Michael Myer: Good day, and thank you for attending today's webinar. I am Michael Myer. I'm with Pacific Northwest National Laboratory. I'll be serving as emcee and host of today's webinar. This was a webinar about a new technology that the US Department of Energy is evaluating and seeking potential partner sites. Today's technology, as you can see written there, is about an energy efficiency pilot program for older commercial buildings.

As someone who is now getting older, I think maybe we should title this for maybe well-lived or vintage buildings as well, so we're looking for buildings that exist, there's a retrofit application, and we'll learn more about it in the next slides. Next slide please. So we've been through webinars before, but here's all the information in case you're dialing in and don't know it. You can see that we're starting. You can see if that you are not directly connected into a weblink you have the phone information.

Please ask questions as we go. We'll definitely have a question and answer period at the end. This is really for us to try to share the technology as well as potential site characteristics that would be ideal. We are seeking participants in this webinar, so we do want questions. We do want feedback. Again, basic policies here.

Everyone has been muted. It's recorded, so it'll be available later if you need it. And we'll also send an email with more information. Next slide please. We have three presenters for today. Jeff Wanner, who is there shown in the center. He will be our first presenter.

He's a program manager who's contracted to the US Department of Energy. Jeff started in the world of civil engineering and then jumped in with both feet to energy efficiency programs. Jeff is attending from the Denver area. Our second presenter will be Shaina Li. She's head of growth for Mesa, which is part of Google, and works with partners to ensure that Mesa is helping them improve operations and meet their energy management goals.

Her past work spans real estate technology and private equity investment. Most relevant to this conversation, she was an asset manager for a portfolio of older office buildings at Hines, which is a large real estate investment firm, and helped scale technology in the old property management. Shaina is attending from California. Finally, our third present will be Nikitha Radhakrishnan. Nikitha is a research engineer at Pacific Northwest National Laboratory and works on R&D for building control systems and grid interactive efficient buildings.

She has a Ph.D. in electronics engineering from Nanyang Technological University in Singapore, and she was a graduate researcher at Berkeley Education Alliance for Research in Singapore as well. Nikitha is attending from the Chicago area. I will return for Q&A portion of today's webinar. And now Jeff will preside an overview of the DOE Better Buildings Alliance and GSA program. Next slide please. So here's our quick agenda.

I did give myself one too many slides for that, but you can see where I talked about the Green Program, the buildings, and the introduction of Mesa. Thank you.

Jeff Wanner: Thanks, Michael, and thanks all for attending. Yeah, so this project and this technology validation comes from the Green Proving Ground. And just a little background on GPG, Green Proving Ground, and DOE High Impact Technologies. This comes from an annual RFI that's released every fall. This particular selection was based in FY22. So it's determined by a range of panelists both within GSA and then industry experts like Michael Myer and Nikitha and others that support DOE.

GSA releases this every year to seek new and innovative solutions that they may deploy across their portfolio. DOE started the program a number of years ago both to support GSA and to support Better Buildings partners and the commercial sector or the private sector sitting ancillary to GSA's private sector. We can jump to the next slide. So I mentioned this is a program cosponsored by GSA and DOE. We're seeking building partners in the private sector generally through Better Buildings but then other avenues as well for validations.

The technologies that are selected are validated by National Labs, hosted by third-party sites such as yourselves, and these evaluations can extend for up to a year or two depending on technology type. I know some of the larger solutions that are packages and controls can last quite a while, but that's typically determined by the National Lab its supporting. The lab project manager primary investigator is the principal on the technology. Nikitha will be presenting later on this validation and will be leading the effort of this particular technology.

DOE contributes to this and is a part of this based on our interest in improving and to help the adoption of new and early stage technologies. The TR or technology readiness level of these technologies is late stage. These are things that – solutions that

have been tested in buildings and have been verified in the lab setting, however, haven't been broadly deployed. So we partner to help and to conduct these case studies toward broad deployment. We can go to the next slide.

So this gives a sample of GPG selections from years' past. This particular last year, in 2022, we had 78 submissions, and from that nine technologies were selected. A similar RFI will be released this fall, and we'll be seeking fairly similar to the technologies that were selected this past year around, or at least the general directive of the RFI will be around low carbon, net zero carbon technologies. Next slide.

This graphic and image kind of shows us where we're looking with this technology and what we see as the primary need, looking at space conditioning as a primary energy in the building and the need occupying this 25 percent and then cooling of the 9 percent, really looking at how we manage that load and manage the loads within the building. This technology that we'll talk about is a building control solution, so looking at the opportunity to monitor and track space use, plug loads and lighting in the space really as being a necessity towards energy savings. Next slide. And with that, I'll hand it over to Shaina who will speak to her technology.

Shaina Li: Great. Thanks, Jeff. Before I get into what Mesa actually does, I wanted to share a bit more about what we saw as a problem in the market and why we then decided to work on a solution. As we look at older buildings, more than 50 percent of buildings in the market today in operation were actually built before 1970, and what that brings is just a lot of diversity in the actual HVAC designs for the building. If you look at a set of older buildings you find that it varies significantly, and if you're the owner or the occupier of multiple buildings and you care about energy management or you're nervous about energy utility budgets, making an upgrade to a variety of buildings is really tough.

Often we see that it's a bespoke process and ends up being really expensive and requires a lot of technical expertise to actually get the projects done. Some of the problems we've seen here with older buildings and why they're inefficient is that a lot of it is based around manual controls. So you literally have to go up to a thermostat to go and make the adjustments. We don't see a lot of digitalization in that space today with an affordable price point. What we also note is that often there isn't great feedback between the folks who actually are using the building and the equipment.

If you imagine that time that you walked into an office space, you sit there and it's incredibly cold and there's not an easy way for you to give that feedback to the equipment besides literally walking up to a thermostat and adjusting it yourself. And then in a group gathering setting everyone has slightly different feedback comfort levels. The equipment today that we've seen in older buildings don't have an easy solution to balance all those, that level of feedback.

And then the last problem we want to talk about is that building controls are not automated. Again, it's manual and the equipment is not exactly functioning efficiently. So with these problems, and you can move to the next slide, we set out on this journey to create a solution that is affordable, easy to install and that gives the digital modern controls that these older buildings need to meet energy saving goals. So Mesa is trying to create a standardized solution that someone can use across an entire portfolio that will help them with energy management.

On to the next slide. So what is Mesa? Mesa is a system of hardware and software. Mesa uses IOT sensors to capture what's actually happening in your space. And the information we capture include temperature, humidity, occupancy and occupant preferences. All this information gets uploaded into our software, which optimizes how the space is actually used, specifically how your HVAC and your plugged-in devices are used.

All those energy saving measures then float into the control devices, which are the smart thermostats and the smart plugs that you see here in the center of the page. Those devices deploy the controls and actually deploy the savings measures. And from there, we also have dashboards that allow your team to monitor and control the equipment. We really believe in making this data accessible and easy to consume and easy to manage. Onto the next slide.

The core of our product is really the software, so I want to dive into this a little bit more. You can see our software in really three parts – automated savings, remote device management and real-time data and trends, and we'll dive into each one of these a little bit more. Automated savings is really the heart of it. We want to make energy management really easy for people who both use the space and own the spaces. What does this actually mean though?

With all the information we've collected on temperature, humidity, occupancy and preferences, our machine learning is actually able

to take that and calibrate to the optimal use depending on the conditions on the site, and then the adjustments are actually automatically pushed through the smart thermostats and the outlets, and that changes your heating, your air conditioning, ventilation and the devices are plugged in. What this means is that we're actually changing the set points in the space. If no one's around, we'll turn devices off or turn maybe the air conditioning down a little bit. During the winters we'll maybe heat it up a little bit more if there's more occupancy.

For remote device management, this is really a great benefit for operators, where instead of showing up onsite to adjust the thermostats, adjust your plugged-in devices, you can do all this through your dashboard. The dashboard will show you all the different spaces you have. You'll have titles that say this is conference room number one, conference room number one is currently set at a set point of 74 degrees, and you can go in there and you can make the adjustments yourself, which saves a lot of manual time going through the spaces. Last thing here is real-time data and trends.

We really want to enable teams to understand what's happening in their spaces and to make that really easy. So on our dashboard, you're able to see what your floorplan temperature, humidity, occupancy. You can see what all your devices are doing. On top of that, we have a series of alerts. So we can set thresholds for temperature, for occupancy, and let you know if there's something that feels a little off in your space today. And this we hope helps operations teams really plan their days and make that monitoring a lot easier.

On the next slide, I want to dive into some use cases, so actual deployments that we have out there with our real estate partners and what some of the results have been so far. So I've got two case studies, both done during the summers since we're rolling off of that season. The first one is in Milwaukee with a real estate owner called Newland. They're a developer and owner of commercial and multifamily buildings in the Milwaukee area. In this building, we're on the second floor. You can kind of see the space there.

There's actually a lot of glass façade in the area which actually fed significantly into our algorithm too. It's a very good example of how we work in an office setting. The office there had private offices as well as conference rooms, and what's most interesting about this is that their team that used this space was going through a hybrid work schedule where folks were not actually coming in

every day anymore. They weren't coming in Monday to Friday in a regular cadence, and I feel like a lot of people on this call are probably experiencing something similar with their companies. That was actually really interesting for Mesa, because we were able to track that the space was unoccupied 63 percent of the time.

And with that information, we were actually able to turn devices off or adjust the setpoints on the HVAC based on the occupancy, and that was able to help us save Newland 43 percent on runtime with that zone level adjustment. So we actually looked at whether a conference room was occupied or not. We set rules that allow us to adjust the HVA to setpoints, and then those savings, the delta, you can see in the graph there, between actual usage with and without Mesa created the 43 percent savings.

Going on to the second case study on the next slide, this is one of our deployments in New York. I think the images are not loading yet, but there's a couple graphs down there that'll hopefully pop up soon. This is our deployment in New York with a landlord called Hines, and this building is quite old. It's 1930 vintage. It's been retrofitted a number of times over the years, one of our larger buildings that we've worked with. In this project, we worked on the 12th floor, which is around 11,000 square feet.

It is the property management office for the building, and in this space you see a lot of private offices, a lot of beautiful conference rooms, a large lobby/reception area. And in this deployment, Mesa actually deployed both HVAC controls as well as plug loads. So we were able to put about 12 different smart plugs throughout the space, and they went into the conference room, the lobbies, this went into their AV equipment, those monitors that you see, TV monitors that you see when you walk into the lobby area that are often left on. We put smart plugs behind them so that during after hours or times when we realized that no one's in the space, we turn off that equipment.

Through both the HVAC savings and the plug load savings, we're able to reduce runtime in equipment by 6.5 hours a day. This company was also going through a hybrid work schedule where folks were not coming in every day, yet the devices and the HVAC was running every day. So through those reductions in runtime, Mesa was able to save 41 percent for this partner. That is it for me on case studies. I'm going to hand it off to Nikitha who's going to share a bit more about the host sites that we would love to work with.

Nikitha R: Thank you, Shaina. Hi, everyone. I'm Nikitha Radhakrishnan. I am part of the team that will coordinate the field validation of Mesa for DOE. Ideally, for this project we would like to recruit office, school or retail buildings. However, if you have a site that isn't in one of these categories we still want to talk to you and consider your site.

It is important that there is no existing building automation system at the site. The site should used force air HVAC system and have a 24-volt thermostat. The space should also have its own dedicated meter. If your site joins this validation effort, you get Mesa at a discounted price. Insulation for the technology will be done within a day, and we're expecting no disruptions. The measurement and verification for this project is completely free, and any meter that we install as part of the effort will be temporary and we'll remove it after validation is complete.

As DOE is coordinating the validation effort, you receive independently-verified savings. The exact duration of the project depends on the individual site, depending on its type, climate zone and other factors. Generally we are expecting not more than nine months for establishing a baseline and then not more than six months after Mesa has been installed. So that's everything related to sites specifically. We will leave the slide up on the screen for you to keep looking at. Michael, we are ready for questions.

Jeff Wanner: And I can – I should have added prior that we've conducted past validations, and those are available mostly on GSA's website. There's a quite a few that end up as case studies through Green Proving Ground – or sorry, excuse me, in Better Buildings, and they're shared on the Better Buildings Solution Center, but we can share links to that both in the chat and then along with the slide deck that goes out.

Michael Myer: Thank you, Jeff, for that followup. We are getting some questions flowing in, and please continue to feel free to enter them into the question pane at the lower part of the screen. One question, and I think this goes to both you, Nikitha and you, Shaina – I'll first go to you, Shaina – who would install the sensors and the thermostat?

Shaina Li: I can answer that. So the quick answer here is that our partners, the host sites would install, but I do want to share that we spent a lot of time designing Mesa for very easy install. And a quick example of this is that I don't have an engineering degree and I've been able to do a number of the installs myself. We've designed it so that it's easy, because we saw that in the market, for any energy

management upgrades, the technical aspect of installation was a big hurdle for a number of buildings to actually adopt and do the upgrades.

So the time of planning it, getting a special expert onsite to actually do the install was what was driving costs, high costs as well as difficulty in install. So our engineering team spent a lot of time curating a set of devices that are very easy to install and also designing a very simple guide. So when you get Mesa, all the devices are laid out sequentially with the right numbers and a floorplan that tells you exactly where they go, and they literally stick up on the walls, and the thermostat is a quick removal and you can put it back in in a few seconds.

Michael Myer: Thank you.

Shaina Li: And of course our team is here if anyone needs help during their install process.

Michael Myer: All right. Sounds like installing a router or similar complexity at your house, so it was great to see that. Also, Nikitha, who handles the M&V meter installation and those type of things?

Nikitha R.: So Kannan at the Pacific Northwest National Lab will coordinate the measurement and work verification process through experts.

Michael Myer: Thank you. Open to the three of you, are there climate zone preferences or regions or other environmental characteristics where you expect to see the greatest benefit or you desire projects?

Jeff Wanner: I don't think so in terms of climate zones that I would envision. I think one of the primary savings of this is space conditioning, so the larger the space conditioning load I would think the larger opportunity for savings, but whether that's heating or cooling specific and regional, I don't think there's really necessarily characteristics that we're searching for.

Michael Myer: Okay. Any other modifications? Or if not, we'll move on to the next question. Okay. Another one, Shaina, about the size of the devices. This person couldn't really get a sense of the scale. How big are these sensors? How intrusive is this technology in the space?

Shaina Li: Yeah, the sensors are very small. I think the smallest sensor is around the size of a Scrabble piece and the largest sensor is maybe twice the size of a Scrabble piece. The thermostats are a little

larger, but the other sensors that go on the walls that you see more of are very small.

Michael Myer: Thank you. I liked using Scrabble pieces as a benchmark. I'm happy to use that from now on. Maybe a question for you, Jeff. What's the value proposition for the site? Why should I participate? What am I getting out of this?

Jeff Wanner: Sure. Well I think this solution provides a pretty low cost and low intrusion opportunity for savings, but beyond that the lab validation is funded by DOE, so the lab validation and the work of Michael and Nikitha in this case would be helping to see the technology's implemented correctly, and then in the analysis, the case study would be based in your building. So if your building's a one-off then it would be a validation of the technology in that one space, but if you have a portfolio it could be included in a portfolio analysis and really assessing what that might do for your suite of buildings.

Michael Myer: Thank you. More questions coming in, and thank you attendees for the questions. Again to the three of you, is there a definition of no building automation system? Some buildings may have some basic automation. What can we – suss out what we mean when we say no automation.

Shaina Li: Yeah. I love this question because it goes back to why we built Mesa, because there's a number of different HVAC designs out there. The quick answer is shoot me an email and I'll work with you to figure out which of your buildings can work. The very quick answer is that we work with buildings that have thermostats in the occupant spaces, so within the office space you'll see a thermostat that can actually control the equipment that you have in the building. Those will have 24-volt – they're 24-volt thermostats which means there's a system of wires behind the thermostat, so I'll work with you closely to figure out exactly which buildings would be compatible.

Michael Myer: I'm going to first go to Nikitha with this question and then back over to you, Shaina, on this one. How is data collected and shared with others and privacy? So first let's talk about the M&V side of it, Nikitha, and then we'll talk about the operational side of it with you, Shaina, if you could.

Nikitha R.: For the M&V side of things, we will not share the raw data. However, we will report the validation results in terms of energy savings and other results that we get, but the report will not

identify specific sites, so it'll be generalized just in terms of the data analysis coming out of the M&V, but the raw data will not be shared.

Michael Myer: Thank you for the data side. And Shaina, for the operational question?

Shaina Li: Yeah. I'm going to break it down into what data we collect and what data we share. For data collection, we collect temperature, humidity, occupancy and preferences. The last two I want to double click on. For occupancy, our motion sensors use infrared to detect whether there's a body in the room. It detects if there's like a warm being, and that will let us know if it's occupied or not.

There's no microphones, no speakers in any of the devices, and there's no identifying characteristics detected. So I can't tell that Shaina actually spent time in conference room today. Instead we just know that there was a presence there for motion and occupancy. And then preferences, we have those devices where folks can go and press are they too hot or too cold, and that feeds into the algorithm. Again, no identifying characteristics actually collected there besides your actual feedback of whether you're hot or cold.

And then from a reporting perspective, I'm really excited about the reporting we do because we're trying really hard to take this information about what's happening in the space and also the energy that is saved, the carbon footprint that's reduced, and actually translate it in a way that is easy to understand in a nontechnical way. So we'll translate it from we save you this much run time, which is this percentage of energy used which is this kilowatt hours, and this generally means this amount of carbon footprint but we'll translate it into something like this is equivalent to planting this number of trees or removing this many cars off the road.

Michael Myer: Thank you. Oh, Jeff, yeah, please go ahead, Jeff.

Jeff Wanner: Yeah, let me add in real quick just on the case study side and the ultimate reporting that comes out. You know, working hand in hand with the host site throughout the process, the lab would be giving updates and certainly look to the building manager and facility manager for their input, and we would want to include that in the ultimate case study. The name of the host organization and that which is involved as the host site partner doesn't have to be included and can certainly be redacted from any publications, but

that would be the choice of the host site. We would want to include the characteristics of the building in terms of climate zone and system types, but that can be anonymized as far as identifies are concerned.

Michael Myer: Thanks for that addition. Can we go to the next slide? We have some interest in how to follow up. So I know that we have that slide coming up where we had the followup. Yeah, so perfect. Thank you so much for the slide.

So if there was some interest in learning more information and also reaching out, so if you have interest in possibly more followup specifically to the project, you can reach out to that email address as well as you can learn about Mesa. We did receive a question that is really Sidewalk specific, and that's not really part of this webinar at the moment so we're going to follow up that offline with you and Shaina. It was really more about company, and here we're talking about technologies and this field evaluation. Again, open to all three of you.

Are there square footage cutoffs for the size of the building that could participate or an average size that you're interested in? And then also, are there buildings that are either too small or too large?

Jeff Wanner: I think I'll start out quick. What DEO saw as an interest and really we saw the value proposition is for small commercial buildings or buildings that are a challenge to bring into building management systems and put these level of controls in with an easy retrofit opportunity for potentially strip malls or those types of small commercial applications where we don't have a large list of participants or of technologies to really apply to. But as far as the validation, I think more broadly open, and if this solution is well suited to the building then I think that it would be an interesting candidate, and I think Shaina can probably expand on that too.

Shaina Li: The main thing I would add is that we designed Mesa to be modular so that we could deploy in one space within a building and then expand to another space very easily. So as folks on this call are thinking about if they have a building and multiple tenants in there, if there's one tenant space that will be more suitable for this pilot first we could do that, and then if they're thinking about potentially expanding to Mesa and the rest of the building later it's an easy add-on.

Michael Myer: Great. Thank you both for that. So yeah, it sounds like definitely small is not a problem, and then it can grow and at some point

there probably is a size limitation also because at some point big buildings almost always have a BAS when you get over 40,000, 50,000 square feet, that'd be a weird building to work in without a BAS. So thank you both for that. It seems like we have a lull in the questions. I think we touched on all the big ones that had been raised.

Were there any things that you thought of while – in case there were any last questions coming in – anything that you thought of that you wanted to add one more time?

Jeff Wanner: No. I think my only thing was that my email can be shared after this slide deck, and if you have questions on the validation process overall or other technologies that are coming through the program we would certainly be happy to correspond with you. We're always looking for building owners to participate in Green Proving Ground as far as reviewing technologies and coming to the point where we're looking for validation sites like this, so getting feedback from building owners and knowing what is on your want list or things that you need is always something that we're after in the Building Technologies Office and want to support all the Better Buildings partners and beyond.

Michael Myer: Great. Thank you for that, Jeff, and I'll make sure to include your email. Yes, we seem to – let me just double check the page. Yes, I think we've hit all the big questions. We've got the followup email and this will be captured in case there was a followup detail you missed. I have no other bits of information, unless Nikitha or Shaina, you'd like to add anything else.

Nikitha R.: Nothing from me.

Michael Myer: All right. I would say thank you all who attended this. Many of you were on the whole time, so thank you. These are good projects. You learn a lot. I think you'll learn a lot. Sometimes we inadvertently stumble upon other problems with your building where you forgot that you had set a setting and so you actually sometimes get some tangential knowledge out of something that you weren't expecting along the way.

So thank you for your time. Please reach out. We really do want to work with different sites and really trying to push the bounds of making buildings more efficient, so thank you.

Jeff Wanner: Thanks all.

Shaina Li: Thanks, everyone.

Nikitha R.: Thanks all.

[End of Audio]