations that really can matter when not just crafting a project and the technical components but also the way you frame the project benefits. I think speaking the language of the person who you're trying to engage is obviously important so if they report by certain metrics and you can put the project proposal into

those terms that's always a good idea.

So the goal of our barriers section is to talk about what some of these barriers are but also talk about what are the opportunities to overcome these barriers in data centers and then we also provide a bunch of resources that can help a project champion overcome those barriers. So we'll just look at some of these here. The first one, no one person tasked with energy efficiency, that's definitely not always the case, but it can be the case where it's not explicitly written in somebody's job description to take up energy efficiency improvements and you know that can often mean that the project champion is picking this up and it's not necessarily something that they really have a lot of time for or a lot of allocated resources.

Another really big one that I think applies to most stakeholders in data centers is misaligned interests and you know they don't have to be completely at odds with one another but for facilities they're trying to make sure that everything is humming along and also probably that the operating costs are within their bounds whereas IT may be more likely to want to oversize things in their data center to make sure that they have capacity for growth whereas a CEO just wants to make sure that everything is meeting organizational demands and needs so there's just a lot going on. Every stakeholder approaches – will approach the project through their own lens so it's just important to think about what are some of these barriers that may be specific to certain stakeholders. Next slide please.

And yeah, so taking a look at our key stakeholder section really we want to hone in on who is this person in the data center, why is their role relevant for data centers, and why should they care and then talk about what are their drivers, what are their barriers, and then also what are some resources that are targeted for that stakeholder. And I think I already mentioned this, hopefully I'm not being too repetitive, but we don't just talk about the drivers generally but we talk about why these – why operating cost production is a driver for the facility manager and dig in a little bit deeper at each level. And for the resources we have found things that are helpful for every stakeholder or may even be helpful for the project champion to engage a certain stakeholder. We have resources on you know why would a CFO care about their data center energy efficiency for example so some of the resources are targeted for that specific stakeholder and others are targeted for the project champion to be able to effectively engage that stakeholder and get them onboard with their energy efficiency project. Next slide.

So just some key takeaways that we've learned as we've developed this Business Case for Energy Efficiency in Data Centers Module, which I hope everybody will go and check out at the CoE is that you know data center energy efficiency projects can require a really concerted and coordinated effort. These can be – I mean they can be simple projects, there are of course always simpler inexpensive, and relatively easy ECMs that anybody can implement, but also it can be quite a task and so project champions really need to consider the drivers and the barriers for the stakeholders that they plan to engage in the project and you know take initiative to share information and educate others and certainly assume familiarity with the topic. There's a really good chance that leadership in your organization maybe just doesn't even know what types of energy and monetary savings opportunities there are in data centers. Also early engagement of stakeholders and establishing a cross-functional project team can be a really great way to facilitate mutual understanding and also achieve buy-in and make sure that everyone's concerns are being taken into account and addressed as you develop the project.

And you know measuring the project outcomes in a way that is – that documents them well that can help pave the way for future projects is also really important. I think that previous experience with energy efficiency projects, especially in data centers, can be a good way to establish precedent and of course hopefully 1 successful project will lead to another. So ultimately we hope that our Business Case Resource can help project champions on their path towards data center energy efficiency. Next slide.

And just wanted to give an overview of our website. If you're not familiar you can find us at datacenters.lbl.gov and our Business Case you can see it's right there on our featured work on our homepage so it will be easy for you to find. And we also have a bunch of new resources that we recently have released on our website. We have our IT Equipment Efficiency Tool and some thermal guidelines and temperature measurements, the Business Case Module of course, and also a new air management packages tool. So we encourage you to check us out and also feel free to email us, follow us on Twitter, and you also can sign up for our newsletter on our homepage. We send out updates on our webinars and new tools and resources. So thank you all so much and I look forward to seeing what David has to say about his case study.

Rachel Shepherd: Yeah, thanks Hannah. That was awesome. I really encourage everyone to go to that Business Case website because it's really

interactive and I think it has a lot of great information. So next we'll hear from David. David Giusti currently manages the Data Center Energy Efficiency Grant, the Locked In Loan Program, and assists with the Maryland Energy Infrastructure Program for the Maryland Energy Administration. David has a Bachelor of Science in Energy, Business, and Finance from Penn State University. David, take it away. I'm looking forward to hearing your presentation.

David Giusti: Thank you for the introduction. Good afternoon everyone. Thank you for joining us today. I am an Energy Program Manager at the Maryland Energy Administration and I run the Data Center Energy Efficiency Grant Program. Today I'll talk to you about the Data Center Energy Efficiency Grant Program, results of the program, and some of the best practice that I have learned over the last couple of years. The Data Center Program is now in its 5th cycle and is designed to support Maryland's robust and growing information technology sector. The program has gone through some changes over the last couple of years. The program provides funding on a competitive basis to encourage the implementation of cost-effective energy efficiency technologies in data centers located in the state of Maryland. Grants typically range from $20,000 all the way up to $200,000 per eligible project subject to funding availability. They are designed to cover up to 50 percent of the net customer cost up to $200,000 for innovative and cost-effective energy efficiency solutions. Next slide please.

The program is open to any commercial, state, local government or non-profit data center located or is being constructed within the state of Maryland. The data center must have a data floor size of at least 1,000 square size. MEA defines a data center as a facility used to house only computers, servers, networking systems, IT components, and supporting infrastructure. Next slide please.

Some of the eligible measures that can be funded through the Data Center Energy Efficiency Program are server virtualization, airflow optimization, aisle containment, lighting controls, uninterruptible power supplies, motors and variable frequency drives, HVAC upgrades, building insulation and envelope improvements, and any additional measures that can be considered on a case-by-case basis as long as there is a reduction in energy. Note this program is only currently for energy efficiency measures. Hopefully renewables will be allowed in the upcoming years. Next slide please.

Some of the project requirements that are set forth to the program

are being able to identify and monitor power usage effectiveness. They must submit an energy analysis or energy savings calculations associated with the project. They must submit utility bills or any sub-meter data. The project must be cost-effective, which MEA defines as a project's lifetime net energy benefits are at least equal to or greater than the cost of the project. The project must reduce the facility's aggregate annual energy consumption for the whole building or the treated area of the data center by at least 10 percent and the applicant must be in good standing with the Maryland Department of Assessments and Taxation. Next slide please.

Since the program is a competitive grant program each application is reviewed by a review team for the demonstration of energy efficiency best practices or innovative technologies, cost effectiveness in combination with energy savings, project feasibility, completeness, accuracy, reasonable energy savings, and cost estimates as well as the diversity of energy efficiency measures or technologies. Next slide please.

Some of the program results, over the past 5 years MEA was able to upgrade 14 different projects through the program. These projects have ranged from a Maryland State University, Maryland Public School System, standalone data centers, and 1 of the largest healthcare providers in the United States. Some of the upgrades were computer room air conditioning units or CRAC units, typical lighting measures and controls, and airflow optimization. In 2018 the Data Center Program was actually selected from over 200 global entries as a finalist in the Industry Initiative of the Year category that was presented by Data Center Dynamics. Next slide please.

As you can see on this slide these were our program results from 2017. Sadly due to the COVID-19 pandemic MEA actually had 2 projects from fiscal year 2019, we run on fiscal year starting July 1 to June 30th, that ended up being canceled. The remaining projects in 2019 and 2020 are still underway and MEA will hope to post the updates once the installations are completed. MEA hopes to announce the FY21 awardees sometime in the next month. All the applications are currently being reviewed and subject to funding availability we hope to plan around the FY22 Data Center Program as well. The Data Center Program typically has a budget of around $500,000 per fiscal year. As you can see 2017 and 2020 were sort of the anomaly. We were able to increase our budget due to the demand of the actual program itself. As you can see the total project cost of all these projects are a little over $7 million and

we're really only able to give out $1.9 million over the 4 years so far. These projects are estimated to save a little over $10 million in kilowatt hours annually and these projects are going to be estimated to save $844,000 annually. And I'll go into some utility incentives in my best practices. Next slide please.

The next 2 slides are going to be case studies that were completed by the program. This one is Kaiser Permanente. They have a data center of 60,000-square feet, a standalone facility that is located in Silver Spring, Maryland. They were awarded a $200,000 grant in fiscal year 2017. They're saving over $228,000 annually per year for the installation of the constant speed fans with variable speed fans in the computer room, an air conditioning unit, and they upgraded the controls to more energy efficient modes and models for monitoring for opportunities to save energy and reduce operating costs. The actual total cost of the project was $1.5 million. They were able to leverage funding from their utility as well as the grant from MEA. Kaiser Permanente actually also received a fiscal year 2020 Data Center Award for an upgrade of a 250-ton chiller that will use the chilled water from the rains for the data center. Currently that project is still ongoing so we hope to have final results of that in the upcoming year. Next slide please.

The next case study is the Montgomery County Public School System. Montgomery County Public School Data Center operates, monitors, and provides technical support for central servers and related equipment allowing 24-hour access to a central student and administrative databases as well as payroll, student attendance and enrollment, retirement, asset management, financial management, report cards as well as online ordering. They were awarded a $127,000-grant in 2018 that is expected to save them $21,000 annually in energy savings and they're saving 180,695 in kilowatt hours per year, which is enough to roughly power 600 laptop computers for 8 hours. The upgrades included server virtualization, the replacement and migration of storage area networks to reduce energy consumption of servers, airflow optimization including rack enclosures, cooling blanking panels. With the energy savings through the program the Montgomery County Public Schools plans to reinvest the grant funding to procure software that will give insight into server usage that is not presently available. This would facilitate and encourage more informed decisions in prioritizing and pursuing larger ticket cost items where energy efficiencies and savings could be realized. Next slide please.

Some of the best practices that I've learned through the Data Center Program are being able to leverage any utility incentives

that can be used to draw down efficiency project capital. To-date MEA has seen grantees use $822,269 in utility incentives with another $127,458 projected. We'd like to see more comprehensive retrofits. Data centers are highly energy-intensive and will continue to see significant growth in the upcoming years. Better efficiency reduces carbon emissions and demand on the power grid. Next slide please.

More best practices, being able to quantify performance. It is often best practices to install a system or unit level metering to quantify pre- and post-project performance to give more accurate data. The Energy Star Program may be used to benchmark existing data center performance against peers and said performance targets for energy projects. Resilience and uptime, being able to improve efficiency often results in a reduction in operating and maintenance costs and will allow reinvesting the savings elsewhere. The replacement of equipment before the end of its useful life can improve data center reliability. Actually in some cases it can be cost effective to employ natural gas and other renewable fuels or even combine heat and power systems to the data center. Next slide please.

Data centers are such a large energy consumer and the amount of energy they consume is expected to grow in the upcoming years. Data centers can and perhaps should be leaders in reducing the energy and environmental impact through low-carbon pathways. They can also support the grid during periods of peak demand. The facility operates under generator power or even the generator can feedback power onto the grid. Once again thank you for the opportunity to speak today and here is my contact information if you have any additional questions. Thank you.

Rachel Shepherd: Great, thanks David for sharing great information about the program as well as some case studies and lessons learned. I think that will be helpful for a lot of folks. So before we jump into the Q&A for some of our panelists I see some questions we've got here, we actually have another poll. We'd love to hear from you on what are some key takeaways that you've received from today's lessons. So if you close down your browser on your phone or the website please open up a new browser and type in Slido.com #DOE as your code and we'd love to hear from you what are some key takeaways so far from today's panelists.

Let's just give folks just a minute to enter in any key takeaways that you've had and then we'll open up the questions. All right, again we'd love to hear from you any key takeaways that you have

and if I could ask David and Hannah if you could turn on your videos and we can jump into the Q&A section. So we've got some really good questions that have come in. The first question is related to COVID and David I'll ask this of you. What has been your experience maybe with some of our grantees on what they've been talking about? How have data centers been impacted by the pandemic, particularly if they have a data center in the office, the office has low occupancy? Have you heard anything from them on how they're dealing with that and what their experience has been?

David Giusti: Yeah, that is a very good question. A lot of the grantees that I actually have been working with some of them are working from home but due to urgent matters they can go to the facilities and stuff like that. You know data centers are 24/7 operational so sometimes they may have 1 or 2 employees there just being really safe to make sure that everything's working properly.

Rachel Shepherd: Awesome. That is helpful. The next question maybe Hannah is to you and then maybe also David if you want to chime in as well. Can you give some examples of commonly implemented ECM's and then there was another question about what are the top 2 energy efficiency measures? You want to talk Hannah about maybe from your perspective some of the common ECM's that the Center of Expertise works on and then maybe David I know you showed a lot of ECM's up there that are part of the incentives program but maybe if you want to touch on that as well. So yeah, Hannah, you want to go first? I think you're on mute.

Hannah Stratton: Okay. Yeah, so air management is really a huge – can consume a huge portion of data center energy consumption overall so looking at ways to reduce the cooling costs for data centers is 1 of the main I guess buckets of ECM's if you will. So that could mean turning up the temperature a few degrees, relaxing humidity requirements, and also making sure that there's aisle containment so that – to reduce mixing of hot and cold air so making sure that that is efficient and there's a lot of smaller ECM's within effective air management. And I think another important one is looking at utilization, decommissioning servers that are not really being used and also consolidating servers and also integrating metering and monitoring and DCIM systems to actually track what's going on can also pave the way for determining what ECM's you should be looking at. I guess I'll hand it over to David for any other things he thinks should be throw in there.

David Giusti: Yeah, those are a lot of the ones that we work with at MEA. I'll also add HVAC upgrades as well as lighting, obviously low-

hanging fruit with lighting. Those and chiller upgrades are really the 3 main ones with everything else that you pointed out as well.

Rachel Shepherd: I think going back to at the beginning when we talked about there's opportunity between 20 and 40 percent on average in a data center for energy cost savings I think that a lot of that is attributed to some of the ECM's you're talking about, air management, HVAC upgrades, lighting, so those would be the first places to look for some energy cost saving opportunities if folks are looking for them. The next question David is for you. There was a question about what were your utility incentives based on and then what is the process that you guys go about validating them?

David Giusti: Yeah, so the utilities incentives are based on Empower Maryland. It's funded through a charge through the Maryland Repairs Utility Bills. They have a prescribed program as well as a custom measures so whatever they're allowed up to 50 or 75 percent for the cost of measures so that's a sort of utility incentive that they can get at least in the state of Maryland. I don't know about all over the US but that's what we work with for the state.

Rachel Shepherd: Great, that's helpful I think. I'm familiar with a lot of other utility programs that are set up that way too with that custom that can be a catch-all for data center upgrades so that's helpful. So if one was to – Hannah, if one was to look at what they can do jumping into either their data center or they know of a data center with opportunities, you know you talked about the Business Case website. I think that that's really helpful and really well organized for folks to try and understand what opportunities there are, but there are a lot of resources in the Business Case website. Can you talk about some of those resources that are available right now to folks to help identify opportunities and get started working on energy projects?

Hannah Stratton: Yeah, so a lot of them are ones that we have developed here at the Center of Expertise so we also pulled other tools and resources from other organizations and literature and things like that. So we have a lot of our very popular tools linked there sort of in the appropriate spot like our Data Center Pro Tool, which allows you to put in some inputs specific to your data center and kind of look at a list of recommended ECM's so actually that would be something I would look at for the person who asked about ECM's as well as our guideline temperature and humidity measures and just all kinds of operational guidance that we have developed. And additionally we also have a lot of great case studies and links to anything from procurement, how to make sure you're purchasing

Energy Star servers to databases and utility incentives and state energy incentive programs like the one David talked about and we also have case studies. There's just a lot of different types of resources that come into play so it's a good place to kind of get started as far as what we have and what is out there generally for data center energy efficiency.

Rachel Shepherd: And that's a good transition into maybe it wasn't a question but a comment that was put in the Q&A. So as part of the Business Case website there's a master list of all the ECM's you could really be doing in a data center. One of the comments was going into more details about examples of an energy efficiency measure. David do you want to – is there a particular ECM that would be good to dive into from 1 of the examples you had on 1 of your slides?

David Giusti: Yeah, let me go back real quick. Could you go to – Hannah do you have anything while I look up something real quick? I'm sorry.

Hannah Stratton: Sorry, so specifically just to talk a little bit about a particular EMC?

Rachel Shepherd: Yeah, maybe it would be helpful Hannah describing some of – I guess more of how the buckets of ECM's are organized and then David can talk about a particular ECM and diving into more detail on it.

Hannah Stratton: Yeah. So I think 1 things that comes to mind is I'm thinking a master list of energy efficiency actions would be a really good thing for whoever is asking this to take a look at. And so I think ECM's can kind of be looked at through air management and then IT equipment, so taking a look at what servers are underutilized and need to be consolidated as I mentioned previously, also monitoring and controls, and you know we also have 1 other – and also the cooling plans, and another resource that we have, I think it's our small data center guys, talked about – divide ECM's by the level of effort so I think that also is a really helpful resource because you can also see okay, what are some low-hanging fruits that I can pick off versus which ECM's are going to be a more significant list both from a technical and probably a financial perspective.

Rachel Shepherd: Yeah and we have a link to that website which has that master list as well as that document that is now – that prioritizes ECM's by effort as opposed to maybe potential savings. You can get started right away with kind of low-level effort measures so that might be helpful for folks too. Let's see, we've got about 1 or 2 more

minutes. David did you want to touch on anything else on that question or we can also move onto to talk about some of the resources?

David Giusti: Yeah, so I'll go with Kaiser Permanente. They upgraded a computer room air conditioning unit, which is just a usual device that monitors and maintains the temperature, air distribution, and humidity in a network room or a data center. The units are replacing air conditioning units that were used in the past to cool data centers so it's a relatively new technology.

Rachel Shepherd: Okay. That is helpful and I think for those out there looking to learn more about different ECM's I think again maybe that's in the next slide we have a list of links that you can go to to learn more and you of course can reach out to us as well. So I think that's all the time we have for Q&A. if you have further questions feel free to reach out to us or you can feel free to put them in the Q&A in Slido and we can also answer them there. Next slide please. So here's the list of resources there and that last website, that Center of Expertise for Energy Efficiency in Data Centers, that's the link that Hannah's talking about. You can go in there and find the list of all the ECM's that you could think of for data centers. That link is also available through the Better Buildings Solutions Center so if you go to the Data Center Accelerator page, the Toolkit, the Sector page, all of them you can end up getting to that Center of Expertise website that has a lot of different resources. Next slide.

We can transition to what's upcoming and where you can learn more about data centers, which is the 2021 Better Buildings Better Plants Summit. So registration is now open. The summit is taking place May 17th through 20th and will be featuring engaging and interactive sessions along with opportunities for attendees to network with their fellow industry peers and experts. You can learn more and register for this virtual, no-cost event at the Better Buildings Solutions Center today so when you go there and check out information that we have on data centers you can also go and register for the Better Buildings Better Plants Summit. Next slide.

So as I mentioned this webinar is part of a series. It's part of the 2020/2021 webinar series. This is our final webinar in this series but we look forward to seeing you this summer during our summer series, which is – as well as our 2021/2022 webinar series. So we're just going to continue doing lots of webinars and those webinar topics will be announced soon. But you can always go back and look at the recorded webinars as part of the series. Next slide please.

We also encourage you to visit the new workforce development portal that's part of the Better Buildings website. You can take the next step towards a career in energy efficiency and get resources, information, training, education, and job opportunities so I encourage you to check it out. Next slide. As I mentioned you can watch the recordings of the Better Buildings Virtual Summit, which was last year, the 2020 Summer Webinar Series, and other technical presentations from National Labs as well as webinars that have been a part of this webinar series. So we encourage you to check it out. It's a really great resource with lots of great presentations. Next slide.

Here's our contact information. If you have more questions feel free to reach out to us. I want to thank our panelists very much, David and Hannah, for your time today and talking to us about all of your resources and information you have available. Again feel free to contact our presenters or me if you have additional questions or if your question wasn't answered during this Q&A period. I encourage everyone out there to follow the Better Buildings Initiative on Twitter for all the latest news and information on Better Buildings. You'll receive an email notice when this session is archived and then available on demand in the Solutions Center to watch again if you're interested in it. Thank you again and I hope to see you at the Better Buildings Summit in May. Thank you everyone.

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