Holly Carr: Hello. I'm Holly Carr with the U.S. Department of Energy. I'd like to welcome you to the November edition of the Better Building Webinar Series. In this series we promote the best practices of Better Building's Challenge partners, Better Building's alliance members, and aligned organizations who are working to improve energy efficiency in buildings. Today we'll be looking at data center energy and energy reduction strategies. If you are listening to this webinar today, you have already accomplished step one of this process, which is getting data centers on your energy radar. If you're a business that is not data focused, if your primary reason for going to work every day is not to do work with data, then you may not consider yourself a data organization. But to a certain extent we have all become data organizations, as we increasingly use electronic communications, engage in online retail sales, and archive all kinds of information for our organizations over time. Data becomes really important.

So congratulations for thinking about data centers and thinking about data in your organization, and I'm really excited to have our three panelists talk to us today about this topic. Two of our panelists are those examples of organizations that are not doing data as a business but yet data has become very, very important to them and they've realized that. So with that, let me go ahead and introduce our presenters. First off is John Clinger. John helps manage the U.S. Department of Energy's Better Building's Data Center accelerator. John has also worked with the U.S. Environmental Protection Agency, EPA, as the lead technical consultant in the development of eligibility criteria for several Energy Star information technology data center and medical equipment products. And John is coming to us today from Philadelphia.

Next is David Oshinski with the Home Depot. David has been with the Home Depot since July of 2006 in charge of proto process criteria development and corporate facilities. Prior to joining the Home Depot he was with Walmart Stores Incorporated for 12 years as the director of construction covering much of the United States. David is also a member of the Better Building's Alliance with the Department of Energy and the AGC's Private Industry Advisory Council. And finally, Bill Lakos from Michigan State University. Bill is an energy analyst at Michigan State. His duties include analysis of campus energy challenges from both the perspective of building demand as well as the energy supplies at campus. In his previous position at Michigan State, he managed the day-to-day operation of the campus building automation systems, which serves over 100 buildings and 16 million square

feet of space. In that capacity he also managed the small data center which hosted all of the building automation functions.

So thanks to all three of you for being with us today. And before we get started with our presentations, I'd like to remind our audience that we will hold questions until near the end of the hour. We encourage you to send in those questions to the chat box at the bottom of your webinar control panel. We'll be collecting those and try to get to as many of them as we possibly can at the end of our session today. Also the session will be archived and posted to the Better Building's Solution Center website for your reference. So to start us off, let's get a bit of a primer on data center energy use from John Clinger. John, can you tell us how do we define data centers, why should we be harvesting them for energy savings, and what can our audience members do right away to get started?

John Clinger: Sure. Hi, everyone, this is John. Let's go to the next slide. Next slide. So yeah, we'll start off with what a data center is. Really a data center is any room or building that houses most of your high-level computing. Servers, telecom equipment storage, you know all the stuff that's the backbone of what's going on in your campus, your infrastructure, your building. You know we typically look at three different size ranges. You have your small server closets and server rooms to the left. You have entire rooms in the middle and then you can have entire standalone buildings to the right. For the Better Building's program we typically focus on data centers that have an IT load of 100 kilowatts or greater, which is typically a bigger-sized server room or larger in this case.

Next slide. So why are we looking at data centers? Probably the biggest reason is because data centers are very energy intensive, up to 100 times more intensive than some offices. The server racks in the data centers are becoming more densely populated, driving up the power. There's a lot of demand from customers for more data, data storage, and that growth is just continuing to grow. You know right now data centers make up just over two percent of the U.S. electricity consumption and the number is growing. They're also a bit complex. You know a lot of these data centers are found in embedded buildings, and it's hard to deal with them, so that's a challenge that we're trying to address along with power and cooling constraints in the building. So it's hard to kind of revamp what's already been done, especially in a building that's being used primarily for another purpose. And as costs continue to rise obviously the cost of electricity is of growing importance, so it's something that people are taking a closer look at. The problem is a lot of times the people looking at it, whether it's the IT department

or the facilities department, aren't always communicating with each other. So that's another issue that we're trying to address with our partners.

Next slide. So some of the benefits of really taking a look in trying to improve your data center is you can potentially increase your reliability, reduce the load on the IT equipment and the facility infrastructure equipment. You know sometimes things are set up in a way where you're doing a lot more than you need to to get the workload done, so there's some improvements possible there. You can reduce your staffing and maintenance depending on what kind of automation you rely on, and typically we see savings from 20 to 40 percent on a lot of the projects that our partners pursue on the infrastructure side. So why infrastructure specifically? 'Cause you know there's a lot of attention on the IT equipment, and that's good. You know there are many federal programs that focus on that as well, but the infrastructure equipment is something that's harder to change. It doesn't change every three to four years as IT equipment is usually refreshed. And it's also just much more complex to change when you do get around to it. Beyond the metering issue, it's just often very expensive, often a lot of other building considerations to take into play. So you know that's why we're focusing on infrastructure is it's something that's not as natural to upgrade in a timely manner and something that we're hoping to help accelerate the improvement in.

And here's just an example showing that you know IT equipment makes up about half of a typical data center equation in a building, but everything else, the cooling, electricity, the lighting, the air movement, that makes up about half of it as well. Your mileage will vary depending on your building, but this is a pretty good approximation. Some of the things we look at with our partners, you know these are pretty low-hanging fruit for the most part, but it really breaks down to two categories, improving your air management and cooling and improving your electrical support structure. So you know in the HVAC side, hot and cold-aisle containment, using lighting panels, just improving the efficiency of your HVAC units in the fans, finding different ways to cool things using free air using liquid cooling and HPC situations, just adjusting temperature and humidity set points. Sometimes data centers return so cold and there's really no reason to do so given theater newer equipment that's in them. So taking a look at those and then also just optimize your property errors not only in the room but underneath the room as well on raised floors. And similarly on the electrical side you know upping the voltage and

improving the wirings and the UPS's, some pretty straightforward fixes can really help with the efficiency across the IT equipment.

Next slide. So what we do at DOE is we partner with many organizations to basically help them improve their situation on the infrastructure side. There's two ways to do that. One is through the Better Building's challenges where organizations commit their entire portfolio and they're shooting for a 20-percent improvement over ten years of their entire committed portfolio. And the alternative for someone who just wants to commit say one data center is to join the Accelerator. And in that it's a faster slightly more aggressive goal where we're looking to try to help someone who whether it's a data center that doesn't have the appropriate metering or just has a lot of work to do, help them move through that process of getting them say from a POE2 to a POE1.3, you know something like that. That's the goal of that program is really to push people along and produce technical solutions that we can share with the general public, show cost-effective solutions for everyone.

Next slide. And how we do that? Typically we collect POE data. So POE is the overall energy use in the data center over the IT equipment energy, and what that does is it gives us an idea of how well the infrastructure is behaving. We take the POE data and we actually subtract one from it to focus on the infrastructure energy itself and we use that metric as the baseline to track people's progress over time. But you know point being you know really the focus here mathematically is to improve the infrastructure side of the equation rather than the IT side of the equation.

Next slide. The biggest problem we run into with many partners is they don't have sufficient metering, 'cause metering in a data center requires more than metering in just the typical building. You obviously have to have the IT equipment metered up, which a lot of people handle the UPS's, you know the interruptible power supplies. But sometimes metering the infrastructure particularly in a mixed-use building can be really challenging. So we work with partners to help address those challenges. We receive technical assistance from Lawrence Berkeley National Lab to help individual partners figure out solutions for their particular you know situation. So that's something that we're very active in helping partners with.

And finally, I think one of the last slides, just why it's great to join. You know there's a lot of recognition for leadership. The results are profiled and promoted on the website through publications. The

technical assistance from Lawrence Berkeley, and you get an opportunity to work with some of the other partners in the field and learn from them some solutions that you may not have thought of on your own. I think those are the largest things. I think one more slide. Yes.

And here is just an idea of who we're working with right now through the program. So it's kind of a sandwich right now. You see a bunch of federal agencies and state governments up top and then a bunch of national labs at the bottom, and in the middle there's a lot of private sector organizations, including some higher-ed groups in the middle. But we have a nice representation mix of federal and private members or partners I should say. And yeah, everyone's at different places. Obviously the Facebook's and eBay's don't really need too much help *[laughs]*, but you know in their sense they offer solutions for others in ways that you know some of that hyper-scale stuff can creep down and be useful for everyone else. And vice versa we have partners who are at the opposite end and really are just starting from square one. So we're definitely open to working with more people, so if you have any interest in working with us on this program, please do reach out. There will be some contacts at the end of the presentation. Thank you.

Holly Carr: Great. Thanks very much, John. Now we're gonna turn from sort of the primer and providing a little context about data centers to looking at some actual examples of what folks out in the real world in the trenches [1 minute pause in audio]…for our audience. David, I assume you're not able to see a change in slide, is that right?

David Oshinski: Oh there we go.

Holly Carr: There I just saw one. Go ahead and advance again if we can.

David Oshinski: Yep, all right. I just wanna give a little bit of information about what we're doing at the Home Depot. One of the things – I come from not the IT side or not the energy management side even though some of the energy folks report after me. But one of the big things our group does is we work on all facilities here, whether it's stores, distribution centers or the corporate office facilities. We manage all the design for them, the maintenance programs, etcetera. And as you know, when the economy slowed down a lot through the last recession, we weren't building very many stores. So what our leadership did is they challenged us to look for ways of getting value out of our existing assets. And one of the things

we did is we started benchmarking with other retailers, with other companies around town and looking at what they did. And one of the big areas they saw was a huge area of opportunity in reducing energy in our data centers.

You can go to the next slide. Okay, what I'm gonna speak about is at the Home Depot we really have two sites that our data centers are in. The first one is in our Atlanta home office. The original first building was built in about 1995, and our data center is in one of the floors on another building about 39,000 square feet, and that building was built in about 1997. So the buildings are about 20 years old now, so there's a lot of changes in the industry that's come about. You can go to the next slide please.

And then we wanna talk about our Austin location too. We have another data center in Austin. It's a little older building. It's about 120,000 square foot. It's got a small group of office in there for some programmers and it's got a little call center in there also. Data center makes up about 53,000 square feet of that building. It's basically a single-level building.

Next slide. All right. Some of the issues we encountered when we started researching you know these centers in Atlanta, SSC we call it, store support center. In the data center of course in 39,000 square feet cold air was flowing 24/7 in there without regulation. Find out our heat exchanger wasn't working either, and they were continually adding new equipment increasing the energy load all the time. And the other thing that we noticed in there, and I know that John brought it up in his presentation, the layout of the equipment. It was all haphazard. They were all in different directions, cold facing hot, etcetera. They were just wherever they found a slot they put the units. You know in the Austin data center we had a little different issues going on there. It's an older building. The units were about 15 years old and they were air-cooled units. It's pretty amazing to try and cool a data center with air-cooled units. We also had no backup. Any time there was an emergency there our technicians were on call like 24/7. They had to come out there and work on the system. None of the economizers up on the roof were working. All the units had the old R22 refrigerator in there. And I mean there were times that that building was so bad that we had associates up on the roof with water hoses cooling the building off. It was so bad there.

Next slide. Okay. What we did for the fix in Atlanta. One of the things we did was we partnered with our IT associates. We visited sites all over town with our vendors and our consultants and

looked at different methods to help improve and reduce energy in data centers. We toured a lot of different facilities all over town, and what we came up with was installing cold-aisle containment in our data center. We used a lot of different methods to do this. As you can see, on the left we used air curtains and then we used some rolling units, which are on the top on the right that roll in and out. And then we put some rooms with doors on them also. One of the other things we did was we repaired the heat exchanger, and we continue to upgrade our cooling system here. In fact next year we've got a big program going to help improve the cooling towers here, so our energy usage went way down in the data center here.

Next slide please. In Austin basically what we did was we decommissioned 19 DX units. We installed one 800-ton water-chilled tower there. We repaired the economizer, and then the units that fell all the areas on the floor we changed all the motors out on them. They were 50-horsepower motors. We went to 35-horsepower motors with BFDs, so we really reduced the energy there.

Next slide please. We also installed a central plant there, and we installed three backup 450-ton air-cooled chillers, so now our backup will be N plus two, so it's not such an emergency anymore.

Next slide please. Oh we did it. Well we had consultants to help us. In each location we had different consultants do studies and come up with recommendation. A lot of these we went over and over again with our vendors also. We brought vendor partners in, mechanical contractors. We brought the cold-aisle guys in. We had them walk with us. We had them show us examples. We had them take us to buildings all over town to figure out what the best method to do this was. And then of course you have to request funding from leadership. Basically we had to go before an executive committee to get funding for it since we're a publically-owned company. These were two separate projects basically and they came under two separate requests. The Atlanta facility went to corporate facilities and the Austin project went to the IT department. Basically when we developed the budgets for these we showed an NTV. The Austin center also had a big risk component to it too because there was no backup and it was air cooled. And the age of the units too were an issue there, so that helps sell it. A couple of the other things that we found out as we got into this process. When we were in Austin, we got a good utility rebate. I mean they'll pay you incentives for reducing your energy in a lot of locations and bringing in more efficient equipment. I mean even

with the water, I know that water's a big issue these days with shortages and that, but it helped us to do this.

Next slide please. Atlanta is basically complete, except we're always adding new equipment in there. In fact we're just about to do a study in there now to see what we need to add. One of the things that we do each fall is we come up with our annual budgets for our facilities, and I always put some funding in there. And basically what I'm gonna do for the next five years is putting funding in there for additional cold-aisle equipment in Atlanta because we know that they're gonna be always adding equipment. I mean our .com business is growing like crazy so they're always adding things, so we know that we're gonna have to continually put those rolling rooms or add curtains, etcetera, so we need to put that in our funding. So that's something you need to think about too when you're doing these type projects because it will always be ongoing. Now in Austin we just finished the commissioning there of the system. We're starting to collect data. Basically we'll have our first month of comparison out shortly. We're also trying to work through some issues on separate metering. Just like John said, you know when you got an existing building, the metering is not very good. I mean even here at the SSC where I'm at we have one meter for all these buildings that run all the energy, and everything's not broken up so we're trying to come up with ways how to measure things better here. In Austin it's a little easier because the system you know it's a separate building on its own. The other parts of it are small and you can do calculations on it. One of the things that we've seen here in Atlanta, huge energy savings, I mean just not only in kilowatt hours but since we've put the cold-aisle containment we have saved over $200,000.00 in energy costs, electric costs, for our facility here. So it does pay off to do this; there is a return on this. And I mean if you're a company and it hasn't looked at doing this, this is something you really need to look at. I mean our next goal probably in Austin too is see if cold-aisle containment will also even help that building further along, so there is a payoff for it. And thank you and if there's any other questions at the end, just let me know.

Holly Carr: Thanks so much, David. This is great case studies of both of these locations and looking forward to hearing more about the results from the newly-completed project. Quick reminder to folks that if you haven't already, we've gotten a number of questions and we've been sending those on to our panelists and we will get to those at the end. But please do continue to send questions to us through the question box on your webinar interface. Next up is Bill Lakos at Michigan State University coming to us from East

Lansing, Michigan. As Bill will show you, Michigan State, like most universities, has data centers of all shapes and sizes, so in Bill's case, taming the energy hog as our presentation is titled, is a lot more like taming lots of little energy piglets running around campus. So, Bill, take it away and show us what you have at Michigan State.

Bill Lakos: Okay, thank you. You can go to the next slide. So Michigan State University, for those of you that aren't familiar with us, we are located in East Lansing, Michigan, and we have this mission statement about what Michigan State Spartans do, and I'm gonna carry that theme through. But really our challenge is to advance the common good in uncommon ways, and we're looking at tough problems and some that are not so tough problems and trying to find solutions that make things better, make life better for us.

Next slide. So we have these figures are a little bit out of date. We've got over 50,000 students this year, over 11,000 staff, 5,200 acres of campus, 21 which are developed. The rest is agricultural land and that sort of stuff. Lots of buildings, lots of academic buildings, and we also own our own power plant. So that's gonna be unique to us in that because we are our own power plant, it's really about saving the fuel that's used to generate the electricity that the campus uses.

Next slide please. So our commitment to this data center challenge is really two different facilities totally only about 5,900 square feet and 700 kW of total load. But as you'll see, the problem is much bigger than that for us. So we're looking at changing the way we do things, starting with taking our primary campus administration computing and a high-performance computing center and creating a purpose-built facility so that it's not embedded in a building, or if it is embedded in a building at least it was built with data center functionality in mind.

Next slide please. So the important thing is, like Holly mentioned in her beginning statement, even those companies that are no like the Google or the Yahoo or the Microsoft or the Facebook that are data center oriented, just about every business out there relies on data centers. The university is not any different. Our academic mission, our operational needs, and our research needs all have data center components that are key to us finding solutions, and our latest tag line is who will, Spartans will. We will find a solution, and sometimes we find solutions that are not ideal so the challenge for us is finding good solutions.

Next slide please. So this is our campus. This is the developed part of campus. We have a river that runs through the campus and to the north of the river is the historic part of campus, and to the south of the river is those buildings that have been built primarily post World War II. The key point to this slide is that the top ten, the ten largest data centers, are the larger red cylinders, and you'll notice that two of them are located in close proximity to the river. They are in fact within the 100-year flood plain. They are at risk, and those are two of the primary data centers, the computer center and the administration building, the top two are in the flood plain. And so for us it's not just about saving energy but it's about reducing the risk to our critical infrastructure. Now when you think about how many data centers do we have, John's definition of the three different types of data centers, the original assessment was that we had at least 56 of them; those numbers were based on self-reporting. A further study determined that we have many more of those data centers, some of them data closets. We've got them scattered all over across campus, so it is about, like Holly said, lots of little piglets. It's about managing the entire herd and how can we find solutions.

Next slide please. So we have over – we have seven facilities that are over 1,000 square feet, another more than 45 that are under 1,000 but above 100 square feet. And this says a dozen but there's probably dozens of server closets out there just waiting to be found. So the key to this is you know taming this energy nightmare is first assess what you have, and if that means bringing in consultants to assess what you have, you really need to understand where you're starting. That would include determining what kind of energy footprint these have. Now you can't go down to every server closet and determine that, but at least understand in your bigger facilities what you're starting with and assess what options are available. The comment that John made earlier about server room temperature sometimes you have to understand what the reasoning was for that server room temperature being so cold. You know part of it is that's the way we've always done it. Our IT folks like it when it's colder. Why do they like it when it's colder? Well one of the things that we've found is that when they have the data center colder, they feel that they have an added protection should something fail. So the challenge is addressing those concerns about failure and backup systems and convincing them that maybe a colder temperature isn't required to gain the assurance and the protection that you need.

Next slide please. And then you need to look at some of these other places where you may have racks of servers that have been moved

into an office. The IT folks inherit these racks of servers, and in this case you can see the cooling system is a window shaker, a window air conditioner, which is not ideal.

Next slide please. And then you see even further that they're free cooling option is an open window with a fan hanging on it. And when you think about security and when you think about energy, those are some of the things that we really shouldn't be doing.

Next slide please. In this case, we have a portable air conditioner serving as the cooling unit, and the exhaust, the hot air, is exhausted out the window and it's kind of caped up in a haphazard manner. Again, part of the challenge is recognizing what problems you have, admitting that you have a problem in order to find that solution.

Next slide please. So a not-so-clever solution for heat rejection but what we found is that Spartans will find a solution. They will do what they need to do. And if they aren't given an option, sometimes the decisions they make are not the best that can be done.

Next slide please. So as a university, our goal is to – we're much earlier in the process; we're not as far along as say the Home Depot has. They've achieved some significant gains. We're in the early stages, and we're trying to figure out just what it is that we need to do. Our concept is to combine two major data centers into a single purpose-built facility, include some of those things like indoor or in-rack cooling, hot-aisle containment, cold-aisle containment, whatever it is. But really at its heart we want to determine what the optimum mix is for those servers that need to remain local, those that can be virtualized or remote, and also are there cloud-based solutions that we should be leveraging in order go get the right mix?

Next slide please. So where are we? We have issued an RFP, and the idea is that we want a firm or teams of firms so that are experienced in helping us with the design engineering and managing the construction of a new data center and thinking about things like scalability. So something that David mentioned was really building in the scalability and the variability so that we can operate the data center in an efficient manner. Some of our challenges though are what's it gonna cost us and what are the future operating costs? So really comparing those and creating a you know what is our return on investment, and sometimes it's that return on investment is not just the energy saved but the

elimination of the risk, for instance in our case getting at least one of those primary data centers out of the flood plain. Leverage those opportunities that pair well with the energy conservation that you might realize. And for us it's about creating a trust relationship between the facility people who maintain the facility and pay the utility bills, the IT people who operate the IT infrastructure, the administration trusting that we're making the right choices, and academia they need to trust us all so that we are delivering for them what they need in order to carry out the mission of the university. Is that the last slide? One more or is that it?

Okay, yes, our anticipated outcome. Currently we estimate our POE as being over 2.2. What we'd really like to see is a POE that's under 1.3, which we would estimate that being a 40-percent reduction, 10,000 megawatt hours per year, million dollars, and again echoing some of the things that have been said previously, avoiding outages due to failures. And this is what our first step is. We think there are future integration opportunities that we might be able to once we realize our first goal, what we might do beyond that.

Next slide. So I think we're to the point where we can start with questions, or do you have other –

Holly Carr: Yes. Thank you, Bill, and I wish I was there to give you a glass of water. *[Laughs]* Hopefully you can go run and get one now. I'm sorry. Thank you so much for providing that insight into what you all are doing on campus at Michigan State. We've had a number of questions come in for both of our panelists, so we're gonna give our panelists a chance to take a peek at some of those. And in the meantime I have some additional resources that we wanted to share from all three of our panelists. Kendall, if we can move on to the next slide please.

I love those photos of the data centers such as they are around campus, and I'm sure that a lot of our audience members can relate to those cobbled together data centers as well as you know the big and official ones that also need energy efficiency help, so. On the slide that you're now seeing, we have a couple of resources for folks. The first off is from DOE. This is a link to our center of expertise for energy efficiency and data centers, and this is kind of the headquarters for all things data centers. You'll find many resources here as well as information about participating in the data center accelerator program that John Clinger mentioned earlier. So if you have data centers as a part of your building portfolio and you're interested to get to work on some of those and

receive recognition for doing that, please take a look here and/or contact John Clinger. You'll see contact information for everybody in just a few moments.

Second is the partner profile for the Home Depot's participation in our data center accelerator. You can see what they have committed to and a little bit more information about what they're doing. And then finally, for Michigan State we have some resources more broadly describing the work that Michigan State is doing on energy efficiency on their campus. So Michigan State as you may or may not know is participating in this data center accelerator. They have also stepped up to participate in the Better Building's Challenge, and they're a partner in the challenge, which means they've made a commitment to 20-percent reduction in energy use across their entire building portfolio, so that's 16 million square feet on their campus. And these are three different case studies talking about what has worked for them so far. So an implementation model on their long-term campus energy planning software that they used to help them figure out which direction to go for such a big portfolio of building and as well as two very specific case studies, one on Anthony Hall and one on Erickson Hall where they've had great success already with energy efficiency retrofits.

Next slide. So yeah, now let's move to some questions from our audience. And, Kendall, if you would let's go ahead and put contact information up. Can you just move forward to the contact info slide so that folks can jot that down and have more than 30 seconds to get those contacts, 'cause I've seen a number of folks who'd like to reach out to some of our panelists. So let's start off with a couple of questions for John on some of the kind of primer information that you gave us. We had a couple of questions on temperature settings. So one person asks, "At one time IT managers wanted to set temperatures in the 60s. I have heard the IT industry has changed their position and now sets temperatures in the high 70s or low 80s. Can you expand on this and tell us more about temperature settings for data centers?"

John Clinger: Sure. So I'm sorry I brushed over that so quickly in not much time. Basically a lot of the temperature guidance in data centers most of those refer to astroid. They have data centers guidelines for different operating conditions within a data center, and that's what most of the federal programs and most of the private industry you know usually stick to as recommendations. Now what's happened over the past several years is the IT equipment themselves has achieved there's astroid levels where a product can operate in higher temperatures, different community conditions, and there's a

lot more products available now so they can operate in conditions that are warmer than what you might have thought in the past. So the general guidance has crept up over time, but products are also becoming more aggressive and are building to operate in environments that used to be somewhat you know a place you wouldn't wanna go to.

I will point out with temperature also, for one, a lot of the savings actually has been on the community side, people just not controlling human weakness nearly as much as they used to; that's saved a lot. And with temperature it's not just the air temperature. If you have chilled water, some of the largest savings we have seen is just changing the set point of the chilled water even a few degrees if possible. And there's ways you can go through the process without having to shut down to figure out where your right balance is, how much can you push it without really creating any risk. And that's one area where you know if you have an internal expertise it'd be great to explore. If you don't, the savings we've seen from such simple changes have been so large it's probably getting a consultant to look at, because you know that's one of the easiest low-hanging fruits there are and it's one of the most impactful as far as savings, so.

Holly Carr: Great. A number of folks have asked about speaking of getting a consultant to help out. *[Laughs]* A number of folks have asked about Michigan State's RFP that they've put out and are interested to see that, and I don't know if Michigan State might be willing to share that. So please note that Bill does have contact information here if you'd like to reach out, and we'll talk to Bill afterwards to see if that's something we might be able to share as a resource elsewhere. Another question for John Clinger. What is free air and then some strategies?

John Clinger: Yeah, so what I meant by that is using outside air to do the cooling rather than conditioning the air. Different geographies benefit from it better than others. If you're out in the bay area or pacific northwest, you can get by with close to if not completely using outside air as your main source of air for cooling the equipment. So I mean it's not gonna work for everyone; it depends on their geography. But where possible being able to use the outside air to help cool the IT equipment is a huge savings as far as energy and just you know there's other benefits from it as well.

Holly Carr: Great. And speaking of cooling strategies, we had a question about I think primarily directed at David and the Home Depot about different cooling strategies you've tried and which you think are

most effective. So looking at curtains versus glass wall for cold aisles, etcetera, if you have any sense of what works best in what conditions?

David Oshinski: Yeah. Basically it's you know I think you gotta look at it at the life of the equipment. I mean you know we have some old equipment that we know that within the next couple years that we're gonna take out, so we may put curtains around those. And then we know we have some permanent equipment that we know is not gonna move; it's gonna stay in its location and we're gonna keep it long term we will build a room around that. And the most, I guess the easiest, is those rolling units that go around the units. If you're adding a lot of equipment and moving equipment around, those are best for that. You know once we've completed all this and figured out the different uses and likes of things, we did what John said, we started turning the temperature up in the surrounding area too, which helped a lot. But because of the different ages of the equipment, you have to come up with different applications. If you had an unlimited source of income, the rolling ones would probably be the best.

Holly Carr: Great, thank you. Bill, a question for you around – actually this is a question we can expand to both Bill and David. We had a couple of questions about getting the right buy-in, working with the right folks, developing relationships internally so that you can address trust issues. So presumably in the higher-ed. space it's really professors and programs on campus that are protective of their data for their research. And so a question to Bill about what strategies have been most effective in getting people to trust and to, if you will, give up their data centers for a purpose-built facility?

Bill Lakos: Yes. And that is a key at least for us when we're challenged by all these different diverse groups that have data centers. And really our best result has been finding the partner who's already done it, and we've found that our purchasing department went ahead and did a virtualization project, moved all of their – they essentially eliminated the data center from their building. And when you think about purchasing department, this is really you know they're putting a lot of trust in that configuration. They're trusting financial. They're trusting their provider's information. So really what we did was we said, "Okay, you know here's a customer. Here's somebody who's using this centralized data center and taking that relationship and really setting it out there as an example." And absolutely we have on the academic side a concern about that sensitive data that they may have, and definitely a

challenge. Some of them will be willing. Some of them will be willing with the right incentives.

Holly Carr: Great. And similar question for you, David. It sounds like you have established some good relationships with IT folks and you know you're more of a facilities and construction person. So can you give folks some suggestions, best practices for reaching out and making the right contacts if our audience members are energy managers, sustainability folks, facilities folks in their organizations and they want to address data centers? What are some good ways to reach out to IT and make contact and start that relationship?

David Oshinski: You know each of the facilities basically has a facility manager or a senior manager. You have to get them deeply involved in it what you're doing. That's why we took them out when we were visiting different locations with our vendors and showed what other corporations are doing. And then you have to get their leadership involved also. I mean I would set up here is we have a senior manager. We have a director, and then there's a senior director over the one here at the SSC. And then there's a facility manager at the one at you know Austin, and we got them all involved in what we were trying to do in these projects. Sometimes there's even people that report up just to the facility manager who you know I mean we had one guy here, he was probably here 15 years, and he knew this place inside and out and you really needed to get him involved in it too. He was more of a day-to-day guy, but the senior manager really listened to him and what he had to say. And once he got bought into it, I mean it was a pretty easy process.

Holly Carr: Okay, thank you. One question for you, John Clinger, about participants in the data center accelerator, a person wondering if there are financial incentives involved and you know what the recognition, what the incentive is for participating.

John Clinger: Sure. So there is no financial incentive from DOE directly. I will say for some of the federal partners through the Federal Energy Management Program FEM does provide some funds at times for certain projects within the federal government. But for the private sector, primarily the benefits are recognition and being a leader and also technical support. You know it really depends on your outage. If you're closer to the cutting edge of things and you're doing a great job and your metering's in a great place and you know you're using the cutting-edge solutions, then it's really about you know just getting your work out there. Another avenue not only on the DOE website but DOE works is a lot of publications and other ways of getting that out there for people to see. In-person

events, participation in a large Better Building's Summit, which is often in May which we'll talk about a bit at the end. So it's a lot of PR. It's a lot of working with the government to highlight your solutions and to show people look, here are some cost-effective ways to move forward that everyone can consider.

For those on the other end who really are struggling even to get metering going, I think the technical assistance is a really big deal because you know having one of the national ops who specialize in this work with you to develop a metering plan and help guide you in the right direction so that you're applying metering that will actually be beneficial. There's a lot of people who have installed metering but they may not do it right and then they find they're not getting the data they need. That doesn't really help anyone and can also be a large waste of money. So avoiding situations like that, making sure that solutions that are being taken to improve your metering so then you can track your improvements on the larger scale is nice to have a technical support there to guide you in the right direction.

Holly Carr: Thanks, John. Kendall, let's go back a couple slides back. We kind of skipped to the contact information, but let's cover the next webinar. Great. So December's webinar for the Better Building's Webinar Series really will focus on plug load and what folks can do to address and reduce plug load in their buildings. So particularly as you're starting to address the low-hanging fruit as we call it of lighting and other low-payback activities in your buildings, plug load starts to be a big deal. It starts to become a bigger percentage of your energy use in your buildings. So we have three great panelists joining us on December 1st from 3 to 4 PM Eastern time. First of all, Rois Langer from National Renewable Energy Lab, NREL, who heads up a lot of plug load work and our Plug and Process Load Technical Team in the Better Building's Alliance. Rose will be presenting on a number of resources that that team has put together for folks to help assist building owners, managers, with reductions in plug load.

And then we'll hear from Jason Sielcken from the General Services Administration, GSA, with a case study of the Aspinall building in Colorado, which is a historic federal office building that has gone through a major, major retrofit to become a zero-energy facility. So this is a historic building, a retrofit to a zero-energy facility, and as you can imagine plug load became very important to them as they are striving to hit zero energy. So he'll be talking about their strategies in that building to get there.

And finally Moira Hafer from Stanford University. Stanford has been doing a lot of work on a pilot addressing plug loads on campus, and she'll be detailing that effort and what they've seen so far. So I encourage folks to register and attend that session next month. And let's go to the next slide if we can, Kendall. So this is our save the date for our big summit this spring, May 9th through the 11th, which we mentioned earlier. This is really the big in-person event of the year for the Better Building's Program. If you're interested to hear about what partners are doing and really do a lot of peer networking with leaders in energy efficiency, please consider attending the summit. Registration will open up in a couple of months for folks, and we really look forward to seeing everybody there in Washington.

Next slide. All right. So we're back to the contact information, and with that I'd like to just give a big thank you to our panelists for taking the time to be with us today. Feel free to contact our presenters directly with additional questions that we weren't able to get to during the Q&A period today. If you'd like to learn more about the Better Building's Challenger or the alliance, please check out our website or contact me directly at the e-mail shown. And I encourage everyone to also follow us on Twitter for the latest Better Building's information. You will receive an e-mail in the next few days as soon as this archive session is available online. So thanks to everyone for joining us, hope it was useful information. Goodbye.

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