Jefferey Murrell: Hello, everyone, and welcome to the 2021 Better Buildings, Better Plants Summit. Thank you for joining us today. We have a wonderful session prepared, and some fantastic speakers we're going to introduce in a minute. Before we dive in, there are a few housekeeping points I would like to cover.

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Please note today's session will be recorded and archived in the Better Buildings Solutions Center. We're following up when today's recording and slides are made available. Next, attendees are in listen-only mode, meaning your microphones are muted. If you experience any audio or visual issue at any time throughout today's session, please send a message in your chat window located at the bottom of your Zoom panel.

I am Jeff Murrell; I'm your moderator. I serve as a program manager for the US Department of Energy Federal Energy Management Program, FEMP, where I currently manage the federal metering, the federal Energy Management Information System, aka EMIS, and the federal energy-intense facility program. I previous managed the strategic inter-agency agreement between FEMP and the NASA, and also serve as the technical lead for the Army Microgrid Tiger Team Initiative.

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We're gonna kick off today's session with some introductions. I will give a brief presentation about EMIS, and then hand things over to our distinguished guest panelists. We'll wrap up, at the end of the session, with plenty of time for questions and answers.

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So I hope everybody is familiar with Slido. If you are not, we are excited to announced that today we'll be using this interactive platform for Q&A polling and session feedback. So please right now, please go to www.slido.com, using your mobile device or by opening a new window on your Internet browser. Today's event code is #DOE. Once you enter this event code, please select today's session in the dropdown menu at the top-right, "Beyond the Low-Hanging Fruit of Energy Efficiency." If you would like to ask our panelists any questions, please submit them in Slido any time throughout the presentation. We'll be answering your questions near the end of the session.

If anyone has already asked a question that you would like answered, you can upvote the question by clicking the thumbs-up graphic. We will go back and forth between the polls and the speaker questions at any time, by clicking the polls and Q&A tabs at the top of your Slido window. We will also give everybody a few minutes to open up Slido and select our session. So please go to www.slido.com right now. All right? Now let's go to Slido.

So, the first poll that we would like to ask you: Where are you joining us from today?

And the city name only is acceptable. And if I was to enter anything, I would say I'm currently in El Paso, Texas, where I'm helping out the humanitarian effort to assist the unaccompanied minors who are at the southwest border. So, we have a great deal of cities, with the top one being Boston, and we have Sacramento, Milwaukee, Grand Rapids, Michigan – all cities I've been in – Washington, D.C. – my home – Pennsylvania – all right. Thank you, everybody.

All right, let's go to the second poll question: Is this your first time attending a Better Buildings Summit?

All right, so, it seems like we got a lot of newcomers. This is great. This will be my third time attending a Better Buildings Summit; the first time as a moderator. Okay, fantastic. Now, seemed like 57 percent of you are repeat participants, fantastic.

All right, let's go to our third question – and we're going to launch another poll: What sector are you from?

Oh, government started out with top lead, now it's tied with industry and manufacturing. Very good. All right. All right, industry and manufacturing is taking the lead, fantastic. All right, we'll just wait one more minute, to see who's gonna be declared the winner. We do have a lot of contractors and service providers. Others is tied for the bottom with higher education, but you're always number one in our heart. All right, so let's start there, so, industry and manufacturing are most of our participants; more than a quarter of you are from that particular area, great.

All right, let's launch the next slide. So we'd like to know what is the next big project or challenge related to energy efficiency. And I could tell you, down in the southwest border, air-conditioning is *[laughs]* top on that list. All right, money and decarbonization, great. One of the main focus of DOE is decarbonization. Capital

and development, cause, yes, meeting energy goals, decarbonization, also, outside air, which is very important, funding, money, money, money, yes. Motivation of owners, buy-in by people, and you could probably say buy-in by management is also regarded. Electrification, that's very true, saw something in the news about that today.

Profiting, financing – that's somebody working on their doctorate in business, yes, funding and profits are very important. Intersection of public health in energy efficiency. That's a great conversation, and you'll definitely enjoy today's discussion about EMIS. Balance air quality with energy, very important. Equitable solutions and elimination of existing refrigerants used in equipment, very good. And last, but not least, serving LMI. So, all right, very good, so thank you so much for that. We'll go on for at least 30 more seconds, and we'll proceed on, just see if we got any more last questions. Seemed like equitable solutions is coming up a lot, energy efficiency in hospitals, converting from steam to hot water, great. I remember working in my first project for the army, back in 2007, doing a conversion of steam to hot water. All right, thank you so much.

Now, next slide.

I will briefly give an overview of EMIS, the Energy Management Information System. So, as we begin this session, we just want you to be familiar with this particular topic, especially how the federal government is tackling EMIS.

So next slide.

So, the first thing we wanna do is define what EMIS is, and EMIS consists of a broad family of tools and services used to manage commercial and federal building energy use, and to analyze and apply energy and water metered data – very important. These technologies are association with functionality, including monthly data analytics, energy-efficient and energy-saving estimation technology, that's new, coming directly from the Energy Act of 2020. Energy information systems, fault detection and diagnostic, and automatic system optimization, which is also very key. And let you know right now, we have a draft, an EMIS technical report.

This is our first-time document ever for the federal sector. We basically have been learning from what has been done with EMIS on the industrial side. And so, on this slide you see that energy deployments can be divided into capabilities, stacking, and scope.

All right, next slide.

So, as I mentioned before, we're basically learning from what's been done on the commercial side. So, over the last three years, Cedar Blazek and her crew have been basically working on a Smart Energy Analytics Campaign. And basically, this campaign involved more than 104 organizations, representing more than 6,500 buildings, involving more than 567 million square feet. And the EMIS software that was presented represented more than 40 different EMIS vendors that have been installed. Some of the energy savings that we have achieved so far is, for just information energy – energy information systems, about three percent's been aggregate total, and in terms of fault detection, it's about nine percent.

In terms of annual cost savings, it's been about $95 million, with annual savings somewhere around $3 million. And this is one of the key things, the investment payback is usually between one to two years, with the average being two years. So, if you'd like to know more information about the Smart Energy Analytics Campaign, please click the link below.

All right, next slide.

So, as I mentioned before, there is a current draft of the – and I should say federal EMIS technical report, that we've been basically working with three different laboratories, and also with our sister agency of the Better Buildings Technology. So, what this report is, basically, is complementary of the upcoming 2021 federal metering guidance, which again was called out in the Energy Act of 2020. We basically expand on the section that deals with energy management system, and also, this report served as a primer for the energy efficiency, energy savings information technologies. And later next year, we're gonna be basically coming out with a Web-based best practice guide that gives you more information about that.

In terms of EMIS, and this is more focused for federal facility, but if you were in a commercial facility, the same deal also serves. We want to integrate with advanced metering and building systems in their infrastructure, through building automation, building controls, artificial intelligence, grid integrated buildings and smart grids, renewable and clean energy technology, resiliency, which is very much an important part of the federal portfolio and retro-commissioning and retuning.

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So, again, we want to incorporate comments and suggestions from federal agencies, last year, during our O&M roundtable. They allowed us to better fine-tune this particular technical resource on how we can illustrate what technologies, in terms of EMIS, that could be very helpful. We plan it to be like a planning and acquisition guide, including some tips if you have to pursue third-party financing, and how you can overcome a lot of common challenges. Though it was written for the federal sector, it's also served as a good primer if you wanted to incorporate an EMIS on the commercial side. And speaking of which, FEMP and BTO worked together to come up with a way to facilitate procurement for EMIS.

And if you see that link located in green, you can click on that and you'll be able to download an EMIS specification and procurement support materials. And also, we wanted to let you know that, later this year, we're gonna come out with a FEMP EMIS website, where it'll be user-friendly and it will serve as a way to get practical answers to potential questions.

All right, next slide.

Some of the content that's currently in the draft EMIS is how it's gonna benefit federal agencies, what are the capabilities, the planning, the procurement, and operations, and some of the topics are listed over to the right.

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So, one of the things that we were able to come up with, because we definitely live in a visual society, is we came up with a graphic in terms of the various EMIS levels. And so, right now, if you just wanna basically start with any building that has a utility bill, you're basically looking at a Level One, where you can do things such as M&V and utility bill management. A Level Two is a building that has some type of advanced meter system or distributed energy resources, where you can do things such as interval meter analytics and applications. Level Three, you're basically dealing with buildings that have a building automation system or utility control system. There, you can do things such as fault protection and O&M optimization.

And then finally, Level Four, a very sophisticated building where

you can get involved in utilizing advanced supervisory controls, including grid integration. But mind you, you can use grid interactive buildings at any of these particular levels whatsoever. And also, you must be cognizant of any cybersecurity requirements. So, over to the left-hand side, you see some of the portfolio characteristics. We suggest that, if you are having concern about funding, which is one of the things that a lot of people – I think it's more than a third of the people – mentioned something about funding or cost, you can start slow. You can start with making sure your buildings are a Level One, then advance to a Level Two, and then finally advance to a Level Three and then a Level Four.

All right, next slide.

So, today's presenters are listed on the screen. We have Wendell Brase, we have Becca Rushin, and Peter Isabell. And they are some very fine panelists, and I have listened to their presentations in the past, and I have even learned a lot of new things that we'll be incorporating when FEMP come out later next FY with a federal smart energy analytics campaign. So, just a quick reminder, if you're having any issues, please message technical support team by using the Zoom chat function. And now, I'm going to turn – we're gonna ask our panelists to unmute and introduce themselves. Let's start first with Wendell.

Wendell Brase: Hi, I'm Wendell Brase. I'm the associate chancellor for sustainability at the University of California Irvine.

Jefferey Murrell: All right, thank you, Wendell. And now Becky? Or Becca.

Becca Rushin: Hey, Becca Rushin with Jamestown. We're a commercial real estate owner, based in Atlanta, Georgia. I've been with the company about eight years, and currently serve as their vice-president of sustainability and social responsibility. Thanks for having me.

Jefferey Murrell: Thank you for participating, Becca. And finally, Peter.

Peter Isabell: Yeah, thanks, Jeff. Peter Isabell, Lifetime, been here for almost 14 years, and my title is the director of energy management and sustainability.

Jefferey Murrell: All right, great, thank you all for being with us today. And as of now there's less of me, more of these distinguished panelists, so we'll start first with Wendell. And Wendell, please take it away.

Wendell Brase: Thank you. Yes, go to the next slide, which is a title slide.

I picked this title slide because I think some of you listening and watching will decide that what we did was over-the-top. And I hope to convince you, through giving you quite a bit of evidence and data, that what we did was sensible. But I leave it to you, actually, I'm going to leave it open-ended.

Next slide.

We've been tracking energy use at UC Irvine for quite some time. We started doing this seriously in the early-'90s, because we had a deficit in our utilities budget. It had nothing to do with having adopted any sustainability goals or carbon reduction goals; it was a budget problem. And actually, what we discovered was that, every time we built a new building, we got a little bit bigger deficit in the utilities. It's because the utilities budget was pretty lean compared to the costs of the buildings' energy budgets that we were adding.

So, next slide.

Okay, so the green is what actually happened. You can see, on the blue line at the bottom, we adopted a goal of beating Title 24, which is the California energy code, considered to be one of the tougher codes, actually, in the country, by 30 percent, for all those new buildings. Because if we hadn't done that, this curve was just – our deficit was gonna get worse every year, it was just gonna add every time we added a new building. So, the business-as-usual curve is not an actual curve, meaning, it's a computed curve. It's what we would have consumed in terms of energy, as you can see listed on the vertical access, if we had continued to build new buildings to California's code, built'em to code and operated them in a reasonably sensible manner. So, in 2007 –

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– something really interesting happened. The chancellors of all the UC campuses, all ten of them, agreed to join the American College and University Presidents' Climate Commitment, which was a pledge to attain net-zero by a certain time. In the case of the University of California, that date is 2025. We decided we needed to go deeper on energy efficiency. So if you compare those two curves, the blue business-as-usual curve and the actual curve, what you see is, in about 15 years, we achieved about 15 percent improvement. That is, the difference between the green and the

blue curve is 15 percent, in 2007, that's about 1 percent a year we were improving. We knew we had to do way better than that, now that we'd signed this commitment.

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By the way, the campus was continuing to grow. That top curve is basically a surrogate for campus growth. This was all kinds of buildings, you can imagine, and – but let me show you what happened after 2007.

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That's what happened. It's all because we prioritized what we call deep energy efficiency, and I'll explain exactly what that means to us, as we go forward. But –

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– what you see here on this next slide is, if you go back and look at where the green and the blue lines departed, in 1993, we doubled the size of the campus, over the period that's displayed on this chart, doubled the size of the campus, and were using the same amount of energy.

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So, why was this possible? You might wonder. It would be a fair question to say, "Well, maybe our buildings were so inefficient to start with that we were just – everything we did was low-hanging fruit." Well, that actually wasn't the case. Our campus had been built to the standards as any other young or middle-aged campus in the University of California. That does not explain how we got to 50 percent. We knew that waste had been built into designs, because as we were building new buildings, I went to a lot of value engineering sessions where I heard a lot about the so-called margin of safety. And after I had heard that term used by design engineers, oh, probably 50 times, is tarted to get skeptical.

And finally when I dug in, I realized that margin of safety wasn't more safe for students or occupants. It was more safe for design engineers. It meant they didn't have to dig as deep. And the other thing we started questioning was this whole idea that kept coming up that more is better. We thought that was probably not evidence-based, and we're a research university, we believe evidence-based findings are very important. Then we focused on laboratories

which we knew were energy-intensive, but we didn't realize quite how energy-intensive they were, until we really measured it. They're five to ten times as energy-intensive as all the other types of space you have on a campus.

Now, that's because all the air in a laboratory goes through one time, it's once-through air, and they tend to have long hours, and in many cases they have pretty high heating loads, because of the energy intensity of what's going on inside the building. We did find, as we started going into deep energy efficiency, some things actually yielded nonlinear results. Best example I can think of is, in any research university, if you look on the tops of the research buildings, the lab buildings, you'll see a bunch of exhaust fans up there. Those exhaust fans at UC Irvine are now operating at half the speed, since we retrofitted all of them. And on all the new buildings, they're operating at half the speeds as what they used to.

Now, the way we were able to do that was we discovered that, if we added a stack extension to those fans, those exhaust fans, the average stack extension was only six feet. No one even noticed when we did it, but it allowed us to cut the exhaust speed coming out of those exhaust stacks in half. Well, that follows the cube rule: that means the savings is seven-eighths on those exhaust fans. With things like that, that's how we get to numbers like 50 percent. And some people say, "Well, you know, your cost of capital is low in a university, because – "Well, we were borrowing money for all these energy-efficiency projects I'm gonna cover, and we were using tax-exempt bonds, so that's true, it's a lower rate of capital than the private sector would see.

But guess what, so was our cost of energy low. We were justifying projects based upon six-cent-per-kilowatt-hour electricity. That's what our average electricity cost was over the last ten years.

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So we can cross out the first and last reasons as possible reasons – they don't apply. These other things do, and there are a few more.

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Some more factors, here. One of the things we had and really were fortunate to have engineers with an attitude. And I think engineering with attitude is a term I need to explain, because it's not clear. If you said to any of our engineers, "Well, such-and-such a mechanical design practice is a best practice," or it's a standard

practice, or even if it's code, they would say, "Oh, really? Well, let's take a look at that. Let's look at the data." In other words, they wanted to see evidence. And that attitude took us a long way. It took us as far as the technology itself.

We started evaluating whether we were going to do projects, in other words, the feasibility assessment, based on the debt coverage ratio, rather than how many years of payback. A lot of people were, in those days when we started out, saying, "Oh, you need to do two- and three-year payback projects, because that's where the benefit is." You know, some of our projects actually have a ten-year payback. Now, they meet the debt coverage ratio, they had to meet a debt coverage ratio of 1.15, but you know what, it's those 10-year projects that met that debt coverage ratio that saved 50 percent, typically. So, and if they were right on the edge of that 1.15 debt coverage ratio, we take a look at whether there were economic benefits to be derived from the co-benefits. Now, I'll give you a few examples of those in just a minute.

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We consider buildings as complete systems. Now, that seems as a no-brainer when you just say the phrase. This building in the photograph, that building was an old dog, I mean, it's 50 or 60 years old, it is a very big building, that's showing just a little slice of that building. It's actually 350 feet long in one direction, and 150 feet in the other; it includes a lot of medical science laboratories. At one point, we considered whether we should tear it down, because it was so inefficient and had so many problems. But we did a comprehensive project that fixed all the deferred maintenance problems at one time, and did a complete overhaul of the energy systems.

Now, when we do that, we try to make systems smart, and "smart" is a term that we use to define precision control. Rather than designing mechanical systems based upon the worst-case assumptions about airborne contaminants or the number of people in the building or any of those worst-case things. That's the way things used to be designed. We have real-time measurement, now, of air quality in buildings, and even air speeds outside, for those exhaust fans I mentioned a minute ago. The savings of combining a big differed maintenance project with a big energy efficiency project was phenomenal.

The energy savings in these laboratories when they were retrofitted, as I've just kind of mentioned, 80 percent – 80 percent.

And it made a much more sensible retrofit project, you only have to disrupt everybody in the building once, not for two separate projects. This is an example of using a complete systems analysis in the building.

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These co-benefits, I'm not gonna go through these and read them for you – I always hate it when people read slides to me – but if you skim down those things, you can pick out the ones that actually can be assigned an economic value, like the cost of breakdowns. Lower central plant costs, what that means is, we actually, after we did all of our energy efficiency projects, we had a central plant that was too big. Well, we're a growing campus, that's good. That means that, as we continue to add more buildings, we don't have to add more chillers in the central plant, or anything else, we don't have to expand the electric grid on campus, because we have opened up capacity that now is very valuable as we continue to grow.

Lighting is not only more efficient, it's high color rendering index, almost equivalent to daylight, and the correlating color temperature, meaning the color of the light, is optimized. Meaning that we don't have the wrong color of light, especially in places like patient care areas where you don't want to be triggering sleep disorders by having the wrong color of light at the wrong time of day. So, there are all kinds of code benefits and – oh, and indoor air quality, I should say. But because we slowed down air changes in practically every kind of building, not just labs, across campus in almost all buildings, we slowed down air enough that the penalty of using really good filtration was almost trivial.

So we've been using MERV 14 filters, now, at UC Irvine, for a decade. That's our standard. Some people have just been doing that for the last year, during the concerns of infection control during the pandemic, but we've upped it to MERV 15 for the last year. Almost no cost to doing that, and, yeah, there is a big payoff in this.

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Other things we learned. Well, building systems, indeed, had been designed to worst-case conditions, we sort of knew that going in. Yeah, we were right, more is not necessarily better. In many cases, airflow changes actually, in many cases, are – you have better infection control and contaminant control based upon the quality of

airflow, as opposed to the quantity. And, so, as we were optimizing smart building design, we actually moved diffusers and changed diffuser designs and that kind of thing. We focused on quality more than quantity, because that paid off, and it actually made for a safer campus.

The project at the margin I said, earlier, may be a clear winner when co-benefits are included, so we looked at it that way. And as I've said earlier, it's a combination of technology and attitude, but I always say I give the slight edge to attitude. Having an attitude that we can go deeper, we can question the status quo, we can look at evidence-based results, and it will get you much further. I can guarantee, though, that aiming low will produce certain results. The certain result will be a low result.

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So now is the time to go deep on energy efficiency, the cost of capital is low – you know, we're gonna be paying more for decarbonized energy, that was our assumption back in 2007 when we signed that pledge to become carbon-neutral. We always thought that decarbonized energy would have to cost more than fossil-based energy, and a lot of people aren't really focused on this because a lot of people are enthralled by the very good news that the cost of installed solar and installed wind is going down, a lot. But the real costs of decarbonized energy aren't going to be in the sources of renewable energy. It's gonna be in reimagining, redesigning, rebuilding, and reinvesting in an entirely different kind of infrastructure, which is gonna be a way more complex grid, with the capacity to do stabilization, resiliency, seasonal storage, in a climate which is getting more extreme.

So all those things I just mentioned are gonna get harder to manage. It's gonna be a way more complex grid, and it's gonna be replacing grid, or grids, a gas grid and an electric grid, which have been in place for 50 years. Many of those investments were paid for a long time ago. So, we think the cost of decarbonized energy is going to be, in round numbers, double the cost of fossil-based energy, but the best way to address that is use half as much. And that's been our basic overall strategy, and remains that. Another reason to do this now is, all these technologies I've been describing, they're no longer high-risk.

They've been proven, they've been developed, they've been – this whole idea of having a smart campus – and just to give you an idea of how smart it is, we didn't just make labs smart. We extended

this idea of precision control, using lots of sensors and a big informatics layer behind the sensors. Right now at UC Irvine, as we speak, 465,000 datapoints are being measured, most of them every 5 seconds. Now, what this means is, if there is a fault in any part of those mechanical systems, such as in the laboratory, we discover it within seconds or minutes, not decades. And I can tell you, when we retrofitted all those buildings, we discovered things, problems that had existed for decades we didn't know about. This is what good instrumentation does, it not only is more efficient, it's a lot safer. Especially in a laboratory-rich environment, you wanna discover problems right away, with a mechanical system.

So, there are huge benefits, and it's a proven thing. And by the way, if you're wondering, "Gee, that must've cost a lot to put in that big informatics layer and all those sensors," yes, it did. But actually, the savings were so great it's actually a no-brainer, the savings far outweigh the costs, and I can't say enough about that, actually. So, this is now the time, I think, to go deep, and there's a few things on here I hadn't mentioned before, like, oh, wavelength-selective glass, now, which is – and lighting controls which you don't even have to rewire a room to put in a totally different kind of lighting system. They're wireless controls, you can just do it right in the switch blocks.

There are so many good opportunities, and one of them is energy services contractors are now willing to jump into projects like this. And that's a good thing, because for many organizations, that is the most viable solution to solve a problem – they can't do tax-exempt borrowing like we did, for example, so energy services contracting, I think, is a real good option for many organizations, many good reasons to do it now.

I think that's my last slide. Do I have another slide. No, I'm done.

Jefferey Murrell: That's it. Thank you so much, Wendell, we appreciated it, great presentation. It seemed like a lot of people in Slido are coming about your "engineers with attitude," and as an engineer, I hope I have an attitude to measure up to what you were discussing. So, that's gonna be part of questions, later.

As a quick reminder, if you would like to ask any of our distinguished panelists any questions, please submit them in Slido anytime throughout the presentation. We'll be answering your questions near the end of the session.

So next, let's hear from Becca. Becca, please take it away.

Becca Rushin: Thanks, Jefferey. And Wendell, you know, it's always a good sign when I'm on a panel and I'm taking vigorous notes. I think there's just a lot to be learned from your approach, and even across sectors, that might seem kind of, on the surface, to be very different.

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For those of you that aren't familiar with Jamestown, we're a design-focused real estate investment and management firm. We've got about 450 employees worldwide, and we're vertically integrated, so, full-service. We own a number of iconic assets. One of my favorites is One Times Square, pictured on the slide, and I mention that just to say that – well, I joke. I joke that a lot of owners claim that they have a bunch of what I call special snowflakes, right? You know, like, "My portfolio is so difficult, and I can't do this because xyz." We do own a lot of really weird buildings, we have a diversified portfolio that creates some interesting challenges.

But, you know, I think what I've learned over the years is that there's something that can be done at every type of building. And so, I'm gonna take a little bit of a – I'm not an engineer, so my points are gonna be a little less technical. But I'm gonna focus on how we've kind of worked to connect the dots between our corporate strategy and our building-level energy management. And I like to think of myself, in many ways, as a translator for those engineers with attitude, and really, you know, my goal is to help them get projects implemented, and really to make them look good.

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This is just a quick summary of our portfolio – I think this was as of the end of 2019. You kind of can see our geographical diversity, but also our diversity in terms of asset type.

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And, you know, from the ownership perspective, you know, I think that there are a lot of similarities between the three of us, our perspectives that you'll hear from today. You know, one thing that I always think about is our fiduciary responsibility. So, anything that we do, you know, must ultimately support that. And then, really, there hasn't been a lot of appetite, traditionally, for risk or

failure with energy-saving technology. And Wendell, I like your point that, you know, at this point, a lot of this technology really isn't experimentation anymore, it's proven. And so I've seen owners, you know, not just Jamestown but owners, as well, really getting more aggressive on implementing these programs.

Another kind of point and an important part of my work is just the investor expectations. Over the years, we've seen a real increase in the inquiries and just the level of detail that our various stakeholders expect us to share about what we're doing. I think, you know, it's seen as a way to reduce risk, but also, it's value-based, people really wanna see that we're doing the right thing. And I think that also applies to tenant attraction and retention. They're looking for landlords that are aligned with their values, but they also want spaces that can operate efficiently and maximize productivity for the occupants.

One of the things that comes up a lot in a multitenant environment is that there can be a disincentive for landlords to make investments in efficiency, particularly if the tenants are the ones experiencing those savings. This is something that I think the Green Leasing movement has really addressed, and, you know, it hasn't been a huge barrier for us. I think it's an area where there's a lot of room for collaboration, and there are various programs from DOE and others that have really kind of helped connect those dots, as well. Asset diversity, I think I mentioned this already, but there's really no one-size-fits-all solution for our portfolio. I'm very frequently approached by vendors that think that they're gonna get every single Jamestown building into their beautiful platform, and the reality is, at least in my opinion, is that that's never really gonna be a great fit for us.

And I'll kind of go through some more concrete examples about that in a minute. And then the other is just community character. You know, we're very kind of placemaking-focused, and so, you know, some projects can really support involve the community, whether it's a green roof that's accessible, it's an amenity but it also provides shading and helps with cooling and insulation. Or even a solar panel or another solar or another highly visible project that can serve as an educational moment for visitors.

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These are just some highlights of our program over the years. You know, in the commercial space, you see a number of numbers adopting aggressive targets. So, we've adopted a goal of achieving

net-zero carbon emissions by 2050, but, you know, really across a number of environmental impact areas, we're working to increase the performance of our whole portfolio. So these are just kind of some of the highlights to date.

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And one of the ways that I look at our data is both kind of the long-term, so, performance towards our 2050 goal, or what was previously a 2024 target that we met a couple years early. So we look at things on kind of a longer-term cumulative timeline, but we also look at our data on a like-for-like basis. So basically, we look at buildings owned for both years of a two-year period, and that's how we kind of look at our annual portfolio performance. And so, you know, supporting the numbers that you see on the slide is a very detailed spreadsheet that kind of goes asset by asset. And that's just kind of one of the layers that we use to compare and prioritize projects and target assets for improvements.

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I mentioned our ESG impact areas. These are the nine areas that we use to kind of organize our short-, medium-, and long-term targets.

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And in the last year, we *[audio cuts out]* to refresh all of our ESG goals, and basically aligned all of our targets so that they together supported all 17 United Nations sustainable development goals. You know, whenever I'm speaking internally about this, it's a little daunting, I think, as, like, a property manager, you're, like, "Okay, so, what exactly is my role in ending hunger?" You know, these are, like, really big, big global issues, but each of these goals have some targets that, you know, really are material for the real estate industry. And so, we felt like it was important to ensure that we were supporting these broader global goals.

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So how does that actually happen? This is just kind of one impact area, a sample of how we tracked our progress towards our 2024 targets, which were our old targets. That's what you see in the graph in terms of our energy intensity. And then you can see our kind of refreshed targets that are spread out over time. You know, sustainability, in general, is always going to be very dynamic, you

know, it's never a – it's always a moving target. And so, I fully anticipate amending these over the years, but this is kind of where we're starting and where we're focused for the immediate future. And really, the EMIS systems are a huge component of how we're going to actually get there.

So you can go to the next slide, please.

I really loved this diagram. I had never seen it before. *[Laughs]* I guess I had been flying blind a little bit. But with our portfolio, it really makes me think that, you know, we have properties that I think fit into each of these levels. And I have a slide, in a second, that'll kind of go into more detail, there, but, you know, I think it's important not to get discouraged if you can't go super deep right away. But at the same time, you know, my goal has been to ensure that we're doing kind of like a baseline of activity or energy management at each of our properties. So, when I started in 2008, Wendell, I was also very impressed that you all had been benchmarking for as long as you have been.

I inherited a bunch of really crummy ENERGY STAR accounts that were all incorrect, and, you know, burned lots of hours and brain cells trying to clean all of that up. We really didn't have what I considered a super clean baseline until 2014, so it took, like, 2 years, really, to get that to a level where we could, you know, audit our data and get it verified and that sort of thing. But at this point, like I said, we have buildings that kind of fit all of these levels, and it's helped us both with our actual energy performance, but also earning recognition such as ENERGY STAR Partner of the Year. And I think the thing about recognition is, once you start getting recognized for doing things, it really motivates team members.

So, you know, I mentioned that I'm not an engineer. I've kind of bounced around to a couple of different departments, but throughout my career at Jamestown, I've worked very closely with our building teams. We manage some of our buildings inhouse, but a majority of our buildings are managed through a joint venture partnership. So, it's a nuance that I think is important, right, because I'm not the boss of these engineers, right, so how do I work with them and how do I motivate them. And really, you know, for the engineers with attitude and the engineers that are really digging in, it's amazing what they come up with. And so, you know, usually, whenever I start the project, or even every year during budgeting, I usually start by asking the engineer, you know, "What's on your wish list?"

Or, "What do you want that you don't have?" Or, "If you could convince ownership to do one thing, you know, what would that be?" And I've found that, with these EMIS tools, frankly, some people, I think, are just more naturally inclined to engage with software tools than others. And so, there are some buildings where I know I have an engineer that's, you know, logging into the system and using the data and making changes to their operational schedule. You know, there's others where the property team might not be as well suited for that, and I might, you know, suggest something that's a little more automated, something more like a Level Three or a Level Four, if the building context allows. So, you know, I do think that just kind of the property teams and the interpersonal relationships are really important, as well.

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This is just kind of how I look at our portfolio-level data management. So, that, for us, starts with utility data automation. There's very few things that I make everyone, every building do; I feel like I try to conserve my political capital. *[Laughs]* But one of the things that I felt was a really important best practice was to automate the payment and the data collection from all of our landlord-paid utility bills. I didn't want property managers having to spend time on it, and so we'd outsource that through Schneider Electric and their bill pay partner, Cass. So, for the first time when we implemented that, we had Schneider's three-source advisor platform, which was, you know, a single place where we could see all of our landlord pay utility bills.

It's definitely been a lot of work to get it set up and, you know, make sure everything from, like, maintaining square footage and properly, you know, labeling meters and things like that, you have to keep it up. But it's been really helpful just to have that visibility, and even things like variance testing and bill errors and things like that. That, for us, that populates ENERGY STAR portfolio manager, which we use for Better Buildings reporting, for, you know, LEED certifications and other purposes, local law reporting. And so, so it's nice that we no longer have property managers manually entering data. And then, we use measurable through ULI Greenprint, for our what I call portfolio-level data management.

So, on top of all of the energy, water, and waste performance data, we can actually enter our project information. So, all types of projects, energy projects, even health and wellness projects, and we can kind of overlay that. And for me, you know, when I'm reporting on, oh, gosh, like, 20 to 40 million square feet, a couple

hundred buildings, it's really helpful to have all of that centralized. And for a relatively, you know, small firm, we didn't really have a ton of, like, project-tracking software, so for us, that's been a really efficient way for me to make sure that I'm kind of telling the story about what our teams are doing.

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And, you know, I think where the rubber really meets the road is with our property-level energy management. So, you know, I talked about the UBM – we've been doing, I think it was 2013 when we first started doing real-time energy management. And, you know, I think all the platforms, all the providers have really advanced a lot over the years. You know, for a while, we were pulling utility interval data, which, you know, for some buildings, it was, like, a couple hundred bucks a year, it was very cheap, right? It wasn't the deepest of data, but it was nice to get, you know, warnings on peak demand and things like that.

And then we kind of moved more into the real-time interval data plus demand response. So I think we started with, like, 5 buildings, and we now have about 14 buildings on that system. But, you know, I mentioned a comment about our special snowflakes, earlier. You know, our 2.1 million square-foot mixed-use facility is a lot more complicated and expensive to rollout something like that than our more traditional office assets. So, a lot of the buildings that are on our kind of like real-time interval data platforms are our office buildings, and we have most of them with one vendor. And it's really nice to be able to log in and kind of see, you know, all of those buildings in one place, get quarterly reports.

But as I mentioned earlier, I'm not completely married to only logging in to one portal. That might be a personal preference, but I'd rather have the right solution for each of our projects. And so, we have others where, you know, we're looking into more sophisticated systems that have more ability to actually control the building, they're integrating things like occupancy, access control, you know, fire life safety systems, and indoor air quality is one that I'm particularly interested in. And so, I think, you know, now that we've kind of, we've had a couple of years under our belt with the more basic system, I think it'll be interesting to kind of roll out the more extensive systems to some of our additional assets.

This is my last slide, but, you know, the one thing that I will say is that I think the vendor landscape is really interesting. Wendell, you mentioned service contracts, and it's something that I think some

people in the real estate industry have a bad taste in their mouth from, from, like, years past, like, you know, 10-15 years ago. But I've really found it interesting to see vendors coming in, like, willing to put skin in the game, right? Like, guaranteed savings, or guaranteed to help you meet a local law compliance standard, that sort of thing.

I think that really kind of de-risks things for landlords, which we obviously love. And then, the final thing that I'll say is, you know, during Covid, we were able to use our EMIS data to show that we had about $500,000.00 in savings, through operational efficiencies. And, you know, that was just another way to kind of give a boost to our property teams that were really kind of buckled down and doing what they could to reduce expenses. And I think, you know, it was very welcome during 2020, so it was a nice way to provide some validation to what they were doing.

I'll stop there, but will monitor the chat for any questions.

Jefferey Murrell: All right, great, Becca. We appreciate listening to you talk about how to translate those engineers with attitudes.

So now we'll turn everything over to Peter. So, Peter, take us away.

Peter Isabell: Thanks, Jeff. And it was great to hear from Wendell and Becca. Your presentations were very educational, so, thank you.

Next slide.

I don't have a super cool title like Wendell did. I just basically took the title that we were supposed to talk about. So, that's just a picture of one of the front of our buildings, pretty elaborate, pretty topnotch.

Next slide.

So, just wanted to give you guys kind of a background of who Lifetime is. We were funded in 1992. We have 157 locations, about 18 million square feet of real estate. We have over 800 bodies of water, pools, and hot tubs, and such, 1.7 million members that go to our facilities. And over 19 million individualized group fitness classes visits by members, like yoga, Pilates, group fitness, and so on and so forth.

Next slide.

So I just wanted to kind of go over some stuff that we've done in the past. Basically, what you can see, here, is that it's taken 11 years to get where we are. We started off with some showerheads, first generation lighting upgrade, brought eight controlled systems basically in our fleet in 2014, tried to get underneath a single pane of glass, so, retrofitted 100 clubs, at that time, and had new-construction clubs under a single pane of glass, to have all of our energy management data underneath one supervisor. Did an LED upgrade in 2016 and '17, VFDs in our pool pumps, and, you know, a couple more things, there. And then, put some new construction design goals for new clubs that were being built. So we're building anywhere from 500,000 to 1 million square feet of clubs per year, so.

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So, basically, what was the impact over the last 11 years. So, electric's down 35 percent, gas down 15 percent, water down 10 percent, so, pretty good, you know, water not so good. And this is normalized for everything that we put, you know, basically, into our clubs as adders. And what I mean adders, we're constantly making changes to our facilities, increasing pool temps to serve our members, adding mechanical equipment to cool server rooms or laundry rooms because we've added load. So, we normalize for everything that we add from an electrical, mechanical, or water adder, so.

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So, these are just some graphs that kind of show the progress over the last decade. As you can see, electric is down. This is our same store, so basically, we just took a sampling of 100 clubs. The red line is basically showing an incremental 2 percent electric adder for the previously mentioned mechanical adders and stuff like that. So, electric, we made the biggest improvement as a fleet, down 35 percent; gas and water not so much.

Next slide.

Where are we going as a fleet. As I had mentioned before, it took us 11 years to get where we're at, but we're gonna reduce our electric and gas down another 20 percent, over the next 3 to 5 years, through stuff after the low-hanging fruit. And water, we're gonna drop another 40 percent, over the next 3 to 5 years, which is a pretty significant goal for us. That incremental 40 percent water reduction is equivalent to 650 million gallons of water per year, so,

we're a large water user. In 2019, pre-Covid, we used about 1.5 billion gallons of water, which is equivalent to a lot of, you know, cities out there.

So, and when we take the electric and gas total reduction of 55 percent and 35 percent, basically, it comes down to a 50 percent total BTU load. So, our electric BTU load is a lot more than our gas BTU load.

So, next slide.

So, how are we gonna get there? Big-picture. So, we're going into baselining our clubs, analytics and reporting, variance management with EMS, with our bill pay process, we've been kind of testing the waters in this stuff now. Like I had mentioned earlier, we're going into new clubs and creating, you know, more robust goals in them, and then try to bring them on, fully commissioned, to ensure that they're running, right out of the gates, as efficient as they can. And then, we're gonna be educating our team members and members. So, we have over 30,000 team members, employees within our clubs, and 1.7 million members. So, we're gonna be teaching them about sustainability, and I'll talk about that in a future slide.

So, in the electric projects, in 2021-'22, we're gonna go into lighting and control and validation. One thing that we've noticed is we have a lot of lighting control systems out there. What we didn't know is not a lot of them work. So we did a survey at the end of 2020, through Covid, and this kind of was prompted by a – you know, through Covid, we actually had to shut all of our facilities down for anywhere from two to eight months. So, I started going to clubs, afterhours at night, and seeing what was left on, and it was amazing. So, things that we thought we were controlling, you know, we have 5-6,000 pieces of mechanical equipment, 300,000 lights, wasn't actually happening.

So, validation became a big one for us to focus on, which we'll be going through in the next couple years. So, like I mentioned, lighting control and validation in the next two years, shutting off things in non-occupied times. Pool pumps, yearly validation of VFDs, you know? We put in 500 VFDs, years ago. Well, you know what, some of them got bypassed. Commissioning of our mechanical equipment – there's lot of words in there, like "HVAC" and stuff like that. But there's a lot of variants in mechanicals, so, by trending, looking at trends and variance reporting on systems, just, a lot of information.

We're finding a lot of variance within our mechanical systems, just in unitary package rooftop units, energy recovery units, and stuff like that. So, VAV optimization, we found that our VAV units that are installed, a lot of them didn't even have pressure transducers in them. So, through review of systems. And in the review, also, we're going through batteries, renewables, and demand control in that.

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Natural gas projects. Like with the electricity, we're gonna be optimizing our RTUs, ERUs, and ensuring that we're continually providing the best outside air to our members, and to ensure that our buildings are running at optimum efficiency. And another thing, like, you have yoga spaces in a lot of these spaces, a lot of our clubs, probably, like, 95 percent of'em, that are locally controlled. A lot of people will just leave the yoga space on, heated to 95 degrees overnight, and they might even leave the door open. So, by watching trend data, we were actually able to see that, not only is the space occupied and running at 95 degrees overnight, but somebody then left the door open. And you can see that because it impacted another RTU.

So, by analyzing trend data between adjacent pieces of equipment, we can start showing, basically, we call'em exceptions or anomalies or deficiencies in our process. But dryers, just wanted to kind of go through, you know, we do a lot of laundry. We do three to four million loads of laundry a year, through our clubs. And those aren't just regular loads; those are, like, 70- to 100-pound loads of laundry. So we wanna ensure that our dryers are optimized, to ensure that we're optimizing in our natural gas usage.

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Water, for us, is the hardest one to manage. So, how are we gonna go forward? Well, we implemented an irrigation management process, last year, and we actually signed the contract, and then two weeks later, Covid hit. It was great. But even though that we struggled through last year, where a lot of our employees were furloughed or at least gone from the clubs for temporarily purposes, we were still able to save 20 percent of our irrigation water. Showers, testing and validating GPM. We have, basically, we serve over 50 million showers a year to our members, so just a lot of laundry again. And education and accountability, and I'll kind of explain a little bit of that in a couple slides from now.

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So, one of the things that we came up with to try to capitalize on the total 50 percent water reduction goal is to create a purpose that is outside of our 4 walls. So, you know, in order to save 650 million gallons, and to have people understand that, you know, it's creating a behavioral thing for not only our team members but also for our guests. So, this kind of started in our café, where I went to go get a smoothie, and I watched a team member who was making the smoothie take the blender, it was in her hand, and she put it under the sink and she let it run for as long as I was standing there. So, because I'm an energy nerd, I got out my stopwatch and I timed it, and I'm, like, "How long does it take to fill up that smoothie maker?" It was, like, 4.6 seconds or something like that.

So then, I found out the volume of the smoothie maker, and I calculated, and I'm, like, "Wow, we're going through $12,000.00 worth of natural gas and water, just in that one sink with that one behavioral thing." So, if I can create an educational process and a thing outside of our four walls, we as an organization might think differently with our behaviors. So, just some statistics, maybe, you know, not necessarily lifetime-related, but $5.00 can help bring an individual clean water for a lifetime. So, what can a million dollars do?

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So, this is something that we're really focused on as an organization, right now. It's taken 11 years to get, you know, the energy reduction statistics that we have so far, but it's really siloed within just a couple individuals. So, basically what this is, is we're gonna be, through our – we have LTU, which is lifetime university. We're gonna be teaching 35,000 employees about sustainability 101, and then going into departmental goals. So, if 35,000 people understand sustainability 101 and what their impact means and within their department, then we're gonna see that they potentially are gonna make impacts at home. So, as you can see down there, the smoothie maker, don't run the water. It's just kind of, I use that one as an example a lot.

Another one is, my wife, her sister came over to our house for a weekend, and my wife, when she would leave a room, she would actually go back into the room and shut the lights off. Her sister says, "Why do you do that?" and she said, "Well, I don't even know that I'm doing it. It's because my husband is an energy manager that I go in and I shut the lights off." So, she

unconsciously is doing behaviors because we've talked about it. So we're gonna try to implement that same sort of strategy within our 35,000 employees and 1.7 million members.

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Lastly, as we're trying to take all of our EMS data, energy data, we're trying to put it all underneath one portfolio or one supervisor. We're linking that information, or deficiencies or variance or alarms or performance issues, and we're going to roll those out into tasks to our building operations engineers and ops. Those are going to end up getting reported on service channel, and we're gonna start looking at analytics on variance on alarms and systems.

So, I think that's about it.

Jefferey Murrell: All right, thank you to all of our speakers. Now we are transitioning over to the final piece of today's session, our live Q&A. Attendees, if you haven't already done so, go to slido.com, enter event code #DOE, and select "Beyond the Low-Hanging Fruit for Energy Efficient" questions. And so far, you've submitted 29 questions, so what we would like to do for the sake time is, we're going to just ask the panelists some just one question each, for a quick response. The first one is to Becca: "Are your GHG emissions third-party-verified or self-verified?"

Becca Rushin: Yes, and I don't know if I did it properly, I think I did it anonymously, but I answered as many as I could on the chat. Yes, they've been third-party-verified for a couple of years. First we did checked, then we did kind of the full assurance. You know, it was rough *[laughs]*, but I really think it's helped our overall accountability. And when I tell property managers, like, "Hey, it's not just me making this up, you know, this is like an accounting audit or anything else," I think it really adds – it helps validate the whole process. And it makes me, you know, able to sleep at night, 'cause I'm very paranoid about data quality. *[Laughter]*

Jefferey Murrell: That's great. Wendell: "As a research institution, how does UCI engage with students and researchers across the university, when implementing EE projects, energy-efficient projects? Curious what type of engagement take place. Love the 'engineers with an attitude' comment."

Wendell Brase: Is that one question? *[Laughter]*

Jefferey Murrell: Yeah, it is.

Wendell Brase: Okay, well, yeah, I responded on Slido, but, yeah, the way we – we have townhall meetings with the groups that are affected. So, if we're doing a complete smart labs retrofit on a laboratory building, we will invite all the faculty, all the students, all the grad students. And we get a lot of them there because we give them lunch, and that works with students. And actually, faculty, too. That's one thing we do. And the second thing we do is, an idea that, actually, Mark Gomez, who was head of facilities and environmental health and safety, at a time when we were starting to hear a little bit of paranoia, about ten years ago, that we might be changing people's air change rates in laboratories, and people were worried about whether that had a health impact, Mark had the idea that we should dispel suspicion by giving everybody all the data.

A lot of times, facilities or organizations kind of keep all the data in a black box behind the mechanical room door, and Mark's idea was, "Let's show it to everybody." And guess how many complaints we've had in ten years. Zero. That works. What was the other half of that question? Attitude? Was that it?

Jefferey Murrell: Yes.

Wendell Brase: Well, this is all about attitude. I mean, the truth is, the stuff we've done in industrial hygiene and in environmental health and safety, it's about precision control, and being open with the data. And insisting that everything has to be evidence-based. It's not just the newest trendy thing you read about; it has to be evidence-based. We're a research university, and we're spending public money, by the way. We have to spend it responsibly. It's the taxpayers of California who are paying for our university. And I'm happy to tell you that our safety specs have gotten way better since we started doing this, because the whole culture of precision control goes right over into the way sustainability works on a campus. And that's pretty important to everybody who's on this call who may have a student who's going to college or university, you wanna know that they're in a safe environment, guess what: deep energy efficiency actually improves safety.

Jefferey Murrell: Great, appreciate that. So, as we come into a close, I just wanted to mention that the Better Buildings Solutions Center has more than 3,000 solutions to help you find proven, cost-efficient strategies to help you reach your energy, water, and waste reduction goals. Check out the center, so that you can find a video that you can click on that will give you more information. We also would like you to invite you to attend our Better Buildings summer webinar,

starting in June.

So finally, again, I would like to thank the panelists for taking the time to be with us today. We have launched a short feedback survey in Slido, and ask you to please take few minutes to give that feedback on this session. Your answers will be equally visible to all of the attendees, and we rely on your feedback to design webinars, future summits, and more. The poll will be open until tomorrow morning.

If you would like to learn more about the resources we discussed today, please check out the Better Building Solutions Center, or feel free to contact me on the e-mail below. Again, thank you, Wendell, Becca, Peter. This is Jeff Murrell, and you have a great rest of the day.

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