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John Jameson: Hello, everyone, and welcome to this Better Buildings Alliance Healthcare Sector Peer Exchange webinar. This one is titled "Lighting for an Improved Environment of Care." I'm John Jameson, Healthcare Sector account manager with Better Buildings Alliance, and I work with ICF International here in Washington D.C.

Today, we have two panelists joining us, and we'll be discussing lighting and making it a top priority within your organization – how to make that argument to different internal audiences. So we'll be hearing from John D'Angelo at Northwestern University. And then we'll also be hearing from Michael Myer, Pacific Northwest National Laboratory, on technology guidance and some lighting campaign opportunities through the Better Buildings Alliance.

Here, you'll see a little bit of background on each presenter. John is now at Northwestern University, but has 27 years of experience ranging from the US Navy to New York-Presbyterian Hospital, and Cleveland Clinic. And Michael Myer – as well, from PNNL – a lighting expert with our Alliance lighting team.

I'd like to ask that folks save their questions for the end of the webinar. We'll have about 15 to 20 minutes reserved for question and answer. So, please save those questions until after John and Michael present, and we'll be happy to answer those, at that time. At this time, I'd like to turn it over to John.

John D'Angelo: Okay, thank you, John, very much. And if you could go ahead and advance the slide. For those that are listening in, thank you very much for joining us today.

One of the things that Michael and I talked about was, we believe that the majority of people in the facility's management organization understand the benefits of higher quality, lower cost lighting. But we often have great difficulty in getting the financial or the organizational support to move forward. But I figured I would take a step back.

When I started my career as a facilities manager, I would've had a hard time putting lighting in my Top Ten, especially when I started in healthcare. I was looking at outcome safety experience, declining budgets, aging staffing, et cetera, et cetera. In fact, if I

listed lighting as an issue, it probably would've been somewhere about 20 pages away from my Top Ten.

John, could you go to the next slide?

But over the course of especially my Cleveland Clinic experience, I started to understand how lighting was really part of the majority of my Top Ten. And so I started to try and find a way to, one, convince myself, and, two, to use that to help message improved lighting for the various stakeholders within the healthcare.

So, when I talked to administrators, I would talk about circadian rhythms. When I talked to nurses, I would talk about HAI. When I talked to physicians, I would talk about the consistent visual presentation. When I talked to surgeons, I would talk about how I could make them a little bit more comfortable within the operating room.

And for those of you who have already made the switch from traditional source surgical task lighting to LED task lighting, you know that underneath the light it's a lot cooler, simply by the means in which LEDs get rid of their waste heat. When I talk to the Millennials, we start talking about carcinogens and asthma from airborne particulates.

If you could go to the next slide, John.

So, from an outcomes perspective, that really allowed me to message. From a safety perspective, as I started looking into how lighting led to safety beyond the traditional that we all know from slip-and-falls. You can prevent a lot of issues on slip-and-falls, by having good lighting on the floor, with solid maximum to minimum ratios. In other words, you're removing a lot of the shadowing.

And, especially as you have an older patient base, making sure that you have good visual presentation along the walls, and anything that could become a trip hazard. As we get older, some of our spatial orientation is not the same as when it was young. And, lo and behold, while I was at the Cleveland Clinic, I found that the worst healthcare fire happened at the Cleveland Clinic. As you can see from the little blurb, 123 people were killed, and the root cause of the fire was a bare lightbulb.

When I started putting the message together, to talk to my chief financial officer and my chief operating officer – for the funding

and for the inconvenience of operations in doing a major lighting – what we started really looking at was the reliability, the recoverability, and the capacity benefits of going to higher efficiency lighting. Most hospitals were built between the '50s and the '70s. The majority of those hospitals have dramatically increased the amount of electrical equipment. And very few of those hospitals have changed out their transformers, or the utility companies have changed out those transformers for them.

So, dramatically reducing your lighting load really does allow you to have higher reliability on your electrical circuits, greater capacity for new construction projects. When we did this at Cleveland Clinic, we were able to put more things on our existing generators, just from the reduction in load.

We had a similar experience while I was with New York-Presbyterian. We upgraded some of our main corridors. And instead of going with every third light, on an emergency power circuit, we were actually able to string every light on the circuit. And we still had additional capacity leftover on the generators.

The stuff on the right-hand side was just fun with an infrared camera. I had a restroom that had the traditional incandescent lamps on a make-up mirror configuration, so I played with my infrared. And as you can see, the hotspot on those incandescents was 203 degrees, in the second picture. On the third picture down, I had actually unscrewed – with a glove, 'cause they were so hot – the incandescents, screwed in LEDs, and turned them on.

The way this particular camera, the mode that it was in, is find the hottest thing it saw – a red – and the coolest thing that it saw – a blue. So even though those LEDs in the third picture are turned on, the hottest thing in the room is actually the waste heat from the old incandescent lamps, coming back out of the wall.

And so, if you follow the timestamp to the bottom photo, it took about an hour for the LED lamps' waste heat to become the hottest thing in the room, the wall itself to cool back down. And you can see between the third and the fourth picture that the LEDs were burning at 99 degrees, from the beginning through this entire series, as opposed to 203 degrees for the incandescents.

John, if you go to the next slide?

So my top three have always been patient outcomes, patient safety, and patient experience. For those on the line that are in healthcare

facilities, you're fairly familiar with the ANSI/IESNA RP-29. The updated version is actually about to go out for public comment. The team has really been working very hard on that, and there's a lot more in the updated version of the RP-29 – which is lighting for hospitals and healthcare facilities – than there was in the 2006 version on patient experience.

The three big that you have up there: control of lighting; the quality of electric light. And, most importantly, we've done some experiments at both Cleveland Clinic and at New York-Presbyterian on giving dimming capability to the nursing units – is probably the single most effective way to control noise on the unit.

There's something that is inherent in all of us, when we walk into a church or some other dimly lit area, that we start to naturally moderate the volume of our voices. We've proven that over and over and over again, that even somebody coming from off of the unit, when they walk into a unit where you've dimmed the lights, it automatically makes them much more respectful of the noise that they're making.

Next slide, please, John?

So, a couple years ago, Department of Energy had sponsored an *Advanced Energy Design Guide* for healthcare. And the charter on this, through ASHRAE, was to – using only commercially off-the-shelf available technology – design a hospital building based off of an actual hospital design, that met all of the same services and sizes of that actual design. But did so at 50 percent of the energy usage of that existing hospital.

In doing the studies, Department of Energy was able to find that the interior lighting in healthcare, as a percent of your total energy use – that's diesel, natural gas, and electricity – ranges between eight and ten percent. So, if you assume that you're one of the average hospitals, that your total energy bill is about two percent of your hospital budget – or about a quarter of your facilities management budget – and that you can cut your lighting in half, that's about a $50,000.00 a year savings on every $1 million of energy spent.

It is not an insignificant amount of money, since most of us are in the several million dollar energy spending category.

John, next slide?

These are exact excerpts from that *Advanced Energy Design Guide*. And, as you can see, these are really not some future generation that maybe it will get invented. These are just opportunities that you can pick and choose from. You don't have to do them all. You can pick and choose from those that fit within your culture, and within your desire. But each and every one of them is proven to reduce your total energy demand.

Next slide, John?

From the lighting power density, you can see a whole building of 0.9, and at the time, that was the base requirement. And the 90.1, which as most of the people in this line know, that's a prerequisite to even consider for LEED. So 0.9 watts per square foot is not a strong reach, and just designing to the code minimum allowed you to do major savings. You can get there a lot of different ways. You just have to make sure that we are much more thoughtful about the lighting being a part of our integrated design, and not an afterthought.

Next slide, John?

So I had an opportunity that was a lot of fun. While I was at Cleveland Clinic, the *Advanced Energy Design Guide* had just come out, and we were building two large family health and ambulatory surgery centers. We had just come out with our energy standard for Cleveland Clinic, and so, our two designers and our two contractors for those two different awards both got the same standard. The two family health and ambulatory surgery centers both had very similar missions. They had very similar services. As you can see, their sizes were the same.

And the way those design teams approached reading the Cleveland Clinic Energy Standard is written out there, between insulation, lighting, HVAC. And what you're able to see is just using that Advanced Energy Design Guide as a basis. The one design team was able to achieve a 25 percent improvement over the 90.1, and the other was able to achieve a 16 percent improvement over the 90.1. And both did it within the program budget. It did not come as a cost penalty. It actually came as an on-budget initial cost, and a long-term maintenance and operations savings.

Next slide, please, John?

So, I am going to go ahead and turn it over to Michael, and we will be available for questions, at the end.

Michael Myer: Thanks, John. Moving on to the next slide.

I'm gonna present on a couple different things, as John J. mentioned. The problem with having two Johns on the phone, you have to distinguish which one you're referring to.

First, I was gonna discuss the LEEP campaign, which is about lighting, energy efficiency, and parking. And then, broaden it to some exterior lighting comments, in general. And then we move __ with interior lighting and some specifics related to daylighting, as well as electric lighting and some of the benefits of those, and some things to consider. And then, finally, moving on to the Department of Energy, the co-sponsor of the Interior Lighting Campaign, where we're really focusing on helping people achieve more savings in their interior lighting, as well.

Moving on to the next slide, please?

I happened to quote John, here – even though I know he was presenting, but I actually quote John often – about patient experience. He always told me – a long time ago, when we were working on projects, together, at the Cleveland Clinic – about how patient experience starts as they arrive. Not when they walk through the door. It's the parking lot. It's that whole experience.

And, ultimately, I always found interesting how that affects the scores. And you all know that much more about it than I do, but I always found it interesting about how just how comfortable they feel as they enter it, can affect their perception of how well they're gonna be serviced at that hospital or healthcare facility. And that might affect your Medicare scores. So it's always good to remember that.

The reason I start with that is that we found that, when people go do relighting in parking facilities, it's actually enhanced their experience. So, I'm gonna tie it back into this, into the Lighting Energy Efficiency and Parking Campaign. It's a national campaign that's supported by Department of Energy, BOMA, IFMA, and the International Parking Institute, as well as Green Parking Council. Encouraging people to consider either new construction, high efficiency lighting parking solutions, or to retrofit something that they currently have.

A great example of this is, again, with the Cleveland Clinic, that project I was talking about, that John and I worked on, earlier.

They had actually had a parking structure that was using a high-pressure sodium that was on a simple on/off setting, and they converted it to LEDs that were on occupancy sensors. At the time, there was some concern about what the perception would be, both on the security staff as well as the patients, of the occupancy sensors.

And they found even one time – while they were doing some field tests of the potential product they were evaluating – that one person parked up on the fifth level, where they were testing the lighting out. They drove through every empty level, and they got to the lighting where it was now being renovated, because they liked the appearance. They thought it was better placed. So they actually sought out the better lighting, to park, even though it required them to drive up multiple more rows. So I think that's just interesting about even how it affected them in a parking structure.

Multiple healthcare facilities have been recognized in Phase 1, and we're about to announce our Phase 2 winners, end of June. Again, I don't wanna divulge who they are or what their energy savings were. But a couple of healthcare bodies cross-country did a significant number of savings in the second phase, and they'll be highlighted, soon.

Moving to the next slide, you'll see what one site did. This is Thedacare, which is the name of the organization. It's their Appleton Medical Center. They had metal halide, and they converted it to a low-wattage LED, and they were able to recognize an 86 percent energy savings. This is a Google image of high level, of what their exterior facility looks like, not the specific parking structure itself.

The power density – for those who may not be familiar with the term – is watts per square foot. This is the amount of equipment and the power it draws, divided by the total area. 0.22 is about what many current parking structures are, depending on the energy code you're in. It could be as low as 0.19, but that's a pretty standard run-of-the-mill, not really working hard.

They worked very hard, and they got it down to 0.03 watts per square foot. This resulted in a $16,000.00 annual electricity savings, just at this facility alone. The other advantage – and this is something that we always like to remind people – is that, typically, when you go from metal halide to LED, you're going to pick up a longer-life light source in the process. So that deferred maintenance is saving you money, as well.

So, it's not just the electricity savings. We didn't have the actual maintenance savings available, to help calculate that out. But it's always something to remember, is that it's not just about the electricity. It's about sending staff out there to have to replace the lighting.

Next slide, please?

This is a parking lot in Vacavalley, California. Why I like the juxtaposition between this and the previous slide was that the first one was a parking structure, and this was a parking lot. And, again, here, we're seeing about a 58 percent energy savings. And that's significant, because in the parking lot, they can't use controls as well. Most parking lots can't use controls as well, compared to a parking structure. As well as, the operating cycle's a little different, so, therefore, it limits some of your savings potential.

But this site, through the use of, actually, very aggressive lighting controls, was able to see almost a 60 percent energy savings. You'll notice that, again, the power density, here, has gone from a 0.07 to a 0.06. And that's not a significant change, and the reason is that they really only just replaced a certain number of light fixtures. But in the process of changing those light fixtures, they added in a series of new lighting controls. And in the process, they used microwave controls, to detect motion.

So the idea, here, is that when the exterior lighting, when there's low occupancy in the parking lot, low light levels actually reduce the output. So, again, you're saving more energy. And so, that's why the energy savings number is significant, but it doesn't look so with the power density change. They're seeing about a $1,200.00 of electricity savings, as well. So it's significant that they're able to save that, as well.

Next slide, please?

The first keynote thing, here, is that parking facility lighting just should be replaced. Most people are using, still, outdated HID lighting. This is dying technology. Its shipments, every year, diminish. Manufacturers are not looking at ways to make it any better. They're looking at ways to walk away from it, if they can.

When you consider new lighting, you're going to probably get better uniformity. And better uniformity means that you can actually achieve better results, with less light. There was actually

just a research paper published, last week, that proved that, as well. So it's not just kind of a math mumbo jumbo. It's an actual methodology. So by making a space with less bright spots and dark spots, an overall uniform blanket of light, you don't need as many luminants. That actually allows you to save energy just right off the bat.

Also, with the better quality, patrons and security staff will like. Even __, that orange light that we all know, it's kind dingy, at Cleveland Clinic, we heard that they really liked the higher color rendering of the LEDs. They were able to tell out cars differently. Security was able to distinguish different people wearing different shirts. So the color, people like. It enhances the appearance of the space.

Even metal halide, while it is a broader spectrum source, it still has some color issues. So some of the newer lighting – LED, but even some non-LED sources – have much better color quality characteristics than metal halide. So you save energy that way. Then, the new lighting, also, just helps save money and energy.

The other thing that I would talk about with your exterior lighting, is that we know – and this is recently published by the IES – And I said IES, a couple times, but if you're unfamiliar with the organization, it's the Illuminating Engineering Society of North America. It's a trade group in the United States. They ultimately publish recommendations for lighting, both interior and exterior. As John mentioned, RP-29 coming out.

In their most recent document for exterior environment, they stated that, "The effects of light on humans, other animals, and plants, while much more research is required, the overall negative impact is not in doubt." Essentially, we know that we're having an effect on our environment, because we're lighting at night. And if you can reduce some of that negative effect, by reducing your light levels, then you're actually reducing some of the __ why some of the people might be in the hospital, from get-go. Also, you're not flashing light through their windows, by using better lighting.

Next slide, please?

So, the Department of Energy has a Better Building Alliance, which you are all familiar with. On their websites, which are listed at the very bottom, are the specifications. There is a high performance parking structure lighting specification. A high performance parking lot specification.

There's also a wall pack specification, here. If you may not be familiar with that term, a wall pack is a wall mounted fixture. It kind of tends to blast a lot of light, and sometimes that's an efficient way to do it. So it's a specification and application guide, which will provide information on how you better apply certain types of fixtures. When to light. When not to light.

Also, on this website for the Department of Energy's specifications, includes exterior control guidance. Controls are gaining a lot of momentum, and a lot of people are interested in them. But the real question is, when you're considering for exterior lighting, what type of protocols are you looking at? How do you use them with different light sources? So if your healthcare, you should see, is considering that, you might wanna look at the controls guidance.

Finally, the second to last URL at the bottom of the page, is for the LEEP Campaign mentioned a couple times. If you are interested in exterior lighting or parking facility lighting, the website provides information about resources where you might go find more information. Such as case studies, hospital incentives, a couple of different tools – like a financial calculator and some other lighting tools. As well as, we still are able to provide a limited amount of technical assistance.

So if you're interested in our __, if you have a question, if the vendor keeps coming to you and saying, "This is the greatest thing since sliced bread." We can provide some unbiased technical feedback on whether or not some of the claims are worth merit, or whether or not you should be asking other questions. But you have to go through the LEEP Campaign, so we can document that. That's the official way we can help provide some technical assistance.

Moving from exterior the lighting into the interior lighting, on the next slide.

I thought it would be fun – John mentioned circadian rhythms. We spent a fair amount of discussion on circadian rhythms, in grad school. And it was really worth talking about, because from a lighting perspective, really, in the last three to four years, it's, by far, really the one thing that everyone's talking about, more and more. Partially because the research out there is getting better and better, and we know directly what some of the effects lighting is playing on the circadian rhythm. But, also, it is now becoming a

manufacturer pitch point, is the best way to describe it.

So I thought I would just quickly talk about circadian rhythm, and then touch base on some of the research that we're seeing, related to that.

So, essentially, it's a 24-hour cycle that affects sleep and certain hormones. Light is the single largest zeitgeber. And zeitgeber is just, essentially, a nice, fun German word for "timekeeper." It's, essentially, what tells the body when you should be getting up and when you should roughly be going to bed. But it's a complex phenomenon, so that it matters when the light exposure occurs, and also the intensity of it as well as the spectrum.

So if you get up in the middle of the night and you turn on the light in the kitchen to do something, that is affecting it. Versus if you get up in the morning and turn on the light in the kitchen, that affects it differently. The spectrum matters a lot, that's why you often see red lights over blue lights. But, again, it matters what time of the person's cycle the light is being administered.

It's, as I mentioned, an area of significant current research, and the key thing I wanted to mention is that it's an area of potential sales and marketing. And that's where I'm a little nervous, that people are claiming that this spectrum might help people, or some of these benefits. And while there's some early research suggesting there's a relationship, I would be concerned of someone saying that this is going to affect it in a positive way. Because we don't entirely know when it's going to work.

There are light pictures, what we call "color tuning." These are, essentially, what we call "shades of white." An LED is, really, the best type of technology that can do this. The light fixture that can start out, such as at a low color temperature around, say, 2500 or 2700, which is your amberish color. And then, through a control system, you can dial it in and it'll move all the way up to, say, 6000 Kelvin, which is your blue. More, even, blue than some elements of daylight.

The idea is that, depending on when you want the person's circadian rhythm to be, you would essentially make it, say, the high blue content in the morning. And then, through the later day, you might change color tune during the course of the day, to some of the lower Kelvin, so, again, you're not affecting their circadian rhythm differently. There are potential benefits, and claims need to be verified.

And the other key detail, here, is that the solutions might be person-specific. So, again, very nervous to say that one protocol works for everybody, or the right time.

Next slide, please?

As I mentioned, there's a lot of research going on, and I thought this slide would just be a quick overview. Again, because I think in some cases, it might be leverage for your organization to upgrade your lighting, to your management, if you said, "Hey, we know there's some interactions, here. We can get energy savings, but, also, you might be able to see some ancillary health benefits." So if you give them the things that people are talking about, again, the health professionals need to weigh in on some of the exact applications of them.

So, the University of Toronto and Northwest, on that bright light associated with extreme, visceral – good and bad – emotions. Nara Medical School of Medicine, they found that nighttime light is correlated with depression and metabolic anomalies in the elderly. Schools in Europe, the London and Munich, found that blue light can activate Type 2 drugs in pancreatic cells. And then, Tulane is finding that exposure at night appears to negate the efficacy of cancer drugs in rats with certain types of breast cancer. And then Northwestern also has found that light exposure in the morning is linked to lower BMI.

So, I don't know if your healthcare organizations are instituting environmental protocols, along with their medicine. But if so, they might wanna start considering some of the lighting, and here is some of the early research. And, again, I said this might be a lever for energy efficient upgrades.

Next slide, please?

I thought it also worth discussing daylighting. John mentioned daylighting, briefly, in one of his slides. I like this slide, really quickly, because CBRE – which is a pretty large national commercial developer – this is a tweet, roughly a year ago, where they were talking about daylighting improving healthcare. The fact that major developers are focusing on daylighting is great. That means that no longer do hospitals have to be windowless rooms.

Even, in one of the examples, they talked about where a surgeon

actually requested daylight for the operating room. I've been in a handful of surgical suites in my life, and I've never been in one with a view window or access to daylight. So I think it's interesting that the surgeons are asking for it.

And then, also, I mentioned that healthcare research is, again, we're finding that there's relationship to daylighting, related to depression and reducing time in hospitals. So, again, that idea of daylight that is being brought in, let's actually look at some of the other tangible benefits to it, than just the energy savings.

Obviously, everyone always talks about pairing daylighting with lighting controls. So, now that you've brought the daylight in to either the patient room or to a common core or a hallway, if you don't put a daylight sensor in the light fixture, to reduce some of that lighting, you're kinda wasting all that energy savings that you're gaining through the daylighting. While there are ancillary benefits, it's really important to think about some of the energy savings, as well.

Next slide, please?

As I mentioned, some of the ancillary benefits – So this is an actual natural experiment. A hospital in Canada started discovering different durations for patients in rooms that, essentially, received more daylight, than rooms that didn't receive daylight, after myocardial infraction. And they found that, as a result, that female patients stayed 2.3 days in sunny rooms, versus 3.3 days in dull rooms. And, obviously, what they're calling a "dull" room is one that didn't get nearly as much light, because it wasn't facing the right orientation.

And that was interesting, as the research report said that women generally do less well after this type of procedure, than men do. So it was interesting that the effect was so pronounced, for women. There was no difference in male patients.

I put the table, here, so you can see what the measurements were. Those were in lux. So you can see that in the north-facing rooms, there were 20-30 foot-candles, roughly, or 200-400 lux. The south-facing, obviously, that's where you're gonna have more of your daylight. They were in the neighborhood of 120-130 foot-candles, in the summer. In the winter, because this is in Canada and inner reflections from snow, they were in the neighborhood of 250 foot-candles.

It's worth pointing out, here, that I don't think that more light was the case. I don't think that just by giving people more light, that is what the root cause was. Obviously, it's probably something to do with the natural component, and there's even some non-lighting benefits. There's associations of beauty outside, and those type of things. So I think it's worth pointing out that, as another lighting professional has said, after I've showed you some research, I also want to highlight the two cautions.

One is, as an industry, lighting people have to stop making vague claims about the effects of lighting on productivity and health, and we need to look at the plausible mechanism. So while I think that the daylighting played a role, here, again, I would not say it was the more amount of light. It's probably a couple different things, here. More light, possibly in the spectrum, and then, also, non-lighting aspects of it.

We also have to accept, as an industry, that many activities, lighting conditions are just one amongst the many factors ____ the outcome. And I tried to, hopefully, make that enough of a caveat.

Next slide, please?

So that brings us back into interior lighting. Troffers – this is a picture of an interior office with troffers. You're all probably sitting under a troffer, right now, if I had to guess. There's roughly one troffer per person, in the United States. They are the most common light fixtures in hospitals and healthcare facilities. They represent 50 percent of all florescent fixtures.

The reason why I highlight those details is that there's tremendous energy savings potentials with troffers, right now. I tried to talk about some of the benefits of new lighting, through the circadian and daylighting. But now I'm gonna focus, really, just on troffers and the energy savings potential.

Next slide, please?

So, in terms of efficacy, we talked about that's similar to cars, in miles per gallon. Efficacy for lighting is light output per watt. So, the current troffer fixture output efficacy is about 66 lumens per watt. And the reason why I chose a graphic, here, of a Honda Civic, 'cause we're not trying to say that fluorescent lighting is bad. It's actually pretty good; it's like a Honda Civic.

But the new fixtures are anywhere between 85 and 120 lumens per

watt. And I use the Prius, there, as a comparison, one, because it's more efficient, and, two, because the Prius also has other benefits besides energy efficiency – operating quiet mode, and those type of things. And that's, again, why we're seeing huge energy savings with renewed lighting. There's also other things that you can put in these fixtures – new types of sensors, more use of controls, whether or not you wanna put a CO2 sensor, in there.

I know that John, in some of his hospitals, he likes LED troffers, because, as he says, they're essentially sealed to the grid. And I know that's an inspection control mechanism. He and I have looked separately, trying to see if there's a way to monetize inspection control of the lighting. I have yet to find one, but I know that's something that he likes, and he can speak to the benefit, there.

But I would like to try to highlight that there are benefits besides energy efficiency. There just happen to be abundant energy efficiency potential, with these fixtures.

Next slide, please?

And that brings us into the Department of Energy's Interior Lighting Campaign. So this is, again, where Department of Energy is partnering with BOMA, the IES, and IFMA, to encourage either new construction, or the retrofitting of troffers. Retrofit could be with tubes, kits or entirely replacing the whole fixture, altogether.

The Interior Lighting Campaign's current goal is 100,000 troffers by May 2016. This would be the equivalent of 10,000,000 square feet of lighted area, or about 5,000,000 kilowatt hour savings. It's also about half a million dollars in electricity savings, if this goal is met.

Next slide, please?

The benefit of the Interior Lighting Campaign is that we have a lot of information on our website. These are just some quick snippets. Again, we have a troffer specification. So if you need an RFP, you can download the specification, and essentially it could be the draft basis for your RFP, providing performance requirements and color quality and its warranty requirements. To help you weed out some of the stuff that's less reputable, versus the good stuff.

New technology is dynamic, it's changing. We also provide

reports and factsheets. So if you have questions about either how do LED tubes fare in troffers, we've referenced some reports published by Department of Energy, that provides a lot of information on how some of those tubes perform. We also have developed a list of incentives, that we've culled from across the country.

We also can provide some limited technical assistance. Again, if you have questions about what you're doing, if you join, we can help provide information.

Next slide, please?

So, benefits and features of participants. I tried to touch base on a lot of'em in the previous slide. Really, we can help identify sites and campaigns. We do wanna recognize people for their good efforts. So if you have an exemplary site, you can join. And you can also possibly be awarded an award for exemplary energy savings, for troffers. So if you have an organization that is very award- or recognition-focused, that might be something you might wanna do. I mentioned all the campaign websites in the last slide, and the recognition awards, already.

Next slide, please?

This is the final slide for the lighting campaign. As I mentioned, the campaign just started at the end of May. We're having a webinar, where we'll go through a lot more on troffers, and we'll have, actually, a lot more specific slides on the difference between retrofit kits, the tubes. Many people are being inundated with manufacturers preaching the value of LED tubes, as a quick way to get energy savings for minimal cost.

We're gonna talk through some of the technical issues, there. Also, provide some limited flow questions of when you should consider one or the other, things you should ask, that type of stuff. As well, we'll hear from other sites that are currently in the process of renovating or installing new troffers. Then they can provide some specifics on some of the things that they're finding or challenges that they're running into.

Our current Phase 1 of the Interior Lighting Campaign runs through May of 2016. And there's our URL. If you have questions or if you're interested in joining, you can click on that and that'll take you to the right place with the right information.

Next slide, please?

And at this point, I turn it back to John J. for Q&A.

John Jameson: Yeah, thanks very much, both John and Michael, for those presentations. At this point, we would like to open up for Q&A, so if you've been holding on to questions, now is the time. Since we have not too large of a crowd – about 20 of us on – I would like to open up the lines. So, if you have a question, go ahead, and you can either raise your hand – through the webinar interface, there should be a little button, there, giving you that option – and I can unmute you. Or you can type it into the question panel, as well, and I can read it out loud to either John or Michael.

I am going through here, and I'm reading people, as well. So feel free to jump in with a question, if you have one.

Okay, well, I can jump in and start things off, at least. John, I know you mentioned HCAP scores, and I was wondering if you can give any specific examples of a lighting upgrade directly affecting any HCAP scores? I believe when we spoke earlier, you mentioned a lighting project in the basement of New York-Presbyterian. I don't know if that's one you wanna refer to, or if you had another one in mind.

John, are you there? Okay. We might have some trouble with John's audio, right now.

Michael, can you hear me? Okay, I think we're having some audio problems, here.

Holly, Kristen, I saw you had some questions and unmuted you. Can you hear me and speak, now?

Audience: Hello, John. This is Holly. Can you hear me?

John Jameson: I can hear you, Holly, yes, but nobody else.

Audience: I just have put in a clarification question about the Interior Lighting Campaign. If folks are doing lighting upgrades on their properties, and they're just doing a couple of different places – maybe even just a couple of floors at different hospitals – can they still join the campaign, without doing their whole portfolio?

John Jameson: Okay, Michael is saying, "Yes." I received a text response from him. We can't hear you via audio, Michael. He says, "Yes, it's

scalable."

Michael and John, we're gonna try and get your audio back up and running, again. It may be best if you tried dialing back in? See if that works?

Kristin, did you have a question, too? Are you able to speak, right now?

Okay, Daniel Rogers, I have a question from you, as well. Would you like to speak up and offer that?

Audience: Sure. The question was just whether PDF copies of the slides would be provided to participants who attended.

John Jameson: Yes, we will be posting these online, afterwards, along with a recording of the webinar, and also a transcript. So an e-mail will go out when those are available.

Audience: I appreciate it. Thanks, John.

John Jameson: Sure. Carter, it looks like you had a question on here, too. __ if you'd like to go ahead.

John, Michael, yeah, are you back on?

Michael Myer: Yes, __ Myer. I dialed in directly from my cell phone. I'm connected, so – Holly had a great question.

So, yeah, the Interior Lighting Campaign is meant to be scalable. If you have a series of one or two – we really would need two, at a minimum – to as many as many hundreds. We have many different methods for participation. If you want just basic, just even on the awards, then, but before you get to the awards side, yeah, as many troffers as you are currently doing.

We do understand especially some healthcare organizations might be mammoth and obviously can't undertake a whole portfolio-wide upgrade. But, yes, so, it is *[audio cuts out]* extremely scalable.

John Jameson: Great. Other questions, here? Feel free to keep them coming, folks.

Got one from Sydney Geister. So, Sydney, I can unmute you, if you'd like to go ahead and ask.

Audience: Hi, can you hear me?

John Jameson: Yes, I can hear you.

Audience: Great. Related to the Interior Lighting Campaign work that John D'Angelo discussed, were the changes communicated to clinicians before the project started, to obtain buy-in? And what kind of communications were used, if so?

John Jameson: Great question. John, are we able to hear you? I haven't heard your voice, in a little bit. Okay, I think we might have him, right now. John, are you there?

John D'Angelo: I'm here. Do you have me?

John Jameson: Great. Yes, I can hear you.

John D'Angelo: *[Crosstalk]* _____.

John Jameson: *[Crosstalk]* _____ hear Sydney's question?

John D'Angelo: No, I've been trying to get back in, for the last *[laughs]* ten minutes, or so.

John Jameson: Okay. Would you like to repeat that one, Sydney?

Audience: Sure. My question was related to the Interior Lighting Campaign. Were the changes discussed with clinicians prior to the work starting, to obtain buy-in? And what type of communications were used, if so?

John D'Angelo: Okay, so I'll take this one, Michael.

Greater than just for an individual campaign, but whenever I'm doing changes anywhere, then I always try and engage the staff and make them a part of the change. I just really strongly believe in engagement and transparency.

So I actually worked with the primary users of the space, whether it was an administrative space, a nursing *[audio cuts out]* space, or a physician space. In fact, it led me into further and further and further conversations on different things. 'Cause you can always find somebody who's excited about an opportunity to have their ideas put forward.

In my case, I ended up forming a partnership with three surgeons –

a cardiothoracic, a pediatric, and an orthopedic surgeon. We did all kinds of really fun things with lights in the operating rooms, so it became surgeon-led, as opposed to facility directors-led. So I do highly recommend engaging your end users.

John Jameson: Okay. We do have one question, here, from Mike Carter, that I can read out loud. He sent it via chat.

He asked, "What advantage does LED edge-lit or light __ products offer, either in energy or light quality terms?" Maybe you'd like to take that, Michael?

Michael Myer: All right, so, the advantage of – Well, LED, we can start there. Just, side-light, edge-light, or, depending on how the troffer itself is lighted, the idea of LEDs have gained in efficiency. So, as I mentioned earlier, fluorescent, we've pretty much reached its maximum efficiency. And, for the most part, depending on what you're doing, your fluorescent is gonna be about 60-70 lumens per watt.

LED, we're seeing, for the most part, 80 to 110, 120, lumens per watt. So, right there, you're probably just converting from fluorescent to LED, you're gonna pick up a 20-30 percent efficiency, just right there.

The difference between the __ methodologies and how the LED produces light, being edge-lit. For those who may not be familiar with that term, exit signs are the best way to think of it. This is where you have a very thin surface area, and they're putting a series of LEDs right along the edge, and _____ directly there.

One of the primary benefits, in my opinion, of an edge-lit fixture is form factor. It allows you to really – If __ and depth is really a restriction, edge-lit would actually allow you to save that, versus being top-mounted inside the fixture and lighting down. There are some optical differences, but it gets into some kind of – I don't want to say, semantics is not the right word, but some – preferences. You can get some slightly different optical patterns done, through the different way you design an LED fixture.

I would say that appearance and form factor would be the primary benefits of an edge-lit LED fixture. Again, form factor, it would be thin in appearance. Again, you could use things like, depending on the way you're doing it, you could make it be a see-through fixture. You can do all kinds of stuff with it. Through edge-lighting it, it could just have a different look to it.

So I'd say that the primary benefits are appearance and form factor. There are some limitations and some things that you would run into, when you choose that option.

John D'Angelo: Michael, could I add a couple things? This is John.

So, I tend not to be a big fan of the appearance of most edge-lit. They tend to be very industrial-looking. But I like to use them in immunocompromised areas, because they are really a true flat plate, and you can seal them to your grid. There is absolutely no air that will pass through those units, for the majority of the manufacturer's edge-lit products.

LEDs, in general, are a little bit better at keeping the stuff that's up in your interstitial up in your interstitial, and not allowing it to come down into your spaces, than are fluorescent. But the edge-list are, literally, just a flat panel, where they fit into the grid.

John Jameson: You have another text question, here. This one's from Yasiin, asking if – John, maybe this one's for you.

Do you normally model the effects of LED retrofits to HVAC loads? For example, reduced load on cooling, increased load on heating?

John D'Angelo: I do not. I've never found it to be significant, in a healthcare setting. The real big difference – and it's a great question, by the way – is on how they get rid of waste heat. Essentially, all light sources are equally inefficient. An LED is still, about 90 percent of its energy goes into waste heat. It's just that it's a much smaller amount of energy, so it's a much smaller amount of waste.

You can't run an Easy Bake oven off of an LED, the same way you can off of an incandescent. If you have downlights, or something, in a low ceiling space, and you have patient care areas that are under those downlights, because of the way that the incandescent gets rid of its waste heat – or a fluorescent, for that matter, gets rid of its waste heat – you can make those spaces in the path of that light fairly uncomfortable. But it doesn't really increase your overall building HVAC load.

Same thing with an LED. It tends to get rid of its waste heat through conduction, through the heat sink, and then convection from the heat sink into the surrounding areas. But it's not a

measurable impact, to even a small MOB, let alone a large hospital's HVAC load.

John Jameson: We have about four minutes left, and I thought I might wanna return to the question I had for you earlier, John, about an example of lighting directly affecting HCAP scores or *[audio cuts out]* patient experiences. Do you have a particularly great story you wanted to share? Or –

John D'Angelo: I actually did. I had shared two great stories, up until I realized that I was on perpetual mute and nobody else could hear me.

[Laughter]

So, one, I talked a little bit about. Even without going to LED, if you have dimmer circuits on your nursing units, you can affect a higher rest score, or a higher quiet-at-night score, if you're using Press Ganey to help model your HCAHPS, by just raising consciousness through dimming of the lights. The benefit of the LEDs, especially the generations of LEDs that are on the market now, they pretty much come off the shelf as dimmable.

It's a little bit more difficult to go back and retrofit an existing non-dimmable fluorescent fixture, and make it dimmable. Not impossible, but at the point where you're going to do that, you really wanna look at maybe just upgrading to an out-of-the-box, off-the-shelf dimmable LED *[audio cuts out]* __ fixture. So that's one area, is the quiet-at-night.

The other area is the cleanliness area. I think we all know that no matter how often you clean, if it looks old or it looks weary or it looks bleak, it doesn't look clean. One of the examples I had, at New York-Presbyterian, we had some major patient corridors that we came back in, we did some very minor upgrades – new drop ceiling, new lighting, painting on the walls, and some little repairs.

And the night-and-day difference between what was and what is, now, resulted in not just patient experience improvements, but employee engagement and employee experience. It was not a depressing adventure, to walk through the halls, anymore. It was uplifting. And that's what, I think, we're all trying to achieve, in healthcare.

John Jameson: Okay. Looks like one minute, and maybe we can squeeze in one more question. This one's, again, from Mike Carter.

The question is, "The 2010 version of the 'Guidelines for Design and Construction of Hospitals and Outpatient Facilities,' that requires medication safety zones and pharmacy areas to meet stringent lighting requirements, to avoid medication errors. The question is, are codes like ASHRAE 90.1 accommodating this?" Let me know if you need me to repeat that.

John D'Angelo: Yeah, that's an easy question, and, yeah, they are accommodating that. For healthcare, 90.1 has several exclusions, because they understand that the services delivered in healthcare are not the same as are delivered in a typical commercial building. So you have some opportunity for exam lights, et cetera, et cetera. And the 90.1 is also applied, typically, over a much larger space than just a medication prep area.

And beyond *[audio cuts out]* the 90.1, those recommendations, as Michael had mentioned, are also contained in the RP-29. And the RP-29 is referenced by FGI, as the code that they recommend that you look at.

John D'Angelo: Okay, great. Well, I think that will wrap up the session. We're at 2:00 Eastern. So thank you, everyone, for joining. And as I mentioned before, the slides, recording, and transcript, will be posted on our website in the coming weeks. So an e-mail will be sent when those are posted online. And here are everyone's contact information, if you'd like to reach out with another question or request for more information.

So, thank you, again, and have a great afternoon.

[End of Audio]