Recorded Voice: The broadcast is now starting. All attendees are in "Listen Only" mode.

Michael Deru: Welcome everyone. This is Michael Deru with The National Renewable Energy Laboratory and this is Better Building, DOE, Better Buildings Alliance peer exchange for Ventilation Setbacks for Healthcare Facilities.

We have three great panelists today lined up and we will be starting here shortly. So all attendees are in "Listen Only" mode, but if you do have questions please type them into the Chat box and we will be getting to those at the end of the presentation.

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So I wanted to here's the Agenda today. We're going to have a short welcome and introduction of the speakers. Then we'll have these three speakers in these areas talking about ventilation requirements and ASHRAE Standards. Then we'll have two panelists speaking about what they've done at their healthcare facilities. How to get buy-in for air exchange setbacks in operating rooms from Cleveland Clinic and the New York Presbyterian Hospital talk about their experience in how they've implemented their HVAC setbacks and what their plans are for the future.

Then we'll wrap it up with Q&A session at the end.

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So our three speakers today: Jeff Boldt from KJWW Engineering. He's the Director of Engineering there. He's very active within the ASHRAE Standards committee with 90.1, 189.1 and a consultant to ASHRAE 62.1 and also contributing author for the Advanced Energy Design Guides for Large Hospital and Small Healthcare Facilities.

Then we have Paul Slebodnik from Cleveland Clinic. He's the Director of Facilities Management there and he's going to be talking about their efforts at Cleveland Clinic.

Then finally we have Robert Nunez from New York Presbyterian Hospital and he's the Director of Facilities Operations there.

So again if you do have questions for the speakers as you're listening to them please type them into the Chat box and we will get to those at the end of this discussion here.

So I'm going to pass it over to Jeff and let him take it from here.

Jeff Boldt: Okay. The next slide. Okay, next slide also. So just like the codes that we tend to see for a lot of healthcare facilities we see a fair amount of FGI-2010, setting the ventilation requirements. Probably we'll start to see in 2014 being adopted by jurisdiction soon. I haven't seen it yet in any facility I'm working at.

Also, ASHRAE 170 is brought along by FGI. Then we see a lot of 170-2008 and soon we'll probably see 2013, which is referenced in the 2014 FGI Guidelines.

You know also for the non-healthcare areas most of the country is governed by ASHRAE 62.1 through adoption of the International Mechanical Code. We see a lot of that. Obviously if you're in California both of those will probably be different. You know and individual states often in healthcare have their own regulations. For example I do a lot of work in the Midwest. I live in Wisconsin so I would adopt FGI-2010, including the ventilation stuff. Wisconsin adopts only the ventilation stuff of FGI-2010. Illinois has their own Illinois Department of Public Health and probably some people on the line are from California where they have different regulations because of OSHPD.

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So I'm going to do a couple of examples out of ASHRAE 170. For example in a patient room the requirement in 170-2008 is for 6 air changes total and 2 air changes of outside air. One thing I want to clarify about that in Standard 170, which is different than a Standard like 62.1 is that in Standard 170 you can add-up the outside air requirements for each room, total them, and if you bring that much in at the air handler you're good.

So just because a patient room requirements 6 total air changes and 2 air changes of outside air, this does not mean your air handler has to be at least 33 percent outside air. I sometimes call that the "California rule," because the rest of us have to deal with 62.1 and the multiple spaces equations, where as the lucky dogs in California can just add-up the outside air and bring it in at the air handler.

One other item in Standard 170 is that in 2013 for patient rooms it reduces the total air changes to 4, which can be of a significant energy savings. So maybe you can talk to your local code

authority into letting you step-up to the newest code you might be able to save some energy.

Also, I think the wording could be a little more clear, but my reading of the reading in Standard 170 is that the unoccupied patient room has no requirements for air changes. The actual wording says that pressurized spaces can be setback to the minimum required to maintain the required pressure relationship. It doesn't quite mention spaces that don't have a pressure relationship, but I think it's pretty well implied that it means there isn't a requirement.

I'm not a guy who designs in California at this point, but my quick reading of the OSHPD requirements is they would allow reduction to 25 percent of flow when a patient room is unoccupied.

Next slide.

So for an operating room the requirement is for 20 total air changes when occupied. In unoccupied the only requirement is to maintain the pressure relationship, which depending on how airtight your operating room is may take a couple hundred cfm, could take as much as a thousand based on some anecdotal things we've heard from people who have down blower door testing in operating rooms.

It can have a huge impact on energy use especially I put up a graphic here of Advanced Energy Design Guide for Small Hospitals and Healthcare Facilities. In that guide when we added the recommendation that OR's setback and I think we picked 4 air changes as being enough to maintain the pressure in that case, it took us from being a 30 percent savings guide to making over 40 percent savings in every climate zone except Alaska. So it has a huge impact on the energy use of those spaces.

My quick reading of the OSHPD regulations is that they would let you go down to 6 air changes.

Now you do want to be safe. I mean the biggest reluctance we see to people doing this is that they're afraid somebody will forget to put it into occupied mode. We've seen things like you've got a switch that overrides it to occupied. You've got a time of day schedule that also overrides it to occupied. If a procedure light it goes to occupied. If the general lights are on it goes to occupied. So that if any of those kick-in that you're in the occupied mode.

Next slide please.

So another thing at least during design that you have some control over is ceiling heights. Now everybody loves a tall ceiling and nice daylight and views and so forth, but our ventilation requirements are usually in most codes based on air changes. So just for a code minimum 150 square foot patient room with an eight-foot ceiling I do an example say and that requires 120 cfm flow, whereas with a nine-and-a-half-foot ceiling it's 143 cfm. You know often that air is being cooled to dehumidify it, plus it's being reheated to avoid overcooling the room depending on what time of year it is, so it can affect your energy use.

You know also in a new facility if you choose to do displacement ventilation Standard 170 only counts the 6 feet of the height into the volume, which could lower you in this case to 90 cfm. Do note however that that stayed at 6 air changes and six-foot in height in the 2013 version. So actually with an eight-foot ceiling and 4 air changes if you're on the newest version of the code you'd actually get a little below that down to 80 cfm.

I've never quite understood why these are done on an air change basis. To me having a taller ceiling doesn't add contamination to the room. I'd prefer some of these things be done a square foot basis, but I don't write all the codes.

So next slide please.

So one thing I wanted to point out is that sometimes it's not just you may reduce the flow, it's that you must reduce the flow. If you're in an area where IECC 2012 or newer or ASHRAE 90.1 2010 or newer is your energy code it is actually required that you do that, because if you're reading the air which is normally the case in healthcare there are really only 4 exceptions left that allow you to reheat air. The only one that applies to most healthcare spaces is Exception #4, which is: "The airflow rate required to comply with applicable codes or accreditations standards, such as pressure relationships or minimum air change."

Now I'll do a couple of examples of that. Next slide please.

So here's an example in a patient room. So I've chosen a nine-foot ceiling and a code minimum 156-square-foot room in this case. So I have 135 cfm minimum flow that I have to maintain. Let's say my cooling load on the peak day is 250 cfm. So what that really says is I can only reheat 135 cfm by ASHRAE 90.1 or IECC 2012.

So that means I am VAV system. I mean that change to the reheat requirements basically made constant volume hospital not in compliance with code in areas that use those energy codes.

But next slide please.

I do another example with an operating room. But say you have a 400-square-foot OR with a 10-foot ceiling, 20 air change requirement under ASHRAE 170 or FGI. You've got about 1300 cfm when you're occupied.

Unoccupied the only requirement is to maintain 0.01 inches and in my example I picked 400 cfm is what is required to satisfy the pressure controller. You know you're may be higher or lower.

But again 90.1 and the IECC only permit reheating that 400 cfm when the space is unoccupied. So from a code standpoint it's actually required in those energy codes. Again, it makes it a VAV system.

Next slide please.

Another option at least if you're doing a new building is dedicated outside air. The biggest savings there is avoiding reheat. You know I included the pie graph there for a typical VAV reheat hospital. It's even worse if it's constant volume facility where reheat is typically the biggest piece of the pie.

The picture I've got in the lower left is the Great River Medical Center in Burlington, Iowa. One of the things with a DOAS that's actually a geothermal heat pump with DOAS, but one of the biggest savings is that a lot of times you know in Iowa it's kind of cold and you've got a little heat being generated by the lights and the patient and maybe a piece or two of equipment and a TV and you've got cold coming from the outside window and the wall and you're kind of in temperature balance. So the only thing that's happening is you're ventilating and the fan is running in your heat pump but the compressor isn't necessarily funning very often.

I believe that facility is Energy Star 100 and the last I heard was somewhere below 100 kBtu per square foot per year. I would say the bulk of those savings are because of the DOAS plus heat pumps.

When we did the Advanced Energy Design Guide for large hospitals we included a system similar to that except without the

pond, because you know for those of you that live in urban areas it's kind of expensive to buy all your neighbors buildings and to knock them down and build a pond, but you still got most of the savings from that type of system.

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So also for your on-healthcare spaces demand controlled ventilation can save quite a bit of energy. It's becoming required for a lot of these spaces more and more in the newer energy codes, your conference rooms, your dining rooms, your lecture halls normally this is not your spaces that are regulated by Standard 170 or the FGI.

In multiple-zone system the math can get kind of complex, except I think if you're in California there's a rule about what parts per million you should set it at or if you're a single-zone system the math also gets pretty simple, but it can be a big energy saving feature.

Next slide please.

So I'm just going to finish up with an item about surgical procedure lights. At first you may think, "Well what's this got to do with ventilation reset?" Well what we have found is that the traditional surgery lights are basically an incandescent style of fixture or halogen which is somewhat more expensive efficient, but it's still puts out the bulk of its energy as a beam of infrared heat, which is heating up the people in the operating theater. And because of that they want to turn the thermostats down and you have to maintain 60 percent maximum relative humidity.

So if your surgeons are asking you to keep you know 60 degrees instead of 65 degrees or you know 63 instead of 68 that's a big energy issue and much more of an HVAC energy than a lighting energy.

Next slide please.

Here I just did a quick calculation of an operating room with two surgical lights being retrofitted to LED instead of quartz halogen. We're showing in the end a savings of about 370 watts by changing to LEDs, but if the people using the operating room set the thermostat up we've got 6000 watts of HVAC savings from over-cooling, having over-cool that air going into the space. So it can be a big deal and especially for the facility that's having

trouble you know like the surgeons keep asking for it colder and you start missing that 60 percent it can be a big deal for you.

Next slide. I think that finishes me up actually.

Paul Slebodnik: Hello, this is Paul. Next slide.

Basically I wanted to talk about the process that we did to obtain buy-in to get OR exchange setbacks at our hospital.

Next slide.

So what's the big deal in getting approval? The first part as Jeff alluded to is from the surgical perspective is safety and that would be impact on infection rates; hopefully not a negative impact. Also again as he mentioned the surgical team wants to be comfortable and so we need to keep that into account.

From the administration and facility side, at least on our end, we've been tasked with cutting our utility consumption by $12 million in a run rate, not cumulative. This OR setback is one of the largest single opportunities that we have.

Also it provides us an opportunity to standardize the OR look and feel. We have 215 OR's in our enterprise.

Next slide please.

So the first thing that we felt we had to do was figure out how we were going to control it so that we could present that to everyone with confidence that the system will always be in the right mode when we needed it.

So with that as Jeff also talked about there are many different ways to activate it to go back to the occupied mode, whether it be a light switch on the pattern lights. We considered RFID tags on the patients so that when you rolled them in it would sense that and kick-up to 20. Occupancy sensors, you know so make sure that you have a redundant group of sensors that if anybody even twitched in the OR it would pick that up and make sure that it maintains the 20 air changes.

Also a fixed schedule which will work just fine in an ambulatory surgery center when all the cases basically start at 7:00 AM and the majority of them end at 3:30 or 4:30, you can just make that you

put a buffer on the end of that and you'll be covered or looking at a flexible daily schedule.

So in our particular case when we looked at all of these one of the regional hospitals actually did use the pattern lights to turn it to 20 air changes per hour, but that was until we were walking down a surgical corridor one day, noticed movement in a dark room and found out that some of the eye cases were being done with the pattern lights off, so we had to change that.

The RFID option doesn't address one of the things that infection prevention wanted us to address and that was they said that they wanted it back to 20 air changes per hour as soon as the surgical team opened-up the first surgical pack.

Then on the occupancy sensors as we did our investigation we found that there are very few periods of times in the middle of the night that somebody's not in our OR's. We found that the terminal cleaning takes place in the middle of the night, that stocking by the anesthesia group takes place in the middle of the night. Then there's another stocking group that comes in and does the surgical supplies or the general supplies. So we saw it most a three-hour period where there was nobody there.

So what we're planning on doing is utilizing our surgical schedule and we'll look for the first case to take place and we'll set it back to the 20 air changes per hour 30 minutes before that first case hits the room. Then we all know that the surgical schedule never really follows exactly the way it was planned and so that there could be add-ons or cases taking longer than required or scheduled and so we're looking at the schedule and saying, "After that last scheduled case takes place we're going to look for an indication that the surgical light is shutoff to actually start it into the setback mode and we'll add 45 minutes onto that to purge the room."

Then you have the emergency situation where we had a concern well maybe emergent cases don't get put onto the schedule and even though we've been assured that they all do we felt that there should be an override and a user interface in those OR's, so we make sure that we did that.

Then lastly if they're still concerned about those emergent cases you may have to set aside one of the rooms that they use for emergent cases and not put that on setback. Although that's not optimal at least it gets you where you need to be and maybe you

can prove to them over time that the other system does work and convert that one as well.

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So our next step was to obtain buy-in from infection prevention. So in meeting with those folks we shared that the existing conditions that we found weren't optimal as they are. While looking at the rooms after hours we're finding that the pressure isn't always maintained and when you investigate that further you find that doors are propped open during those stocking periods.

The other thing is the current in-room information isn't a hundred percent accurate. You know basically we were using $50.00 peel-and-stick temperature and humidity sensors in the room that didn't jive with our building automation system. Also currently we don't have all rooms with continuous air exchange rate monitors in them. We would rely on the annual balancers report to tell us that we were within compliance.

One of the things that we found out was our design team felt that if 20 air changes were good, then 25 is probably better. And then being facilities and cautious you know they'll set it for 30 and as you get that balance report you'll find rooms as high as 35. So we did some calculations and found out that if we set it back to the ASHRAE Standard we would save about$ 250,000.00 just on the main campus.

The other thing that we wanted to present was this is not a new concept. We found out that in Washington State as early as 1986 they were suggesting this as a standard practice. And that ASHE already recognized it as the best of best practice and that other major healthcare systems are already doing it.

Then lastly reiterate to that team that the relative pressure relationships are always maintained during setback, as well as temperature and humidity.

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So getting the buy-in from infection prevention and taking that buy-in or that recommendation to the surgical executive committee was our first step. But the other thing is we wanted to present it in the light that this is not just an energy saving measure, but it's going to improve the quality over what's already there and it will improve the quality by providing improved oversight, that they'll

have continuous monitoring with alarms for all four of those critical variable, and that they'll have that in the OR so that they will be able to see what those four variables are all times and that they would actually be consistent with that building automation system.

We have a webpage setup that the surgical control desk will also be able to view all of their OR's and the four variables for all the OR's.

Lastly one of the big deals is that it would not require human intervention. They don't want to have to have to go throw a switch on the wall to put it into 20 air changes per hours and they don't want to have to remember to turn it off when they're done.

Lastly we talked about the visible indication that if it's not a 20 air changes per hour you'll see something red on that user interface to let you know.

The other thing if the system were for some reason to fail and start to setback into the 6 air change per hour that it would give an audible alarm before it did that. And also if that last case for some reason was going on longer they can always hit that button and again that's a last ditch try not to have human interface required, but do that so override the system.

Then lastly we presented to provide a prototype for them to see, to play with, and ask questions about.

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So the present status is that setbacks have already been utilized in some of the regional hospitals and they have been that way for awhile. So we're just trying to get everybody doing the same thing and that they would get upgraded with those in-room indicators. That infection prevention did in fact provide endorsement to the surgical exec community and that the surgical executive committee has agreed to move forward with us having prototypes installed in two OR's, but only being used to show the condition status at the present time; that our sequences have been written for the controls; and that we already have two OR's that are being recapitalized and that we're putting the equipment in place.

Lastly the final approval of the funding to do all this work is being presented at our financial committee today and with that approval

we're going back to the surgical exec committee and asking for us to be able to turn the system on.

That concludes my section.

Roberto Nunez: Good afternoon everybody. My name is Robert Nunez. I'm the Site Director at New York Presbyterian Hospital. I represent the on-hospital campus at New York Presbyterian.

If you go to the next two slides. One more.

So I'm going to be primarily focusing on controls since I'm originally from the digital controls industry, which will be the main focus and I'll be focusing on how we're utilizing the ventilation setback option at New York Presbyterian.

It's one of the major contributing factors that has helped us achieve our energy savings and associated accolades from our partners in the industry.

The Allen Hospital which I currently work is responsible for approximately up 300,000 square feet of acute care community hospital with approximately 200 licensed beds. We're just one of eight healthcare facilities within New York Presbyterian Healthcare System.

As you can see with this slide the New York Presbyterian consists of eight campuses and it continues to grow and we're multiple ambulatory care all sizes, all locations throughout the hospital. The enterprise is comprised of approximately 12 million square feet. So to put this in perspective we are responsible for more than four times the square footage occupied by the Empire State Building. With 2,700 beds, over 21,000 employees, and we're a nonprofit organization.

We are also the largest energy consumer in New York City with a demand of approximately 40 megawatts. Our utility bill exceeds $50 million annually. So as you can see this present optimal opportunities for energy savings. New York Presbyterian is participating in many programs to help us achieve that.

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As you can see we're participating in many programs to help us so facilitate that. New York Presbyterian is involved with the

Department of Energy, Energy Star, Healthier Hospital Initiative, and more.

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Because of these participations we have been able to achieve many awards of recognitions: ASHE Energy to Care; Energy Star Partner of the Year for sustained excellence and energy management; Practice GreenHealth Environmental Excellence awards for energy conservation and many more.

As most professionals in the industry know energy costs consume over 30 percent of the healthcare facilities operational budgets. Ventilation requirements for critical care as such are a large driver in these energy costs as previously mentioned.

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So at New York Presbyterian we utilize the building management system to monitor and control and ventilation as most people utilize to take care of their buildings. The one thing that we have at a disadvantage compared to other places is that the ASHRAE Standard was attempting to increase the air exchange requirement in operating rooms to 20. Unfortunately for us New York Department of Building requires operating rooms to operate at 25 air exchanges if a hundred percent outdoor air unit is not utilized and because of our change in seasons you know hundred percent outdoor air is not recommended if you're looking for energy savings.

So today's presentation I'm going to focus on the Allen Hospital and the building management features and because we received an Energy Star Certified Building Award in 2014, also previously in 2005 and 2006, because of these night setbacks and other energy savings functions.

We currently use a Siemens Energy Building Management System, but there are many building management systems can help utilize these features, help you monitor programs and tighten the controls on all air handling units and variable air volume boxes serving critical and noncritical areas. This is significant for energy savings capabilities.

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So utilizing Building Management System we work at the mandatory office without city requirements which would use excessive energy and wear out components. It also prevents drifts below the required range to keep our operating rooms compliant and safe. We have remote digital monitors on all the critical environmental points in the OR's at the Allen Hospital.

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As you can see these are some of the points that we monitor to help us make sure we're maintaining a safe environment while taking advantage of energy saving opportunities. Utilizing all these inputs we have ranges, alarms, and inputs so that all critical care components are taken care of. Whenever a critical point is in alarm it notifies the engineers to respond accordingly so that we make sure we're maintaining a compliant, safe environment.

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So taking advantage of night setback and occupancy. So during normal operations there are very minimal opportunities for energy savings. You maintain within the operating ranges, but you have to maintain your set-points for compliance. The opportunities come during the off-shifts when the operating rooms are not in use as previously mentioned.

The Allen Hospital utilizes a night setback feature where we adjust the temperature set-points which is setback for energy savings. The adjustment in set-points in turn reduces the output needed from the mechanical cooling and heating at cfm. Humidity and pressure set-points in the operating rooms are verified that the rooms remain complaint to keep a sterile, safe environment.

If emergency cases take place on or during these timeframes a call would be placed at the engineering department that would disable the night setback feature. This process has achieved significant savings especially during the summer month when mechanical cooling drives energy costs to twice the average monthly budget during the rest of the year.

Another feature we're looking at is the occupancy sensors to take advantage of during normal operations. The Allen Hospital has received capital funding to implement controls that will allow the same savings that occur during the night setbacks to take place whenever an operating room is not being used. Although these are minimal at times and opportunity it would be significant savings if

not using utilizing the air exchange of the mechanical cooling capacities when a room is not being used.

So we're utilizing by doing an analysis and doing training with the staff and education we're hoping to take advantage of these benefits and show a proper utilization. With more than a hundred operating rooms to account for the New York Presbyterian Hospital this process of implementation would mean significant savings and energy yielding.

This is pretty much the end of my appointment but I can ask questions at the point for anything involving controls and automation. Thank you.

John Jameson: Great. Well thank you to our panelists so far. This is John Jameson, the Healthcare and Higher Education Account Manager with Better Buildings Alliance. We're going to our question and answer session here. So we've got a couple of questions that have been typed through the Chat function. I encourage you again if you have any questions for Paul, Jeff, or Roberto please type those into the Question field and we'll receive those and read them out loud.

The first one here we got this is probably for you Jeff. It says: You talked about reheat and VAV system, is this for critical humidity control and is this really required?

Jeff Boldt: I don't think I've ever seen a VAV healthcare facility that didn't include reheat. Two reasons primarily, because you have a minimum air change requirements, you know you have a minimum amount of air that you have to deliver to these spaces and you know at least for those of us like myself who live in the areas of the United States that have humid summers you pretty much have to cool the air down at least to 55 degrees or so to dehumidify it in order to stay below your 60 percent humidity limit in most of the healthcare spaces. So you've got a fixed amount of air that's around 55 degree Fahrenheit going into these rooms and typically if you don't have a means to reheat that sometimes you get complaints that the rooms just get too cold. You know also in my climate we have winter and that's often used as the heating source also.

I do know of one or two facilities that have made the decision but infection control is more related to your room cleaning and physical contact and have set their air changes maybe lower than the code required which does save a lot of reheat energy, but I'm

certainly not going to recommend to anybody you know go below the code mandated air change rates.

John Jameson: Okay and if you have any follow-up on that question feel free to type that back in and we can run that past the panelists again.

Next question we have here from Allan Doyle. I sent this to you Jeff but I think this might be for Paul or Roberto as well, feel free to chine in. The question is: For LED procedure lamps in operating rooms do you have data on surgeon preferences for room set-point temperature with halogen and LED lamps?

Jeff Boldt: I can start this off but I may kick it to Paul at the end of this being you know just a nice, kindly person. I only have anecdotal information. When this was first brought up to me it was actually John D'Angelo when he was working for Cleveland Clinic who brought it up when we were writing the Advanced Energy Design Guide for Large Hospitals, saying that you know they had justified it based on the physicians well, (a) on energy, but also the physicians liked the LED lights. That they had less issues with shadowing when you're shoulder covers part of it because it's a number of discrete light sources instead of all one source.

But after they did it they found that the surgeons set the temperature up several degrees and some OR's that they had trouble keeping the humidity below 60 percent, at below temperatures people wanted, that those difficulties went away because of that. I think he mentioned in the four to five degree temperature range, but maybe Paul maybe you have some more data than John had at that time.

Paul Slebodnik: No, I don't have any data on that and I know that a lot of the OR's are still asking for the temperatures to go below the ASHRAE guidelines which now CMS is really starting to take a careful look at. We're hoping that changing out the pattern lights to LED will try and get us some benefits to keep them comfortable at the ASHRAE 68 to 74 AORN, 68 to 75 degree marks. We're real hopeful for that because we're anticipating even higher energy savings because as you talked about on the reheat affects on the chilled loop that also services the OR's many, many other places are serviced on that same loop. So since we're setting it down to cold to achieve the temperatures that they want we turn around and reheat like crazy everywhere else.

So that if we get closer to that 68 to 74 range we'll be able to increase our chiller output temps, which will save energy and then use less reheat as a result of that.

Lastly on the LED preference I also know that the surgeons like those because the focal point or the depth of field on a LED light is a lot deeper than a regular halogen light. But I'm assuming that they have some benefit in temperature and comfort as well.

Jeff Boldt: Yeah, because I think the LEDs use a heat sink on the back of them so most of the energy that isn't light, the lights aren't very efficient. I think at the proper frequency a theoretically perfect light fixture would be about 700 lumens per watt. So the extra heat in an LED is convicted off the back of the fixture, whereas an incandescent most of it beams out the front of the fixture.

It would be actually an interesting calculation. I guess I could do a mean radiant temperature calculation for equivalent comfort according to ASHRAE 55. I'm kind of geeky enough to think that would be fun.

Paul Slebodnik: *[Chuckles]*

John Jameson: Just to jump in we've gotten a number of questions about the presentation and we will be making the slides available online, along with a recording of the webinar and a transcript. So that will be going up on the website in the next week or two.

We do have a few more questions here though. This one is addressed to everyone. Has there been any thought of monitoring air quality in the operating rooms especially during setbacks? Sample parameters could be particle levels or others.

Jeff Boldt: I don't know of anybody who has done that. I mean I know when ASHRAE 170 was determining the air change rate for example in operating rooms ARHD did a bunch of research both in numerical calculation and then built a mockup to test the different air change levels and that's when the change to 20 was made. But I'm not aware of anybody who's done like particle count testing with 20 air changes versus maybe 3 or 4 or whatever it takes to maintain pressure. I don't know have either of you hear of anybody doing that?

Paul Slebodnik: I know that one vendor sells a system that measures the particle count, but we don't think that that's really an issue regarding or

has a correlation with infection rate. So we're sticking with the existing codes and hitting the 20 air changes per hour.

I think the only thing that we exceed is that we filter the OR's with HEPA's instead of the MERV 14.

Jeff Boldt: Yeah and I think we find that a high percentage of our clients do that, go that extra step to HEPA also.

John Jameson: Okay, another question we have here: Have you ever found when implementing LED light retrofit in surgery that there was an increase in reheat energy to maintain reheat?

Jeff Boldt: I have not, but I mean I could imagine it happening if they want the OR to be relatively warm.

Paul Slebodnik: Yeah, I can't see that happening just because they do want it cold the majority of the time. There are very few cases where they want them warm and it normally involves infants.

John Jameson: Okay. I have one here from Dave Angelotti: Is there any work being conducted utilizing particle counts and TVOC as it relates to demand control ventilation and it sounds similar to the last question we had.

Jeff Boldt: I'm not aware of anything related to demand control ventilation. No I'm not aware of anybody who's doing an ASHRAE research project or anything of that sort related to that.

Paul Slebodnik: I know that I wanted to look into the monitoring systems for the areas that Jeff spoke about to do it on a demand basis with CO2 as your guide point so long as codes would allow us to go below the minimums. A lot of those systems sample not only the CO2 but also the VOC's and the particulates.

I heard one gentleman from UCLA Berkeley who said that he's cut his energy costs in his laboratory by 60 percent and he utilizes that kind of ventilation control and that it does in fact work. He had a spike in VOC's and found out that one person was wiping down the lab tables with isopropyl alcohol and they got a spike everyday when they did it.

Jeff Boldt: Hmm. Yeah and I know ASHRAE has several presentations about that type of system that I think can be purchased for like $15.00 or $20.00 a crack. Gordon Sharp is a very good speaker on that topic.

Yeah, but I haven't heard of anybody using, extending it to where you could also pick-up VOC's for things like a conference room and so forth. We've mostly just seen the CO2 which is really being used as a people counter, not as really as contaminant measuring device.

John Jameson: Okay. Next we have Asesh I believe you had a question that you wanted to ask via the phone. So I can go ahead and un-mute you know if you're ready? Just go ahead and speak when you're ready.

Are you there Asesh?

Okay, Asesh let me know when you're ready and we can try this again.

Next question we had and I think Paul and Roberto this might be in your wheelhouse. How have surgeries staff responded to the idea of indicators telling them that ventilation system is set back while they're working?

Roberto Nunez: Unfortunately it all depends on the surgeon. But the reality is as long as you've conducted education and they are aware of their environment I haven't had for the most part I haven't had an issue with that. But like I said it's all about maintaining communication and knowing what the reason is behind the plate. The reality is for the most part at this point, right, we're only taking advantage of the nighttime opportunities or only emergency cases and that's understandable that they would have to make a phone call.

Right now we're kind of trying to do the buy-in just like they previously mentioned with the other *[audio break]* because of the *[audio break]* have for us.

Paul Slebodnik: And as far as Cleveland Clinic is involved we haven't implemented the setback yet. We're just putting the prototypes out there to get their buy-in. When we showed the surgical executive committee the actual user interface they really liked the idea of being able to see those variables real-time and have them actually coordinate or correspond with the exact readings that the building automation system has as well.

Jeff Boldt: Yeah I was really happy Paul that you talked you know about how to get buy-in for that, because that's probably one of the biggest problems we see is that a lot of the facilities we work for are so afraid that they'll accidentally do a procedure with it at a much lower air change that they just say, "No."

You know really we can think up all the energy saving ideas we want, but if you don't have a plan to sell it to management and the surgical staff you know it doesn't amount to anything.

Paul Slebodnik: And no like I mentioned as we got into it it became more of a "Wow, this is not just an energy saving thing but this will improve the quality of the air and the actual physical conditions as they're doing surgery in real-time, not a year later with a balance report or anything like that."

Roberto Nunez: To piggyback on that or when you utilize these systems you can also track and monitor a report so whenever any data is asked for you can present that at any given time for any given day. So whenever a case comes up when somebody says an incident occurred I would refer to, "Well how was the environment at the OR?" You can state that it was within temperature guidelines, within the humidity guidelines and within pressure guidelines to eliminate those factors.

Paul Slebodnik: That's exactly right. Being able to pin those variables and be able to look-up the date and the OR and the time is very helpful because trying to pour through the data otherwise is very difficult.

John Jameson: Okay. Asesh we can try this one more time. I'm trying to un-mute you here and see if we can get your question in.

Asesh are you there? Okay, yeah I got your message but we can't hear you on the phone line. So if you wouldn't mind just typing it in we can read it out loud.

In the meantime we've got another here for Jeff. This one says: Are there any studies or research pertaining to air quality comparisons for ASHRAE 170 Addendum and accepting the sum of spaces for multiple spaces? Generally these two methods deliver significantly different results for OA requirements at the AAHU.

Jeff Boldt: Can you repeat the first few words after "Addendum and"?

John Jameson: Yeah. Comparisons for ASHRAE 170 Addendum and accepting the sum of spaces for multi-space formula.

Jeff Boldt: Yeah and I think that was originally accepted as what's the right word, an interpretation, in response to an interpretation request. I know ASHRAE has done some research about the what I'm of the

little older generation I still think of it as the multiple-spaces equation; Dennis Steinke always corrects me. But that their math works out that in a space that is taking different spots in a building and just mixing it, bringing it in at the air handler and so forth does result in the rooms that are being I'll call it "under ventilated" per the 62.1 procedure do show-up as being under ventilated.

The hard part about it is nobody can solve that 62.1 math. It's so much simpler designing the system by the outside air method where you add it up and bring it in at the thing. I don't disagree with the 62.1 math, I just think nobody can solve it. And if you take a very conservative approach you tend to end-up with buildings that are a hundred percent outside air or close to it.

It's been a real conundrum in our industry because it's theoretically the right way to go, but it's extremely complicated. So there is some research showing that it's correct though; that we should be doing it that way. Whether it shows that anybody is going to be less healthy, you know a lot of the air changes rates that are in the literature are kind of educated guesses more so than being backed-up by some research.

John Jameson: Okay. I'm going to go ahead and read Asesh's question out loud here that he had before and that was: At the VA hospital they normally don't allow setbacks in the OR suites. Does ASHRAE accept this concept for OR's? It sounds like the answer is "Yes."

Jeff Boldt: Well I mean I guess it – I mean VA is the federal government so they don't necessarily have to comply with all the ASHRAE Standards, but I guess I thought the VA, the newer VA guidelines actually did ask for setback in operating rooms. Because I remember reading through the more recent energy guidelines for them and I thought they were very well written.

I know there was a time when VA did not permit that, but I thought that had changed.

John Jameson: Okay. Asesh if you have a response to that feel free to type it in and we can run that back pass Jeff.

Here's a good question for Roberto and Paul: How much selling and what kind of information do you provide through infection control staff?

Paul Slebodnik: Well like I'd given in my presentation basically we're telling them that the work to put the setbacks in place actually is improving our

ability to maintain the required pressurization and air exchange rates all the time. What we had been doing in the past with inexpensive temperature and humidity monitors in the room that were likely inaccurate and not calibrated and not corresponding with the building automation system caused us problems. Letting them know that the doors are being held open after hours because now we're really paying attention to the pressure monitors and that the air exchange rates on some of the OR's are set once a year and that we don't have the ability to look back on them.

With this project we will be upgrading all of those measuring devices and having the ability to control the air exchange rate from the building automation system and make sure that it's a hundred percent right a hundred percent of the time I think that went a long way to having them endorse it to the surgical executive committee.

Roberto Nunez: To piggyback on that the reality is to have the best kept environment you need all these monitoring devices for real-time scenarios. And if you're going to have all these devices and control features you might as well take advantage of it. But if you don't have this you can't guarantee at any given time that you're maintaining the proper pressure, maintaining proper air exchanges, you're estimating.

When you make the estimates when something goes wrong you're not going to be able to prove that you've done your due diligence to maintain the safe environment. So like you said you do need these devices and if you're going to have them take advantage of that opportunity for energy savings and maintain the most safest controlled environment possible.

Paul Slebodnik: You know the other thing that they did ask for and I found hard to get even though infection rates are supposed to public information, they had asked originally, "Well find other big systems and get their infection rates based on surgical cases before and after." So I didn't find that being an easy task to do.

So we were able to tell them, "Look that's just not easy to get especially trying to get the dates that they started doing the setbacks versus when they weren't doing the setbacks." I was eventually able to get them away from requiring that before they could make a decision.

John Jameson: Okay. Asesh I saw your response. So we can try this one more time. I'll try and un-mute you here.

Audience: Can you hear me now?

John Jameson: Yeah, I can hear you.

Audience: Oh okay, yes. Sorry I think it was some miscommunication I had. I thought that at the beginning one of the speaker did mention that in the VAV system in the OR and that is why I wrote that thing and we don't have any VAV as such in the OR at all. We have a constant running system and the only thing we do is setback as you call it if it is unoccupied to 50 percent of that in volume then we cut it down if it is unoccupied. Other than that we don't change the volume during any other situation in the status in there.

Jeff Boldt: And that is really the way that we see it from most people. That during occupied mode it's always at the 20 air changes. Sometimes we have VAV to go above that if the cooling load demands it because of the low temperatures they're requesting. But then where the VAV really kicks in is when you go to unoccupied mode and they drop it back to maintain just the pressure control in the room.

Audience: Yeah, okay but you don't use the VAV system as such for controlling the temperature, hope not, right?

Jeff Boldt: Yeah, really at that point if you're bringing in 20 air changes and the air has been dehumidified so it's probably fairly cold air, you know maybe it's been cooled to 53 degrees or something like that, typically then you may be reheating that air somewhat because 20 air changes is a lot.

Audience: Exactly, yeah that's exactly right what we do normally reheating it.

Jeff Boldt: Yeah and some clients we found prefer really to control the temperature of the air going into the room as opposed to a thermostat on the wall. I kind of like that concept because the surgical team is living in the air that's whatever temperature it is coming off the reheat coil, where as the thermostat over on the wall is somewhat of a different environment and responds fairly slowly to things that things that happen quickly in the surgical area. So we're starting to see more clients going towards controlling it directly by the air temperature.

Audience: Okay, only thing is that there is always the fight between the people who are doing the operation and the patient. Patient says it's too cold and the operating people are saying, "Oh we want

more cold." So that's why we don't keep it on the air control as such on the wall.

Jeff Boldt: Yeah and I think Paul actually first alerted me to that. I have not heard that CMS was on the warpath about that or anything. I'd never heard of it amongst our clients I've not heard of anybody being criticized for going below 68 degrees Fahrenheit so I'm kind of interested into checking more into what the whole situation is there.

Roberto Nunez: It seems to be – this is Roberto, it seems to be it all depends on the actual surveyor, because I've seen both sides of that circle. It depends on how familiar they are with the guides, because some of them focus with the actual range posted in FGI and then some of them will focus on the asterisk where it says, "Up to the physician's care discretion."

But I've seen that up here in comments in there that some of them have been forcing that guideline, not on a regular basis but off-and-on.

Jeff Boldt: Oh yeah that's interesting, because when I read 170 you know I think it says the system I design has to have the capability to bring the room to between 68 and 75 degrees. I don't think it says that you as a facility operator need to control it within that range if you choose not to.

Roberto Nunez: I think what the focus is with the asterisk that says if you're going to focus it has to be at the physician's discretion so they want to see how you're managing that aspect. Are we getting the physician's input on what is our basis on? You know so guess they really want to see that we're understanding what we're implementing and why.

Jeff Boldt: Okay.

Paul Slebodnik: When CMS came to us and was investigating our data it was kind of an odd situation. They weren't actually here to do a survey, they were here doing kind of a prototype on checking-out air quality and making it part of their survey, so it was kind of a cooperative thing for them to look at our data.

Audience: Good, well it was a good presentation anyway and it was a good discussion and thanks.

Paul Slebodnik: Thank you.

John Jameson: We're a couple minutes past 3:00 so thanks everyone for hanging on.

One more announcement. If you haven't already we encourage to register for the Better Building Summit coming up May 22nd through 29th. It's here in Washington, D.C. It's our annual gathering for the Better Building Alliance and Better Buildings Challenge Programs. If you aren't a member of the BB Program, we encourage you to join us or we encourage you to come to the summit even if you aren't currently a member.

If you found this session useful, there will be many more like it. You can learn from technology team leads and your peers all those three days.

So thank you once again and feel free to follow-up with us individually via e-mail if you have more questions.

Thank you.

Michael Deru: Thank you John.

Jeff Boldt: Thank you.

Roberto Nunez: Thank you.

[End of Audio]