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Description:	WORKSHOP to PRESENT and DISCUSS the UPDATE to the CODE COMPLIANCE METRICS for the 2022 BUILDING ENERGY EFFICIENCY STANDARDS
Filer:	Cody Goldthrite
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STATE of CALIFORNIA

STATE ENERGY RESOURCES CONSERVATION and

DEVELOPMENT COMMISSION

In the matter of:	)	Docket No. 19-BSTD-03
	)	
2022 Energy Code	)	STAFF WEBINAR
Pre-Rulemaking	)	
	)	RE: 2022 Energy Code
_____	)	Compliance Metrics

WORKSHOP to PRESENT and DISCUSS the UPDATE to the CODE COMPLIANCE METRICS for the 2022 BUILDING ENERGY EFFICIENCY STANDARDS

Held via Zoom Conference

from the
California Energy Commission
Warren-Alquist State Energy Building
1516 Ninth Street
Sacramento, California 95814

October 7, 2020

Reported by:
Marlee Nelson

APPEARANCES

FOR THE CALIFORNIA ENERGY COMISSION:

PAYAM BOZORGCHAMI, PROJECT MANAGER, 2020 BUILDING STANDARDS

SIMON LEE, ELECTRICAL ENGINEER

RON BALNEG, MECHANICAL ENGINEER

PETER STRAIT, SUPERVISOR AT THE BUILDING STANDARDS DEVELOPMENT TEAM

ALSO PRESENT:

YAO-JUNG WEN, ENERGY SOLUTIONS

BERNARD BAUER, INTEGRATED LIGHTING CONCEPTS

JAMES BENYA, BENYA LIGHTING DESIGN

JOHN BADE,

NEIL BULGER, RED CAR ANALYTICS

TIM MINEZAKI,

PUBLIC COMMENT

JOHN MCKISSACK, JOHNSON CONTROL

CHARLES KNUFFKE, WATT STOPPER

TANYA HERNANDEZ,

MATTHEW FRIEDLANDER,

I N D E X

P RO C E E D I N G S

OCTOBER 7, 2020 9:00AM

PROJECT MANAGER BOZORGCHAMI: So, let's get started. Good morning everyone. My name is Payam Bozorgchami, the project manager for the 2022 Building Energy Efficacy Standards. First thing, I want to welcome you all to the Energy Commission's virtual pre-rule making workshop for the 2022 energy standards.

Um, let me write you some house-keeping rules. We will be muting everyone and after each proposed measure is presented, you can either raise your hand, we will unmute you or on your cell phone, um, you can punch in STAR6 to mute and unmute yourself. Or if you want to, on your cellphone, you want to raise your hand, you could use *9.

We just learned about that today and — and — and — and it's — it's good to know and apologies for learning new things with the Zoom system these days. Um, there's also a Q&A box on the bottom, that you can either write your questions in there and we will try to answer them. And if we cannot get to all the questions, there's a bunch of questions coming in, you can submit your concern or your question in our docket and I'll share a link with that a little bit later, or, um, or — and also the questions and answers are being saved, so if you don't see it, that

doesn't mean we don't have it. We do have it, it's just they're saved, and we'll get back to you separately.

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Um, so with that, let's move forward, so as you guys — most of you knew — the Energy Commission started due to — um, to reduce wasteful, uneconomic, inefficient and unnecessary consumption of energy by two California Assemblymen. That's Assemblyman Warren and Assemblyman Alquist. Um, they developed what's known as the Warren-Alquist Act in 1974 under Ronald Reagan and when Governor

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As of now, if there's any questions, you can either put it in the Q&A box or — and the attendee can raise their hand and I will unmute you. And if not, we will start our first presentation by Simon Lee on indoor lighting. Simon?

MR: LEE: Oh, thank you. Let me share my screen.

PROJECT MANAGER BOZORGCHAMI: Simon, one second, I apologize. I have, um, one raised hand from John. John, I

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MR. MCKISSACK: Thank you. This is John McKissack with Johnson control Application Engineering Support. And I've put a question in the Q&A and the question essentially is: How likely will these proposed changes be implemented? Um, are we pretty much sure that this is going to happen or is this like a fifty-fifty kind of thing?

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redirected by the governor's office of legislature onto a higher priority task. Which would necessarily reduce the scope of rulemaking. There are a lot of factors in play. That said, I would participate with the assumption that absent anything else, these will simply continue through the process and become code language, so it is very important that we have members of the public. Especially members of the public that have reason to be concerned, voice their concerns on the records of the staff and leadership are able to benefit from consideration of those viewpoints.

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MR. LEE: Okay, thank you Payam. And I will bring up my screen. Can you see my screen?

PROJECT MANAGER BOZORGCHAMI: Perfect. Go ahead.

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Hello, everyone. My name is Simon Lee, from the Building Standards Office. Before I go into the first measure, I would like to thank some of the, um, persons who I and um — submit this indoor lighting proposal. They are

Marissa Lana, Jasmine Shepard, Christopher Urane, Yao-Jung Wen, of energy solutions; Bernie Bower of integrated lighting concepts and John McHale of McHale energy. They serve as offers of the non-residential indoor lighting proposal. They will also serve as a panelist during the Q and A session at the end of my presentation. In addition, Jim Benya and Neil Bulger will also serve as the panelists. Finally, I would like to thank those that who have provided inputs and supports in the process.

There are two measures in the indoor lighting proposal. They are multi-song occupancy sensing controls for large offices, and indoor lighting power allowance.

First, let’s go into details of the multi-zone occupancy sensing controls for large offices. A number of sections in the building energy efficiency standards are proposed to be revised for this multi-song occupancy sensing control measures. They include section 100.1, section 120.283, section 130.1(c)60, section 130.1(f), section 140.6, table 140.6-8, and table 141.0-(f). And in the reference appendix, section N87.5.17 and N87.6.2.3. This measure is about multi-song occupancy sensing controls in large offices. Large offices and open office — Large offices and open plan office could mean differently for different persons. In order to avoid confusions, it is proposed to specify offices larger than 250 square feet as large

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And, let me take a minute and I would like to really briefly — current co-requirements of occupancy sensing controls for offices. Current co-mandates occupancy setting controls for offices 250 square feet or smaller. And several occupancy setting types can be used for meeting this requirement for offices 250 square feet or smaller. They include occupancy sensors, parcel on occupancy sensors and we can see sensors. Current code does not mandate occupancy sensors control for offices larger than 250 square feet.

And some background about this proposed measure. According to the survey date, current occupancy setting control insulations usually treat office space as one song. Not multiple songs. The survey also indicates in large office space, occupancy sensors are installed in combinations with time switch controls. Time switch control is also known as "time call" to someone in the building industry. And this measure is proposing to have a more granular occupancy control song — a control song of 600

square feet. And no greater than that for each control song. And one benefit of (inaudible-20:39.3) to reduce lighting power in each control song.

Besides the 600 square feet control zone criteria for each control song. The table on the slide shows expected UN's in each song and in the entire office space. The middle columns show the expected UN's in each individual song and the white columns show the expected UN's for the entire space. So, let's look at the second rule for a minute. Let's look at the second rule — within thirty minutes of non-occupancy in the control song, the general lighting power in the control song is to be reduced by no more than 24 percent of full power. And then, um, let's look at the next row. With the entire spaces empty and unoccupied, within thirty minutes of that non-occupancy, all lights in the large office are required to be turned off. And so, um, these are the essential requirements of this multi-zone occupancy setting controls.

And, um, this slide shows some more — some more footnotes for the table. Note one and note two are for the tables. And tells, um, details about those UN's. And no (inaudible-22:19.9) to clarify, that's occupancy sensor. And, but as part of the luminaires that allow. And then the last note, note four, is more or less like a pointer note, telling that our PAF, power adjustment factor, is available

for control zones smaller than 250 square feet.

And then this slide shows the proposed language for section 130.1(c) and I have already covered, um — I've already summarized requirements in the previous two slides, so I'll just move on and, um, yeah. The PowerPoints like we have measured, so you know, it'll be docketed tomorrow so, I'll just move on from this point.

And most likely, in any large office space, there are some other lighting controls besides the proposed occupancy setting controls and so this slide shows the proposed language for the control interactions. And then, number eight. Number eight is about — is clarifying the relationship between the lighting controls and occupancy sensing controls. And number nine is a clarification note for occupancy sensing (inaudible- 23:56,8). I'll just touch upon it briefly. When a space is required to have occupancy sensors and the ventilation air is permitted to be reduced to zero during occupied standby mode, the space conditioning song shall be controlled as specified in section 120.2(e)3. And that section 120.2(e)3 is occupancy sensing control — occupancy sensing song controls for space conditioning system.

And then the following two slides will show the language and section 120.2(e)3, so this is one of the slides for that section 120.2(e)3. And this is- Section 120.2(e)3

is an existing requirement in the section, in the code (Idk what he says- 24:58.3). And the changes I intend to clarify: existing requirements in regard to the applicable occupancy sensor (indiscernible) requirements and the occupancy information requirements. Those two requirements in section 120.1(e)2 and (e)5. Uh in addition this is also intended to clarify the response time in this section 120.2 and also in acceptance test in NA. We'll have some more slides for that. Acceptance test section. And one thing I would also like to mention. Also, within 20 minutes after a space becomes unoccupied the occupancy sensors shall (indiscernible) the space conditioning to go into occupy standby mode. And you'll see the occupy standby mode mentioned a couple of times in this presentation. So, um, it's good to keep that in mind. In the next slide we'll show what happens during the Occupy Standby mode. So, within five minutes of entering Occupy Standby mode, two things need to happen. Number one the operating temperature should I - either set up or set back. So, this, is the - for the operating. According temperature and also the operating hitting temperature. So that's number one thing that you should either set up or set back on those temperature. And then number two thing that should happen, is that. You start the airflow to the zone should be shut off when the temperature is between the active heating and cooling set point. And there are

associated changes - proposed changes to the definition of mechanical cooling, mechanical heating, and space conditioning systems. Mechanical Cooling: (ERV) and (HRV), they are short for Energy Recovery Ventilation and Heat Recovery Ventilation, are proposed to not be - not being considered mechanical cooling.

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meet the multi-song occupancy sensing control requirements. This slide shows several drawings of large offices and different configurations. The one on the bottom left is relatively small and the one on the right is the largest of the three shown.

And, let me take a minute and I would like to really briefly — current co-requirements of occupancy sensing controls for offices. Current co-mandates occupancy setting controls for offices 250 square feet or smaller. And several occupancy setting types can be used for meeting this requirement for offices 250 square feet or smaller. They include occupancy sensors, parcel on occupancy sensors and we can see sensors. Current code does not mandate occupancy sensors control for offices larger than 250 square feet.

And some background about this proposed measure. According to the survey date, current occupancy setting control insulations usually treat office space as one song. Not multiple songs. The survey also indicates in large office space, occupancy sensors are installed in combinations with time switch controls. Time switch control is also known as "time call" to someone in the building industry. And this measure is proposing to have a more granular occupancy control song — a control song of 600 square feet. And no greater than that for each control song. And one benefit of (inaudible-20:39.3) to reduce lighting

power in each control song.

Besides the 600 square feet control song criteria for each control song. The table on the slide shows expected UN's in each song and in the entire office space. The middle columns show the expected UN's in each individual song and the white columns show the expected UN's for the entire space. So, let's look at the second rule for a minute. Let's look at the second rule — within thirty minutes of non-occupancy in the control song, the general lighting power in the control song is to be reduced by no more than 24 percent of full power. And then, um, let's look at the next row. With the entire spaces empty and unoccupied, within thirty minutes of that non-occupancy, all lights in the large office are required to be turned off. And so, um, these are the essential requirements of this multizone occupancy setting controls.

And, um, this slide shows some more — some more footnotes for the table. Note one and note two are for the tables. And tells, um, details about those UN's. And no (inaudible-22:19.9) to clarify, that's occupancy sensor. And, but as part of the luminaires that allow. And then the last note, note four, is more or less like a pointer note, telling that our PAF, power adjustment factor, is available for control zones smaller than 250 square feet.

And then this slide shows the proposed language

for section 130.1(c) and I have already covered, um — I've already summarized requirements in the previous two slides, so I'll just move on and, um, yeah. The PowerPoints like we have measured, so you know, it'll be docketed tomorrow so, I'll just move on from this point.

And most likely, in any large office space, there are some other lighting controls besides the proposed occupancy setting controls and so this slide shows the proposed language for the control interactions. And then, number eight. Number eight is about — is clarifying the relationship between the lighting controls and occupancy sensing controls. And number nine is a clarification note for occupancy sensing (inaudible- 23:56,8). I'll just touch upon it briefly. When a space is required to have occupancy sensors and the ventilation air is permitted to be reduced to zero during occupied standby mode, the space conditioning song shall be controlled as specified in section 120.2(e)3. And that section 120.2(e)3 is occupancy sensing control — occupancy sensing song controls for space conditioning system.

And then the following two slides will show the language and section 120.2(e)3, so this is one of the slides for that section 120.2(e)3. And this is- Section 120.2(e)3 is an existing requirement in the section, in the code (Idk what he says- 24:58.3). And the changes I intend to clarify:

existing requirements in regard to the applicable occupancy sensor (indiscernible) requirements and the occupancy information requirements. Those two requirements in section 120.1(e)2 and (e)5.

Uh in addition this is also intended to clarify the response time in this section 120.2 and also in acceptance test in NA. We'll have some more slides for that.

Acceptance test section.

And one thing I would also like to mention. Also, within 20 minutes after a space becomes unoccupied the occupancy sensors shall (indiscernible) the space conditioning to go into occupy standby mode. And you'll see the occupy standby mode mentioned a couple of times in this presentation. So, um, it's good to keep that in mind.

In the next slide we'll show what happens during the Occupy Standby mode. So, within five minutes of entering Occupy Standby mode, two things need to happen. Number one the operating temperature should I - either set up or set back. So, this, is the - for the operating. According temperature and also the operating hitting temperature. So that's number one thing that you should either set up or set back on those temperature. And then number two thing that should happen, is that. You start the airflow to the zone should be shut off when the temperature is between the active heating and cooling set point.

And there are associated changes - proposed changes to the definition of mechanical cooling, mechanical heating, and space conditioning systems.

Mechanical Cooling: (ERV) and (HRV), they are short for Energy Recovery Ventilation and Heat Recovery Ventilation, are proposed to not be - not being considered mechanical cooling.

And then for the mechanical heating definition: Um, this is proposed that systems that only solar energy or heat recovery as their heating source are not considered to be mechanical heating.

And then one more, about some proposed changes to space conditioning system. This is to revise the proposed changes to heating to be mechanical heating and similarly proposed to change cooling to be mechanical cooling.

And this is all for the multiples sensing controls related to the mechanical side or the space conditioning side.

And so, let’s go back to, uh, the other section. And some - some - some background about the development of this part of the code - code changes. Some six stakeholders have suggested to remove the PAF, Palo Alto Inspectors, as they have not seemed to be - being used. And so, this proposal suggests to keep the PAF provisions, and also to revise the pay of credit to align with new multi-zone

Occupancy Sensing controls for large offices.

And as mentioned before, uh, open plan office is an ambiguous term to some. And it is proposed to be removed that language "open plan office" from this code section. And it is replaced by the term, for the body, the definition: office space greater than 250 square feet is qualified for this power adjustment factor. And two - greater than 250 square feet, use the physical size of the office space.

And then - and then, another proposed changes. For the alteration part of the code, it is proposed that the multi-zone - the new multi zone Occupancy Sensing control requirements are applicable for the alteration installations, when it meets the indoor lightning power requirements of Section 140.6.

And here are the slides to the two Acceptance test for Multi-zone Occupancy Sensing Controls. And one - one is for the lightning systems and another one is for space conditioning systems. So, NA 7.6.2.3.2 is for lightning. And NA 7.5.17 is for air - for space conditioning system.

And the next two slides will show the Acceptance test for the space conditioning system. But the changes to the acceptance in NA 7.5.17 is to clarify the response time, and to test is to verify - is also to verify the occupy standby mode the ventilation before and after the scheduled occupy periods.

So that's in a nutshell (coughs) um, what these proposed changes would do for the acceptance tests.

And this is page two for the same acceptance test, NA7.5.17.2.

And so, repeating the highlights, again. The acceptance test is to verify the Occupy standby mode, the ventilation before and after this schedule occupy periods.

And next, let's look at the lighting acceptance test.

Downtown proposed to be conducted on each selected occupancy sensor. They are occupied test, unoccupied control zone test, control size test and unoccupied office test.

The occupied test: This test is to simulate an occupied condition in the control zone controlled by the occupancy sensor and to verify the occupancy sensors can turn on the control lightning. And one more - um - and one important step is to measure the luminance as the - the measurement will be used later for another test.

The unoccupied control tests. This is to simulate an unoccupied condition in the control zone controlled by the occupancy sensor.

And two things to confirm here. Number one: the occupancy sensors can uniformly reduce lightning output of the control lighting within a maximum of 20 minutes. And then number two: measure the luminance, and this measurement

should be no more than 20 percent of the measurement from the occupied house.

And then next, the control zone size test. This is to confirm the controls size does not exceed the 600 square feet control criteria. And two methods proposed here, and either method is acceptable. So, method one is about taking some measurement and some simple calculations off the - off the - the testing coverage of the occupancy sensor.

Um another method is - could be simpler in terms of steps. This is basically about counting the number of zones, and then the entire office space square footage by the number of zones. And the - the calculated average figures must be less than or equal to 600 square feet.

And then to the last one, unoccupied office test. This is to simulate an unoccupied condition in the entire office space and verify all lighting in the enclosed space turn off within a maximum of 20 minutes from the start of the unoccupied state.

Okay, and we’re going to look into the energy savings and cost effectiveness.

And so first, energy savings simulations. There are three model spaces. We call the office A, office B, and office C. They are all different sizes. One is about 2500 square feet, office B is about 4000 square feet, and office C is about 7500 square feet.

And then all these um - these models basically down to two sense of inputs. The first set of inputs are set up related to the model office with the following parameters: um, I'm just mentioned the square footage of the model office, the luminaire layout, the input power of the Luminaires, number of occupancy sensors, FH workstation, or cubicle size. And lastly, the number of occupants.

And then the second set of input is the time series of occupancy pattern representing the fresh occupancy and this is in percentage for the entire office space.

(pause) So those are the - are the inputs or the assumptions for the um Energy Savings models.

Electricity savings for this measure is about 1.025 kilowatt hours per square feet, in average, for these measure models.

And like I mentioned earlier, um they are free office models studied here for this measure.

And the TDV energy savings is about 32.42kBtu per square feet, in average, for the measure models.

On this slide shows the labor and material cost information used in the cost effectiveness analysis for this multi-zone occupancy sensing controls for large offices.

This table shows the - the cost effectiveness and also summarize the incremental (pause) um (pause) so the, um, yeah, so the benefit to cost ratio is 1.26 and - and so

the measure is cost effective.

And this slide shows the expected benefits of implementing the measure in the first year with the requirement are in effect. The annual energy savings is expected to 62.44GWh and the annual cost savings is expected to be 176.28 million dollars.

In addition to the energy and cost savings. The other benefit you start to measure allies with the ICC 2018 requirements for occu- for occupancy sensor control function in the open plan office areas. This requirement is similar to the occupancy sensor functionality for often - for open plan office of the ICC 2018 code.

About the greenhouse has emission reduction impact. The annual - the annual greenhouse gas emissions reduction is estimated to be 15,103 metric tons - metric tons of greenhouse gas.

And let’s look at the technical feasibility and cost effectiveness.

Well, first, technical feasibility. Occupancy sensors and lightning controls for meeting the proposed requirements are commonly available in marketplace. They’re relatively new approach of pacing the occupancy sensors at the luminaire, also known as Luminaire Level Lightning control, (LLLC).

The benefits on this approach is an increase of

granularity of the control area, if the control decision of the luminaire depends on the luminaire sensor detection. Also, that network lighting controls wireless controllers, digital controls, and luminaire level lighting controls are allowed to be used as part of this approach to provide for meeting the multi-zone occupancy sensing controls in large offices.

And for cost effectiveness. This proposal is expected to be cost effective in all kinds of zones and for all building types.

And that's my - that's all for my presentations and I will stop here and open the floor for any questions.

PROJECT MANAGER BOZORGCHAMI: Um, I don't see any raised hands. But, uh — Oh, we got one raised hand. Sorry. Charles, please, I'm gonna unmute you. You have to unmute yourself. Uh, state your name and affiliation please.

MR. KNUFFKE: So, Charles Knuffke with Watt Stopper. Um, I'm trusting you can hear me.

PROJECT MANAGER BOZORGCHAMI: Yes, perfect. Go ahead.

MR. KNUFFKE: Thank you very much. I just wanted to say, appreciate the work that's been done on this, uh, for the multi-zone occupancy center approach. What I particularly appreciated was the feedback that the team that - that were putting this together sought from the industry

at large and the availability of the pre-draft report for us to provide, um, some suggestions. The original language, I thought, was going to include some things, some lighting types that necessarily might not really be appropriate and, um, really wanted to make sure that we did line up with the ICC language and making sure it was general lighting only being controlled. And so, I wanna say that, not only did we get that reconciled in the final report, I also wanna say I really appreciate that during that session we were talking about the misunderstanding about what was going on with the HTAC integration occupancy sensors. We have been given feedback from the CEC originally that that five minutes was basically demanding a five minute time delay for the occupancy sensors and it was during that meeting that we actually realized, no, the actual intent was that after the sensor detects no occupancy and goes unoccupied, the five minutes was a grace period to allow the HTAC equipment to appropriately come up to speed and provide the ventilation, so. It was really a great opportunity to work with the case dean and you never know what you find out when you get committed people talking and I'm trying to understands each other's problems. So, I just wanted to say that. Thank you very much.

PROJECT MANAGER BOZORGCHAMI: Thank you, Charles. Tanya, I'm going to unmute you. Please state your name and

your affiliation. Thank you.

MS. HERNANDEZ: Hi, good afternoon. Can you hear me?

PROJECT MANAGER BOZORGCHAMI: Yes.

(Silence)

PROJECT MANAGER BOZORGCHAMI: Sorry. Go ahead. Tanya, apologies. Unmute yourself. There you go. Sorry about that.

MS. HERNANDEZ: Hi, you can hear me now?

PROJECT MANAGER BOZORGCHAMI: Yes, perfect.

MS. HERNANDEZ: Okay, great. Tanya Hernandez for the Acuity Brands (indiscernible). Um, I had a question about the energy savings, uh, information. It is well-known that with LED's energy savings by including controls tends to have a lot of trouble reading, um, sometimes cost effectiveness at this point. So, I was curious — I didn't see it in the occasional report (indiscernible), but perhaps one of your panelists can speak to the significant different or was there a significant difference in looking at just the space control aspect of the energy savings versus the dimming (indiscernible) control or, um, controls of lighting.

PROJECT MANAGER BOZORGCHAMI: Um, would anyone want to speak to that? John? Simon?

MR. LEE: Of this measure, I think the um —

comparing the multiple device of occupancy sensors or the multiple, you know, individual control zones like within that space. Versus the — this measure, to basically — so one of the key (inaudible-47:57.7) is that, with this measure, when the entire office space empty, it would turn off all lighting in the large offices. So that ought to save things there (indiscernible)

MR. MCHUGH: This is John McHugh, you hear me?

PROJECT MANAGER BOZORGCHAMI: Yes, John.

MR. MCHUGH: Yeah. So, I'd just like to point out that Marissa Learner and, um, yeah, yeah when (indiscernible) are the two case authors on, on this portion of the report. But I thought I might as well just ask a clarifying question from Tanya to understand her question. You know, there's, there's two ways you can comply with the standard one, is to have occupancy controls that, um, turn on/off and that is legally allowed, actually has the most savings. But, um, out expectation is that most people who are designing, you know, especially larger spaces will want to dim the lights for the individual zones and then only turn the lights off when the entire room is, is unoccupied and the team looked at the savings under both scenarios. And then so, so, just to understand Tanya's question, what is her question about the space control versus a dimming control. I wasn't quite sure the question and I think that

will probably be helpful in answering.

MS. HERNANDEZ: So, can I have the floor again?

UNKNOWN SPEAKER: Sure.

MS.HERNANDEZ: Ok, hi. This is Tanya Hernandez again.

My question actually is - is about the lighting controls versus the energy savings you'll get just from the HVAC. I'm assuming, and I'm looking only at cost of effectiveness or energy savings. The examples that were given. The examples that were given uh I was wondering if you guys did - uh if ran scenarios that would show how much - what is this? Significant difference uh including the HVAC versus not including it in this large office multi-control strategy. That's all.

MR. MCHUGH: Oh okay, thank you so much. So, the question is - is what the savings from the occupied standby portion of the requirement versus the lighting control portion of the requirement.

So, in 2013 the uh adopted into title 24 was a requirement for occupied standby when spaces qualified to these two particular criteria. One criteria had to do with whether or not the space in section 120.1, which has to do with ventilation air, whether those spaces could turn their ventilation air off under occupied standby conditions. So that was one criteria and offices have always been in that

criteria. The second - the second criteria was whether or not the space was required by section 131(c), which is the automatic shut with - under that section, which it's required to have occupancy sensors.

So historically only the small offices were required to have occupancy sensors and now with the - bringing in from the ICC that the larger offices would also be required to have occupancy sensors, now both criteria are met for these zones.

And then - then finally answering the question about the energy savings. I'm actually going to have to defer to the team that worked on this part of the report. But from mu understanding is - is- is they did an analysis of the HVAC saving. So, I'll - I'll defer to the two authors.

MR. WEN: This is Wen from Energy Solutions, so I can provide some insight into that for the per unit energy savings and the statewide energy savings.

The numbers Simon's presented did include both lighting energy savings and energy - and HVAC energy savings. Uh in our calculation, we did separately, look at - look at the savings from lighting systems and from HVAC's systems. And the predominant savings or for - from lighting systems and savings from HVAC's occupied standby was relatively insignificant. I don't - I don't have the exact

number at hand to directly answer quantitively what the difference is, but the high-level answer would be: HVAC's savings is relatively insignificant compared to the savings generated directly from dimming and turning off the lights when the control zones are unoccupied.

PROJECT MANAGER BOZORGCHAMI: Yeah, this is Payam. Is that information in the - in the document, the case report document?

MR. WEN: Um, I think the in the summary we combine everything. But we do have that data and we can add in those data.

PROJECT MANAGER BOZORGCHAMI: Okay, wonderful.

Okay, thank you. You probably might want to do that in the staff case report and the staff report, the supplement report for the case.

(pause) So if no more raised hand or no more questions in the Q&A. I'm going to Simon, go ahead and move on to your next topic.

MR.LEE: Yeah, sure, thank you everyone.

I will go into the second measure. The second measure: Indoor lighting power allowance, enlightened power densities.

A number of sessions in the building energy efficiency standards proposed to be revised for this measure of indoor lighting power allowance. They include section

100.1, section 130.0(c), section 140.6(a), section 140.6(c), and a number of tables in 140.6. They are 140.6 B, C,D, and G. And the proposal report has a lot of details. And so here, I will bring up the essentials in this presentation, and I might go light on some slides which are packed with numbers and data.

So I just wanted to bring that to your attention.

And first, I'll go for the Complete Building Lighting Power Densities, as the complete building method is relatively straightforward.

Sorry. Um then we'll look at some associated changes to lighting definitions, luminaire classification and wattage. Next, we will be - look at the Area Category Method.

And last, we will look at the Tailored Method.

(pause) Okay. Computing for lighting power allowance. And the changes are underlying, and these are LPD's for lighting power allowance. These LPD's are based on an area weighted average of the primary function areas and so, I just call for some of these building types for assembly building type. They allow lighting power density has changed from (indiscernible). What per square feet and financial institution building type would be renamed by adding the World Bank in the fund. So, they become bank or financial institution building. And the building types not

listed here in this line, um, have the same LPD of the 2019 code. And so, building types not listed here, they have no proposed changes to their LPD values.

I'll go to the next slide.

Okay. There are some chain -- okay, so this slide shows the essential changes to the indoor lighting power (indiscernible) for the area category method. And so, in this proposal, the area light power density, and power densities have been revisited. And we analyze with the same lumen method but with some revision to the inputs. And some of the general and additional lighting power allowance has been, um, revised some. Others are revised on (indiscernible) And still there are, um, still there are some LPD that stay the same. And also, all the proposal LPD's are assumed to be met with LED Luminaires.

And then I just want to mention two highlights. Open Plan office is merged with the rest of the Office Areas, greater than 250 square feet. And parking garage dedicated ramps are proposed to be merged with parking zone. And they are also changes to the qualified lighting systems for the area category method in which is in table 140.6-C.

Um, in this proposal, several lighting definitions are proposed to be update and they are accent lighting, display lighting, decorative lighting or decorative luminaire, and ornamental lighting or luminaire. Um, for

the, for accent lighting. The proposed accent lighting definition is to align with (inaudible-1:00:08.8) and definitions for illuminating and engineering, um, (indiscernible) areas-1-20. Areas stands for like in signs (indiscernible). So, this definition of accent lighting is to align with the IES standard.

Display lighting. Here we are — so this is proposed to add new types of lighting that could be considered as floor display lighting and wall display lighting. These are added because they are typical, um, typically, um, the lighting — typically installed as display lighting in museums.

And the next two decorative and ornamental lighting luminaire. Um, this changes to decorative and ornamental luminaire is to clean up existing language so that the new language as a whole would be more consistent. And in existing language, decorative lighting is defined in two locations, which could be confusing. So, the proposed definition use a revision and a combination (can't understand - 1:01:34.0), a combine of the decorative lighting language.

And the ornamental lighting definition, um, it is called this as a clean-up (idk- 1:01:51.0). Um, so on existing code they are subset of definitions within the elemental lighting definition and so this proposed change is

to, um, just tip to keep it simple and that's strong on these lines. And so, the elemental lighting luminaire definition is still in the definition and this proposal, I'll talk alter lighting use.

(pause)

Um, next. There is a proposed code change to simplify section 130.0(c)2 for luminaires with line voltage lamps. So the wattage would be the maximum rate of wattage as labeled in 130.0(c)1. 130.0 (c)1 is about the maximum rate of wattage of the luminaire as listed on the factory label specified by UL.

And so here, are the top used to post language on the bottom is the existing language. Um, yeah, so this strong to be a comparison side by side or bottom to top. There are qualifying requirements about tunable white and dim-to-warm luminaires. These tunable white and by small, it has to do with the aperture. It is proposed to add the word aperture to clarify the requirement and there will also be a new definition of, um, luminaire aperture.

And one example is about linear luminaire products on — the language that does not dictate the length. So, for, linear aperture — linear luminaires, linear aperture is the factor to determine the small, the small aperture of it. And a two-inch aperture why can be qualified for the wattage adjustment.

On, in the Newman models, there are some assumptions and a set of inputs I'd like to highlight here. And so, in this case, in this proposal effort, there is an exercise of mapping out general journal writing, task lighting, supplemental lighting, and wall washing lighting level to the IES recommended practices and handbook. And there are shown in Appendix J of the proposal report.

Um, for the task lighting, the lighting levels are the, are for the recommended lighting levels for the task. And the mapping does not include ornamental or architectural lighting. And then, the fraction. There is a fraction in the, um, in the table in appendix J, just want to point out that, um, the assigned fraction for task and supplemental lighting, that fraction number in the case, the one illuminated to the illuminance value. And then for the assigned fraction for the wall wash lighting, that number, that fraction number it means the fraction of the wall areas illuminated to the illuminance values.

And then, and then there's also a consideration of the luminaire lumen output range. Um, they are durations that have been considered on this standard lumens, high lumens, and low lumens and they are shown in the appendix I of the proposal report.

And so on, and one more. In appendix J, it shows the portal. Portal typical primary function area data. And

they include the dimensions, the one cavity ratio, and the ceiling, wall, and floor reflectants. And then besides the lumen method, or the lumen models, there is also an exercise in looking into the large office and testing out some, some models of large offices using, um, AGI32 software, too. And one of the um, model it shows the scenario with one more of low reflectants and then in the next slide, I'll show a summary of these models.

So there are six models being done for large offices. And then on the top right-hand corner is a windowing image of one of the large office space and this is um, I believe this is an image of the model B2. So yeah, the conclusion of this analysis is that it shows the qualify lighting system can be used to supplement general lighting in meeting the lighting power requirements. And then, in the following slides there will be, there will be details of Table 140.6C, so there will be a lot of numbers and details. And they show the proposed lighting power densities for each of the powering function area type of the area category method.

In some area types like audience sitting area and civic meeting place areas, there would be a reduction in lighting power densities. For some other area types, like auditorium area, the general lighting power densities stay the same. And then also want to point that in the additional

allowance for qualify lighting systems, um, there are revisions to the qualify lighting types. As well as the lighting power densities. Um, okay. Okay. In auditorium, hotel function area, um, library reading area, museum area, and well, in the exhibition does pay off museum area and religious worship areas. Um, the additional wattage allowance is proposed to be reduced, um, .05 watt per square feet and this reduction reflects the increase efficacy of high CRI light source.

And then of, in this table of ornamental lighting is replaced by Decker for decorative lighting. The, okay, the barber, beauty salon, and spa area, dare you say, um, they use the definition for it and it shows on the bottom of the slide.

I'll go to the next table. Okay, I want to mention about the bar and lounge for dining area Um they have a high level of dim lighting and more lighting than other dining areas. And therefore, the high alarms for the decorative and display lighting. And then on some concourse and atria area, um, based on the difference, the significant difference between the lighting order and the 2019 lighting power allowance. To measure the configuration of the concourse and atria areas. And therefore, the proposed dropping in general lighting in the LPD and the additional, um, lighting LPD.

Um, the scientific laboratory, um this application

— the LPD's revised space on, um, what the criteria's in, um, LPD-7. And then the library's stacks, um, the changes are based on IES LP-4. Um, and then they, yeah. So, they (inaudible- 1:14:08.5) to the, um, scientific laboratory definition, it changes our clarification in nature. So, some areas you see for the, on the additional lighting power allowance. The terms are being — the qualifying lighting systems, um, have a change from, to the proposal display decorative as the qualify lighting types. And then, the um, the office area, larger than 250 square feet that will capture what used to be, um, open plan office. So, this is all accompanied as to just one, um, one function area type as an office area greater than 250 square feet. And then, as mentioned earlier, the parking garage ramps are combining up together with the parking zone. And then along some proposed changes to the definition to clarify what is considered to be parking (indiscernible- 1:16:05.0) and ramps and also, daylight adaptation zone.

All of these are areas you'll see that, um, additional lighting allowance for the qualified lighting systems are revised to be for the— the one for retail sales. Um, similarly display decorative is the newly proposed for additional lighting system. I'll just go over these slides quickly to get to the next topics. And healthcare. So yeah.

Lighting power allowance for Tailored Method. Um,

our first goal for the summary of the proposed changes then we'll look at the proposed power allowance in table 140.6-D and C. So some of the highlights, the, the proposed lighting power allowance varies the LPD for the tailored method is based on 90+ CRI LED luminaires. And, um, there are changes to the general lighting LPD's. Display lighting LPD as well as, um, the decorative special effect lighting LPD.

Also wanted to mention that, um, all the metal will be replaced by decorative in section 140.6(a)3E and 3J, that's for the additional lighting allowance. And for the variable display case lighting, um, there will be a slight reduction to the lighting power allowance for the primary function and also, um, a change to the allowance for the display case.

So next we will look at the proposed LPD values in table 140.6D. So, this in the next slide shows the proposed changes to the Tailored method lighting power allowance. Overall, some modest reduction in the lighting power allowance. And some stays the same as the current code.

And this is a part two of the table.

Okay, this table 140.6G. It shows the tailored method lighting power allowance for different room cavity ratio. And some modest reduction of the general lighting power density values.

As part of the cost effectiveness allowances,

luminary information such as the unique cost efficacy CRI information is collected in this measure effort. Luminaire types include area lighting and wall washers of contractor grade and specification grade were collected where possible. And, 70/80 CRI and high CRI models. And the table on the slide shows the table luminaires being surveyed in this proposed measure. And, um, incremental first call wasted so that, the incremental costs can be calculated from the difference in between the 2022 measure model and the 2019 measure model.

So the measure as a whole is cost effective. In the proposal report, cost effectiveness is done for each prototype space. And so here, and the, um, next few slides will show the cost effectiveness for each prototype space.

Um, I want to bring to your attention that there are several cases in terms of cost effectiveness in this measure. What typically, when the cost — when benefit cost ratio, short for BC, benefit cause, benefit cost ratio for the proposed requirements, what if it's a one and above it is expected to be cost effective. There are some few cases, well actually there are, um, some accounted cases, um, in this proposal. Um, when they expected an increase in energy use, the benefit cost ratio is not applicable. And I'll go over that. And then, one of the cases that the benefit cost ratio of, um, for those cases where they use caught energy

savings. Um, but no incremental cost. Okay, so this slide shows, um, the benefit cost ratio in the increasing order. So the first one, the first one, hotel function area. The benefit cost ratio is 0.14, um which is not cost effective. And then the bottom two, Barber, Beauty Salon, and Spa Area is 1.18 is above 1, so this one is cost effective. Civic Meeting place area 1.7, this one is cost effective. And then, um, okay, on this slide, commercial industrial warehouse is cost effective and similarly, health facility, the nursery of healthcare facility and hospitals is cost effective. Okay. So, this one slide and the next three slides, um, they are the same scenario. They are expected to be, having a negative incremental cost. Um, an example of a reduced incremental cost can be um the cost efficacy has increased. And, but the cost stayed the same or decreased and, thus, that can be — that's one example of, um, a reduce incremental cost. And then, they are also expected to be an energy savings, so all these function areas are expected to be cost effective.

And then, some more function areas expected to be cost effective. And then this slide, the function areas are also cost effective. And then, one more, these function areas are cost effective.

And then, um, these areas are we have a note too for these areas. Let me explain it. These function areas are

proposed to have an increase in lighting power density values. And, as a result, these area types are expected to have an increase in energy use and also, an increase in energy cost. So that means, the BC ratio is not applicable. Um, so these are the areas.

Okay, so. Like I said, overall, the measure is expected to be cost effective and are expected to have energy savings. The annual energy savings are expected to be 101.9 gigawatt hours. And the annual energy cost savings is expected $246 million dollars. And, for the greenhouse gas reduction emission impact, um, the annual greenhouse gas reduction is estimated to be 24, 496 metric tons of greenhouse gas.

Technical feasibility, the survey conducted indicates, report indicates effective lighting are available in marketplace for meeting the proposed requirements. And for — in terms of cost effectiveness, the energy saving calculations are done by comparing energy use of lighting that is minimally compiled with the 22019 code to the proposed requirements for the 2022 standards.

So overall, there are expected energy savings and energy cost savings. The measure is not climate sensitive, so energy savings are the same for every California climate zone.

And then, oops. A number of function areas are

proposed with decrease in the lighting power density waves. Some are proposed with an increase and the rest are proposed with the same LPD's. And with that, I conclude my presentations on the indoor lighting power measures, and I will open the floor for any questions.

PROJECT MANAGER BOZORGCHAMI: Thank you, Simon. Anybody, any questions for Simon, or for the case team?

(Silence)

Oh, we have one raised hand. Tanya, please state your name and your affiliation.

MS. HERNANDEZ: Yes, this is Tanya Hernandez with Acuity Brands. Uh, I was curious and maybe you covered it, but if you could recap. I think you stated that these LPD's were revisited and re-analyzed and so, I was curious because we went to the LED baseline in 2019, what did the case team think they either got wrong or some new updated method or values that warranted this re-look?

MR. LEE: Um, in this one, they have, um, looked at some of the — oh, and this is based on my understanding of what they did — so they had looked at the, um, recommended lighting level and, um, also look at the ratio of the how general lighting and all the supplementary lighting are being used in a typical space.

MR. MCHUGH: Yeah, hi. This is Jon McHugh and I'm assuming that Bernie may have some comments as well. Um,

Tanya, similar to the process that, um, the ASHRAE committee had done and, um, we had conducted our own process of revisiting, um, all of the inputs into the models. And so, um, you know, the basis of LPD models first start with the recommended illuminance, um, and in some cases, the recommended illuminance and IES standards have changed and in other cases, the mapping of the tasks to various primary function areas were, were revisited and so, um, and so in some cases some of those changed and I'll just give an example.

So for instance, for the concourse, um, the values there had a higher design illuminance to include the circulation tasks and these concourses they're primary task is circulation. And so, not surprisingly, when you actually re-evaluate a application like that, what you see is that the design illuminance drops, the LPD drops and the amount of equipment drops and so the, you know, that's one of those applications where you see that, you know, the benefit cost ratio is infinite. And then there's some other applications where when we revisited the applications. We looked at task levels that were higher and this also includes when for instance when we looked at stairways. We looked at the IED standards and our original in our draft report, we ad lower LPD's for stairways and we reached out to various designers and they actually came back and said, you know, due to the

you know, issues associated with liability, we actually recommend that you use a higher luminance value than the recommended values in the IES standard so, you know, it's a complex task, but those are the kinds of situations that we looked. We looked at the best, you know, the most recent updated standards and then also interviewed lighting designers and other market participants. I'm wondering, Bernie, do you have anything?

MR. BAUER: Yeah, yeah, Jon. I wanted to add to that. Now, you covered all the basics.

PROJECT MANAGER BOZORGCHAMI: Sorry, Bernie. State your name. Sorry.

MR. BAUER: Oh, I'm sorry, yeah, yeah. Bernie Bauer with Integrated Lighting Concepts. One of the team members on the panel Tony Fore, non-res lighting proposal. And what I'd like to point is, I mean, you've covered all the complexity of it, but so that we can sort out technology changed. The only area where technology affected and down crease in an LPD lowering was in the high collar rendering scenarios. When the models were done in 219 as well as the current models, everything in tailored method is assumed to start out with a 90 CRI baseline and then accent display feature actually uses very high CRI 9697 with higher nine. All the other basic spaces, the modeling has always been in the base on the set of an 80 CRI 3,500-4,000 Kelvin package.

So, obviously, there has been a big change when in 219, we found differential between high CRI and standard products being somewhere in the neighborhood of 25 percent to 30 percent. Now it's more like 18 percent to 20 percent and so that's why you see those numbers drop on spaces that were being modeled using the high CRI. Other than that, the other changes are really based on the various topics that Jon went through.

MR. BENYA: Could I add something? This is Jim Benya. Payam?

PROJECT MANAGER BOZORGCHAMI: Sure, of course.

MR. BENYA: Good morning, everybody. Jim Benya. Benya consultancy. Davis, California consultants to commission staff. I'd like to say a couple of good things and a couple of cautionary things. I reviewed these proposed standards in depth with staff and I think Simon's done an excellent job at presenting and explaining this. I think that the, the case team did a very outstanding job at putting this all together, but there's some concerns that were raised, some of those have already been discussed.

Let me start off by saying that I'm a little bit concerned and we didn't talk much about this on the team, but with the addition of healthcare facilities to this discussion, I did mention to the team that there are issues associated with color rendering and health care facilities

that may not have been fully considered here because they definitely affect efficacy and I have been designing some health care and senior care facilities. One of my concerns, of course, is, is addressing those color rendering requirements. Some of them by OSHPD, some of them just by what I consider to be involving good practice. But short of that, my compliments in general to the team for being very thorough, especially about color. I appreciate having a professional lighting designer, Bernie, because Bernie is on the front lines and he does know what's going on. I have some reservations, my biggest reservation is that we, if you were to average out the reductions across the board of lighting power density from 2019 to 2022, you're probably going to see something well in excess of 5 percent, probably closer to 8 percent. Now, some of them haven't changed, and some of them change more than that. But there's a across the board effective decrease.

There's only one thing in, my opinion, today that can cause that and that's going to be increases in efficacy by LED's. Optics haven't changed significantly; lighting designs haven't changed significantly. IES luminance recommendations in general haven't changed significantly. So that there's no real way to reduce lighting power, except to use more efficient light sources. I'm very concerned. We're approaching, you know, practically no opportunity left to

harvest that anymore. Little bit concerned that I know that the team reviewed, something on the order of 300 products to assess that. And, unfortunately, when I look at the 300,000 products that are listed on design lights consortium and admittedly not all of those are luminaries but most of them are, we're looking at a, you now, one out of 1000 survey.

Now, it's unfortunately, you now, probably not a high enough percentage of products to be reviewed. So, in general, we have to be very careful with the idea that in the future this downward trend can continue. We're already operating at 95 percent less energy use and a new building complying with title 24 than we did under title 25 number one in 1979. That's an incredible accomplishment to which we all are ought to be grateful for the work of the commission and for the case teams and frankly, pat ourselves on the back as a community because of that accomplishment. So that's a pretty darn big deal, show me one other end use of energy that is accomplished anywhere near that and you'll, you'll be hard pressed to find that. But we can't rest on our laurels. Because with what I see in 2025, is that we're going to start to change the way we look at lighting. We can't keep reducing lighting power. I'm concerned now we're starting to cut into the area where we may be limiting lighting design opportunities. In other words, what our clients expect of us are continuing to be the challenge of

any lighting designer some more than others, admittedly, but I think that one thing that we really have got to be extremely conscious of, going forward is that, although the case report is taken into account like human centric lighting or phrase that I hate, but it's still popular, um, I think that and I think the manufacturers themselves deserve a lot of credit for evolving products. I think we have to be far more circumspect with the 2025 standards and ask really hard questions about, okay is there anything left to, to take off of these lighting power densities and some of the other requirements.

So my review, which was done under contract to the commission is in the general a cautious — I'd say a B plus, A minus, because their work is very good, very well documented, but we're getting close to the point, as I'm trying, hopefully, everybody's getting this message, where I'm concerned that there won't be a lot left. From now on, we have to look at other avenues to make a difference with California energy and climate issues. Thank you for the opportunity to make a few comments.

MR. SHIRAKH: Hey, um, this is Maziar. Can I make a couple of comments?

PROJECT MANAGER BOZORGCHAMI: Sure, Maziar.

MR: SHIRAKH: Yeah, I kind of actually wanted to reflect on something that Jim, man, you just said. That you

know it's been a while since I've been looking at these LPD"s for the area category method and complete billing method and when Simon showing those numbers and I had the same reaction that while we've, we've really made a big change and impact, these LPD's, these are phenomenal, but um, Jim, are you saying that over the last three years there has not been any improvements in LED lighting efficacy that warrants a 5 percent or 6 percent or 7 percent reduction, is that what your concern is?

MR. BENYA: Yes. LED technology really accelerated in the first decade of the 2000's, it still continued to accelerate in the second decade. But I think we're beginning to reach that (inaudible- 1:43:37.1) where every lumen per watt of light source is coming harder and harder these days because it's requiring new science and improvements from what I've been told, and we have countering issues. You know, if you take a light source at, at, CRI and you use the same fundamental system chemistry and everything else and you boosted up to 95 CRI, you actually lose efficacy. That's a natural part of the physics of how we measure light and power, you know, the lumen is based on V lambda and V lambda is a curve that favors green and human vision doesn't want to work in green spaces. We tried that, in the 1960's and 70's. It wasn't very popular. So we were balancing color quality against efficacy and therefore efficiency

constantly, we're kind of reaching the point where there's not a lot left to do and, I'm sure there's an LED company out there going to say oh, Jim, you're all wrong. What do you know about making LED's. May be right. I don't know an awful lot about making LED's. But I do track what luminary manufacturer are showing me, photometrically of their completed products and I've been looking at the products constantly for the last, how many years, more than a few and I've been watching the evolution, it has slowed down. We're not going to see, you know, big jumps in lumens per watt anymore. An unless there's a real radical change in technology that I'm not aware of, here isn't practical yet.

So, the answer is no, this is, this is coming. I think it's coming pretty much to an end. Where we can go with efficacy constant improvement and unless there is a fantastic innovation in efficiency in general lighting systems through optics, or something else, we're kind of coming to a close, in my opinion. Now, maybe I'm wrong, but I haven't seen any evidence yet.

MR. BAUER: Our foot from the case team like to, uh, comment on several of Jim's comments. And, actually, I tend to agree with you. A good 92 almost 100 percent Jim, I think, to that, too, this may be the last time that we can lower LPD's.

Unless from a technology standpoint, unless

something that we don't know about all of a sudden becomes hitting on the scene in the next three years.

As far as the health care issue is concerned, you and I discussed that a little bit earlier, and we have been looking into that and would like to work with you, much closer to see how that would impact what we have an LPD's and also if there are some variations that we can do to address those issues.¥

MR. BENYA: Good. You know I it's been good working with you, Bernie, directly on this one, the last couple last week and we can have.

Because, you know, I want to compliment you on your work and the way you explain it. It's made it made it very workable from my standpoint. So, but I'm glad we're kind of arriving, same thing. And yes, the, the realization that light affects human health and wellness is a big deal. And it's not — I don't believe it is any words mature idea yet human centric lighting and color changing lighting. It's not — doesn't necessarily provide any benefit with slightly more complicated than that. And as it becomes — as we begin come to realize how it works, we're gonna have to change a few things. And that's, that's something we may have to react to sooner rather than later. I keep hoping that we will the CIE will finally come out with an international standard, but until we do any claim about human wellness

from lighting is questionable, unless you are very sure about the scientist that you're that you're working with. But to sell a product that's going to make a healthy is still to me snake oil.

So, we've we're going to change in that direction in the next three years, perhaps by the time we're having this discussion in 2023 for the 2025 standard— I hope there will be a way through. And we'll be able to document it better. I look forward to working with your Bernie and again congratulations, you guys did a good job on those.

MR. SHIRAKH: So, Jim, this is Maziar again. Sounds like you're not necessarily opposed to what the case, Tim is proposing is more of a cautionary note about future standards and how we may or may not be able to modify LPD's, does that summarize it?

MR. BENYA: Very well, Maziar, yeah, I just — It's intended to be cautionary because you know the case team, you know, there's been some excellent work here. Cautionary because the lighting industry is now in flux, there's so many things going on. Of course, we have some other aspects of lighting UV and other stuff that are sneaking into the discussion as well. I don't think we want to deal with them, and in this section of the standards. I think we want to stick with, you know, visual light as it were. But yeah, you're right, it's meant to say, let's start reprogramming

ourselves for 2025 and looking at this differently. We've been doing things pretty much the same way to varying degrees for 40 years and we've done an excellent job, that's major message number one, but going forward, we've kind of gotten to the end of this road, we have to make a turn. And I know that's being talked about at the state level in many different ways. I'm very excited about the possibilities. I know that the CEA is looking at it from a different state point of view, which I truly appreciate. So, I think there will be a turn in our direction. And so, I want everybody to proceed, looking forward to the next time we all get together that we've got to stop taking lots out and start looking at it from a more holistic standpoint.

MR: SHIRAKH: Thank you, Jim.

PROJECT MANAGER BOZORGCHAMI: Thank you, Jim. Any other questions, comments?

MR. STRAIT: Um, actually this is Peter Strait with the California commission. That does raise one question for me that if the case author just on the call. Because we're asserting that there has been an advancement, not so much in improvement in lighting efficacy, but in the additional waters required to hit a high CRI targets are those improvements that allow a higher CRI to be achieved with less of energy — energy premium over a lower CRI product. Patented technologies are these ones simply techniques to

become broadly available like the ability to make smaller Diode and dice for various electronics.

MR. MCHUGH: Hi, Peter. This is Jon McHugh. We looked at high CRI products from multiple manufacturers. So no, this is not a proprietary technology and just to reiterate, our findings were that even though the bulk of efficacy of LED's did not increase we found an efficacy increase for high CRI products. Basically, the differential between the standard CRI products and the high CRI products have shrunk over the last three years.

PROJECT MANAGER BOZORGCHAMI: Thank you, Jon. Any other comments, concerns? If not, um, we're gonna move on to the next presenter. Um, Ronald, would you want to..?

MR. BALNEG: Good Morning everyone. My name is Ronald Balneg, and I'm a mechanical engineer here at the Building Standards Office at the Energy Commission. I'll be going over the non-residential air distribution proposals for 2022.

First, I'd like to give a couple acknowledgments to the case authors and those who are involved in this proposal, and that's Chad Worth, (indiscernible1.55.05).

So, the proposal summary.

So, we received 2022 code updates, and these will be related to - I'll be going over the fan power budget, a

fan energy index and a duct leakage, and a new thing for this code cycle is that healthcare facilities will be subjected to these proposed requirements. And here are there sections that will be effective. So, we have definitions for 120.1 and prescriptive requirements and mandatory requirements as well as some changes to the reference appendices.

So, definitions. There's gonna be a lot of definitions being added for this proposal, I won't go through each one here, but you can take a look at the report and provide feedback to us.

So here we have quite a few slides.

(pause) So the first proposal was going to be fan power budget. This proposal is revising the current standard of fan power limits and replacing it with what is called the fan power budget. So, this prescriptive requirement will include a variable of air volume multi-zone classification, to distinguish - to distinguish it from a constant volume single zone systems will be changing the electric from the horsepower kilowatts, expanding the requirements for fan systems to include all systems greater than or equal to one kilowatt. There will be addition to fan power allowance categories and splitting the power allowances for the supply and return side of the system. Will be adjusting for components with partial fan system airflow and there will be

formed methods for determining the input power by the calculation comparison. Also, the air density production and healthcare facilities will be subjected this proposal or to the Sun measure, but with additional allowances and additional alterations will also be given additional power allowances. So, the multi-zone variables volume fan systems. This is a - must serve three or more conditioned spaces individually control-based on heating, cooling, or ventilation. And some of the minimum air flows shall be 40 percent or less than the fan system design conditions and the fan needs section 140.4(m), which are the current fan control requirements and prescriptive path.

So, the calculation of the fan powered budget. The first step is calculating the fan power budget is knowing your system's design airflow and the type of system shown in this bulleted list to determine your base allowance.

The parallels look up tables and are used to determine additional panel answers from other components of your system. I didn't list these tables here, but there are in the docket. They're quite large. So, could take a look at those.

These component power allowances are split into two tables for the supplier return, exhaust believe and transfer fan systems.

For a component that only has a portion of the

airflow ratio based on the proportion the air and air flow system with just the 10 pounds value. Some of those pan - those power allowance values, plus the base power allowance will then be multiplied by the system design airflow to result in the fan power budget.

If the building is in an elevation greater than 3000 square feet. The temperature will be multiplied by a correction factor and another lookup table.

So, this fan system input power. This is the value that determines if you are within the fan power budget requirement. These methods shall be calculated using a midlife filter pressure drop, and there are four options in determining the fan power and each of these methods can be mixed. You don't have to follow one specific pathway.

The first method is to look - there's a lookup table which are based on what motor input horsepower. The second option is provided by the manufacture at design conditions. And the third - third method uses AMCA 208 to estimate motor and transmission efficiency at design conditions. And the fourth is the maximum electrical input power marked on the nameplate.

(pause) So here's the method that the case team used to calculate energy savings. There are many methods and achieving requirements for the Fan Power Budget. Uh and this can be bettered up design. More efficient fans, more

efficient motors or combination. The energy savings approach for this analysis only uses a better duck designed to show that it's able to meet - to meet this proposal as a conservative approach.

So, as you can see here, in the example for large office prototype the static pressure is the only value changes in the proposed design. Keep in mind, again, that other approaches such as using more efficient fans would be easier and potentially more cost effective to meet this requirement.

So, here are the prototype building model: Hotel, small office, large office, media Lab and so on. And here is the summary of the energy savings per year, with all the prototype buildings that I had shown earlier for console.

(pause) So the analysis showed an incremental cost of about 27 cents per square foot for the constant air volume system.

And about 31 cents per square foot for the variable air volume system for the large office prototype. This increased cost is due to the increase in sheet metal for larger ductwork and better fitting selection, but the gym geometrical layout and the critical paths were the same distances.

So, with cost effective analysis 29 cents per square foot was chosen as the incremental cost.

(Indiscernible02:02:28)

The average benefit cost ratio, across all eleven building types and climate zones analyzed was about 3.8. All buildings and all climate zones were cost effective, with the exception of the warehouse, hotel small, office medium, office large, retail large and school secondary in climate zone one. And the warehouse in climate zone four. But keep in mind that the case team had extrapolated the incremental cost of .9 cents per square foot. On the large office, to all the building protypes and all climate zones, which is a conservative estimate, as mentioned earlier. Since this stock work is significantly less than many buildings such as like warehouses.

And with that, do we have any questions for this sub-measure?

PROJECT MANAGER BOZORGCHAMI: We have one raised hand. John McKissack, please state your name and affiliation.

MR. MCKISSACK: This is John McKissack, Johnson Controls Application manager. Can you go back one slide in? Can you explain, so one, hotel small, climate zone 1.8. Explain what the .8 means again.

MR. BALNEG: So, this is just the cost effective - cost effectiveness ratio. Where it's considered to be cost effective, if it's - it's greater than one.

MR. MCKISSACK: And the ratio is?

MR. BALNEG: I believe it's the incremental cost over the energy savings.

MR. MCKISSACK: No cost savings. (coughs) So, yeah.

MR. BADE: Yeah, John this is John Bade speaking, and you should be aware climate zone one is coming up in the very extreme northern corner of California. It's a very cool climate zone. So the reduced fan input power was - was countered by some increase use of gas for eating. And that's why climate zone one, just pretty much across the board is - is worse than the rest of the climates.

MR. MCKISSACK: Right.

My goal was just to understand what the cells mean, that it all is savings over costs, and they're cost effective ratio.

MR.BADE: Okay

MR. MCKISSACK: Thank you.

MR. BALNEG: Any other questions?

PROJECT MANAGER BOZORGCHAMI: If any other questions, if not we do have a comment in the questions & answers and that is from Laura: "This is HR, I request that CEC release the calculation spreadsheet for the Fan Power Budget approach." I think we can do that, we'll put it on our docket.

UNKNOWN SPEAKER: Yeah

PROJECT MANAGER BOZORGCHAMI: Okay, um other than that.

(pause) Um, I think you good to - um we got one more.

Oh, I think we're good. I think we can move onto the next one.

MR. BALNEG: So, the next sub-measure is the Fan Energy Index. So, the fan energy index is a ratio of the electric input power of a reference fan to the input power of the actual fan.

So, this is calculated per ANSI/AMCA 208 at fan system design conditions. This proposal will have a scope, similar to ASHRAE 90.1.

The intent is to encourage designers to sell fans closer to peak efficiency based on given the duty point of airflow and pressure. As you can see here in the fan curve. Might be a little difficult to see the numbers, but the areas marked in red show a FEI of one or greater. So, this proposal will apply to a broader scope of fans and the fan power budget, such as fans moving unconditioned air.

So, these are new mandatory requirements. Each fan or fan array with a combined motor nameplate greater than one horsepower or electrical input power grid and have 0.89 kilowatts shall have a FEI of at least one at design conditions. This FEI value will be calculated according to

the ANSI/AMCA 208, as mentioned earlier. And this will be provided by the manufacture and third-party verified.

And there are some exceptions. Embedded fans do not need to be third-party verified. FEI is not required for listed equipment under section 110.2 or any equipment, having an efficiency standard under the 10 CFR 431. Embedded fans and factories with combined horsepower less than five or electrical input power for part one kilowatts. Circulation fans, ceilings fans, air curtains and for fans use for emergency conditions are also exempt.

So, the energy savings methodology, use the large office protype as a conservative model.

Typically, large offices are two-fan system, but currently C back models are a only one fan system at a 5.35 inch per water column and 66 percent fan advocacy.

You see their values are equal to the maximum allowable power consumption at the fan product limits for the 2019 code cycle, which serves as the baseline.

So, the standard - the standard design baseline was then converted to have a two-fan system to target individual fans for the FEI but keeping same overall efficiency.

So, shown here are the changes to the standard design for a one-fan system to a two-fan system for the typical return fan efficiency was found to be around 37

percent. Increasing that fan efficiency to 42.5 percent would increase the FEI value from .8 to one, where the rest of the values remain unchanged.

And here are the energy savings for that large office prototype and the TDV savings range from 0.492 to 0.93 kBTU per square foot. And this is yearly energy impacts per square foot.

So, for incremental cost, the case team had used a Greenheck's eCAPS software. It's like the fans closest to the FEI values used in their model assumptions for incremental cost estimates.

For the large office, the incremental cost is shown here about $1,000 and the case denotes that they believe the prices on fan selection software are apparently conservative for budgeting purposes.

So, here's the cost effectiveness for the FEI proposal and it's been found to be cost effective for each climate zone you can see here. Ranging from 1.6 and climate zone 123.1 in climate zone 15.

Any questions?

PROJECT MANAGER BOZORGCHAMI: We have one questions from Robert Glass, and the question is that - oh, it's a comment actually. (indiscernible2:10:24) noted on the presentation as five horsepower or less, but speaker noted less than five horsepower. So, which is correct?

MR. BALNEG: I'm sorry, I may have misspoken there.

It would be five horsepower or less.

PROJECT MANAGER BOZORGCHAMI: Okay.

We have one raised hand. John, I'm going to unmute you, please state your name and affiliation.

MR. MCKISSACK: John McKissack, Johnson Controls. Can you show the, uh, savings index again?

MR. BALNEG: Over savings?

MR. MCKISSACK: Yeah.

Next slide.

Next slide.

See me today. There we go. That's fine. Okay, it's cut off at the bottom. Is there any? -Uh, okay, there we go. Okay.

Looks pretty good.

Yeah, thank you.

PROJECT MANAGER BOZORGCHAMI: Any other comments? concerns?

(pause) Let's move onto the next slide.

MR. BALNEG: So, this is duct leakage and testing.

So here the change - the change proposals for each section. All duct work will meet Seal Class A to align with ASHRAE 90.1. The existing prescriptive section 140.4(l) will move to a new section for mandatory - in the mandatory requirements for duct systems to meet that sealing in

accordance to us, the California Mechanical code. The code 603.10.1. And altered duct systems will have references updated to meet the new leakage requirements.

So, for systems that do not meet the existing and prescriptive duct leakage criteria that has been moved into the mandatory requirements or is a system in a multi-family type building. These will be subjected to the duct leakage testing requirements and non-residential appendix seven. Changes to appendix seven reproduces some part of the California Mechanical Code.

And this leakage - this leak testing will be performed by certified technicians and will require represented sections of ductwork have at least 10 percent of the total installed be tested.

And currently, the Energy Commissions is in discussions with the California Building Standards Commissions to implement this language into the California Mechanical Code.

The section I mentioned earlier, 603.10.1, or the standards would reference to instead of being included into non-residential panic seven.

So here the energy savings methodology, the baseline for supply air systems are Seal Class B and the baseline for the exhaust air systems are Seal Class C. And these are compared to a proposed Seal Class A. The savings

resulted from reduced fan energy and slightly reduced heating and cooling. There are some slight heating penalties from less air movement, lowering the fan motor heat and no savings were assumed from duct leakage testing because the intent was to improve compliance.

So, here are the energy savings for the large office prototype. The energy savings for the large, medium, and the medium lab offices ranged from 2.9 to 30.8kBtu per square feet.

So here the incremental costs, the case team worked with the National Energy Management Institute; The sheet metal and Air Conditioning Contractors National Association, and the Western States cancelled to estimate medical costs to comply with the proposed testing.

This table assumes 1.5 hours for each zone tested at an hourly rate of $86 an hour. In this table, you can see the increments testing costs for office large, medium, and medium lab. So, these are the incremental cost for Seal Class A, VAV from California Sheetmetal fabricators and installers approximate about seven cents per square foot increase for Seal Class B to Seal class A, feedback from contractors approximated 14 cents per square foot for Seal Class C to Seal Class A. So, here's the cost benefit ratio for the large office prototype. For new construction, additions, and operations for duct leakage. As an example,

it was found to be cost effective in all climate zones for the large office, medium office, and the medium lab office. Ranging from, for the large office and climate zone one to 33; for the medium lab office and climate zone 15.

This one right here, in specific, just to the office large.

Any questions for this sub-measure?

PROJECT MANAGER BOZORGCHAMI: Ronald, oh, this is Payam.

We have a comment from Richie Mohan from Goodman manufacturer and the ask is, your exception one to 120.10 needs to be reworded, so there's no confusion between what's required under the 10 CFR 431, so it's no longer exempted as of FEI after January 1, 2026. So um, and they're going to submit a comment.

So, I think we could look at that and we could maybe do some cleanup of word smiting.

MR. BALNEG: (cough) Sure thing.

MR. BADE: Yeah, this is John Bade.

I'd just like to comment. That's not the intent of that language. The intent of that language is that any - First of all, all federally regulated equipment is intended to be exempt going forward. The intention of that language is any equipment that's not currently federally regulated but becomes federally regulated before 2026 will - will also

become exempt.

PROJECT MANAGER BOZORGCHAMI: Thank you.

Any other comments or concerns? Questions?

We have until October 21st. If you think of anything, you could submit it to our docket.

MR. BALNEG: Yeah, sorry, I forgot the date here.

PROJECT MANAGER BOZORGCHAMI: It’s all October 21st. What did it say, August 21st? It’s October 21st. Sorry.

MR. BALNEG: There’s some contact information, if you have any questions.

Okay, moving on to non-residential HVAC controls.

I'd also like to acknowledge those who have worked on this proposal Tim Minezaki, Yao-Jung Wen, for Energy Solutions and Neil Bulger for Red Car Analytics.

So, here's the - here's what I'll be going over

Variable Air Volume Type Deadband Airflow changes dedicated outdoor air systems and exhaust air key recovery.

So, first of all, look over the Variable Air Volume Deadband Airflow.

This is the affected sections, sections 140.42(d)2Aii

I’m sorry.

So, this is the current existing language where the Deadband Airflow should not exceed the larger option A,

or Option B. The propose language will move Option A, the 20 percent peak primary airflow, leaving only option B for the deadband rate airflow shall not exceed the designed outdoor air flow rate specified by 120.1(c)3. So, this proposal is metal reduce the complexity of code and align with ASHRAE 90.1.

So, here are the prototype buildings model for this analysis, casting considered any non- residential building prototypes that included variable air volume controls. If there was a prototype that did not include the AV systems, the systems were not modified.

The energy savings methodology standard design was calculated based on the larger of the two airflow rates, how it is in 2019 building code and it was monitored against the design outdoor air flow rates for each of the building prototypes.

And here's the summary of the energy savings per year for all the prototype buildings model per climate zone.

So, the energy cost savings over a 15-year period are shown here for new construction and additions and alterations, the incremental costs are expected to be zero as sub-measure is just changing the minimum gap or positions that point. Which can utilize existing controls. So, therefore, this proposal is cost effective across all climate zones.

Any questions?

PROJECT MANAGER BOZORGCHAMI: Ronald, I don't see one. So, go ahead.

MR: BALNEG: So, the main types of DOA units that are listed here. There are types that only mess with air recover sensible heat as with a heat recovery ventilator and lastly, there are those that active dehumidify and condition with the DX-DOAS. They're commonly used for humid climates, but in California, which has relatively dry climates are not as used often.

So, here are the proposed changes overview. The definitions will be added for DX-DOA's, integrated seasonal co-efficient of performance, integrated seasonal moisture removal efficiency. In Section 140.1E, See, they'll be additional pressure credits given for systems without getting cooling and 140 percent for he and exemption will be added for (inaudible) if they use a belief system during accordance with the new section for dollars. Which is the 144 P and so on 14.4 P is the new section for the donors. I said, and here are the general summary of the requirements, but has cooling modulating and fan speed zone, turn off and control. Limits and for our (inaudible) and for the NA, 7.5.4 this as a requirement to verify the bypass controls are present in the habit calibrated.

So digging a little bit deeper into this new

section here are some of the specifics. The doors unit has to meet the prescriptive economize or exhausted heat recovery requirements or can meet this criteria listed. Under B this would include this would include being designed and operated that no less than 150 percent outdoor air flow rate, to each his own minimum energy recovery ratios bypass controls and demand ventilation controls, depending on the air flow rate.

For these requirements. There is an exact exemption for exhausting touch scary like.

So fan systems need to have modulating fan speed control heating and cooling financial turn off when there's no calling for conditioning except exceptions are for fans using less than .12 watts per see FM during that.

Continuing on door shall be delivered directly to our enterprise space or downstream of a terminal heating or cooling coils.

Exceptions are there for active chill being systems sensible only cooling terminal units with pressure independent variable airflow regulating devices and turn on units using less than .12 watts per CFM.

Though as a mechanical cooling provide ventilation to multiple zones operating with zone heating and cooling system shall not keep the supplier above 60 degrees Fahrenheit.

Majority of the zones require cooling and lastly fan systems fan power systems, less than one kilowatt automatic see the combined fan power of one walk or CFO anything greater than one to watch show me the Power fan power limits of the current code. And just as a note, though, in the previous proposal that I had talked about with the fam current budget, if that is adopted the alternate language here will require the dough as fans with less than five horsepower. So not exceed a combined power one walk for CSM and fans greater than five horsepower will meet the requirements of the budget and the other unit. The system is not baseline system of any of the prototypes individual protests were modified to replace the standard design a perfect system with the code enhanced events for go as and separate heating and cooling systems, the systems were defined based on research of common practice in dollars building go as buildings today and to the current 2019 top 24 Part six requirements for equipment nominal efficiencies and controls. So here we have the office small office medium office larger school primary school secondary with different configurations.

So, here are more of the prototype buildings continued to this one is for retail standalone focus for retail water.

So, from those prototype buildings. The case team

developed a reference design configuration based on market research typical (inaudible) has configurations and thought today.

Since the (inaudible) units in the system have not directly been regulated and pass energy codes reference case one and two are developed and our show here.

So, under the column header, excuse me, the under the column header market typical design primer value. You can see the assumptions that are made for these references.

And the case team and modify the standard designed to reflect the most common current POS system under industry standard practice.

To have a diverse unit and as a separate heating, cooling system. So, several heating and cooling system options showed earlier with simulated depending on the specific building type

So here the energy savings overall buildings will reduce in peak demand due to projects implementing ventilation heat recovery more often.

This component and others in the system overall produces a peak intensity on the grid, making the demand flatter and more predictable.

This proposal also includes an exception for economizing if a building system utilizes advise unit with ventilation energy recovery.

Energy analysis was done to evaluate the impacts for equivalency of the system type versus a mix air system with Eric on either

Those found that the DOAS configurations or its energy efficient as these mics air systems with airside economize. There was also found to be true for systems within air source cooling system, including single zone packaged units and multi zone dx variable air volume systems.

So here the incremental costs, there is assumed to be no incremental cost for these for set fan Parliament since this is already sent the building codes for fans systems. Reheat requirements on the go as units with active cooling is considered controls configuration which can be done as part of the typical installation and would not increase the cost of the system. The incremental cost accounted for the ductwork and duck or duck configurations

And it was pointed out in the report that seven cents per square foot is a conservative estimate 70 cents per foot sorry is a conservative estimate that is potentially overestimated by a factor of two.

Bypass or frequently controls and modulating fan speed controls were also included in the cost and this estimate would be the same as the first class for an addition or alteration to our system.

So, compared to the baseline of typically installed those systems is proposals county cost effective in all time zones. Here you can see it ranges from 3.5 to 5.2 for new construction.

Alterations. We're also found to be cost effective and I'll climate zones and this ranges from 3.3 to 4.6 show here.

And with that, I'll take any questions for the last proposal.

PROJECT MANAGER BOZORGCHAMI: So, Ronald. Can you go back to slide? I think the number is 122 on the bottom.

Yeah, one of the questions that came from john and I apologize, with the last name, Mick McCabe

From Johnson control believe it is — Is on your You talk about 150 percent design. What does that mean, is it this slide, or the one?

MR. BALNEG: Previous

PROJECT MANAGER BOZORGCHAMI: Previous all right there on subset. So, what does that 150 percent of the some of the other airflow mean?

MR. BULGER: This, this is Neil Bolger from red car analytics. That is hundred and 50 percent of the ventilation air flow rate of all the spaces served by the DOS unit.

PROJECT MANAGER BOZORGCHAMI: Okay, thank you. Also, John has another question. Are you working with HRI

and HR I 920 team? 60 degrees Fahrenheit reheat does not doesn't meet the 920-testing standard

MR. BULGER: We have — This is Neil, again. We have spoken with them. But if you would like to connect offline. I'm happy to discuss this, we did recommend the 60 degrees F based on language that's an extra 90.1 as it relates to reheat dx to us systems. So, if this needs to be modified in some way, we, we would welcome input.

PROJECT MANAGER BOZORGCHAMI: Okay, so, John just raised his hand, so I'm gonna on allow him to speak. Go ahead, Jon.

MR: MCKISSACK: Thank you. Appreciate it. So back to the design operated—

PROJECT MANAGER BOZORGCHAMI: Sorry, Jon. I apologize state your name and affiliation.

MR: MCKISSACK: Sorry, Jon McKissack with Johnson Controls application engineering. So, looking at the hundred and 50 percent design and operate. Are you saying select a unit that can handle 150 percent of the air, even though that you're not running there? I'm just trying to understand what that means. Why not 100 percent?

MR. BULGER: So, this is Neil again I can support this question and forthright car analytics. So, the intent here is that unit is capable of designing and running at 150 percent of speed and effectively. If it was operating at

ventilation only at 100 percent it would use less fan energy, or it would also have higher abilities to economize if configured to economize and bypass the recovery. So effectively, it has to do with reducing fan energy and being able to further increase free cooling from higher amounts of ventilation. We have been debating the language around operates as well as designed.

So, you can see the final language in our recommended case report that we posted.

MR. MCKISSACK: Okay so, operate is differently, is different than design. So that's, that's a big difference. You could — really short, you could say I have a 1010 unit or 15,000 unit you know both can do that. So anyway, you understand what the problem is there.

MR. BULGER: So, did we answer your question then, that it’s designed to—

MR. MCKISSACK: Yeah, yeah, you I'm saying you want to select a unit that can handle 150 percent even though you're running it at once. That's what you, that's what — that's, that's right, that did I interpret that correctly?

MR. BULGER: Yes, here we did say this, it does say design and operated at the highest of the airflow. As the case team were recommending, we have made enhancements to this that a unit could be designed and at 150 and not operated at 150, it could be operated either at 150 or 100

percent, yeah.

MR. STRAIT: And actually this is Peter straight to the California Energy Commission, to be clear, the, the building standards that were, that the energy code is a part of, do not regulate operation that is we are, we are setting design standards for buildings to make sure it is designed to have certain capabilities and in a case like this, what we're saying is

We have a calculated outdoor air flow rate that's required for zone. And that's a minimum. But we want this, the unit to be capable of being operated at a higher rate if need be, for the reasons that the case team are citing. So I agree that the language where we say operated at is, is misleading and we're going to use different language for thar or the actual regulatory text, but what we're trying to do is make sure that this DOAS system has a capacity that is not just at the bare minimum needed for air flow rate for a given situation.

MR. MCKISSACK: And you just summed it up. Clearly right there, that, that, that handles it.

MR. STRAIT: No problem.

PROJECT MANAGER BOZORGCHAMI: We have a question from Craig Bender. What is the background and the reason for 150 air flow?

MR. BALNEG: I think we kind of went over that.

PROJECT MANAGER BOZORGCHAMI: Kind of went over. Yeah, we did. Okay, so with that. So, Ron, I think we just did the questions.

MR. BALNEG: Okay so tonight. Okay, moving on, exhaust air recovery. So, this proposal will have any section and walk 3.4 and you'll have the same changes in the reference dependencies, as it goes proposal and Any 7.5.4. So, this proposal is modeled similarly after ASHRAE 90.1 but these are adapted scalpel and climate zones and will also include higher energy recovery. Requirements sensible energy required recovery requirements conclusion of bypass damper and also apply to non-critical areas for healthcare facilities, the non-res, the non-res appendix will also have a new requirement verified by pastor falls our president can calibrate.

So, the energy savings methodology, the baseline assumption are compliant with 2019 code the modifications were made to include exhaust air heat recovery with these assumptions. Energy recovery when outside temperatures were or above 75 degrees or below 55 degrees. It's placating exchangers 60 percent sensible energy recovery ratio and static pressure was added, based on the calculation, the current code for the energy recovery device. Other than it's I think it's listed under as other than CLO run around the standard question.

And so this pressure adjustment is constant throughout the simulation and the analysis, but in an adjacent proposal, the, um, the pressure will change to (inaudible- 2:36:37.9). But it was not modeled as one in this analysis as well. So, the casing is the office area and open plan. The casing uses the office area. It's an open plan space function to adapt this ASHRAE 90.1 exhaustive heat recovery tables to the California climate zones.

This was chosen as a basis for the analysis because of its modern internal lows and it's represented as the bar space function in terms of the forecast and building area.

So here the results shown as a service box for climate zones well in Sacramento one of one of these plots with ASHRAE's office schedule of 4644 hours of operation and one for continuous operation, which is 24 hours and.

So, these parks were developed for each client zone to determine the professionals in which this proposal is cost effective to create the California specific table.

So, here's the proposed table that was adapted to the calculations of climate zones. This is split between systems that will operate greater than or less than 1000 hours per year, which is that threshold of being continuous in that operation. Are the prototype buildings us and modeling the energy savings of the postcode office large

media retail large school secondary?

And here are the incremental costs for this proposal, which include the heat recovery devices with bypass dampers and controls heating and cooling equipment boilers air and water cool chillers materials and labor costs included worthy reduce costs from right sizing the system and take over regression dependent on the client. So that's specific to each building models outdoor air. Additions and alterations are not expected to be different than what was proposed measure was found to be cost effective in all the climate zones that they are being required and utilizing the surface analysis describing the presentation applying these corresponding design airflow and outside here attractions that particular DC ratios to the content models results in the benefit cost analysis, shown here climate zones. I did not have sort of same models that were impacted by the new requirements were admitted

So overall the benefit cost ratio was better than one where the requirements applying, and another added benefit is that the expected water savings is a yearly water savings is about 90,000 gallons.

And so, do we have any questions for this proposal.

PROJECT MANAGER BOZORGCHAMI: We have one raised hand Matthew, when I unmute you, please state your name and

affiliation. Thank you.

MR. FRIEDLANDER: Hi this is Matthew Freelander with Renew air. My question has to do with the requirement that played exchangers have a bypass is, um, I guess I've got two questions there. One has to do with the pressure drop allowed through the bypass and another has to do with whether a bypass required when a separate air handling system would be providing economize function.

MR. BALNEG: Um, Tim, you — do you wanna respond to that?

MR. MINEZAKI: Hi, Matthew, this is Tim Minezaki, I'm actually going to ask Neil who, who provided some of the, um, functional testing apart from this.

MR. BULGER : Yeah, so this is Neil again from current politics. So two questions, I believe, and please correct me if I'm wrong, but the first one: the bypass pressure credit or pressure allowance, we did not set a different pressure allowance than what the system would otherwise be operating at and this was somewhat intentional, given that different models, we reviewed use either a may use a low pressure drop, or may maintain the same pressure drop as they would otherwise through a core. Given how they buy control unit so in this instance, we were conservative and assumed the same pressure drop to be less we would, we didn't change the energy savings in that regard. And then on

the other question about if a system was operating in parallel to another system that provided fully or side economizing, I don't think that has been fully considered in terms of, you know, would that still necessitate the bypass for ventilation.

I think if you would like to

Discuss offline and email Tim or myself, you know, we would be open to understanding better.

The frequency of that or you know what that might need to look like and yeah.

MR. FRIEDLANDER: Was just gonna say my thesis is that, when they're in some applications, an RV is applied as someone standalone, but it is serving a space. For wench and error handler is also providing heating and cooling and when that error handler is required admin economize or — That's a great way to do the economizing can you and you simply during the year be off during that period. Next, there are applications where that could work. I can't tell you how common that would be in your market.

MR. BULGER: No, yeah, I — yeah from speaking as one of the case authors, that’s a great insight and I think a scenario we had not yet considered so thank you for that.

MR. FRIEDLANDER: Thank you.

PROJECT MANAGER BOZORGCHAMI: Thank you guys. We got one comment question in the question and answer, that’s

from Craig. Craig Bender since schools are open so many fewer hours than the retail then, the exhaust air heat recovery or more cost effective. It's surprising that the exhaust air he covering are more cost effective in schools, then retail. Can you explain that?

MR. MINEZAKI: This is a Tim Minezaki. Ronald, can you scroll back to the results page.

I think so, like maybe one more for yeah.

So just for clarification, Craig, are you, are you kind of comparing this climate zone one here retail large to this, uh, school secondary model here.

PROJECT MANAGER BOZORGCHAMI: Since it’s written and I don’t see a response, I’m going to say yes.

MR. STRAIT: Also, if there are several zones where it is cost effective for schools but is in a for large retail. I think that's also part of the question.

MR. MINEZAKI: Oh, ok so —

MR. STRAIT: Just clarifying that. They're assuming yeah, if you can see that.

MR. MINEZAKI: Thank, thank you, Tim Minezaki, again, so the reason is a little bit more muddled when you dig down into the details.

There are multiple air handlers on all of these different prototype models, not just one air handler. And if you go back to the requirements table that we are

recommending here. It's a trigger based on the particular requirements of the air handler. So, in some cases, it's not really an apples to apples comparison on, say, a retail model for person to school model.

MR. BULGER: This is Neil, I just might recommend I would suspect that the retail model in the coldest climates zone has a higher fraction of outside air and so it triggered exhaustive heat recovery, whereas in warmer climates that fraction would be less than ff we looked into the models. I don't think it would have been triggered.

Tim, is that what you're saying?

MR. MINEZAKI: Yeah, correct. So, so looking at this table of exhaustive heat recovery. Different prototype models and different air handlers within those prototype models. at different columns here going left or right. Based on the use cases.

So, it is a bit of an exercise to dig deeper into the models to the question presented. Okay, thank you. Thank you. Thank you.

PROJECT MANAGER BOZORGCHAMI: Okay, thank you. Thank you. Thank you. And the NA's are just not applicable or not required in the previous slide because it doesn't show cost effective, correct?

MR. MINEZAKI: This Tim Minezaki and I am yeah that's — that is correct. Okay. The, the requirements for

climate zone one and climate zone two are quite different, or can be quite different, depending on what you're looking at, but more it's the auto sizing of the air the air handler’s region.

PROJECT MANAGER BOZORGCHAMI: Thank you, Tim. Thank you, Craig for the question. Um, any other? With that, I think, Ronald, you can move on.

MR. BALNEG: Yeah, so for the comments for today's workshop again.

Please submit them by October 21 but yeah here's the link.

And here is the contact information again for me, Payam, and (inaudible).

And with that, I am done with my presentations. Thank you, everyone.

PROJECT MANAGER BOZORGCHAMI:

Thank you everyone. So with that, I think, and if there's no more further questions or comments, we will be posting the slides on the Commission webs on our commission docket here shortly by tomorrow morning and everything that we presented will be posted and all the links and on the emails and so forth, will be available for you

And with that, thank you. That ends today's meeting.

CERTIFICATE OF REPORTER

I do hereby certify that the testimony in the foregoing hearing was taken at the time and place therein stated; that the testimony of said witnesses were reported by me, a certified electronic court reporter and a disinterested person, and was under my supervision thereafter transcribed into typewriting.

And I further certify that I am not of counsel or attorney for either or any of the parties to said hearing nor in any way interested in the outcome of the cause named in said caption.

IN WITNESS WHEREOF, I have hereunto set my hand this 19th day of October, 2020.

MARTHA L. NELSON, CERT**367

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I do hereby certify that the testimony in the foregoing hearing was taken at the time and place therein stated; that the testimony of said witnesses were transcribed by me, a certified transcriber and a disinterested person, and was under my supervision thereafter transcribed into typewriting.

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I certify that the foregoing is a correct transcript, to the best of my ability, from the electronic sound recording of the proceedings in the above-entitled matter.

MARTHA L. NELSON, CERT**367

October 19, 2020