Rois Langner: All right. Hello and welcome to today's webinar on "How to Leverage the Newly Published Advanced Power Strip Technical Specifications for Commercial Buildings." I'm Rois Langner with the National Renewable Energy Laboratory and I'm the technical solutions team lead for the Better Buildings Alliance Plug and Process Loads Team. We're going to get started with the webinar now. So looking forward to having you following along.

I'd like to go through a brief agenda and introduce our speakers that we have on the webinar today. First, I'll introduce myself. Again, I'm Rois Langner. I am a building scientist and engineer in the commercial buildings research group of the National Renewable Energy Laboratory, also known as NREL, located in Golden, Colorado. I've worked in the Commercial Buildings Group here at NREL for over five years, and within the past year, I've taken on the role as a technical team lead of the Better Buildings Alliance Plug and Process Loads technical solutions team.

Through the Better Buildings Alliance Plug and Process Loads Team, we have developed and published the advanced power strip technical specification that is now available on our Better Buildings Alliance website for free download. As the first speaker of this webinar, I'll be providing an introduction, an overview of the advanced power strip technical specification, and I'll walk you through the document itself so you can understand its content.

Next up will be Marta Schantz from Waypoint Building Group, and she'll be going through a number of use cases on how to apply the technical specification in your building. Marta is an associate at Waypoint Building Group, and in this role, she leads the execution of multiple energy projects *[break in audio]* Department of Energy and NGO clients. Her work includes work on plug and process loads, rooftop units and multi-tenant space sufficiency.

Claire Miziolek from Northeast Energy Efficiency Partnerships, known as NEEP, will also speak towards the team interest in developing the technical specification and how we can promote the specification moving forward. Claire is the market strategies program manager at NEEP, and in this role, she manages NEEP's Residential Lighting Initiative and NEEP's business and consumer electronics effort, including focus work in home energy management systems and advanced power strips. Claire is based in Boston.

So our last speaker is Christine Wu from the U.S. General Services

Administration, and she will be talking about GSA's experiences in using advanced power strips across a number of buildings within their portfolio. Christine Wu is the project manager and communications manager for GSA's Green Proving Ground program. In two years, Christine has overseen the publication of 17 out of 23 Green Proving Ground technology assessments authored by the Department of Energy National Lab. Christine's other projects for Green Proving Ground include the evaluation of electrochromic windows, connected lighting, and socially-driven HVAC controls piloted at GSA federal buildings around the nation.

So each speaker will talk for approximately ten minutes and then we will have some time at the end for questions and answers. Everyone will be on mute for this webinar. So if you do have questions, please type them into the Chat box, and we will address them at the end. We also have Evan Fuka from Energetics Incorporated who will be helping us with the questions and answers at the end. Also, please take note that this webinar is being recorded. We will be sending out a link of the webinar recording along with the slides to participants after the call. It will also be posted to the Better Buildings Alliance Plug and Process Loads Web page.

So to start, I'd like to take a moment to talk about the Better Buildings Alliance itself. As you are maybe aware, the Better Buildings Alliance is a platform where members in different market sectors can work with the Department of Energy's exceptional network of research and technical experts to develop and deploy innovative, cost-effective, energy-saving solutions that leads to better technologies, more profitable businesses, and better buildings.

The Plug and Process Loads technical solutions team is focused on solutions and process loads or processes to reduce energy consumption associated with plug loads in a building. Plug loads account for an increasingly large percentage of commercial building energy use, and it's expected to grow over the next number of years. The Plug and Process Loads team is dedicated to providing a central location of resources, which can be found on our Better Buildings Alliance website. We have focused member team calls in various plug load metering and control issues, and the national labs provide technical support to help address challenges that our membership faces around plug and process loads metering and control.

So now for the very terrible pun that is so intended, here is my plug for joining our team. If you are not already involved with the Better Buildings Alliance and would like to become either a member or an affiliate, you can join by clicking the Join box that I've highlighted in red on the screen on our Better Buildings website. We're always looking for more members and affiliates to join our team. So if you enjoy the webinar today and would like to continue in these types of discussions, please do sign up.

Okay, so getting on to our main focus of the webinar, I'll now provide an introduction to the technical specification for advanced power strips. The acronym here is APS, if any of us, any of the speakers use it. I will talk about our motivation to publish it, how to find the specifications, a few applications, and I'll walk through the actual document itself so that you can understand this content. And just for reference, this technical specification was published in April of this year.

So where can you find the specification? Evan, I believe, if you could put the links in the Chat box, if you haven't already, but we will provide a direct link to the specification and any other documents that we'll be talking about today in the Chat box. You can also visit the Better Buildings Alliance Plug and Process Loads website, and under the Take Action - Activities, you will notice these small dark green boxes with S's in them. This is all the direct link to the specification as well.

So why did we choose to create this specification? Our motivation comes from a few different aspects. Office equipment accounts for 7 percent of commercial building energy use. Plug-in equipment is also very diverse, which makes it hard to manage and control and plug loads in certain situations, like a net-zero energy building, can account for over 50 percent of the building's energy load. There's also lack of industry-wide specifications for plug and process loads equipment. So this is something that the national lab and our supporting partners thought that we could really play a role in.

I like to show this graph of plug load power density from NREL's net-zero energy Research Support Facility, where plug loads have become a very prominent component of our energy consumption and in meeting our net-zero energy goals. The black dotted line shows the model average, what we estimated for plug load usage in the building. We're employing advanced power strips at each workstation for office equipment. So we were able to get our daytime usage down considerably, which is all the colored lines in this graph. However, as you can see, we can still do more at night.

So if we choose another advanced power strip or another control type, like a timer control, then we can program our equipment to automatically turn off at night and see even more savings. So even with our net-zero energy buildings, we're still seeing savings for advanced power strips, and we can do even more with them as well. Buildings are also only occupied one third of the time. During nights, weekends, and holidays, buildings are usually unoccupied and plug loads can be turned off during these times, and of course, advanced power strips can help with this.

The graph here shows energy use intensity values and I'll just show this for reference. In NREL's old office building, we were using about 25 kBtu per square foot per plug load. By turning equipment off at night, we were able to reduce our EUI down to about 10 kBtu per foot squared. Furthermore, by using more efficient equipment, like laptops instead of desktops or consolidating printers into a central location, we were able to further reduce our daytime plug load energy use.

So our EUI ended up being about 6 kBtu per square foot. That's a dramatic reduction, and part of this comes from using advanced power strips, and this is why we decided to develop this technical specification to really help building owners procure the appropriate advanced power strips for their equipment type and building type. So advanced power strips, as seen on the slide, they're great retrofit options. They can be implemented at low procurement costs, which can be done in phases, and they can easily apply to all buildings.

So now I'll walk-through a high-level overview of the specification itself. If you would like to download it while I do this, please click on the link in the Chat box. The first section provides a list of definitions. This can be really useful in understanding the components of an advanced power strip. For instance, what is an always on outlet and what is a controlled outlet? What's the difference between the two? It also describes other language that describes advanced power strip. We also did our best to be consistent in our naming and definition with other plug and process loads or advanced power strip documents that currently exist, and Claire Miziolek of NEEP will be talking about that as well.

Hardware requirements – these are requirements for advanced power strips to be defined as an advanced power strip. So for instance, advanced power strips, by definition, have a feature that automatically de-energizes plug-in electrical devices and can

connect and reconnect power according to the product specification.

The section also talks or the section talks about those requirements along with other requirements, such as the safety features which include things like hardware compliance requirements for various UL standards. It also talks about physical configuration, which are features that make the advanced power strips easier to use like clearly labored and/or color-coded, always on controlled outlets, or a light to indicate that the advanced power strip has power supply to it.

The ease of installation section focuses on features that allow easy installation, have a likelihood of high user acceptance and promote high energy savings. This section recommends looking for advanced power strips that include instructions on how to properly install setup and troubleshoot the advanced power strip. As an optional feature, you may want to look for advanced power strips that have more dynamic and interactive Web-based instructions.

The usability section lists required features that make advanced power strips easier to use. This includes information about how a power strip should be intuitive and user-friendly so that a non-expert user can make adjustments to the installation and control the setting. The energy savings functionality section might be the most important. This section provides information on the different control strategies that advanced power strips can employ.

First, however, it's the times that advanced power strips should have maximum parasitic load of less than one watt at all times while connected to the wall outlet unless providing wireless communications. So make sure your advanced power strip, when connected to the wall without anything plugged in it, consumes less than one watt or no more than one watt.

Also to be considered an advanced power strip, it must have at least one of the control features listed in this section of the specifications. Marta Schantz from Waypoint will describe the control features in more detail during her talk coming up next, but these control features include timer power strips, master-controlled power strips, masterless power strips, remote switch power strips, and activity monitor power strip.

Lastly, the specification recommends looking for optional features that are related to the embodied energy and life cycle impacts of advanced power strips. This includes awareness of the packaging

and materials used for the advanced power strips. Are they designed to easily be disassembled for recycling, or does the manufacturer offer a "take back" or recycle program? These are some of the questions that you should ask when procuring advanced power strips for your building.

So in summary, here's the workflow for how to use the specifications. First, check for utility rebates incentives. Marta will explain that we have a resource dedicated to this that you can use for free. Second, you want to pick a control style that is most appropriate for your equipment and building type and these are explained in the tech specs.

Third, compare the specs of the actual product, the advanced power strip to the technical specification, and see if they meet those requirements. And lastly, feel free to reach out to the Better Buildings Alliances Plug and Process Loads technical team to share success stories or even ask for help.

And with that, I'll leave my contact information up there for a moment and I'm going to pass the controls on to our next speaker, Marta Schantz. Okay, Marta, you should have control now.

Marta Schantz: Great. Thanks, Rois. Hi, everyone. Again, my name is Marta Schantz. I work for Waypoint Building Group, and we've been supporting the Better Buildings Alliance program at the DOE for a good number of years. Excited today to speak to you all about use cases and applications for really how to take the APS tech specs and use it in your day-to-day activities.

So first off, as Rois had shown earlier, there are few publications that we have on the Better Buildings Alliance Plug and Process Loads team website that are available for free download for anyone to use. These include the tech specs, which of course, is the topic of today's webinar, a how-to guide, which I'll get to later in my talk, as well as a list of utility rebates and incentives that I'll speak to later as well.

Now some people may think, "APS tech specs might not quite be relevant to me." However, there really is a wide variety of stakeholders that can leverage tech specs for different purposes fit to their tasks. When it's being leveraged, it could be used strictly as a procurement guide, taking it as is and requiring a vendor or a procurement officer to comply with certain or all aspects of the tech specs to make it as efficient as possible, or it could be used as a reference guide where you take the APS tech specs and

incorporate different bits or pieces that are specifically particular to your scenario, and then you can develop your own unique APS spec for your purposes.

The stakeholders that can benefit from the tech specs and that includes tenants or occupants if they'd like to acquire APS's for their own personal use at their workspace or elsewhere in the building space. It can also be used by more of the management or type of stakeholder for commercial buildings or portfolio buildings to acquire APSs from owners, managers, facility engineers or procurement officers to take that leadership role and make it happen across the building or portfolio.

Looking at a little bigger picture, if you think about the APS manufacturers and vendors, they can encourage each other and their clients to purchase and create products that meet this tech spec to keep moving the market forward for more efficient and more energy savings advanced power strips and plug loads in commercial buildings.

And lastly, if you look at the biggest picture when you have utilities and regional energy efficiency organizations on board, this tech spec can enable them to create incentive programs or other efficiency programs that relate to advanced power strips and have this as a technical background for that effort.

Now this is a little bit of a busy slide here, but the point makes it especially clear that it's not just commercial office spaces that can benefit from advanced power strips. While that's a more traditional or immediate thought for who would use advanced power strips, it could be leveraged across many, many building types from, of course, the commercial office down through higher ed or retail, grocery, multifamily. The list is very long here.

And in terms of examples, spaces that can use these APSs, it's really not just an office, that workspace area, but it could include other aspects, such as printer or break room. Looking at the retail grocery side, it includes electronic displays or cashier aisles. And looking into the hospitality and multifamily side of things, it can include a business center, gym, fitness area, party room. There really is a lot of opportunities to use APSs. And as I go through, I'll give some examples of how those can be set up so that you can apply that to your own spaces.

Now since the office workspace is the most common use currently for advanced power strips, NREL and the Department of *[break in*

audio] a how-to guide. It's just a one-page printout for occupants or anyone really that needs to install advanced power strips in an office setting. So I'll walk through this quickly just so it's a little more clear but it really does speak for itself when you print it out. The link is here and when the slides are posted later for everyone to view after the webinar, you can feel free to click that link and download it yourself.

First off, you have the primary outlet and this is the one control outlet. For an office setting, it's the master. That would be a laptop or a PC, the thing that matters most at your desk. And when that turns off, the different appliances plugged into these secondary outlets highlighted in blue here follow suit, and they're controlled by that primary outlet. You turn off your PC or your laptop, your monitor turns off automatically because that's in that secondary outlet spot.

You might think, "Well, I don't want everything included in that," and that's why there's this third outlet option called the "always on outlet," and that's what you can include on landline phones, fax machines, a mini fridge, just certain appliances that you don't want to turn off and on based on your laptop or PC, and those can still be plugged into the power strip, that master outlet. And so hopefully, this isn't too high level for you all. Maybe you already know how APSs work, but I figured I'll just walk through this very briefly so that you're all aware and everyone is on the same page here about this effort.

So that picture that was on the slide there, that how-to diagram, that's basically a master-controlled power strip. As Rois mentioned, there are five different types of controls for advanced power strips, and I'm going to walk through them quickly just so you all know the different types and how they can be applied in different settings.

So the first is a master-controlled power strip, and this is when you have the master control, and the peripheral devices are turned off when the primary device is turned off. As I mentioned, this is very easily applicable in an office work desk area. But also if you think about it for entertainment centers, and the residential space is very common to use. The entertainment centers are also found in hotel rooms multifamily rooms and that can be applied across those different building types.

The second type of power strip I'd like to speak about is the timer power strip and this is similar, but instead of having a master

control per se, you have a timer that you can set either based on business hours or really just any preset schedule that fits for your building type and your scenarios. For example, in a conference room, if you have a reservation system through Microsoft Outlook or some other schedule like that, you can have that line up to that schedule and have it very easily turned on and off, the different pieces of equipment that are plugged into the advanced power strip and save energy in that sense. Further, you can do motion sensors or other activities, but that will come for another power strip slide.

This timer power strip can also be used really nicely in retail and grocery scenarios. For example, if you have an electronic display area, you have a bunch of TVs that are on display, you really only need those on when you have customers in the stores. So if you align the business hours to the advanced power strip timer setup, then it really saves that energy by having the TVs automatically off when they're not in need of being turned on. This also applies in places like gyms or fitness center or a multifamily game room, party room.

There are all sorts of equipment that only need to be on during certain hours and so that can be applied to this example here, that I'd like to bring up is the activity monitor. And so this happens when you turn equipment on or off in response to motion detected in the room. Very logical; it's a good title for that power strip name. So with this, it applies to a lot of the different spaces I've already spoken to. A lot of it depends on what your management preference is for the advanced power strips, if you prefer to rely on the activity motion sensors or the timer or the master control, and you'll see there are two other types as well. And it just depends on what the management and what the occupants prefer for their plus and process control strategy.

I would like to point out that when you think of an office desk, it's not necessarily just a big commercial real estate building that has offices. There's medical offices. There's higher ed that has research offices for their professors and such, and also multifamily has a lot of leasing offices that can leverage these advanced power strips for those building types. Opportunities to save energy in different building types with these advanced power strips.

Another type of power strip is the remote switch, and this is when you have a little more human control over these things because there's a remote switch that you manually – users can turn off a power strip with. And so that way, you don't need a timer or a motion; you just have a clicker or a switch that you can turn off the

power switch with; and that way, you have that control, you turn everything off. It's all together saving energy.

Lastly, there's a masterless power strip. And the masterless power strip turns off power to the outlets completely when the devices that are plugged into the power strip are turned off, and that eliminates the vampire load. So that phantom load that a lot of people hear being spoken about when an appliance is plugged in, it's still drawing power even though it's off. And so this can be applied in a lot of different spaces as well, such as an office desk, electronics display. When you manually turn off the equipment, it cuts the power to that appliance and those different pieces of equipment to continue saving energy and avoid that vampire draw.

So with all those choices and all these activities going on for advanced power strips, it comes down to sometimes cost. Is the business there to spend more and more upfront for those advanced power strip in the long run? And one thing to help with that is that utilities do have incentives for purchasing advanced power strips, often just a simple rebate. And we have a list of those utility incentives on that plug load tech team page that Rois showed earlier.

There's a list of many different utilities that have both residential and commercial incentives available, and more and more frequently, we're hoping that utilities will be able to leverage those APS tech specs and create additional incentives and rebates that we can add to this list. So we're very excited. We think that advanced power strips have opportunity across the commercial buildings market, and we're looking forward to seeing it used and seeing some impacts in energy savings along the way.

And my contact information is listed here. Feel free to reach out if you have any questions about using or trying advanced power strips in your own spaces. I'd be happy to discuss further as well as during Q&A at the end of the webinar. And I will pass it off to the next presenter.

Rois Langner: Great. Thanks so much, Marta. I'm going to hand controls over to Claire Miziolek from NEEP. So Claire, you should have control.

Claire Miziolek: Hi, everyone. Thank you. Yeah, it looks like I have – things are clicking – great. Thank you for that background and context, both Rois and Marta. It's really helpful. I'm going to tell you from an efficiency organization, our perspective on advanced power strips and the tech spec. And so as Rois mentioned, I'm Claire Miziolek.

I'm the marketing strategies program manager at Northeast Energy Efficiency Partnerships.

And just really quickly, we are an energy efficiency regional organization who works in the Northeast and Mid-Atlantic, United States, although for many of our efforts, we are in communication and kind of keep up to date with things happening all throughout the country and throughout the world. And we have a stakeholder approach, bringing folks together to try to help move markets.

We're a regional energy efficiency organization, and in case you weren't familiar, this is a slide, showing there are many of us. We have many sister organizations throughout the country, but these are officially designated DOE REEOs is what we call ourselves – regional energy efficiency organizations. So this is us up in the Northeast.

And we have several different strategies, but I work mostly in our speeding high efficiency products work, and that is where I came to get to know the advanced power strip. So to put it broadly, NEEP really believes in advanced power strips. We think that they are a really useful tool towards reducing energy use and they're not the only answer, but they are an important strategy. And the technology that is developed is available and it's underutilized. We put together a pretty comprehensive business and consumer electronics report in 2013, and one of our strategies, as part of that, was to aggressively focus on savings from advanced power strips.

We put our goal out there that we think in the Northeast and Mid-Atlantic region, they could achieve a 20 percent penetration rate of APS by 2020, and that was the goal that we've been working on through several different initiatives. In terms of what that could mean for savings, well, it depends on the product, it depends on the application. But just to give some rough numbers here, in a residential context, a Tier 1 product – I'll tell you about that in a minute – it could save you somewhere between 50 to a 100 kWh per year, where Tier 2 products have been in the range of 250 to 350 kWh per year.

From a commercial setting, you might be looking at something like 26 to 50 percent energy reduction. So in either case, for either technology, we're talking about some real savings. Now again, this is not the end-all be-all. We don't need to all quit our jobs because all the energy is being saved. There's still several other pieces to work with. But APS, they're here now; they're ready for increased application.

So a little bit about terminology and for folks who have been kind of working peripherally in the advanced power strip space, hopefully this should be helpful clarification for you. It might be new to some; it might be really old hat to some of you. But basically, there are a few classifications of products, and the internal terminology we have been using is Tier 1 and Tier 2. Tier 1, they take a signal and they power down the unnecessary devices. So as Marta went through all the different control strategies, those are all receiving some kind of signal from the device.

There's the master device have powered down or the hour limit you could set is over or that everything is turned off so they can take away that vampire load. Whatever it is, they're getting a signal. And they have a lot of appropriate uses in residential and commercial applications, and you'll hear about from Christine in just a couple minutes, using commercial applications and we've seen it throughout the Northeast and throughout the country in residential applications.

For Tier 2 products, they actually sense an absence in the room, in the scenario that you are, and they power down unnecessary devices. So they don't actually get a signal. It's kind of a lack of signal they get. So if you fall asleep while watching TV and they ping you. There's a flashing light, for example, for some products, but they'll flash because they haven't seen you touch the remote, change anything on the TV settings. If the light flashes for long enough and you don't respond, and they assume, "Okay, you've either left or fallen asleep or something. We can power down."

So Tier 2 have the opportunity to have greater savings because they just don't wait for the user to take that action and power the device down. They actually will take that action away from the user, assuming that there's some absentmindedness, there's some problems. And they have been demonstrated to have quite significant savings, especially in home AV situations. This is especially kind of a sweet spot, as I've just described.

So just for reference, Tier 1 savings generally are not nearly as large as Tier 2 savings. But Tier 2 applications, at least at this point, they haven't seen as many proven applications for their use, whereas Tier 1 applications, we've seen them being used successfully in many different situations. So NEEP promotes appropriate uses of both tiers of APS. They're both great to us. They save energy. They both have their merits.

So what we do underscore is that with many good products available, it's really important to recognize that you need to find the right product for your needs. That's really the most important thing. If you find a product that meets your needs, then we found that the products are reliable and really do save energy in the way that they are supposed to. So with that, I want to share a couple of background resources and a couple of other things that have tried to flesh out this space.

NEEP has convened a working group just focused on advanced power strips on and off since 2010. So we've been focused on this area in one way or another for a long time. And really what we're trying to do is break down the adoption barriers while earlier in the APS working group, there were some technology barriers and things like that. Pretty much at this point, the technology is there. But there are adoption challenges. And so to help this space, we have been working to add resources and ____ all these links will be hyperlinks.

So feel free to click on any of them. But we tried to define some common terminology so that we are consistently referring to the control strategies in the same way, which makes things easier for people in the industry and for consumers to understand what they're getting, trying to add definition to the space. We put together a game-savings methodology and that was for Tier 1 products and that's available, several years old now, but a lot of the fundamentals of it are still very valid.

We've also put together a test protocol and that's really to make sure that an APS is doing what it is supposed to be doing. And that was an effort of the working group and included testing and assistance from the folks at NREL. And this type of protocol is an opportunity to kind of be a companion piece to the tech spec that has come out. Tech specs will tell you what products are eligible, but even if you have a product, if you run it through the tech spec protocol, that will really test if it does what it is it's supposed to do if it operates in a way it's supposed to operate. So this a really helpful tool.

We also put together a Tier 2 case study, and as I just mentioned on all the different Tier 2 products, that case study goes through some examples of where Tier 2 products are being used and you can get information there. And then getting to know APS, there's some common questions and common challenges, rumors: "I've heard that these power strips start fires."

Well, actually in order to be an advanced power strip that it would meet the tech spec, they need to be UL listed and there's a higher protection component of that, so trying to work through some potential potholes that folks might run into, you know, variety of stakeholders. And then there's also this decision tree that we put together by NREL and that you've seen bits and pieces of through Marta's presentation, but it's really a helpful guide to help a consumer figure out what product is best for their application.

So some of the biggest adoption barriers that we continue to face are really public understanding and appreciation of advanced power strips. People just don't get why they should care. And it's challenging because vampire load of any load is the one that we don't see. Products that could be managed better, that's really beyond the scope of most people's range of what they're able to focus on. That is the same issue amongst homeowners or building managers, even though there are savings to be had. So we are trying to help break this down.

We find that motivation and interest in investing in advanced power strips is hard to muster. Power strips rarely fail and so it's not like there's a large replacement market for folks. And while there are some efficiency programs that Marta listed out or referenced, they're not everywhere and they're not always for our applications. Some are just residential; some are just for commercial.

Also, installation can be tricky. They're not difficult to install, but it does take a level of concentration and, again, some people just may not have. But that is where the APS tech spec is here to the rescue to help work through these issues. So it focuses on commercial buildings. It allows building managers to more easily know what APS products will work well in their space, and as Rois went through, it touches on hardware, installation, usability, energy savings, and life cycle.

And some of the pieces of it are subjective, especially regarding usability and making sure that a non-expert could do it well. That's a hard thing to test, but generally, there's a class of products that are intuitive and useable or easy-to-follow instructions, and then there are a class of products that are not, that are unlabeled, that don't have easily accessible directions. And so this tech spec is really trying to differentiate those products to make sure that you have what will work best in your applications.

So a couple of applications and these kind of expand upon what Marta mentioned, but for building managers, these can really help to meet energy goals that you might have, and the applications can ensure that you're getting a good product that will work for your needs. For efficiency programs, there's an opportunity to expand commercial APS promotion and that's something that several efficiency programs don't have a commercial APS promotion running now. So using this tech spec could be a way to expand that in client savings from promotion of those products, and parts that meet the tech spec ensure higher satisfaction.

We see an opportunity for DOE or NREL to maintain a qualified product list of advanced power strips that meet the tech specs. The trailblazers are using the tech spec and are actually seeing which products meet each metric and each requirement that others can refer back to that and build knowledge and that has to recreate the wheel by running each product again through that list. The manufacturers are able to have ____ and ___ products meet the specs, and that's a leverage point and that's really – that can be used in marketing to ensure and then demonstrate a quality product.

So in conclusion, there are a flurry of resources available to help make this easier, help making achieving the plug load efficiency that we know is there from advanced power strips possible, and the tech spec is available and ready to use. So my question is what's stopping you? And in a 4th of July-themed message, we want you to use the APS tech spec. So with that, thank you very much. My contact information is available here and I believe my control should be taken away from me as we pass it along to Christine to talk about some applications in some real world uses.

Rois Langner: Thanks so much, Claire. This is Rois, and I'm just passing on controls to Christine. So Christine, I think you should be able to control.

Christine Wu: Okay, great. Okay, well, thanks, Rois. Hi, everyone. Thanks again for joining us today. I'm Christine and I'm a project manager, as mentioned earlier, for the U.S. General Services Administration's Green Proving Ground program, formally known as GPG. Okay, so to introduce our program, GPG is GSA's innovation program for building technologies. As I imagine, all of us participating in this webinar know there is a wealth of emerging technologies out there to support more efficient operations of our building, but it can be very difficult to know which technologies

are really going to make a difference in a cost-effective and user-friendly way.

As the nation's largest public real estate organization, GSA has invested in interest in identifying real ways, but we can drive down energy consumption and operational costs. GSA has almost 380 million square feet of real estate in this portfolio, approximately half of which is federally-owned, and we cover about 1.1 million federal employees across the nation. Due to energy reduction targets like 2007, GSA has successfully reduced this energy use intensity to just 43 percent below the national average for commercial offices. Now with the new Executive Order 13693, striving us to reduce even further through 2025. It's pretty clear that at least for the foreseeable future, GSA will always be seeking ways to make our buildings even more efficient.

GPG was established in 2010 to aid in this effort by testing and identifying the most energy-efficient and cost-effective technologies on the market. Annually, GPG selects five to ten of the most promising technologies available. We pilot them and select GSA buildings for evaluation by the DOE National Lab. With those results, GPG makes recommendations for the highest and best use implementation of the tested technology in order to accelerate their deployment throughout GSA's portfolio and, eventually, the commercial building industry at large.

Since the inception of the program, GPG has published 23 reports on technologies ranging from lighting technologies to water conservation technologies. One of our landmark reports, though, was one of our early ones, actually Publication Number 3, which is the "Plug Load Management Evaluation" published in September 2012. This technology was selected for our program because 20 to 25 percent of our building electricity consumption plug load energy use presented a large opportunity for us to make a significant reduction to our energy consumption.

In 2011 GPG commissioned NREL to test the effectiveness of three plug load reduction strategies at eight federal buildings in the Mid-Atlantic region. So that's Pennsylvania, New Jersey, and Maryland and those states over there. The three strategies tested included timer-based control, load sensing, or what's been referred to earlier as "master control" and the combination of the two. So in an office situation with kind of typical occupancy, you know, office occupancy patterns, we found schedule-based strategies to provide the biggest bang for our buck: the 26 percent energy

reduction at workstations and 50 percent reduction in kitchens and printer rooms with a simple payback of just two years.

You can see in this graph – and I want to note that this is specific to GSA's most common use case, where we have a lot of office workstations with pretty consistent daily occupancy patterns and where we're already operating pretty efficiently. But in that use case, both load sensing and timer-based control had a positive impact on energy reduction.

The timer-based controls provided the lion's share of that impact. Based on these findings, GSA made a procurement of very simple timer-based advanced power strips in 2013. These strips are automated to turn off after 11 hours with six auto off timed outlets and two always on outlets and then a user-friendly one-touch set-top button for manual control to facilitate engagement through ease of use.

Our program has found just generally that the effectiveness of any technology including of APS is a function of user acceptance, which is a function of convenience, intuitiveness of use, and training. So this is an actual image that we used for our one-page instruction sheet and you can see that we offer some best practices on what kinds of devices should be plugged into which outlet. And as an actual user of one of these strips, I can tell you firsthand that this technology is very easy to use and it's nearly impossible to find ways to circumvent this very simple but effective strategy.

So we deployed over 16,000 units across the nation in almost 100 of our buildings, including our headquarters building in Washington, D.C. We completed this deployment effort in August 2014, so we're now just shy of one full year of deployment. But here is a chart, a sample chart, of two comparative weeks in one of our buildings in the Pacific Northwest, before and after their APSs were deployed.

I should caveat that this data is sub-metered for plug loads, so there might be some noise in here from other variables, but you can see that the week averaged 4 percent reduction in total electricity usage. So when you consider the previously mentioned statistics that plug loads make up about 20 percent of total electricity use and that APSs can reduce that plug load consumption by about 25 percent, that equals about 5 percent, so this falls right in line with the typical use projections found in our study.

Overall, we estimate that this deployment effort will save $1.6

million in life cycle energy cost avoidance and 1500 megawatt hours in annual energy consumption, all considered that these are the results from deployment of only 16,000 APS units when we actually have 1.1 million employees working in our buildings. So the impact of full deployment of these very simple literally plug-and-play devices can be truly staggering. So if you'd like to read about the details of our evaluation, the technical report and the summary finding documents are all available on our website, GSA.gov/GPG.

And I would also like to note on a very significant GSA effort around plug load management, there's a sustainable facilities tool developed by GSA's Office of Federal High-performance Green Buildings. You can find information at SF Tool about different kinds of plug load strategies and get data on the plug load energy consumption for various use cases. And the link is in the Chat box on the right of your screen and also on the Better Buildings Alliance Plug and Process Loads website. And with that I'll turn this back over to Rois for Q&A.

Rois Langner: Excellent. Thanks so much, Christine. It's really illuminating to see what GSA has done and the actual savings that have come out of your efforts to employ advanced power strips. With that, I'm going to turn to our last slide with all of our contact information for everybody to see and we have about ten minutes left of the webinar for questions.

So Evan, if you have – are there any questions that have come through?

Evan Fuka: Yes, we have a few, and I just want to remind everyone that if you have questions, please submit them through the GoToWebinar's "Question and Answer" feature.

So the first question I have is "How about controlling plug load controls using building electrical circuits?"

Rois Langner: I'm assuming that means integrating the control into the actual circuit. In some advanced power strips, some of those more integrated controls do fall under the – or they can meet some of the requirements listed in this advanced power strip technical specification. It was written more for the plug and plays, but it does apply to those that can be integrated into the electrical infrastructure of a building itself.

There's a lot of other technologies that are coming on board with

that, and a lot of them are new. So I think we'll start seeing more integrated controls and metering as we move out into the future here, but at the same time, as we've shown advanced power strips is a very cost-effective way to still control your plug and process loads in the buildings, and it's an easy very adaptable solution for any building type.

If anybody else has anything else to contribute from our presenters, please feel free to add to that. Okay, maybe next question, Evan.

Evan Fuka: "Is the APS tech spec able to link to existing resources, like the SFS – excuse me, SF tool plug load module?"

Rois Langner: The specification right now is more of a procurement specification and maybe, Christine, you can talk about the SF Tool in a moment, but it currently is not linked to the SF Tool that GSA provides. Christine, do you have – can you talk a little bit more about the SF Tool?

Christine Wu: Yeah. So I don't want to give the false impression that this is anything that this great work that's been done by the Office of Federal High-performance Green Buildings. But I think the SF Tool is, it's a great repository for information and this is all a collaborative effort. So I think this tech spec has been installed now and it will be worked into the SF tool. Now if you look at FS Tool, you can see that they pull studies from NREL and from GPG and from everyone. So it really is a continuum of all of the research that has gone into this, and that includes specifications for procurement because that's what we've found to be the highest and best use of APS and of plug load management.

Rois Langner: And just to note, this specification was only published in mid-April, so we need some time to incorporate it into these other tools.

Evan, we'll take another question here.

Evan Fuka: Next one I have is "Why 11 hours for the auto off?"

Christine Wu: For our case, we felt that 11 hours was enough time for people who work a little bit over their typical office day and I should also stress that we, since we have an alternative work schedule, a lot of us work nine-and-a-half-hour days, so that gives enough time in the morning, enough time in the evening for people who work before or after their hours. It was just the timeframe that works for us, but I don't know about the specific APS that we procured, if

you're able to change that 11 hours, but I'm sure that there are other technologies out there where you can dictate not only the time span of on and off, but also maybe even program in the schedule from 9:00 AM to 8:00 PM or something like that.

Rois Langner: Great question.

Evan Fuka: The next one I have is "It's rare that you can make an energy efficiency equipment purchase that tenants can take with if or when they leave a leased space, or owned for that matter. Are there any examples of tenants using APSs and taking them with them when they relocate?"

Rois Langner: I think that's definitely something – and maybe, Christine, you can speak to that, too, with your tenants, but if you have a tenant and they decide to buy advanced power strips for their company, that's certainly a case where they would probably take it with them after leaving. And that is again a more cost-effective – of course, advanced power strips are fairly cheap, so it's more of a cost-effective solution if you are a tenant and you want to try and reduce your energy consumption, especially if you're responsible for paying your electric bill. So that's an option.

Christine, did you have any experience with that with any of your tenants?

Christine Wu: I'm not sure about actual statistics or anything. I'm sure it has happened. But ultimately, I feel like if somebody took them with them, that means that they really like them and I think that's probably a good thing and a good thing for them to start proliferating the market, I suppose. But yeah, I know when we deployed them, we did specify with our tenant representatives that they were to leave those, if any of their tenants leave, if any of their employees leave or the tenant moves locations or something like that. So yeah, I don't know specifically of any specific cases where people have run off with them.

Evan Fuka: Okay, the next question I have is "What is the cost range of APS?"

Rois Langner: Great question. I think they can, depending on which ones you get, and Claire talked about the two different tiers, Tier 1 and Tier 2. Tier 2 advanced power strips, really their application is more on the residential side of things, so almost all of the commercial advanced power strips would be more Tier 1. And I believe those are still averaging between $15 and $30 or so, and definitely take that with a grain of salt. You need to see what's out there. I've

seen some Tier 2 advanced power strips upwards of $80 or so, in my own experience.

And, Christine, I don't know if you have any further comments, or Marta, on the cost.

Christine Wu: Yeah, for GPG study, for the study, we used the really high-end payback – it's not payback – cost, and that was $100 a unit, and this is pretty early on, and it was also a very advanced or complex version of the APS. So that's definitely kind of atypical for the cost of an APS. And with $100, we had paybacks of under, I believe, eight years. The one that we ended up actually procuring was about $22. And once the cost dropped to a kind of more representative cost, our paybacks dropped significantly down to two years or less than two years.

Evan Fuka: Okay, the next question I have is "For the GSA study, do they only look at power strips, or do they consider other strategies like IT policies or task lighting changes?"

Christine Wu: Yeah. So actually, I should note that the 26 percent reduction, we already have advanced laptop controls. So all of our laptops, our federal laptops, are programmed to shut off automatically at, I think, like 6:30 PM or something like that. So already, we have other strategies in place to reduce our plug and process load consumption. But even on top of that with APS, you're able to reduce by at least a quarter. So I think that just goes to show the effectiveness of how much vampire draw can really be eliminated with a real on and off of the plug load of the power strip.

Evan Fuka: Okay, another question I have is "Was the effort, the man hours, cost, et cetera required to audit the existing plug loads in specifying suitable APS – was that documented, and was it considered in a payback analysis? And what is the best way to audit plug loads?"

Rois Langner: One thing I will point out is on our Better Buildings Alliance Plug and Process Loads website, we do have a couple of resources dedicated to that. And I believe they're titled "Reducing and Assessing Plug and Process Loads," and we have one for office buildings and one for retail buildings. So please go check those out. They're free for downloads. And it does have a checklist for what to look for, recommendations for how to reduce your plug load energy consumption, et cetera. So that's already worked out and even linked to a workbook, so you can actually plug in that information, and it will run the calculations for how much your

plug loads are using and how much you can potentially save with that.

And then I think that question again is directed to you, Christine. So we're at the top of the hour, so maybe just a quick reply on GSA's experience with that.

Christine Wu: What we did here was with NREL and they had their own metering equipment to do this. To be perfectly frank, I think GSA probably and many commercial offices, it has challenges in sub-metering. So to do a full-range audit of how much energy our plug loads actually consume is – that would be quite an initiative. It's something that our agency is working on very actively, but for a cost estimate or for an actual estimate of workload, I don't think I can say at this point.

Rois Langner: Okay, great. Well, we're at the top of the hour, and I'd like to – we apologize if we haven't gotten to your questions. Feel free to e-mail us or e-mail me if you have further questions that you'd like to ask and we can provide answers to. But I really want to thank all of our panelists today, and thank you, all, for listening to the webinar. All right, well, thanks, everyone. And Evan, I think we can conclude the webinar.

[End of Audio]