Recording: The broadcast is now starting. All attendees are in listen-only mode.

Moderator: Good afternoon everyone and welcome to our webinar on energy storage in commercial real estate. We are going to give folks one or two minutes to join before we get started. Talk to you in a minute.

Cindy Zhu: All right, I will go ahead and get started. Good afternoon everyone, this is Cindy Zhu, with the Department of Energy. Welcome to the Better Buildings Alliance, Pure Learning call featuring the renewables integration tech team and the commercial real estate team. Today, our topic will be focused on energy storage and its relevancy for commercial and institutional building.

Next please.

First I will share a few updates from both the renewables integration tech team and the commercial real estate team. Next, our renewables team lead, Jay Paidipati, will take us through an overview of the current state of energy storage technology. Then, we will hear about the benefits of energy storage from Carl Mansfield, of Sharp Energy Storage Solutions, followed by a case study from Troy Strand, of Baker Electric.

Attendees can ask questions to our speakers throughout the presentation using the chat function of the webinar. We will be collecting questions on our backend and we will field these questions during the Q&A session after all presenters speak.

Next please.

First up, our renewables tech team have been busy creating new resources based on what we've heard from our Better Buildings partners. All of these new solutions are on our Better Buildings Solutions Center located on the link on your screen. We have three things. First, is seven steps to selecting a solar provider fact sheet which is a step-by-step guide to selecting a system and submitting in best practices for RFP. Next, we have our solar request for proposal template. This provides a format for businesses to present their solar project and a timeline to use for bidders. Finally, we have a cost proposal template which is a financial tool that provides a price proposal template and an NPV template for your step-by-step solar needs.

Next slide please.

This is announcements for those of us on the commercial real estate Better Buildings Alliance team. First up is: our team is selecting new steering committee members for BBA partners. These partners will be on our steering committee for the next two years through 2018, and our steering committee drives a lot of the activities and priorities that we focus on throughout the year. So if you are a Better Buildings Alliance partner and would like to self-nominate yourself for the steering committee, please do so by June 15, to the website on the screen.

Next up, for those of you that are attending the BOMA convention here in Washington DC at the end of June, two Better Buildings campaigns are launching their awards at BOMA. The first is the interior lighting campaign and the second is the Greenleaf Leaders Award. Those of you have not submitted Greenleaf Leaders applications yet and are still interested in doing so, those applications are held until this Friday, June 10. Otherwise, we will see you at the award ceremonies.

Next slide.

Jay, take it away.

Jay Paidipati: All right, thanks Cindy. This is Jay Paidipati, I lead the renewables tech team. Over the last couple of years, kind of from two ends; we been getting a lot of questions from members like yourself saying, hey, what is energy storage? I've got people calling me, I write an article about it; what does it mean for me owning and operating commercial buildings. On the other side, we've seen cost come down. So why is energy storage all of a sudden coming now? The technology has been around for 100 years.

So there are a lot of things and this is just a high-level overview to give you some context of why things are happening right now. There is a lot of demand driven by – many areas of the country, renewable energy becomes more cost competitive. It's intermittent, especially solar and wind energy. So utilities need to keep the lights on all the time so they are storing renewable energy. A lot of customers are interested in it. I think you might be interested in terms of backup power; maybe managing your energy costs.

Looking at it from the utility's point of view, again, they've got a lot of aging infrastructure. The current utility systems were built in the 50s and earlier and are starting to age and energy storage provides a cost-effective way for utilities to reduce cost. Then, in

general, there is a move towards a more networked or energy cloud type grid. So it's driving interest there.

Now, the other side, some of the drivers is policies like allowing energy storage to participate in certain markets; state policies driving energy storage targets. The technology has become a lot more efficient, not just the batteries themselves, but the electronics, the controls. There's a lot the last five years since I've been working on it that really come. Through the air grants in 2008 and 2010, there is a lot of technology demonstration funded, of customer site energy storage and utility site energy storage that get the broader electric power industry a lot more comfort.

Last, but certainly not least, cost reduction. Costs have come down, I think, just in the last year. Lithium ion battery prices have come down 30 percent. So there's lot going on that's driving interest in energy storage.

So, going on to the next slide; what does this mean for you as a commercial building owner/operator? One of the neat things, and also the challenging things about energy storage, is it can do a lot of different things. So this slide, there is a lot of information here on all the different use cases or applications for energy storage and most of these are things that the utilities could do, but for you, I think there is, depending on – this really depends on utility by utility, where your building stock is, what it can do for you. Some of the straightforward ones are if you have time-of-use rates charge in between high on peak rates and low off the great.

Second, depending on if you have a demand charge or maybe a power factor charge, you can use energy stores to manage those things. The most straightforward one is if you have a demand charge from say, your highest 15 minutes of usage, your highest our usage from 4:00 to 7:00 p.m. you can have the energy storage help you manage those costs.

Then last in this area, if you are in a part of the country that either has a cap on net metering or the net metering rules are changing, you could use energy storage to, instead of just throwing away that solar, use the energy storage to capture the extra energy, the solar energy, and use it later on in the day.

At the bottom of this chart; I think when some people think of traditional energy storage or what it had been prior to five years ago, as backup power. So they're using it for short-term and long-term outages.

So those are some of the ideas. When you look at energy storage and what it can do for you, I think these are some of the things that you should think about. You might, if you read articles, you're going to see that energy storage can do a lot of other things, but the ones in bold are the ones that I think are of the most interest for you helping you manage your costs and maintain reliability.

So going on to the next slide. Costs are changing. This is from last quarter and I suspect these costs are lower now. Just to let you know, the cost situation is changing quickly. Costs are coming down. Depending on how long of a battery you need, do you only need two hours a storage, do you need four hours a storage, do you need eight hours of storage? It's going to influence your cost. So it's not as straightforward as let's say – I'm familiar, I come out of the PV world where it's dollars per kilowatt hour and you can normalize the technology. This is a little more complex or keep that in mind going forward, but this gives you some idea where our costs are.

So going to the next slide; when it comes to technology, there is a lot going on in the industry. So I tried to build some of the ones that I think are of most interest to you. I think we need to update this slide; some of the colors might've changed a little bit, but there's a lot of ways to store electricity. It could be mechanical, with batteries, flow batteries which is a type of chemical and there are a lot of other things.

For the most part, I think for commercial buildings, the things that are feasible in the near term or batteries, flow batteries, which are picking up – actually, I don't want to say picking up steam, but which are becoming more – there's a lot more demonstrations and commercial products available. Then, things like ice based storage in certain parts of the country make sense. Then, maybe for short-term, power factor correction capacitors.

The reason I put this slide up here is if you go and start researching energy storage, you're going to see a lot of information about different technologies. The mechanical ones are really a bulk utility scale thing and there are some other things that are still evolving. Within this, I will say the vast majority of energy storage being used for demand charge management, is lithium ion, so that's why that's highlighted under, battery. So this just gives you some flavor. There is a lot of things on here, but really I think your interest would be the batteries and the flow battery.

So that's the technologies. Now even more complicated I think and what's changed even faster than the cost and technologies is the business model. It's a quickly changing space. Over the last six months we've see new business models, and I'm sure in the next six months there will be even more. But there's a lot of options for you to own energy storage yourself and this varies quite a bit by utility and by part of the country. So it's hard to paint a picture that applies everywhere, but similar to you that might work with as a shared saving for energy storage where a third party owns it and shares the savings or you own and share the savings with the third party owner.

There's variance in terms of who actually controls the energy storage. Do you control it all the time? Does a third-party controller it all the time? Does your utility, perhaps, have some control and compensate you based on that? So there are a lot of changes going on quickly here. I think as you look into energy storage, ask the questions of, okay, what are the options for ownership and operation and just be aware that they are changing pretty quickly.

So that was a lot of information, but that is what I had to cover right now. I think with that, and I think we will safe Q&A for the end so hopefully if you have questions just let Jake know. With that, I'm going to pass it over to Carl to talk about energy storage further.

Carl Mansfield: Thank you. Just want to verify everyone can see my screen up here now. My name is Carl Mansfield, I'm with Sharp Electronics Corporation. Sharp has had a long and varied history in consumer electronics and also a 50-year history in the solar PV world. So, first slide here shows a little bit of background about the company itself.

As I mentioned, we do have 100-year track record. We have about 130 MW of energy projects and service in the US currently so we are providing asset management of those, mostly solar PV, projects. We're also recognized through Sharp's corporate history of developing and providing innovative products that simply work and can be depended upon. More recently, about two years ago, we formed a new operating division in the United States to start to market our energy storage products and services to the commercial and industrial space in North America.

So just diving in here, let me talk a little bit about what the Sharp's Smart Storage Energy Management System is. This system is a

commercial, behind the utility meter, battery storage system using high-capacity batteries under automated, intelligent control. Sharp's predictive software monitors the site's consumption in real time and based on historical behavior and expected behavior, we then predict where to dispatch and discharge the batteries to trim off those peak loads from the property and facility. By doing so, under current utility tariffs in many regions of the US, significant demand savings can be realized.

So in essence, what we are doing here, and what the primary value proposition for this particular kind of storage is very similar to a solar installation where you invest capital or you finance and installation and through energy savings, you get a return on the investment or cash flow positive operation.

Just in the bottom right of the slide there's a few feature highlights of the system itself. It's available both in indoor and outdoor deployment options depending on the site's requirement. We have a highly scalable solution from 30 kW up to a half megawatt and higher. The system is fully automated. So as part of the product and service that's on offer here to the commercial building owner, the commercial building owner does not need to control, dispatch, configure, or anything over the system. All of that complexity of operation is handled automatically. There is a real-time web interface for the host beneficiary of the system to look at how the system is behaving and what savings is being generated.

Another critical point for this system is that it can be deployed either as a standalone battery solution, or it can be deployed together with the solar PV installation.

Finally, also as part of our offering, we do provide a 10-year asset management service to our customers and that service comes with the demand reduction performance guarantee which is somewhat unique in the market.

So how does the system operate? Many of you may understand this, but a critical thing to really discuss first to understand the value proposition, is how the utility bill is made up. So most commercial and industrial tariffs, except on the very smallest commercial properties, have their electric bill divided into three elements, of which two contribute the major portion. The first is the energy charge shown in blue on the slide. That energy charge, it may have a different tariff depending on the time of day when energy is consumed, but in essence, it is sort of related to your consumption of kilowatt hours supplied by the utility.

The second element of pricing here is the demand charge. That is assessed by the utility measuring your maximum kilowatt power draw at any point during the billing month. Then you are assessed a portion of your bill based on that demand charge. Demand charges, in many regions of the US, California notably is one example, and York as well, often the demand charge can be in the 40 to 60 percent demand rate of the total bill. So it's a very significant energy cost in many cases.

When a storage system is deployed, such as Smart Storage, as the building's load begins to peak; so here, the right side is an illustrative load profile for a particular facility that's got four fairly tall peaks during the day. When those peaks begin to appear, the battery system will, under autonomous, automatic control, will predict where the appropriate discharges should occur. By discharging the battery, it is effectively supplying the facility's peak demand from the battery and set up from the grid. The resulting peak demand could be significantly cut and result in a dollars of savings.

When the system is co-deployed with a solar installation, we view this is really as a one plus one equals three kind of scenario. So as the graph here is now showing, the solar PV installation will generate kilowatt hours to offset that energy charge. So your energy charge will be significantly reduced by the PV production. The PV system itself cannot reliably reduce any of those peaks in a consistent and reliable fashion.

Really, there are two major reasons for that. The first is that it's an intermittent resource. So when clouds pass over, you will lose some of the output from the solar PV and so you cannot depend on it providing full power output for the entire month of operation. The second point is, many commercial facilities do actually have peaks in the 4:00 to 7:00 p.m. when solar is starting to reduce its production.

So what we find when the system, a storage system, is co-deployed with solar, the two systems work very well in combination and solar's impact on the load profile at the site can allow the storage component to achieve better demand reduction performance. Likewise, the storage component can help firm some of the production from the PV system to allow those demand savings to be realized.

Finally, when the system is deployed as a hybrid solar with storage installation, can be eligible for federal tax credits which can offset some of the upfront capital costs.

Looking at this next slide, I want to dive in and talk about what we view as four of the main critical considerations to bear in mind when looking at selecting and installing a battery storage solution on a commercial property. So all of these drive towards the bankability of the solution. In other words, can you rely on the financial returns that the system is predicting or projecting it will produce if installed? The four factors that we think are critical are listed here; safety, reliability, performance, and ultimately then cost.

So when we consider safety, there are really five steps that are truly important to consider, looking at a battery solution. The first is, the system should have the appropriate component level safety and certifications. So there are number of UL standards that apply to battery systems at cell level, rack level, inverters, and control components. All of these solutions should carry the highest level of safety certifications.

The second point is that the system should be designed with those components integrated with a safety focused design. In other words, interactions between the various components of the system should be designed in a way to avoid any safety issues. The system then should have undergone rigorous testing. I think, critical points that are often forgotten, are the final two which are; once the system is deployed, it should be monitored on an ongoing basis to ensure safety. So just to give one example, with all of Sharp's deployed systems, we are monitoring, in real time, cell voltages, and cell temperatures at those deployed sites. If anything gets out of range, we can shut the system down to avoid a safety issue before it may become a more serious concern.

Then, the final point is, at the end of life of battery installation, and typically the lifetime is a 10-year guarantee period and the system may have some life beyond that. Have an effective end-of-life management for recycling and safety commissioning of the systems is really important. All of these or should be offered by a supplier and service provider who is providing this kind of technology to you. These are all part of Sharp's tenure asset management solution that we provide our customers.

Regarding reliability, again, battery systems, unlike solar installations, they have, we like to say, more moving parts;

meaning they have to be actively controlled and dispatched. With the solar installation it simply produces energy as long as it's available and well-maintained. There is no active control required. So the battery market is relatively new and in order to get the economic returns you really have to be sure that you are selecting products from proven companies that will stand behind their warranties and guarantees. Again, this is a critical piece of the offering provided by Sharp and backed by the performance guarantee.

I will talk a little bit here about performance. I won't touch on this a huge amount because Troy will be providing a case study to follow this presentation. Regarding performance, there are really three key things that have to be done. The first is you've got to predict the performance, then you have to guarantee the performance which means putting a dollar penalty on the line if you do not deliver some minimal level of performance. Then finally, you have to actually deliver, assess, verify, and tune the system so that you can maximize that performance.

We are confident in the performance of our particular smart storage system to the extent where we are also providing a 10-year long demand reduction performance guarantee which is a really critical piece to provide the bankability assessment for most of our customers. Once you know that the performance can be relied upon and guarantees are solid, the final factor which is an important factor, is cost. As Jay mentioned, prices and costs for these kind of lithium systems have been coming down dramatically in recent years. So we are now seeing quite a good return on investment from these types of installations.

It's also crucial that the system is properly dimensioned for the needs of the site. So looking at an individual sites load-profile, and there are some examples shown at the right side here from actual sites, it's important that we don't over dimension or under dimensioned the capacity or the power rating of the system in order to maximize the possible ROI from these products. We also provide an extensive set of tools to rapidly review a site's operational profile and to create the appropriate assessment to properly size and design a system for any given property.

One other thing I should mention here is that we do find that the system, in general, is applicable to a very broad range of different property types. In particular, when co-deployed with a solar installation, it has a very broad applicability. There are some properties that tend to have more narrow peak loads that are better

in terms of ROI, but even some of the longer peak load sites like hospitals that we've seen, can have effective ROIs in many cases.

When looking out to deploy this, there are really two options here. Either a purchase on the system where tax credits can be enjoyed and local incentives can be enjoyed if available. Typically, on these kinds of installations, and there's an example cash flow from an actual project shown below; we are usually seeing, depending on the site's operational characteristic and as geographical location, a three to five years return in the favorable regions in the US can be achieved. So California in particular, this is fairly commonly achieved.

In addition to a purchase option, which would require a balance sheet financing of the system, there are also available, and we can provide some further information on this if people are interested after the webinar, there are zero dollar down, immediate cash flow positive financing offers available that are combination of power purchase agreement or kilowatt demand reduction agreement and leasing type of structures. So these offers are available both for storage only installations and for hybrid PV and storage installations.

So in conclusion, what I've talked about here is I've deliberately avoided the backup power option. What I'm trying to show is the economic return benefit of these systems to a commercial property. Demand charges are a significant portion of today's utility bills. A storage system like Sharp's Smart Storage can substantially reduce these demand charges. It's very important to select a product, not just from a cost and ROI perspective, but to really properly understand the reliability, the safety, and what performance is really being guaranteed and underwritten by the provider of these products. So that's an important consideration when thinking about installing this kind of system.

The typical ROI for these is in the three to five years range. We've seen some cases below three years. I should say that the three to five is more typical. Financing alternatives, as is the case in the solar PV industry, are also available.

That's the end of my presentation and I will hand back over to Jay.

Moderator: Great, well now we are going to have Troy from Baker give a case study of installing energy storage. Thank you Carl.

Troy Strand: Hello ladies and gentlemen. I hope your afternoon is going well. This is Troy Strand. Here at Baker, we installed the system on our roof along with the portable tag system a little over a year ago. So we do have a whole year's worth of data and I will be presenting that.

A little bit of background on the company; Baker was actually established back in 1938. So we are a long-term, privately held, closely held company actually. We generate about 140 million for last year. Our current bonding capacity is 75 million at a single project. I believe our aggregate is well over 150. We currently run about 130 here at our headquarters at Escondido, California, with approximately 800 staff that fluctuates up and down depending on what we have going on in the field. We are union contractor. We do pride ourselves in the design build arena and we do quite well at it. Our single largest contract at the moment is just north of 37 million and safety is critical. So looking at product that is going to perform safely and reliably is very important to us. Our EMR, we jealously keep that below 1 at .73 for 2015.

A little bit about the market sectors that we serve; so one of our, in terms of solar, we are serving the utility sector; we are at a gigawatt of installed capacity out there. In terms of substation work, we do that as well. We do have medium voltage certified linemen and splicers on staff. We also pursue the battery energy storage arena at the utility or in front of the meter side. We've done work for Southern California Edison, here in Southern California.

Then we have cogeneration plants at the pretty large level; at UCI, at John Wayne Airport, a couple of other locations as well. Ossified work and then the medical office building as well. Commercial; we do pursue solar and battery installations and then we are involved in education. It says K-12, but it really should be saying K through 14 because community college are those last 13 and 14 as well as higher education. We have a controls group and then we are also pursuing military. Then we are doing traditional commercial, vertical/horizontal type construction. So that's a little bit of background on the company. Had to get that out of the way otherwise they would probably kick me in the shins.

So let's talk about the system. You already saw a picture of this that Carl shared a little bit earlier. As we were looking at; as we want to get into the energy storage arena, we wanted to kind of walk the talk. So we wanted to put in the system and understand how it works. Lo and behold, we ended up with a lot of benefits from this. So benefit number one is the 10-year asset management

that Carl mentioned. Along with that comes the performance guarantee. In our case, it's 25 kW per month, is the clip off the demand, or 300 kW per year. It meant a lot to us that it was backed by a larger company such as Sharp. So those were kind of the critical factors we looked at. Sharp, like Baker, long-term company.

The system details; so you can see the single-line; a little bit small on your screens because I can barely see it myself. The key point is that we have an 86 kW portable array on our roof and we have a 30 kW or 80 kWh battery storage system. Both of those feed directly into our main switchboard and get right out on our side of the meter from there.

So here is a detail on an actual day of performance. This is interesting to note; the red line is showing what our load would be without the PV and without the energy storage. The blue line is showing what our actual load was with PV and with the energy storage and then you can see with the green, what the PV is doing and then the black, what the energy storage is doing.

Of note you can see where the sun just pretty much obscures the clouds and the PV system shuts off. It didn't shut off, it was still operating, but at a much lower or diminished capacity. I remember that day. We actually had a cell of early monsoon season here in Southern California come through and just dump a lot of rain on us. Had we not had the energy storage system, our system would have had about an 80 kW peak load and that would've been a pretty big hit. Well, not a big hit, but it would've dinged our demand charges as has been pointed out earlier.

So as we look at this, and let me see if I can move this thing out of my way. Oh, I can. Let's get that down there.

As we look at our peak building load, we can see that our average is 84 kW and then after the energy storage and the PV, it's 53.7. You can see the average of 30 being clipped which is slightly greater then what the power conditioning system, or the inverter rating, is of the energy storage system. That's because the PV and the energy storage work in tandem. There are days where the PV does contribute or months where it contributes. We can see it's done as well as 39 kW and we have a couple of points where we were below at 17 and 26, but the average is 30. Our average savings is 36 percent.

For some reason, I'm not being able to forward my slides. So maybe someone can help me with that. Oh, there we go.

Now, looking at the payback: the system ran us about 77,000. We were given an average savings of 20,000 a year and we are looking at a simple payback of a little over 3½ years. You can see, again, we are just reiterating what the peak load is after, before-and-after, and then what our dollar savings is per month. Some months, as would be expected, in the later summer and coming into the winter, we actually get substantial savings in the range of 1000, 2500 a month.

And then, just to wrap this up, my slideshow was little bit briefer than the others, but the key thing here is; installing energy storage with PV, at the same time you can take advantage of the 30 percent investor tax credit from the federal government on the energy storage. We did achieve a lower than four-year payback on the system. The system is absolutely delivering as designed and as guaranteed from Sharp.

So that concludes my presentation.

Moderator: That's great, thank you so much Troy and Carl and Jay for all sharing your perspectives. With that, we will open up the webinar for questions. Again, as Cindy mentioned at the beginning of the webinar, if you do have a question, please submit it via the question box on your webinar panel and I will propose it to our panelists.

Before I get started with our first question, I did just want to note that there will be a recording of the webinar as well as the slides available to the group after the webinar and it will be available on the Better Building Solutions Center as well. So if you would like to share this with any of your colleagues, that is an option.

The first question, and I might pose this to Carl, but Jay and Troy, please feel free to jump in. What is the difference between an asset management service agreement and a manufacturer's warranty?

Carl Mansfield: There's a couple of things. So what we do is we provide a 10-year management and operation of the system. So probably the major difference is there is a performance guarantee rolled in there. So it's not a hardware warranty which is typically materials and defects and sometimes a performance guarantee. This is an active, managed service. So after we deploy our systems, we don't leave

the customer alone. We are managing that asset for them and tuning its behavior.

So as site changes might occur over the 10-year period in terms of the energy profile of the property, we will continuously manage and adjust the operation of the system to meet that. So it's really an active management service rather than a manufacturer's warranty.

Hopefully that answer the question, but if not, please ask again and I will clarify.

Moderator: I think that was great. And again, if you have any questions, please feel free to submit them via the question box on the webinar panel. That was our only question at this point. So Jay, I don't know if you wanted to jump in quickly with a couple of other things that the renewables team is working on and then I can see if we get any other questions over the next couple of minutes.

Jay Paidipati: Sure, actually, I would ask a question to Carl, what does ONM look like? Is it a monthly service check? Is it an annual thing? What kind of site access or preventative maintenance is required?

Carl Mansfield: So these battery storage systems don't really need a large amount of preventative maintenance. What we have with our particular system is that the system is fully integrated with a cloud-based network operations center and so our network operations staff or monitoring these systems in real time. Any alerts that get generated they require, for example, some reset of a component at the site, all of that can be handled remotely. So generally, we may have a few issues they get handled on an annual basis that require some remote power cycling and reset of components that don't need any site visits.

Then, from a preventative maintenance standpoint, over a 10-year period the systems don't really need much preventative maintenance. We do include, in our asset management service, an annual visit to the site for inspection and so forth, but most of our preventative maintenance is triggered by monitoring the site's performance in real time through our network operations center and then dispatching a maintenance crew as they may be needed.

Unlike PV that requires a fairly frequent panel washing to maintain performance, we are not finding that these battery storage systems really need a lot of care and attention in general when they're being monitored in real time like that.

Jay Paidipati: Okay, great. Then, I have a question for Troy. A question I get a lot is how big is it? How big is the system you guys install? You have a really nice picture on slide three, but is that six feet tall, eight feet tall? How much volume? Because a lot of buildings that I have toured and walked around, sometimes space is tight. How much space is this taking up for you guys?

Troy Strand: We are covering about 6 feet high by about 10 feet wide of wall space with that system. So space is a consideration when you put it in. So that's 30 kW, 60 kWh of capacity. With a larger facility, larger than Baker's office building, that footprint can go double and it could end up being a factor of 10 larger.

Jay Paidipati: Okay, and for your system, what was the installation like? Did you have to have forklifts? How heavy was everything? How did that work out?

Troy Strand: Well, it is out in our prefab shop, what used to be our warehouse. So we used forklifts, but more than likely that's what you're going to offload with just to save people's backs. The inverter, the battery modules, they do weigh around 100 pounds plus.

Jay Paidipati: Sure, okay. In terms of interconnection – oh, go ahead.

Carl Mansfield: This is Carl, let me just kind of add to that. So the 30 kW inverter, as Troy mentioned, is about a 95-pound unit and then the battery racks themselves, when you open those up, they come for installation, the batteries are in a drawer format and each battery door weighs about 150 pounds; something like that. So it is strictly a two-man lift, but the system for the indoor installation, we have designed it so that it can fit in tight spaces without specialized lift equipment. So that's really been one of our intentions there.

Jay Paidipati: Okay, great.

Moderator: And Jay, we have a couple of other questions from the audience. One comes in and asks; is the system suitable for multifamily use and if yes, do you think the economic case would be as compelling for the one presented in Troy's case study?

Carl Mansfield: Let me take that. This is Carl. Our first pilot system is actually deployed on a multifamily property. It's a six-story, half city block, midrise apartment building with about 200 apartments. That was our initial, first pilot system and we do find that the economics can work on that kind of installation. What we're doing there, this is in California, in San Diego, so that particular property, we are behind

the common area meter which has a peak load of about 100 kW or so in summertime.

So we are not doing anything directly to offset each individual tenant's meter, because being in San Diego's territory, every apartment is separately metered and has a separate utility account. But the economics can work on that kind of multifamily property behind common area metering.

Moderator: Yeah, that's great. Another question; do these systems typically draw down to zero or do you build in excess capacity?

Carl Mansfield: This is Carl again. Let me take that one. What we find is that the day-to-day variation across a month on every property that we've ever assessed, and we've probably done more than 1000 property assessments now; varies a lot from day to day. So we designed the system to use 100 percent of the batteries capacity on the worst-case day, but when we actually looked at the cycling utilization of the battery on an annualized basis, they are typically being cycled in the 15 to 25 percent range depending on the properties characteristic. So for these kind of deployments, we are really not hitting these batteries particularly hard.

One of the other things I should add as well is, although in my presentation I'm showing economics based purely on demand charge reduction, another key piece of our asset management service, is over the 10-year period, we will offer additional system upgrades as utility tariffs, programs, or market options become available to allow increased revenue to be generated from these assets. So that's another critical difference between the asset management approach and just a pure manufacturer warranty approach.

Moderator: Okay, that's great. Once again, we will leave the line open another minute or two for audience questions. I don't know, Jay, if you had any other follow-ups that you would like to ask?

Jay Paidipati: No, I want to thank Troy and Carl for coming to present today. We really appreciate it. This is something the renewables integration team is going to start looking at further for the rest of the year; building on the sort of resources we've put together that Cindy mentioned in the beginning and some other ones on the Better Buildings Solutions Center. We're going to start looking at what we could do to help commercial building owners look at energy storage.

Moderator: All right, and with that, I would just echo Jay's thanks to our panelists and thank you all for attending. We will go ahead and conclude the webinar and, as I mentioned, the recording and the slides will be available on the Better Buildings Solutions Center and we will be sending an email to the attendees as well. So thanks again for joining.

Jay Paidipati: Thank you.

[End of Audio]