STAFF WORKSHOP

BEFORE THE

CALIFORNIA ENERGY RESOURCES CONSERVATION

AND DEVELOPMENT COMMISSION

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In the Matter of:                 )
                                  )
2008 Building Energy Efficiency   ) Docket No.
Standards                         )
                                  )
Re: Goals, Plans and Expected     ) Non residential
    Scope                         )
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CALIFORNIA ENERGY COMMISSION

HEARING ROOM A

1516 NINTH STREET

SACRAMENTO, CALIFORNIA

TUESDAY, OCTOBER 25, 2005

9:35 A.M.

Reported by:
Peter Petty
Contract No. 150-04-002

COMMISSIONERS PRESENT

Arthur Rosenfeld, Associate Member

STAFF and CONTRACTORS PRESENT

Elaine Hebert

William Pennington

Mazi Shirakh

Randel Riedel

Martha Brook

Bruce Maeda

Gary Flamm

Norm Bourassa

Charles Eley
Architectural Energy Corporation

James Benya
Benya Lighting

Jon McHugh
Heschong Mahone Group, Inc.

ALSO PRESENT

Don Aumann
California Lighting Technology Center

ALSO PRESENT

Joe Huong
Lawrence Berkeley National Laboratory

Hashem Akbari
Lawrence Berkeley National Laboratory

Steve Blanc
Pacific Gas and Electric Company

ALSO PRESENT

Thomas M. Tolen
TMT Associates

Jon Null
WattStopper

Fred Salisbury
Pacific Gas and Electric Company

Andr, O. Desjarlais
Oak Ridge National Laboratory

Tim Kersey
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Richard J. Gillenwater
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Lee Shoemaker
Metal Building Manufacturers Association
Cool Metal Roofing Coalition

Kevin Kelley
Duro-Last Roofing, Inc.

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Gregory L. Crawford
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American Iron and Steel Institute
Cool Metal Roofing Coalition

Charles E. "Chuck" Praeger, III
Metal Building Manufacturers Association
Cool Metal Roofing Coalition

John A. Goveia
Pacific Building Consultants, Inc.
Asphalt Roofing Manufacturers Association

ALSO PRESENT

Chuck Scislo
National Roofing Contractors Association

Reed B. Hitchcock
Asphalt Roofing Manufacturers Association
Roof Coatings Manufacturers Association

Tim Hart
Duro-Last Roofing, Inc.

Douglas Mahone
Heschong Mahone Group, Inc.

I N D E X

P R O C E E D I N G S

9:35 a.m.

MS. HEBERT: Good morning, everybody, good morning. Welcome to the second day of our workshop on the 2008 California building energy efficiency standards.

I'm going to remind everyone that we are being broadcast over the internet, so if you speak and address the audience please make sure you get close to a microphone so the internet audience can hear.

Those present, if you haven't signed in there are sign-in sheets out on the table outside this room. And it's a voluntary thing, but it helps us to keep in touch with you as these proceedings go forward.

Today we're going to concentrate on nonresidential topics. And the morning is going to be dedicated to the five-minute overviews of a number of topics that the Energy Commission has identified that we're interested in studying for the 2008 standards.

We're going to look at PIER projects first; that's the Energy Commission's Public Interest Energy Research. Then we're going to look at the CASE initiatives, codes and standards enhancements from the utilities. I think a representative from PG&E will be introducing those. Then we'll look at the rest of the CEC projects, and Charles Eley will take over at that point.

So, I'm going to ask Don Aumann of the California Lighting Technology Center to step forward and talk to us about lighting.

MR. AUMANN: Thanks, Elaine. As Elaine said, I'm Don Aumann from the California Lighting Technology Center, and I'm here to talk about four different lighting technologies that have come out of the PIER program, Public Interest Energy Research program, as she mentioned.

So I just gave a little snippet here, an overview. There have been many projects and products that the PIER program has developed, and today I'm here just to talk about these four that, we feel, are the best candidates for the 2008 standards in the commercial sector. And the caveat here is the full code analysis hasn't started, so I'm here just with a little teaser information to get you excited about them.

So the first one is the integrated

classroom lighting system, ICLS. This is a lighting system that uses direct/indirect lighting and has lower energy use than many lighting systems that are out there. It's been very successfully demonstrated at, I think, nine classrooms in California. And it's commercially available.

The teachers who have used this thing just love it. So, it's -- one of the key things is it's a system integrated controls with the high performance lighting system, itself. It's currently available as a system only from one manufacturer, but the truth is that these are off-the-shelf components, and any other manufacturer can put this stuff together. So I'm terming it state-of-the-shelf. It's not even the bleeding edge, it's just state-of-the-shelf. And the specifications are publicly available of just what's in this thing, so there's no secrets here.

Key features is, as I said, direct/indirect lighting; there's a whiteboard lighting that lights up the board for the teacher to use. And the key is using high-performance components. So it's using super T8 lamps, premium electronic ballasts and this high reflectivity paint. So they're able to get lower-than-normal watts per square foot, which I'll give you in just a minute.

And another key thing here is this AB mode. Classrooms, as we know, in a lot of environments like this today we're using a projector screen, and if we turned off all the lights, even though I'm a very exciting speaker, you guys, some of you would go to sleep. So the same thing happens in classrooms.

So, this AB mode allows the teacher to keep the lights on at a lower level while still providing a better light for the ambient.

Integrated occupancy controls, as I mentioned. And one thing the researchers found is that the teachers are grading papers, and that there's tests going on, and that the lights would go off because the space is so quiet. And so they developed this one-hour quiet time override for tests and the grading periods.

So they're getting by with about .8 to .9 watts per square foot. That's total connected load. There's no occupancy sensor credits on this at all. And the additional savings come from the controls.

The cost is quite competitive, about

$2.70 a square foot for the basic ICLS. And the manufacturer estimates that the standard recess trougher systems are about $2.80 a square foot. And as mentioned, these folks are very happy. In fact, we did some tests in classrooms, and the neighboring teachers who didn't have it were fighting because they wanted to get the classrooms with the better quality lighting.

So, in summary, we think that this is a code opportunity to reduce the lighting power density in classrooms. It seems like 1 watt per square foot is clearly attainable. And if they get control credits, it would be even less. And there could be requirements for occupancy sensors.

And, again, as an integrated system there's an opportunity to ease the design and specification and installation process and make it even easier for the end users than it has been in the past. So that's number one.

Number two. Bilevel stairwell fixture. The idea here is that stairwells are unoccupied most of the time in many buildings, especially highrises, except for those avid athletes that like to run up the stairs at lunchtime. Anybody here that does that? Great, one, two, three, all right.

So, quite honestly there's a lot of energy savings opportunities in stairwells. And so there are technologies available that provide a low-level of lighting during unoccupied times, and full lighting level during occupied times.

This has been demonstrated in California, and it's acceptable to the code officials. Three manufacturers, and actually just this morning I found out about a fourth one I believe is available, and there's probably even more, and there's other variations on this, but these are just three that I happen to mention.

But just again, demonstrate the fact that it's commercially available from several suppliers. The LaMar product, which is the one that the PIER program evaluated, and did some demonstrations on, is relatively new on the market, released just a couple years ago. And it's pretty expensive at this point, but there are other versions available, as I said.

So, again, an integrated sensor similar to the ICLS. To make it -- I mean you can go and put occupancy sensors in any systems out there right now, but this integrated feature makes it much easier. You just yank out the old one, put in the new one.

There are various options that are available for different lighting needs, depending on what the end users need, and voltages, sizes, two-foot, four-foot, one-lamp, two-lamps. Different low-level outputs that are available, 5 percent, 10 percent, 33 percent of full-light level.

Meets the code requirements, both the new ones and the existing ones. That was something that again the research was kind of uncovering these things as it was evolving. And so we were just investigating this to insure that it was going to continue to meet all the code requirements.

Key benefits. As I said, provides light only when it's needed. I mean that's the key issue. Stairwells are unoccupied, we found only 10 to 20 percent occupancy in three California office buildings. And the UC Berkeley campus where those students, they need their exercise a little bit more, there's a little bit higher there, 33 percent. Also they work on the weekends more than the folks in office buildings do.

On the order of 50 percent energy savings in a new building, two- to eight-year payback with the relatively expensive fixture that, are lower cost versions coming, we think.

So in summary we think that there's a code opportunity to require high/low lighting systems in stairwells and have integrated occupancy sensors. So, that's number two.

Number three. A similar concept. You're going to see a theme here. Occupancy sensors integrated into systems. So this third one is what we're terming the smart bathroom lighting. And the idea is that there's an integrated night light and a vacancy sensor built into either the fixture or there's a wall switch version, as well.

And actually is Jon Null here? Did you stay at the DoubleTree last night? Is that where you ended up?

MR. NULL: (inaudible).

MR. AUMANN: So the DoubleTree, which is just a few miles away, has 400 of these things. And people actually wrote notes into the management that said, thank you. How many times do you get somebody writing a note that says thank you. So, because of this night light.

And I'm just here to entice you with these things and I won't go on about of all the really great benefits. But the key thing is that this integrated nightlight makes the occupants in these hotels not have to leave their light on all night long.

So the hotel is one application that it's been tested in. And we've also got versions being tested in assisted living facilities where people leave their lights on a long time, as well. This fall we're doing some dorm testing at some of the UC campuses.

So there are two manufacturers that make the wall switch version. And there's one fixture that's in preproduction at this point. I've listed the costs here, and there are other manufacturers that are interested in this concept. this view here gives you a little idea of the nightlight. There's the little LED up there; it's only a few watts. And it provides enough light so that when it's dark you can go in there and do your business and not have to turn on the light and wreck your night vision.

So, key features. A one watt

nightlight. And, of course, you know, you could say well, you just go plug one in. I mean I have them in my house, so my kids get up in the night and they can walk around.

But things do walk away in hotels. And so this thing is bolted down and doesn't walk away. And it provides that permanence.

Again, the integrated aspect of all this is that it eases the design process and the installation process. It makes it much lower cost to get that thing installed and more cost effective.

The version that is available has a one-hour off time to address any concerns of the lights going off when you're in there doing your business. And if you're in there for more than an hour, well, that's another issue.

And a really nice thing is that that's available, this product, is that there's an integrated battery backup. And the hotel people were very very excited about this one. And, in fact, Michael Siminovich from our Center was in a hotel when the power went out. He said, dog gone it, where's my fixture. There was no light in that bathroom or in that room at all. And, anyway, that one-hour battery backup is a nice value for the hotel people to offer their guests.

These things very impressively get about 50 percent energy savings, so the big secret here is that -- and I'm going to ask for a poll here -- how many people leave their bathroom light on all night long to provide a nightlight? Nobody? Only one person did I hear?

Okay, well, I'm amazed. I never heard of this happening before I saw this -- oh, I saw, I won't say his name; I saw a hand go up there.

So it turns out that a surprising number of people leave their bathroom lights on all right long to provide a nightlight. And then they go in, and you know, your night vision gets wrecked and then you walk back out. And so this system here provides that night light and you can turn off your lights.

So, let's see, I guess that's about it. I've said most of these other things already. So I think there's a code opportunity to require occupancy sensors in bathrooms and require integrated LED night lights. And these night lights will be very very low wattage, only 1 watt for the wall switch version.

So, you've been very patient. This is number four. Everybody that was here yesterday saw this one already, but for those that didn't, this is the what's termed hybrid LED exterior fixture. This has been termed porch light, which is appropriate for the residential market. But in the commercial or institutional market this can go alongside any kind of entry door. For example, we're going to be testing it in college dorms where there's lots of entry lights for these things.

So the idea is that there's a 5 watt LED light that operates all night long. It's a photosensor control. And then when somebody walks up to it the occupancy sensor triggers the full light level.

And there's two versions available. A post-mount for walkways and wall-mount for buildings.

A couple different versions available, as I said. The wall and post-mount version are commercially available from one vendor at a relatively high cost right now. But a lower cost version, a less than half the cost, about $85, we're expecting to be available early next year.

And we're demonstrating that one this fall.

Again, a publicly available specification so that anybody else can build this.

There's a couple of other variations that are kind of in development. This universal mounting plate with this integrated sensor and the LED component is possible sometime next year, that would allow this to be used with any fixture.

And also the traditional two-headed par lamp that's occupancy controlled. There's an LED integrated in there, as well, that would provide continuous low-light levels.

So the key features is that this thing will beat CFLs, and that's kind of the option that's out there right now for low-light level -- I mean, sorry, for low-energy use, 13 watt or even higher CFLs versus a roughly 5 watt LED.

And you get this kind of built-in security system when you walk up and the full-light level turns on. LEDs last 10 to 20 years. And, again, the integrated component of it, to make it so it's easy to install.

We think that the code opportunity is some method of stimulating the use of these high/low exterior lighting systems to provide low light levels continuously and then higher light levels only when they're needed.

So, in summary, all of these products are commercially available. In most cases, from more than one supplier. And there's, in a number of cases, additional suppliers that are available and they're in discussion.

And we think that there's a number of opportunities here to provide both energy savings and, in a number of cases, improved quality for the occupants, built-in security systems, built-in night lights, and some of those kind of features.

So, that's about it. Oh, and let's see, there was one question yesterday. I don't see Gary Fernstrom in the crowd here, but perhaps one of you PG&E folks could carry the water back to him.

Gary asked about the efficacy of the LED systems with the 40 lumen per watt criteria to meet the definition of high efficacy. And I talked to our LED guy last night when I went home. And yesterday I felt confident, I was sure that the 40 lumen per watt was available. But I wasn't sure if that included the driver energy.

And so the question is yes. Depending

on the combination of the drivers and the lamps, of course. And our guy was kind of fleshing out my knowledge of how the drivers and the lamps, the LEDs, work together. And you can overdrive them and kill your efficacy, or you can underdrive them and greatly improve your efficacy.

So there's just a range in the manufacturer; they can decide on what combination of driver and lamp that they want to put together. And what efficacy levels they want to meet.

So that's my impression of it. There may be other people here that have additional technical details on the 40 lumen per watt question. But that's what I have.

Mazi, I think you had a question?

MR. SHIRAKH: It's actually Charles' question. The hybrid exterior lighting, the LED portion, is that on a daylight sensor?

MR. AUMANN: Yes, there's a photocell control so that the LED operates only at night.

MS. HEBERT: I have a question, also. And I forgot to introduce myself earlier. Elaine Hebert from the Energy Commission.

For my own edification, are occupancy sensors, do they sense motion or body heat or something else? Just tell me a little bit about how that works.

MR. AUMANN: There's at least three or maybe four different technologies. Now, I got an occupancy guy in the place here, so I'll rely on you, John, to -- or anybody else that can.

But, so there's ultrasonic that sense motion by a difference in the sound waves coming in. There's the PIR, passive infrared systems which sense a difference in the heat that's out there. And in the passive and microwave ones, and I thought there was one other technology, but --

UNIDENTIFIED SPEAKER: Microphonic.

MR. AUMANN: Microphonic?

UNIDENTIFIED SPEAKER: Sound.

MR. AUMANN: Okay. So there's different technologies. Gary.

MR. FLAMM: Gary Flamm with the California Energy Commission. What I'd like to know about LEDs, to me there's two issues. One is the input wattage. And it's my understanding that there's no industry standard for testing that's industry accepted.

The second issue is the efficacy. And I don't think there's a standard at what temperature, is it 25 C. One of my concerns is that if somebody takes a lamp, a LED they're saying is 40 lumens per watt, and they put it in a recessed can; and it's operating at very high, you know, 120 degrees or something, how will it perform.

So one of my goals for the 2008 standards is to get our arms around LEDs, both the input wattage and the efficacy. And try to flesh out an industry standard that we can reference. Thank you.

MR. AUMANN: Well, Gary raises what is probably the crux of the LEDs, and that's the thermal issues. And my understanding is that the manufacturers rate them at 25 C junction temperature. And that they rarely operate in that condition.

But this is a reminder of how fluorescent systems were rated. And I remember back in the mid '80s when those of you were doing the advanced lighting guidelines and all that stuff, and finally getting some information out about the thermal impacts on the recessed troughers.

And that, you know, the lamps were rated at 25 degrees in free air; that was the ANSI test for fluorescent systems.

So, similarly the LEDs are rated at 25 degrees junction temperature, and they operate much higher. The penalties and the ranges are much larger than they are with fluorescents.

So, I think it'll be a challenge to specify performance at, what are you going to pick, 40, 60 degrees C?

But I think the key is light out. And they can deal with the thermals however they want. But you care about light out. And I know that it's easier to regulate watts in than it is to regulate light out. But I just thought I'd throw that out there, that it, I think, is the larger challenge with LEDs to figure out the, you know, a temperature rating.

So, I think that there's a lot of work going on in the subject of performance and trying to standardize some of the information. Life is another question, you know. What's the definition of lamp life, you know, 100,000 hours. And when do they die; they don't die; they last forever.

And so interesting topics. So I think I've just reinforced your impressions and maybe gave you a little bit of data on how they operate and how they're rated. But I don't have the answer on a golden platter for you.

Anything else?

MS. HEBERT: Other questions? Discussion? Joe.

MR. HUONG: I'm Joe Huong, LBNL. And I'm not sure if this is the right time, but I wanted to bring it up, because this is more of a lighting control.

And really I'm mentioning this to sort of ask Art to pitch in on this, because it's a topic that Art and I have discussed, which is if you go to most foreign countries, the hotel rooms have a card key switch, where when you get into the hotel room you put the card key in, and then it turns on all the lights.

And that's almost universal in Southeast Asia, in China, in North Africa, a lot of places I've gone. And I'm wondering if that's something that could be considered for the title 24 standards.

MR. FLAMM: This is Gary Flamm with the Energy Commission. We've been working with Dr. Siminovich at the Lighting Technology Center and a representative from the hotel industry, Jim Abrams. And the goal is to get a demonstration project done. And we were hoping to have that done before the 2008 standards process started. But it hasn't been done yet. But it's still something we're looking forward to doing.

So there is an effort to at least get a local demonstration project done.

Commissioner Rosenfeld, did you have something to add to that?

COMMISSIONER ROSENFELD: No, Joe's right. Joe Huong is right; it seems to be done all over the world, certainly in Europe. Almost never here. We certainly should do this demonstration.

MS. HEBERT: The Red Lion near the Arden Faire Mall has such a system. I don't know if in all of its rooms. But SMUD, I think they worked with SMUD, our local utility here.

MR. BENYA: Jim Benya, Benya Lighting, consultant to the project. One of the things I'd like to bring to everybody's attention is we are specifying right now a product for a hotel we're doing in Calistoga that is a occupancy-sensing system instead of a motion-sensing system.

One of the biggest problems with sensing in particular is most of them rely upon some sort of motion, and repeated motion. In other words, within 20 minutes or whatever the timeout is, something's got to remind it someone's still there.

A company has developed a occupancy-sensing system in which it somehow remembers that there's a warm object in the room, even if it's not moving. And then is able to tell when the room is truly empty. It's already been developed for hotel systems. And we're going to be trying it for the first time in my career on this project that's now under construction.

So, in fact, there's another completely alternative technology not developed, you know, particularly here. But there's been a number of studies that say that the typical American resents the card key system that the rest of the world doesn't seem to mind so much.

The hotel industry has pooh-poohed the idea for a long time. This is a system the hotel industry is actually very interested in because in addition to it being an energy control system of great capabilities, it also has the ability to be a security system and several other things that they desperately would want.

So it improves upon, in other words, the card key system by insuring the room is either occupied or vacant. So we will be talking about that as part of our proceedings for the standard. I'll also have some firsthand experience to share with you all.

Thank you.

COMMISSIONER ROSENFELD: I'm sure the CEC doesn't care how we get the lights and the air conditioning off, as long as they're not running and the room is 58 degrees when we walk in. Thanks.

MS. HEBERT: Okay, thanks, Don. Before we bring up the next PIER presenter I'm going to take a step back and do some introductions. I realize there's a slightly new audience today, and possibly also listening on the internet.

So, again, I'm Elaine Hebert or Hebert, whichever mood you're in to pronounce it. I'm the Contract Manager for the contract we have with an outside party, Architectural Energy Corporation, who is helping us develop the 2008 standards.

Commissioner Art Rosenfeld is with us

today; he's one of the two Commissioners who oversees the work of energy efficiency here at the Energy Commission.

To my immediate right is Bill Pennington; he's the Project Manager for this project. Several persons to my right here, Mazi Shirakh is the Technical Lead for the Energy Commission on this project. And in between them is Charles Eley, who's leading the team at Architectural Energy Corporation. Randel Riedel is helping with our audiovisual today, and playing an important role in getting the presentations up quickly. Thank you, Randel.

I also want to remind folks that we are being recorded today, and the transcript from this proceeding will be available in a few weeks, and we'll post it to our project website.

And if you do come to speak to the microphone and you didn't yesterday, please have a business card handy to give to the recorder so he will make sure to get the spelling of your name right and your affiliation correct.

And when you do come to the microphone, please introduce yourself and tell us your affiliation.

Next I'm going to have Norm Bourassa come to the podium. He's an Energy Commission colleague in the PIER program. And he's going to talk to us about underfloor air distribution and displacement ventilation.

MR. BOURASSA: Good morning, everyone. I'm going to do a real quick overview of underfloor air distribution systems. There's been a lot of work in this area in the last four years. And to a lesser extent there are some synergies, there are some similarities with displacement ventilation systems. So we're going to discuss that, as well.

With respect to the standards, as I said, there's been a lot of research done in these two system types in the last four years through PIER. And the results are showing that there's a significant amount of energy savings, as well as a potential improvement in ventilation effectiveness. So we're proposing to look at it for either a compliance credit, or maybe even a requirement for certain appropriate situations.

A quick overview of the differences. This is a typical overhead mixing system where you would see the supply air and the return air, the extraction air, occurring all at the ceiling level. And we're looking at supply temperatures in the 55 to 57 range for a typical VAV system.

Here are two graphics for underfloor on the upper left, and displacement ventilation on the right. The idea here is that the supply air is supplied down at the floor level and underfloor in an underfloor plenum. And we typically see supply air temperatures in the 61 to 65 range; and 63 to 66, a little bit warmer for displacement ventilation. And that's the principal source of the energy savings that we see in these system types. Without getting too technically detailed I think that's all we need to discuss.

In this area, here's an example of the stratification. The fact that the air is introduced in less of a mixing mode, you get a stratification in the space. Warmer air up towards the top, which tends to be more polluted. And cleaner, more comfortable air down at the bottom. And this is the principal source for the improvement of indoor air quality.

And displacement ventilation systems, there is well documented improvement in the ventilation effectiveness of the space, -- that's not exactly determined yet. But there so far is a lot of empirical data that that is the case.

So, just to summarize very quickly some of the benefits. The top one that we're concerned with, of course, is the energy use. And then the improved ventilation efficiency.

With respect to the marketplace there are other benefits in the occupant comfort. A lot of the researchers at the Center for the Built Environment at UC Berkeley, they've been the principal researcher in the UFAD area, and they've done a lot of comfort studies and determined that occupancy tend to prefer these systems better.

The life cycle building costs are reduced. And the biggest one here with respect to the office facilities, especially buildings that have a lot of churn, is very easy to reconfigure the floor plans.

And then the floor to floor. These are not as important to standards, but the market is important nonetheless.

A specific example of energy savings for a UFAD in particular has been the field study that's been done in block 225 in the Capitol East End Project, I believe that -- they did a comparison of the measured energy from the block 225 metered data against 14, I believe they're VAV systems, 14 California buildings. And they're seeing significant energy savings.

And that's pretty much it that I'm going to present at this time. I'll do as best I can to answer any questions that anyone has.

MS. HEBERT: Yes, Jon, please come forward.

MR. McHUGH: So, what are your -- Jon McHugh, HMG -- what are your proposed changes to the ACM to account for the benefits of displacement ventilation?

MR. BOURASSA: There aren't any specific proposals at the moment. This is just basically introducing that we're going to explore how we can do that, going with either a compliance credit or, as I said earlier, there may be some specific applications where it is so demonstrably better than others that it may be required.

We're introducing that we want to explore finding a way to calculate and account for what is becoming a more demonstrated energy savings from these system types. And we'll do a more extensive presentation of that in April of next year. So this is very preliminary.

MS. BROOK: (inaudible).

MR. BOURASSA: Right. Martha just reminds me I should point out that the basis for all of this -- all of this research came out of developing models of this.

The core ability to model the first principles that are occurring with these system types were developed through PIER research. And what we're proposing to do is adopt those core algorithms into the ACM. And we're looking at how we can do that at the moment.

As it happens, we currently have model implementations in EnergyPlus for displacement ventilation, that's why it's included in here. And we are scheduled to have the implementation of those models into EnergyPlus the first quarter of 2006.

And some time in 2006, probably towards the third quarter of 2006 we can expect both of those models to be implemented into EQuest2, as well.

So over the next year we're going to see a lot more ways to predict the energy use of these system types. And we're proposing that we should find a way to accommodate them within the standards.

Any other questions? Charles, do you have one? I'm not going to let you off the hook too fast.

MR. ELEY: Well, Jon McHugh -- this is Charles Eley -- Jon McHugh really got at the question. I think what we need in order to offer credit, compliance credit for these technologies is a way to model them with the reference method.

And I think that's the challenge here. The reference method, as you would know, is DOEII.1E. And it assumes that all the temperature in the space is uniform. And there's obviously -- the EnergyPlus model that you talk about is, -- I'm not sure that's directly transferrable into DOEII.

MR. BOURASSA: No, --

MR. ELEY: But that does divide the space, I believe, into two zones. There's a lower zone and an upper zone --

MR. BOURASSA: For the U --

MR. ELEY: -- with both mass transfer and thermal transfer --

MR. BOURASSA: Yeah, the UFAD model is a

two node, and the displacement ventilation model is a three node. There's actually a thin film of stratified air at the floor level. And then there's the comfort zone. And then there's the warmer extraction zone.

MR. ELEY: You mentioned that those models are being translated into EQuest? Did I hear you correctly?

MR. BOURASSA: Yeah, we are in the process of finding -- putting together a project to have --

MR. ELEY: Well, EQuest, I believe, --

MR. BOURASSA: -- implement the core models.

MR. ELEY: -- uses DOEII.2, which is closer --

MR. BOURASSA: I understand.

MR. ELEY: -- to 2.1E, so maybe there's some lessons that we could --

MR. BOURASSA: The implementations --

MR. ELEY: -- learn there.

MR. BOURASSA: -- will be different between the two models, and the capabilities. But the core thing is implementing the first principles model that were developed by UC San

Diego.

They developed the model characterization of the physical processes that are occurring in a platform independent fashion. So those are the algorithms that we're going to work with respect to the ACM.

And until next April we're going to determine whether we can do a sidebar calculation methodology to get a prediction of the energy savings. And then, of course, you know, the trouble is how do we calculate it with the reference method, as you correctly point.

It could be that the reference method will only be able to scope the potential energy savings. These are the things that we have to look at.

But we're proposing, and we think that with the emergence of the models that we do have that we will actually have a pretty robust sidebar calculation method. The real struggle will be trying to find a way to get it back into the reference method, of course.

MR. PENNINGTON: So, Norm, could you mention there is an expectation that Martin Dodd would work on this ACM matter.

MR. BOURASSA: Yeah. As we speak that is something that he is working on right now. He's looking at the core algorithms that I speak of. And determining a way to create an ACM implementation of them.

And once we get a report back from him, a definitive how-to report on how to do that, then, you know, the anticipation is that we can pass that on to the contractors for the standard development work.

Any other questions? Thanks for your attention.

MS. HEBERT: Thanks, Norm. Next I'm going to have Martha Brook come to the podium and she's going to talk about performance monitoring and water heating in multifamily buildings.

MS. BROOK: Okay. Pull this close to my short little head. Okay, performance monitoring. Over the last ten years CIEE and PIER research has demonstrated significant energy savings are achievable if monitoring systems that are installed in buildings and allow operators to track the performance of equipment and system over time.

Our current research is developing a

guide specification for performance monitoring systems that will give building owners the information that they need to specify performance monitoring within a control system specification.

What we have been talking about and hope to propose in April for the standards is, you know, a kind of a short definition of what makes up the core performance monitoring that we would want to give credit to in the standards.

And some of the things that we've been thinking about just as the -- I mean performance monitoring can monitor absolutely everything in a building. But, you know, at some point it's very difficult to determine the cost effectiveness of that.

So we're trying to hone it down to just the basic things that we would really really want to see in every building in California.

So right now the short list is, you know, whole building electric and gas meters, major system sub metering, you know, temperature monitoring which, of course, exists in current data energy measurement and control systems.

And the biggest thing that's missing in most energy measurement and control systems is the ability to archive data over time and have the ability to quickly visualize trend information about equipment and systems to really track the performance over time.

So, some of the things that we're thinking about is that if a building design includes performance monitoring then we could create a certificate of acceptance. So acceptance requirements to commission the performance monitoring system.

And possibly come up with some tradeoffs so that if the building installs permanent monitoring, which is much preferred than a one-time acceptance test, then maybe they don't need to do the one-time test.

So some tradeoff between getting what we really want to have in building, which is ability to monitor throughout the building's lifetime the systems that are using energy.

And we think that there's value in that, and we should consider giving credit to these buildings. And maybe there's a tradeoff there between the current 2005 acceptance requirements for some pieces of equipment.

Then the other thing that we're thinking about is in the performance approach we considered discounting energy performance of the standard building systems that are not monitored. So in other words, you know, we have to admit that buildings that are not monitored over time, their performance is going to degrade. Okay, that's been documented time and time again. And that's kind of how the whole creation of the retrocommissioning industry is, you know, based on the fact that building performance degrade over time.

So, we'd like to see some accounting of that in the ACM, so that maybe some equipment and system efficiencies get discounted. So that when you compare it to the proposed building with performance monitoring there's some credit that's achieved there.

This whole concept of installing equipment to allow capabilities for energy savings is sort of a new area for the standards. It's not as easy to develop the lifecycle cost analysis. You have to assume that there's energy savings that are going to be found.

And we think there's actually a precedent that's been set in the 2005 standards in the lighting area because there is a lighting credit given to dimmable ballasts with a central load control.

So, you install the system but there's no guarantee that you're going to use it. So this would be the same way. We would want to give credit to the installation of performance monitoring systems. There's no guarantee that they're going to use it, but our research has told us over the last ten years that people do use it and there's an incredible amount of savings that can be provided. And we want to try and fit this into the standards in some way.

So we're sort of holding our hat on the fact that you did it for lighting in 2005. So, maybe we can do something for the rest of the energy systems in 2008.

That's all I have. If there's any questions I'd be glad to answer them.

I don't have another presentation for the lighting --

MS. HEBERT: So you're not going to talk about multifamily --

MS. BROOK: Yeah, I am.

MS. HEBERT: Okay.

MS. BROOK: I just don't have a presentation.

MS. HEBERT: All right.

MS. BROOK: So, I don't know what you guys want to look at; maybe that's best.

(Laughter.)

MS. BROOK: I just wanted to talk real briefly about a water heating proposal that we are hopefully going to bring forward in either February or April in the area of multifamily water heating.

We are going to be doing some research; we're going to look at new construction practices. And we're going to look at plumbing price and availabilities. We're going to do some extensive field monitoring -- well, not extensive, as far as numbers of buildings. We're going to go into a few multifamily buildings, but do extensive monitoring in those buildings to understand performance and recirculation configurations.

We're really looking for options in the -- for demand control and modulating boiler controls. And we hope to bring proposals forward that would give the demand control and modulating boiler controls credit in the standards in 2008.

And we also think that with the data that we're collecting, we'll actually be able to improve some of the modeling capabilities in the ACM in this area, as well.

So, I think that's about it. If there's any questions I could answer them.

MS. HEBERT: Yes.

MS. BROOK: I might be able to answer them.

DR. AKBARI: Hashem Akbari from Lawrence Berkeley Lab. It's actually not question, comments.

Many years ago I was involved with an entrepreneur that was focusing exactly on that problem. And I help him in doing some analysis.

And our analysis showed that in multifamily buildings the majority of energy loss for the hot water is because of the continuous circulation, and not use in the building.

At that time we collectively devised this adoptive control system that based on the use of the building was capable of reducing the temperature of the water heater during the evening hours or nighttime hours when the use is at the minimum level.

I guess that there is, based on those calculations, if I recall it correctly, there were potential savings of reducing energy consumption by 50 to 60 percent. So it is, indeed, an excellent measure. And it should be considered.

MS. BROOK: Okay, thank you. Yeah, I think the challenge that we're going to have is to make sure that the products are out there, the things that are -- the controls and the ability to make these changes are verifiable and all the things that standards need so they can get the credit that they deserve.

DR. AKBARI: The immediate solution -- yes.

COMMISSIONER ROSENFELD: Hashem, I'm puzzled. I thought I heard you say that the major energy use was the recirculation pumps and not the hot water?

DR. AKBARI: Losses. Recirculation heat losses.

COMMISSIONER ROSENFELD: Oh, okay. All right. So then if you reduce the temperature, yeah.

DR. AKBARI: Correct. The simplest solution for that, that it is a $10 solution and it should be adopted immediately as mandatory, is a time clock that would set back the temperature of all the water heaters to a minimum acceptable one between hours 11:00 p.m., say, and 5:00 a.m.

And that's a $10 solution. And for a multifamily building it pays for itself in a fraction of a second.

MS. BROOK: Yeah. Okay, great, thanks.

MS. HEBERT: Thank you, Martha. Now there's a lot of research going on under the PIER program in the buildings area all the time. Some of it will be feeding into the 2008 standards as you've seen. Some of it might not, the timing might not work out.

But that's all I have on the list for this morning for PIER projects. Am I incorrect? Is there anything else that's ready to be presented in the five-minute overview?

I see other PIER Staff. Okay, doesn't look like.

All right, we're going to move now to CASE initiatives. These are from our utilities in California. Steve Blanc from PG&E is going to talk to us now about a number of items.

MR. BLANC: Good morning, again. I'll

try to do better with the microphone than I did yesterday.

We're going to be introducing -- I'm up here to both introduce other speakers in CASE studies, and also to provide you with an overview of those CASE studies we will not be presenting today. We, like the contractors for the Commission, are just getting started on our work, so a lot of our work is going to come up in February and April.

As you know, CASE stands for codes and standards enhancement study. As we talked about yesterday, they're technical and feasibility studies for specific technologies or issues.

The technical information really is about how something works, how much does it cost, how much does it save. And feasibility is really about market share and any types of roadblocks that we can see that would get in the way of it interacting. And also how it interacts with other codes and practices.

These are the CASE studies that we are going to be introducing for nonres for this code cycle. The ones in yellow are all either in the process of being presented today, or will be presented by other folks.

The cool roofs, Fred Salisbury is going to follow me and talk about that for a little bit. And then Jon McHugh will present TDV lighting controls. Charles Eley will present the insulation level CASE studies. The other ones are the ones that I'm going to go through immediately.

We talked about demand response yesterday. We do have one CASE study focused on demand response. And that case was discussed yesterday afternoon. Unfortunately in the residential section, but in any case.

The issues common to all measures, basically we have cost of electricity and natural gas. You'll note that we are using some of the figures from the PIER/SCE PCT, the programmable communicating thermostat work. These are the most recent electric analyses that we have.

Quantities of building square footage, lighting, and signs outdoors. Emissions factors. These are all common issues.

And as an example, and as an offer, I show you the building square footages that we've come up with. One of the things that HMG did was that they took the Dodge data that is countycentric; in other words you get it all by county by the various end uses, and mapped it over to the climate and temperature zones, the 16 of them.

This data is available to anyone who is interested. We'd like everyone to use this so we're all using common data, if you'd like. If you contact Jon McHugh at Heschong Mahone he will be glad to give it to you.

Finally, we're talking about emission reductions from energy savings. These are the numbers we're going to use, and these came from the California Energy Commission.

Now, on to our CASE studies. The first one we're talking about is outdoor lighting. One comment about this right upfront is the fact that there is an awful lot of controversy about security. Especially in the vein of post 9/11 America about what constitutes adequate security lighting.

And one of the things that actually isn't up here that we are doing is that we're putting together a bibliography of all the research that has been done in the last several years. HMG is going to be looking at that research trying to bring it together. And we will be providing it to anyone and everyone who wants to take a look at it to try to get a basis for some of the suggestions that we're going to make.

But basically we're looking and revisiting parking lot and walkway lighting power allowances, as well as security lighting. And, again, that's probably going to be tread on lightly at first, at least, until we understand what the most recent research says.

All the models that we're using are based on IESNA outdoor standards. We're going to base lighting standards, except for parking lots, on pulse-start metal halide sources. The parking lots will be high pressure sodium.

And then we're just looking at loopholes and trying to deal with just cleaning up the standard a little bit, trying to make it a little more efficient.

This is one of two case studies that's being cofunded by Sempra. And we're working very closely with them on this one.

Indoor light, and Mazi is going to love this one, I'm pretty sure. We're revisiting retail lighting as an area category method. We're going to study the removal of tailored lighting method.

One of the things that we are going to do in this vein is conduct a survey of building departments to look at how much tailored lighting method is actually being used. This one is probably going to come up in August because we want to do the survey out there. And since tailored lighting was just revised we want to look at that and see how it's being conducted before we make any big moves.

But a use-it or lose-it allowance in the area category. Studying removing exemptions such as refrigerated case lighting. Looking at multi-scene requirements or power adjustment factors in terms of normal retail. In other words, trying to establish what a normal retail level would be; what curtailment levels should be; stocking, cleaning; and then off. In other words, emergency or security lighting only. This work is also being cofunded by Sempra.

Sign lighting. This is kind of an interesting one. We just had a meeting the other day, and I want to thank Edison for letting us have Mr. Avery's services, at least for the day.

Doug Avery down at Edison has been doing an awful lot of work to make contact with the sign industry. And we're working together with Edison to try to work through some, what we'd like to say are commonsense types of cases and requirements.

One of the first things we felt we needed to do was develop a taxonomy for signs. There are so many different kinds of signs that we really need to develop some kind of organization by which we can categorize them, because clearly one size does not fit all here.

Right now I believe the singular number that we use in regulation is 12 watts per square foot of sign. And it actually turns out to be a pretty good number for a lot of the internally lighted signs. But a lot of the other signs, it's clearly not an adequate number in terms of how to regulate them.

So, we're looking at the taxonomy in terms of whether the sign is interiorly lit, exteriorly lit; whether it's filtered by plastic or not; what kind of source it has. And we're going to try to come up with something that is usable for everyone to be able to categorize the types of signs.

Specific types, specific requirements by sign type are really two alternates here. One is power density, watts per square foot for a particular type of sign. The other one is to look at power regulation, specific efficiency requirements for all sources.

And one interesting point here, in fact Doug Avery was able to turn this up, we have some challenges in terms of helping the sign industry become more efficient, because in certain cases the type of equipment they're using, particularly odd-sized fluorescent lamps, turn out to be a rather difficult situation.

And we're hoping to, once we understand the problem better, use our power at the utility level to move the lamp industry to provide more efficient sources for the sign guys.

The other one here is looking at the controls issue, which is simply those signs which don't need to be on during the day are off. And those signs that are on during the day are dim.

And there's some really interesting information from Alaska; there were some surveys done up in Anchorage of those kinds of signs. And they came up with pretty interesting answers as to how they could be dimmed.

One important issue here is ease of compliance. We feel very very strongly that we need to work with the industry on this to get them to comply. And we're looking for ways to make compliance with whatever regulations we come up with as easy as possible to deal with, such as factory inspection, things like that. How can you reduce the paperwork and create a situation so that they can do their testing and be compliant as easily as possible. And as I said before, we are working with Edison on that one.

Skylighting. we are doing a code survey on skylighting to look at how this is being done. We're actually going to go out and visit building departments and check and see how people are dealing with the skylighting issue.

But a couple of basic things here. We're reducing the prescriptive skylighting criteria. In other words, we're trying to see how small an area we can actually get to regulate, and how low the ceiling can be. And as you can see up here, below 15 feet does not look cost effective, but down to 10,000 square feet does.

Requiring photo controls instead of just astronomical timeclocks. We wanted -- also I think an important issue, and one that Jon McHugh brought up is creating adjustable dead bands for the photocontrols. There have been a lot of problems with photocontrols because of hystoresis in the control systems. So the idea is you create a little bit of a dead band in there so that when the lights go off they don't come back on again, and they don't bounce on and off.

And then finally improving the daylight area definition for partitions. Most of us live in cubicle offices now, and we'd like to see some work done on trying to deal with that as far as skylights are concerned.

The next one is really kind of interesting. This case study was a direct outgrowth of the survey and analysis done by Heschong Mahone for ourselves, Edison and NEA, where they went out and surveyed well over 150 locations to look at how well the existing photocontrol systems were actually working.

And they found some very interesting answers. And this has informed a lot of what we're talking here.

For instance, redefining the side lit space for the standard. One of the things that we want to do is look at really looking at a better effective aperture rather than just window-to-wall ratio.

The second part of it is the new model for photocontrol power factors and trying to establish these hourly savings model on availability using TDV. So we're going to be doing some modeling with this one.

And then a prescriptive requirement in large side lit areas. In other words, if you've got a large open area, cubicle area, big windows, can we make that prescriptive.

A new area that we're looking at, refrigerated warehouses. I want to point out that we are focusing on cold storage, that we are specifically not going to look at blast freezers, hydrocoolers, ice cream machines, those kinds of things which we consider to be process driven. So that we're really talking about very large cold boxes.

We're studying the U factor of the shell, roof, floor, walls, doors, all those kinds of things, to see, you know, what kind of requirements can run out of that. Also the system requirements for the systems in terms of sizing, efficiency and controls. And I'm particularly interested in the controls of these things, because the industry has to run on a fairly tight budget. And if we can help them work on their controls, I think that they'll be much more amenable.

This also has something to do with some of our utility initiatives with these guys. At the end of the day we have to remember that we're dealing with food. And there's an awful lot of regulations around that. So some of those things we're going to be looking into as we move through this process.

Scavenger fans. A scavenger fan is an exhaust fan for a multifamily building, apartment building condo where it's exhausting either kitchens and/or bathrooms through a common outlet.

And it really is there just to maintain negative pressure, and so smells from one bathroom or one kitchen do not invade someone else's apartment. I've lived in apartments for awhile and found that that doesn't always work. But at least it's there.

We think that the ACM presently is in error because of the infiltration rates it's inducing. Mathematically there seems to be a bug in the system because it pretty much washes over a lot of other measures that you could do in these buildings because of this infiltration rate.

So we're actually going to go out and test a couple of buildings and look at these and compare them to the analyses done through the ACM and see what the differences are, and make some recommendations to that effect on the basis of that field study. And hopefully improve the procedures as a result.

DDC (phonetic) to zone. This is an enabler on a number of levels. Obviously if you can see what's going on in your zones and get feedback from them, you can save energy in them. But also I think the most important thing down there for demand response is that you need DDC to really do global temperature reset properly.

But the bottomline here is that we're going to be looking at this benefit to cost by climate zone and by building type and size, because these things are -- the installation, and I've actually done this a couple of times with buildings at PG&E -- it's pretty expensive to do. And we want to make sure that any regulation that we come up with is definitely cost effective.

But we're talking about being able to relate back zone temperature VAV box, position, and be able to have the EMCS reset zones accordingly.

The overall envelope method, I keep looking at this wondering why we called it the overall envelope method. It's actually a lot more about fenestration than anything else. But the bottomline is that the hand calc method that uses shading coefficients and the solar heat gain coefficient method tends to over-estimate savings from reflective and single-pane glass and under-estimate them from low E double-pane glass.

And what effectively we're trying to do is look at a layers method, a first principles based method for doing this, where we can go back and utilize some of the knowledge that we've picked up in the intervening years since SHGC was developed. And come up with a better model that people can use for these tradeoff calculations.

We talked a lot about demand response yesterday. This is becoming a feature of all of our case studies. There are at least three, and I believe five. Jon, how many do we actually have where I said we had to do demand response on now? Do you remember?

MR. McHUGH: We got the indoor lighting, sign lighting for the specific case of (inaudible) --

UNIDENTIFIED SPEAKER: You're not being recorded, Jon.

MR. BLANC: Okay, it was indoor and sign lighting specifically. And we'll take a look at demand response issues. We're also doing demand response on DDZ to the zone, too.

Automated -- specification automated load controls, power adjustment factor credits. Considering a wider range of demand responsive indoor lighting controls, some of this is going to fall out of a loads analysis that we're doing on the demand response case that we talked about yesterday.

The other issue is considering demand response control of signs lit during the day. That is a more interesting proposition because we'll have to pretty much put some kind of receiver on that sign so that it can get it, because you don't put an EMS on an outdoor sign. At least not yet.

It does not necessarily mean that we'll be talking about DOLY (phonetic) or other addressable protocols specifically. But we're going to try to keep that general enough so we're not getting into a specific protocol unless we see that protocol as being a really outstanding enabler.

As we talked about the other ones, the additions to the case studies, one of the things that we're going to do for this cycle is we're going to offer a lot more support to the Commission Staff and to the prime contractor in terms of dealing with a number of the issues that come up, once the case studies have been accepted and we start doing the regulatory part.

But we are going to add the DR implication in code where applicable for all measures. But I think more importantly for us is that we're going to actually, instead of just pointing out where the standard needs to be changed, we're going to propose language and help work on the ACMs, the compliance manuals and the compliance forms.

I think that everybody concerned was concerned about how far we had to stretch everybody's resources in the last cycle in order to get this work done. And because we're coming up with the CASE studies we feel pretty qualified to be able to do some of this followup work.

As you can see, we're reviewing and altering work plans as soon as we get the new contracts signed. And then we're going to be working on our draft reports and surveys. and we're hoping to have a couple more reports at the next meeting in February. And then finish up in April.

Any questions?

MR. TOLEN: Hi, Tom Tolen, TMT Associates, lighting designer. Just a question why the HPS basecase for the LPAs only for parking lots, not for the other exterior spaces.

MR. BLANC: Jon, you want to answer that?

MR. McHUGH: The reason we were looking at high pressure sodium for parking lots is that's the main category that actually had a significant use of high pressure sodium.

We didn't find for the other applications that there was a significant enough use of high pressure sodium in those other spaces.

MR. PENNINGTON: So, Tom, where did you go?

UNIDENTIFIED SPEAKER: He's right there, the first row.

MR. PENNINGTON: Okay, do you have some comment about recommending other spaces?

MR. TOLEN: No. I think from my point of view the metal halide is much superior alternative, especially with some evidence coming to light that it may be more energy efficient in terms of visibility of a space or an area when compared to a source like high pressure sodium.

So it's curious that we're still seeing this reliance on HPS as a basecase, as opposed to the alternatives.

MR. SHIRAKH: Tom, did you have a reaction to some of the indoor lighting recommendations?

MR. TOLEN: Reaction.

MR. SHIRAKH: Like elimination of tailored lighting.

MR. TOLEN: Yeah. Well, you know, I'd like to see the studies when they're done. I mean, my kneejerk reaction is no way, don't do that to us. Other than that, you know, I'll reserve judgment.

MR. McHUGH: Do you have a lighting related question?

MR. FLAMM: I just have a correction. This is Gary Flamm. I just wanted to make a correction to something that Pat had said about 12 watts a square foot was the only availability for signs. That's actually for internally illuminated signs.

For externally illuminated signs it's 2.3. Just for the record, I just wanted to clarify that that was only half true. Thank you.

MR. NULL: Hi, Jon Null from WattStopper. On the retail initiative was there something to address automatic control display lighting? Was that included?

MR. McHUGH: That's something that we're looking at, yes.

MR. NULL: Okay, thank you.

DR. AKBARI: Hashem Akbari from Lawrence Berkeley Lab. This is again some observation and comments related to the cold storage.

I particularly would like to see that that project and a case be developed for that and go forward, based on the limited experience that I have, and I would like to share it in about a minute with you.

Several years ago under a PIER project when the cool roof program became active in California, several cold storages installed cool roofs. And we measured savings. Surprise, surprise, the measured savings were about four times larger than what we anticipated.

And once we tried to understand this situation better, these were the observations that we made. Number one, the effective R value of the roof had been improved by about 30 to 40 percent by installing cool roofs.

Number two, when the cool roof was installed, the operator had recognized that now they can increase the suction pressure of their chillers. So their chillers would be operating more efficiently. That was that factor of three saving that was coming from.

So in a way, the controls of the chiller system in the cold storage system do have the highest potential for savings of peak, as well as overall energy consumption, particularly knowing that a lot of these cold storage facilities are seasonal operation in California.

I would like to make sure that in your program you would think about the variable speed drives for the evaporator; variable speed drives for the condenser fan, as well as control systems for the operation of the chillers.

MR. McHUGH: I'd just like to respond that indeed all of those measures you've talked about are things that are on our list. So, --

DR. AKBARI: I have no doubt.

MR. BLANC: Any other questions?

Elaine, I'd like to introduce Fred, if I might -- Fred Salisbury, who is one of my confederates, will be talking about our cool roofs project. And then we'll kind of move along from there.

MR. SALISBURY: My name is Fred Salisbury. I'm with PG&E. And as Steve mentioned, I'll be providing a brief overview of the cool roof case study that we're undertaking right now.

Specifically this case study involves the inclusion of cool roofs in nonresidential, the prescriptive requirements for nonresidential title 24.

This particular case study has two main

elements. The first is implementing a cool roof requirement for sloped nonresidential buildings. The second element is modifying the current standard requirements for cool roofs on low-slope nonresidential buildings.

Regarding sloped nonresidential buildings, specifically, anything with a pitch of 2-in-12 or greater.

This is a new study because the current standards do not speak to sloped roof buildings at this time, regarding cool roofs.

Now, because these are sloped roof buildings, these will involve primarily small buildings averaging 3000 to 5000 square feet each, typically no more than 10,000 square feet.

The second element, cool roofs for modifying the current standards for cool roofs for low-slope nonres buildings. The largest portion of that element will involve changing the aging -- the solar reflectance aging figures.

The current standards require a reflectivity of .70 or greater to be considered a cool roof. And we're, right now the three-year reflectivity number is .55. So approximately -- we're assuming approximately a 20 percent degradation. But we're going to be looking at actual measured data to try and make any corrections that are deemed necessary.

Obviously this case study will involve a review of the measure availability and cost. Right now there are more than 400 cool roof products available, right now, and there are more coming out regularly. These products represent a large array of manufacturers and distributors. And a wide range of -- and they're widely available, as I mentioned. So we have no fear in that regard.

Obviously this will all be looked at through the lens of cost/benefit analysis. So we will be evaluating measured savings, as well as using DOE to make savings projections and build models, as well.

Obviously this case study will involve projecting the statewide savings to try and determine the overall benefits. And as I mentioned, this study will involve the measurements of products that are out there being tested, or rather going through an aging process right now, at three facilities throughout the United States.

That's all I have. Are there any questions, comments?

MS. HEBERT: Go ahead, Bill.

MR. PENNINGTON: I had a question about the data related to aged reflectance. When is that data going to be available from this CRRC? And if it's not, if we're not yet at the end of the term of that data collection process, is interim data relevant?

MR. SALISBURY: Yes, as far as I'm aware, and I'm going to answer very briefly, and then I'm going to defer to Hashem if he has anything to add.

But, as far as I'm aware, there is no data available on products that have undergone the full three-year aging cycle. However, we are confident that interim data -- interim data is available, and we're confident that it will be extremely relevant as far as determining, you know, three-year aging numbers.

But, Hashem, do you have anything to add?

MR. ELEY: This is Charles Eley. I had basically the same question. We rely on CRRC data for compliance, so if the data's not available from CRRC it's difficult for us to base a standard on that.

DR. AKBARI: Let me try to add a couple of dates that probably answer that question. There are about 100, plus or minus, 20 products that CRRC installed in the June of two and a half years ago. So, 21st of June, to be exact, of 2003, if I'm not mistaken.

So we are already two and a half years behind that. So chances are that by the time that we make these measurements we are going to be approaching three years. It's not going to be -- until we wait until the next June of 2006, it would not be exactly three years.

But the data have shown that most of the variation and aging of the roofing happens within the first year. And three-year performance typically is for assurance that it is, it does have persistence of staying at that level over these three years.

MR. ELEY: So, in your opinion, there will be age data from CRRC by 2008?

DR. AKBARI: There better be. By 2008 there would be five years of data there that collected, five and a half years of data. And right now they do have something like 300-odd products being tested at this time.

So if we just go three years from now that is 300-odd products available by then.

MR. ELEY: I have one other question. You mentioned 400 products. Are those all low-slope products, or is some of those sloped products. And if so, what kinds of sloped products are you seeing that qualify as cool roofs?

MR. SALISBURY: Good question. Not all of those products are strictly low-slope. As I mentioned there's a wide array of products available. Specifically what products are available for sloped roof I could not -- I can't tell you off the top of my head. But, Hashem, do you know?

DR. AKBARI: Yes. The majority of the products that are being tested are for low-slope roofs. Of course, yesterday we learned from some of our industrial representative here that there are -- the same type of products can be applied for building, for slope roof and the slope is under 4-to-12.

MR. KERSEY: Tim Kersey with Siplast,

representing ARMA, today, as well. The three sites throughout the U.S. that are being aged at this point, are those aging tables on slope or are they flat like we would see in a normal low-slope roofing condition?

DR. AKBARI: Yes. Andre, please help me on this one. I think that they are being tested, if I'm not mistaken, for slope -- for three slopes, if I'm not mistaken. I may be wrong on that one. And one of them --

MR. KERSEY: Did you say three-inch slope?

DR. AKBARI: No, --

MR. KERSEY: No.

DR. AKBARI: -- three type of slope.

MR. KERSEY: Three types of slopes, okay.

DR. AKBARI: Yeah. But most of them are in the small (inaudible) about 1 square feet that are being tested at a slope of 1-to -- 4-to-12, something like that. Andre?

MR. PENNINGTON: If you'd come up and answer, Andre, that would be helpful.

DR. AKBARI: Please. Andre is younger than me, so he has a better memory.

(Laughter.)

MR. DESJARLAIS: Going back to something you said earlier, Hashem, I think you're a year ahead of your time. There will be data available for '08, but we're only a year and a half into the process. The maximum samples now are only a year and a half in the process, not two and a half years out.

But with respect to slope, all of the products have been installed at two different slopes. One is a 5-degree slope, which is traditional of what the test farms use. And the second one is a 4-in-12 pitch, which would be similar to a steep slope application.

So we should have information for both steep and low slope.

There are 400 products in the mix right now, but I think only about 100, as you pointed out, 100 to 150 of them will have three-year age data in '08. But a lot will be coming online very very quickly thereafter.

MS. HEBERT: That was Andre Desjarlais from Oak Ridge National Lab.

DR. AKBARI: I also would like to encourage for this type of the calculation to be consulting with the CRRC webpage. They do have all the information there.

MR. KERSEY: Okay. Tim Kersey again. Just a comment and I'll sit down. But, it's just curious to me when we have these even on positive drainage it'll be interesting to see some age data on basically dead flat roofing situations, which we run into every day, for the dirt pickup comparison on white roofs of that type versus on-slope where they will see some washing effect.

Okay, thank you.

DR. AKBARI: I would comment on that briefly, then I would ask probably Bill to help me. There is a CRRC that is thinking exactly about the issues of how to age and measure the performance that reflects the actual life of an actual climate condition.

So I would not consider myself and this group as the right place, because CRRC is already doing that. And at one time the Commission had decided that the CRRC labeling would be the sole labeling that would be used for the standards. And that I would ask Bill if he has any addition to this comment.

MR. ELEY: This is Charles Eley. If I

may ask one more question. If there's 150 out of the 400 products for which we'll have age data in 2008, will you be recommending some default degradation factor for the other products? Or will the other products simply not be able to used for compliance in California?

DR. AKBARI: Two comments. Number one, this was supposed to only provide a guideline of work, the study that is underway. And hopefully we would answer most of these question when the report is out.

But having said that, there are a lot of data and more of those data are becoming available. And it appears that, excluding extreme conditions, what has been assumed and based on the limited data for the 2005 cycle is not half bad. Of course, it is not half good, either.

So, chances that there are those variations, you know. A white roof, installing a white roof is not going to come black within about two years. It's going to have some level of whiteness. And installing a black roof is not going to turn white within a few years.

So chances are that those numbers that have been used by the Commission is going to be still valid. There may be some changes here and there needed as we get more data.

MS. HEBERT: Just a comment from the acronym watchdog over here. CRRC, for those who don't know, is the Cool Roof Rating Council.

Also I'd like to say that of the 400-plus products that have been rated through the Cool Roof Rating Council procedure and are listed on their directory on the website, not all of them qualify as cool roofs in California. Many of them are below the reflectance and emittance numbers. So not all 400-some-odd of those will be, you know, part of the study or whatever.

DR. AKBARI: I fully concur with what Elaine said, but in the calculational procedure for all alternative calculation approach, a performance calculation approach, it is required to have the measured data from the CRRC labeling.

And if those measured data are not available, very very conservative solar reflectance and thermal emittance is assumed.

So for the credit application and the prescriptive -- for the performance approach it is needed to have those information.

MR. SALISBURY: Any other questions?

MS. HEBERT: Thank you. Steve Blanc, were you going to introduce any more folks on CASE initiatives?

MR. BLANC: I'd like to introduce Jon McHugh, who is going to do the TDV lighting controls, if I'm not mistaken. Right?

MR. McHUGH: Thanks. This is Jon McHugh. Right now I'm going to talk about a new way of evaluating lighting controls in the alternative compliance method calculation method used for the performance method.

And currently the 2005 standards allow power adjustment factors for various lighting controls. And so there's -- I won't read off the bullets here, but they're primarily occupancy sensors and daylighting controls.

These power adjustment factors are listed in table 146. And what you do is you take the power adjustment factor and multiply that times the wattage of controlled lighting. And that power adjustment factor is currently applied to all hours of occupancy in the space.

So, even though we have a time-dependent valuation that allocates various values of energy savings, depending on the time of day and month of the year, the energy savings from various lighting controls are not adjusted by hour of the day.

So our project was to look at the effect of TDV, time-dependent valuation, on lighting controls and to see how TDV would impact the calculation of a prescriptive power adjustment factors, these single values.

And then also to propose a time-varying effect of lighting controls. And that these would be based on the best available data that we could find in the literature where people had collected not just energy savings from controls, but rather the hourly savings. And then we could apply these hourly credits in the alternative compliance method.

So we looked at a variety of data from various sources, from -- there's actually quite a bit of information available for offices and classrooms. There's less information available for warehouses and libraries. And there was essentially no good data on hallway occupancy sensing, which is a new requirement in the standards, manual dimming or multi-level, or multi-scene programmable controls.

This sets the framework and the

foundation for some additional work we'll be doing on the side lighting and top lighting case studies where we'll be looking at using daylight availability to calculate the savings from photocontrols.

And I'm not going to go through all these terms, but essentially we looked at the data from the various studies; adjusted that data. And then what we did was we normalized the actual savings from the field studies, and normalized them to the existing power adjustment factors.

And this table here shows that in general the kilowatt hour savings from controls that we found in the data did not vary significantly from that same amount of savings when we applied the TDV weighting factors.

What this indicates is that the control times that we looked at saved onpeak and offpeak energy. And so they essentially balanced each other out. And that's why we don't see a large deviation between the energy savings and the TDV weighted savings.

And in general, the savings from the research are about 40 percent greater than the values that we use in the power adjustment factors in table 146A.

So, what we found was that there was useful information about assigning a time varying schedule associated with these controls. But at the same time there were some reasons to essentially leave the power adjustment factors as they are in the prescriptive method, and to normalize the schedules back to those prescriptive power adjustment factors.

One issue has to do with the -- that lighting controls have less longevity and reliability than the actual installed lighting power density that you would be able to increase by using the control credits.

So, and this example from the DEER database, occupancy sensor life is given a range from eight to ten years. And typically for the standards we use a 15-year life for the longevity of the lighting system.

So this proposal would not change at all the prescriptive compliance method. We're not suggesting that the tables change; the power adjustment factors would have the same values. Performance method, we're suggesting that we use hourly adjustment factors for the lighting schedule, and that on average that those savings are essentially the same as the prescriptive method.

So we've also suggested that there be some new schedules applied. So, for instance, when we look at hallways in hotel/motel in general the lighting is on 24/7. And yet the current schedule is essentially an office-type schedule, and so our recommendation is to add a new schedule for uncontrolled lighting in those hallways.

We've also recommended that some new schedules be applied when you have occupancy sensors in those spaces, based on this research.

And when we found spaces that we could not find any good research to make a recommendation on change, then we essentially default back to the existing method of applying a constant reduction across all hours of the day.

Related to that is what do we do with -- oh, okay, and then based on -- all of this work is based on the assumption of using the DOEII.1E as the reference program, which allows only two schedules per space. You have a lighting schedule and you have a task lighting schedule.

It should be noted that the task

lighting schedule you can't apply daylighting on top of that. You can only apply the daylighting to the lighting that is applied to the lighting schedule.

And when you have more than two controls in a space, that you can divide the space into subspaces that are wattage-weighted spaces in terms of their area, surface areas, et cetera.

And then for daylit areas you would create wattage-weighted schedules so that for the areas that are nondaylit you can use the task lighting scheduled; and for the daylit area, use the lighting schedule.

But that lighting schedule would be wattage weighted. So if you had half of the area under skylights or next to the windows, that half was on a occupancy sensor, half was not. And you'd use a wattage-weighted schedule for that space.

In the past it was just a fixed power adjustment factor for adding occupancy controls to daylighting controls. And what we're recommending here is that we just model the occupancy control. And then we also then model on top of that the daylighting control, using the daylighting algorithms in DOEII.1E.

And the methods of modeling daylighting so that we don't end up with some pathological results based on just the model, that those will be discussed in the skylighting and side lighting case studies.

So, in summary, what we're recommending has no effect on the prescriptive method. We can use the same power adjustment factors as currently exist from 2005.

In terms of the user there would be no change in how they entered the data. And there would be a little bit of change across climate zones, but little change in the performance method. And we found that there was little change because the savings were balanced across onpeak and offpeak periods where the savings were occurring.

But it also, even though there's little effect on these particular controls, it sets the framework in place to give credit for controls that primarily reduce peak consumption. And this method is compatible with the basis of TDV, which is to give credit for measures that reduce peak consumption.

Any questions?

MS. HEBERT: Yeah, go to the microphone, Bruce.

MR. MAEDA: Bruce Maeda, CEC Staff. There's some problems we had even with the introduction of the retail lighting schedule. Particularly comes in place when you're trying to combine zones. You can't combine zones with different schedules because of the schedule limitation you mentioned in the reference program.

So, you had to isolate those areas separately. And we've purposely, several years back, reduced the number of schedules possible, even -- we were going to end up with about 22 different occupancy schedules. We decided about in 1982 not to do that. But actually to try and combined schedules more and more.

The fact of the matter is there is a variation over time because the lighting schedule varies over time. So, there's -- but there's not a differential variation. So it can't be weighted towards peak savings, for example, because there's just one schedule for lighting, depending on what the occupancy type is.

And so if you want to have differential

schedules for daylighting purposes in the same occupancy zone, then you need to have the TDV weighted, or you need to have new schedules introduced, or you have to be able to model it in some way.

But, the existence of multiple schedules creates other problems in the ACM process, or in the (inaudible) from the standard design, combining zones for efficiency of modeling purposes and things of that nature. So you have to be very cautious about the introduction of new schedules.

MR. FLAMM: Gary Flamm, the Energy Commission. Jon, I believe what you said is that your TDV evaluation validated the 2005 prescriptive power adjustment factors. And then you said that the, for example, you said occupancy sensors have a life of eight to ten years, which makes me start to doubt where we are with those power adjustment factors.

Are there any studies showing persistence that these controls are replaced? The prescriptive power adjustment factors, are they replaced after they fail at the eight to ten years? Or maybe we're overstating our power adjustment factors if those controls are not replaced.

MR. McHUGH: So what I'm saying earlier, and let me just find the slide, it will make it a little easier, I think.

Okay. So, what we're seeing in this slide is that, for instance, for these small spaces -- I'm just going to take the first one -- that the raw data from the research we found that we were saving on average about 27 percent of energy from the research.

And that when we did the TDV weighting we found that it didn't really matter, the TDV -- because we were saving both onpeak and offpeak, that we were still saving about 27 percent of the TDV lighting energy.

Now, the power adjustment factor is 20 percent. So, what that's saying is that when we use a lighting control credit in the standards, we're actually -- it's related to an instantaneous measurement, you know, that these studies occur, that we're under-predicting the amount of savings from occupancy sensors.

And that that is a reasonable thing to do, that you'd want to under-predict the savings from occupancy sensors because of the concern about their longevity relative to the thing that would be -- that when you use that occupancy sensor, it allows you to install more installed wattage.

And that installed wattage is thought that it will last potentially longer than the occupancy sensor. So that's why there's a built in conservativism into method.

MR. FLAMM: Okay, well, I see it's -- the 7 percent, then, accounts for that eight to ten year failure. But I'm just curious, I know the industry's here, is there data on the replacement of those controls that shows that there's persistence once the controls do fail, in the prescriptive method?

MR. McHUGH: For this case study we did not find that data. It doesn't mean that it doesn't exist. And if there's people in the audience who might have some information about replacement rates of failed systems, we're all ears.

MR. FLAMM: I see the industry all shrugging their shoulders, so I guess they don't have data in their hip pocket. Thank you.

MR. McHUGH: Sure.

MR. HUONG: Joe Huong, LBL. I have a dumb question. How do you model occupancy sensors in DOEII or any simulation program? Maybe it's covered in the ACM; I just don't know.

MR. McHUGH: Yeah, okay, so historically what happened was that occupancy sensors were modeled by reducing the amount of wattage in the space. It just said, so for instance, for that example of the less than 200, in small spaces, let's say you had one watt per square foot in that space.

And then if you applied occupancy sensors it would be modeled as if it had 0.8 watts per square foot in the space.

And what we're proposing to do is change the lighting schedule so there's -- the lighting power density, you know this more than I do, probably, but for each hour you're multiplying the lighting power density in the space by these fractions of schedule that defines what fraction of the lights are on for each hour.

And so what we're proposing here is to have a schedule of reduced hourly values depending on the reductions during those hours during these research studies.

MR. MAEDA: Bruce Maeda, CEC Staff, again. You mentioned something about different task lighting schedule and general lighting schedule. And when you start looking at daylighting in particular, usually task lighting and/or display lighting depend upon contrast between general and the task, the light that's on the task. And daylighting can really mess up that contract a lot, so you could end up with a very large, say a large general lighting background, up to 10,000 footcandles if you're outside.

And that would wipe out any contrast that you're trying to achieve with, sometimes with task lighting or with a display lighting. So you need to be cautious about how we evaluate daylighting and what kind of credit we give it in the cases where it actually interferes with the functionality of lighting.

MR. McHUGH: Those are good comments. This format of discussing task lighting versus the lighting is just essentially, it's a way that DOEII uses to calculate two different schedules in the same space for lighting power.

So it doesn't necessarily represent the

actual distribution of light, or the placement of light in the space. Those are good comments.

MS. HEBERT: No more discussion on CASE initiatives? Steve.

MR. BLANC: Our last CASE initiative is being presented by none other than Charles Eley on building insulation. So I'm going to invite Charles to come up and talk that one out.

(Pause.)

MR. ELEY: Okay, this is a study on the nonresidential insulation levels for walls, roofs and floors. But not slabs.

The last time these requirements were updated was 1992. And there's a need obviously to take a new look at those, which we've done in the context of time-dependent valued energy.

So, just to kind of jump to some of the conclusions, and then I'll show you how we arrived there. We are recommending more stringent insulation levels, and you'll see that they are justified by the lifecycle cost analysis.

We're also, right not the prescriptive requirements give both a U value and an R value criterion. You're probably familiar with that. And we're suggesting that with the introduction of joint appendix 4, that there's no longer need for that. That we can simply state the criteria in terms of the U factor. And since all the U factors are then published in one place in a consistent format, it's no longer necessary to have the R factor, R value method in there.

Another finding that we discovered is that the cost effective levels of insulation turn out to be different for retail. The current standards have just two tables of criteria. One is for 24-hour occupancies, and the other is for daytime occupancies.

And what our analysis shows is that retail, with retail buildings you can justify higher levels of insulation than daytime, but not as much insulation as 24 hour. And that kind of makes sense when you think about it, because the retail occupancies are occupied for more hours. All day Saturday and most of Sunday, as well. Where the daytime occupancy is only -- it's not operated at all on Sunday and it's only half a day on Saturday.

So, we have -- the analysis that we did here is based on a conservative present value of pre unit of TDV of about 13 cents a kilowatt hour.

You saw yesterday that that number has been almost doubled.

The 13 cents was the present value per unit of TDV that came out of the 2005 study. And we moved ahead with that number, not having the more recent numbers.

So that'll be kind of a caveat on all the results that you're about to see. Whatever's showing as being cost effective will be even more cost effective, or maybe it would be possible that additional levels of insulation will be justified when we use the approximately 24 cents per kilowatt hour.

We've also evaluated these over a 30-year time horizon, which is consistent with the lifecycle cost methodology presented yesterday.

What we did is we looked at -- we took a simple five-zone building for our analysis and then within that five-zone building we varied schedules of operation and internal gains and so forth. And so that we were simulating the three occupancy types that are recognized in the ACM, which are the 24-hour, the daytime and the retail.

We were not looking at fenestration as part of this study, so we normalized fenestration at 30 percent of the wall for the daytime and 24-hour occupancies, but for retail we reduced it to 10 percent, which still may be a little on the high side for some types of retail stores, at least. So those were the assumptions and their simulation model.

What we then did is we used this model and looked at for each class of construction and type of construction, we looked at a high insulation level; we looked at something that was in about compliance with the current standards, and we looked at a very low insulation level, which usually was no insulation.

So, we got three points. And then we did a regression analysis through those three points to give us a function that explains change and time-dependent valued energy as a function of the change in the UA for that component, or the U factor times the area for that component.

And for those of you that are modelers, this was -- these three points are almost exactly on a straight line. The statistical fit, the R-squared number is near 1, .9999 or thereabouts, for just about every construction type we looked at.

There were some exceptions to that statement, however, for floors, and in particular mass floors. The predictions were not as stable as they were for walls and roofs. So we're continuing to take a look at that type of construction and we're not ready to recommend values yet.

The HVAC system that we assumed for these models was a simple package single zone system with ducted return. Has an air side economizer, outside air meeting the standards; gas heating, you know.

Obviously when you're looking at insulation levels, and the benefits of insulation, if you have a less efficient system the benefits will be greater of adding insulation. If you have a more efficient system the benefits would be reduced. But these are the assumptions we made.

The packaged rooftop equipment is awfully common in California. It's used in a lot of buildings and I think -- but it's important that you understand that this was the assumption that was made.

We used the schedules of operation that are defined in the ACM manual. For daytime it's about 4300 hours a year. For retail about 5500 hours a year. And for highrise and hotels it's 24/7, or 8760 hours a year.

The lighting power density numbers that we used are 1.25 for daylight; 1.5 for retail; and .5 for the 24-hour. And the equipment power densities you can see there, .75 for daytime; .94 for retail; and .5 for 24-hour.

And then the occupancy loads are also consistent with the ACM-specified modeling assumptions.

Another input to the analysis, of course, is the cost of insulating a wall. We relied primarily on cost data from RS Means, their 2005 data. This is -- RS Means, for those of you that don't know, is a cost-estimating guide that's available throughout the country.

The numbers that are presented in the RS Means data are the material and labor costs that the subcontractor would incur. So on top of that we added 30 percent. That 30 percent would include the general contractor's overhead, profit, markup. So the cost differences were basically increased by 30 percent.

In addition to that, the data that's

published in the RS Means database is a -- it's normalized for the entire USA. And when you look into the cost estimating guide there are adjustment factors for each locality. You know, for Los Angeles, San Francisco, Sacramento and so forth.

We developed a -- we looked at construction volume in California by climate zone. And we weighted the numbers in RS Means for the California climate zones. And it came out to be 1.088. So we're basically increasing the cost in the RS Means database by about 9 percent, because it's 9 percent more expensive in California than it is on the average nationwide. So there's those two adjustments.

Now, another point to make about the cost analysis is that we were basically looking at all of the constructions that are listed in joint appendix 4. And joint appendix 4 is intended to be comprehensive. And it has insulation R values that are not necessarily available in the marketplace.

So when that existed we used regression analysis or interpolation to fill in the missing numbers. For instance, if we had a price for R7 and a price for R11 and we needed one for R9, we would set it halfway between the price for R7 and R9 (sic). So those were the assumptions and the sources of data.

We also looked at California-specific data, in particular the DEER data, D-E-E-R data. It's a database that was developed as a collaboration from the Energy Commission, the CPUC, the utilities and so forth. We used that as a cross-reference. And when you read the report you'll see that there's a reasonably good agreement between the DEER data and the RS Means data that we used.

We chose the RS Means data over the DEER data because it was more complete. And it gave prices for insulation systems and products that were not in the DEER data.

So here are the results for roofs, for the daytime occupancy. Is there a pointer up here?

(Pause.)

UNIDENTIFIED SPEAKER: Everybody comes to the rescue.

MR. ELEY: So, one of the things that we've discovered in doing this analysis is that we're probably going to want to make some modifications to the climate zone groupings that are currently presented in tables 143A and B.

Right now those climate zone groupings are roughly equal to north coast, south coast, central valley, desert and mountains.

Now, it turns out that some of the climate zones, 9 and 10, for instance, which are now grouped with the south coast, the insulation levels that are coming out as being cost effective for those are closer to the central valley numbers than they are to the south coast numbers. So, we're likely going to take climate zones 9 and 10 and lump them in with 10 -- or excuse me, 8 and 9, and lump them in with what's now 2, 10 and 11 through 13.

Another thing that we realized when we looked at this is that climate zones 1 and 16 are really quite different. Climate zone 1 is Crescent City and Eureka, sort of it's -- Bill sometimes says it should be part of Oregon. I guess in terms of the climate it's a lot -- it has roughly the same heating degree days as climate zone 16, but it never freezes. So it's just cold all the time, but not that cold, you know. So it's a strange climate zone.

And as you see here, the numbers for 16 and 1 came out quite differently. So what we're showing here are representative data for climate zones 1, 2, which is Santa Rosa. But these numbers would also be representative of the central valley. Three, which is Oakland; 6 which is Long Beach, I think, or in that general area. Fourteen, which is Palm Springs, and 16 which is Shasta or Tahoe.

So, the first bar is the current standard. So the current standard is now set at .051 for everything except the south coast, and for there it's around .74.

Now, what we looked at here is not just one type of roof, but we looked at three different types of roofs. We looked at metal buildings separate from attics.

And we looked at -- another class of construction we looked at is what we call insulation above deck. This is the situation where you have usually a steel deck, and there's a lot of systems and equipment beneath that deck. And it's not practical to pin insulation under the deck. So typically what you have to do is you put a foam or a board insulation over the top of the deck. And the cost of insulating at that means is higher than the cost of blowing fiber into an attic. So the numbers came out a little bit different.

So there's three classes here; there's metal buildings, insulation above deck, and wood framed and other. The wood framed and other is, the assumption there is that that's essentially a wood attic where it's fairly easy to blow more fiber in.

But we have taken account of edge effects at the eaves and that sort of thing, which is built into joint appendix 4.

So, for the most part the recommended U factors are lower than the current standard. There's a couple exceptions to that. One is in climate zone 1. And I think probably the main reason that climate zone 1 is different is -- I have a hunch that in 1992 the standard was based on 16. And 1 was kind of thrown in with it. There was probably no analysis actually done for climate zone 1. It was just lumped in with 16.

But, when you look at it separately, the numbers are a little bit higher for both metal buildings and insulation above deck.

In the north coast, or the Bay Area, the numbers for insulation above deck are slightly higher than the current standard. Other than that, the recommended levels are lower than the current standard in all cases.

Now, remember back eight slides, we used 13 cents per unit of TDV savings. And the number that we're now getting from our economists is based on the '05 curves. It varies by climate zone, but somewhere in the reach of 17 to 22 cents on the '08 curves -- excuse me, on the '05 curves and I think 24 cents on the '08 curves.

So that will change these numbers. And it could be that these numbers will all drop below the current standard.

So this is roofs daytime. Metal building walls, you can see that in this case we've got, let's see, you want to compare each pair of bars, okay.

So the first pair of bars here compares the '05 metal building standard to the '08 metal building standard. The second set of bars compares the '05 metal framed wall to the '08 metal framed wall. A metal framed wall is not a metal building wall. A metal framed wall is a wall constructed with metal studs, which is a very common, maybe the most common, construction technique for the class of buildings we're addressing here.

So you can see these numbers are all lower, are significantly lower in most cases. One of the things that surfaced from metal framed walls is that cavity insulation proved to be not very effective.

And it's really cost effective in most California climate zones to use some type of continuous insulating sheathing over the outside of the stud. And once you do that, the thermal performance of that wall improves considerably. And that's why there's such a big difference here in that second set of bars.

Then another class of construction that we looked at separately were mass walls. Mass walls are concrete masonry walls, or concrete walls that have a heat capacity of 15 or greater.

And in many of the California climate zones insulation levels are not as -- it's more difficult to justify insulation levels for a couple of reasons.

One reason is it's more expensive to insulate a mass wall. Basically you're starting with a wall that already has an interior and exterior finish. And to insulate, you have to build a new wall on either the outside or the inside with a new either interior finish or exterior finish.

So the exterior systems would include things like Driveit or stucco over foam insulation. Interior systems would include furring channels, either metal or wood, with insulation between the furring channels. And then a dry wall system. So both of those are used.

So, what this compares are both the light mass and heavy mass walls. And you can see that the insulation levels, with the exception of heavy mass in the coastal climates, it remained unchanged. Basically no insulation was justified in those cases.

But everywhere else the insulation requirements were reduced, sometimes considerably.

The thing about mass walls is once you, you have to kind of make a quantum leap in terms of lifecycle cost. And once you make that quantum leap then the incremental cost of adding more insulation are kind of small. So once you make that quantum leap then you see a huge jump. And that's what's exhibited here.

And then other walls would be wood-framed walls, and the U factors that we're recommending are lower here, as well. The biggest difference would be in the Central Valley and climate zone 10 and 2 and those areas.

So, those are the numbers for roofs, daytime, metal building walls and metal-framed walls, daytime, mass walls, heavy and light. By the way, light mass walls are defined as having a heat capacity of at least 7.5 or greater. And heavy mass is 15 or greater. And other walls, which are wood-framed walls.

So here are the data for the 24-hour roofs. In this case it was only climate zone 1 where metal building roofs and insulation above-deck resulted in a less stringent criterion. And here are metal building walls and metal-framed walls, and you can see that there's a reduction across the board.

And then mass walls for the 24-hour occupancy. Again, a reduction across the board except in the coastal climates where there's no change for heavy mass walls. And then other walls, 24-hour; again, a change across the board.

And same pattern for retail, basically.

So our recommendations in the current report are presented for all 16 climate zones. And as I mentioned, we are looking at different climate zone groupings. I think at this point we're kind of leaning towards putting 8 and 9 in with the Central Valley, along with 2. And maybe splitting out 1.

And we also have an option of just presenting the data like this. That's the way it is for lowrise residential. So I don't think we've completely settled on whether we want to group the climates or just leave it like this.

MR. PENNINGTON: One other comment on that. From my observation, climate zone 4 seems to be tracking better with the Central Valley, which is actually how we look at things for residential buildings. And so I'm interested in that possibility, also.

MR. ELEY: Yeah. Anyway, the data in the current report are actually presented separately for every climate zone. So you can just look at, I guess make your own groupings.

So here are the daytime numbers, the 24-hour numbers and the retail numbers.

So just to wrap up, I think one of the biggest impacts that we're seeing here is that is rigid insulation, continuous insulation is showing up as being cost effective for metal frame walls. And that's a big change.

And another thing which obviously is occurring here but we haven't tried to quantify it, is these insulation -- the increased insulation levels will result in smaller HVAC systems. And that will be a benefit to the project.

But we've not tried to factor that into the analysis. There's obviously a lot of gnarly issues around how you might do that, because, you know, if you could buy a 4.8 ton system, it might not be available. So you might be stuck with a larger piece of equipment anyway. So we haven't tried to factor that in.

There's a few things we're going to follow up on. We're going to do an energy impact statewide. We're going to take another look at the floor numbers. For mass floors, in particular, in the coastal climates, the model is showing that there are no benefits from insulation. In fact, it's showing that in some instances adding insulation can result in more energy use. And so we're looking in to see if that's really the truth.

I know there's some DOEII experts here right now, so maybe you'd like to comment on that? Joe Long and others.

And we're also going to take another look at this with the more current lifecycle cost numbers that were presented yesterday. And we obviously would have used those numbers, but they weren't available, even to us, until last Thursday. So we didn't have time to redo the report before today.

And we're finally going to look at possible different climate zone groupings.

So, I'll stop there. Any questions?

DR. AKBARI: Hashem Akbari, Lawrence Berkeley Lab. First, a point of clarification. By using the 2005 standard I'm assuming that you are using the high solar reflectance for the roof as a basecase for all these analysis, is that correct?

MR. ELEY: Correct. Yes.

DR. AKBARI: Some of these results for the coastal climate are different from what I have done or other studies have done in previous DOEII modeling. Particularly in the climate regions such as San Diego area, coastal range. That there is, for a lot of time during the year, the outside is cooler than the inside. And a steel building needs air conditioning.

Having more insulation would retard the natural dissipation of heat from the building, and actually would add to the cooling energy consumption.

We discussed this thing, I believe, in several of the workshops that we had three or four years ago, and that was again the consensus right then. I would like to understand, are you coming with a different results? Or it is the same type of results, but it is different climate regions?

MR. ELEY: Well, the phenomenon you're talking about is sometimes called the thermos bottle phenomenon. What we've discovered is that if you model -- if you use an HVAC system that has an economizer, and with the economizer if you have the situation you talk about, where the building is in a cooling mode, but it's cooler outside than it is inside. Then the economizer is basically providing free cooling in that case. So the benefits of losing heat through the wall are negated, or even eliminated.

If we had chosen to -- that's why that assumption that I showed earlier about the HVAC systems is so important. If we'd chosen to model a package rooftop without an economizer, I think we would see the effects you're talking about.

DR. AKBARI: I probably have to think about a little bit more, but still I'm thinking that having less of heat escaping through the walls, even with a free economizer still a fan has to flow, and there would be some more energy consumption.

MR. ELEY: Well, the fans run all the time in nonresidential buildings.

DR. AKBARI: Okay, thank you.

MR. ELEY: They're constant volume system. So you're not getting a fan penalty.

MR. HUONG: Joe Huong, LBL. I came up here to ask a different question, but in reference to what Hashem says, yeah, I agree totally with Charles, that the studies I've done, if you have economizer then that effect goes away because the outside air takes care of the extra heat that the building is retaining.

MR. ELEY: I think if we let the fan cycle we would still see the effect Hashem was talking about. But we're also running the fans constantly, as is required for nonres occupancies.

MR. HUONG: But the question I came up here to ask is actually more directed to Bruce and to Smita, is that does title 24, do you have a -- and this is sort of a geeky question -- do you have a standard approved method for modeling a two-dimensional heat flow for walls?

MR. MAEDA: No.

MR. HUONG: Okay, the reason I ask that is when I did all my runs one thing that came up very quickly is if you take the wall sections in the joint appendix, then there's a question do you model it as, you know, as two different layers of stud section and nonstud section, or do you use some other method.

And I ended up just punting on that because it just seemed like too much work to duplicate all the layers and then if you have metal framed walls you can't even do that. You have to use a 2D program.

And actually I worked on a project for the Commission about '94, '95, to do a 2D analysis of metal framed wall sections.

So that's why I have this question, like do you have a approved method to model 2D heat flow, especially metal framed walls?

MR. ELEY: Well, the numbers in joint appendix 4 were developed, I believe with the zone method. They were saying -- what was the program called?

UNIDENTIFIED SPEAKER: EZ Frame.

MR. ELEY: EZ Frame, that's it, EZ Frame.

MR. PENNINGTON: You need to come up if you're going to --

MR. MAEDA: Bruce Maeda; Energy Commission Staff. Yeah, the metal walls are done with using the EZ Frame program, which is a subtle method which is sort of two dimensional, but not exactly.

MR. ELEY: Now, as far as air models in DOEII, we used the layers that are specified in joint appendix 4. And as described in joint appendix 4 you create this hypothetical layer where the framing and the insulation exist. So we didn't break the wall up into wood and cavity. We put in a hypothetical nonexistent layer that had the thermal properties of the two that resulted in the U factor that's published in joint appendix 4.

So, it's -- that's what we did. So we did capture the mass effects and the layers through the wall, but the trick and the shortcut was to create this funny cavity layer.

MR. DESJARLAIS: Andre Desjarlais, Oak Ridge National Lab. Charles, I have a question about your wall systems. It struck me that you missed one of the most important systems in nonresidential which is a wood deck with bat insulation underneath, which is a lot more typical than blown-in insulation, and it's a lot more expensive than blown-in insulation.

So I wonder why you did not include that and included the one that I think is atypical for nonres.

MR. ELEY: Well, that's a good point. You're talking about like 1-1/8 inch plywood, maybe four-foot spans or something --

MR. DESJARLAIS: Wood bats underneath, yeah.

MR. ELEY: -- and you would pin the bats

underneath that?

MR. DESJARLAIS: Yeah. That's probably the bulk of nonres roofs.

UNIDENTIFIED SPEAKER: That's probably 80 percent of the market.

MR. ELEY: Well, we can look at that. That would probably change the number significantly.

MR. DESJARLAIS: Yeah, I'd suggest you replace the loose-fill product with that configuration because I think that one's much --

MR. ELEY: With that configuration, okay.

MR. DESJARLAIS: -- much rarer in California construction.

MR. ELEY: And it would be a pin system with the stickpins and --

MR. DESJARLAIS: Or staples, yeah.

MR. ELEY: Or staples, okay.

DR. SHOEMAKER: Lee Shoemaker, I'm the Director of Research and Engineering for the Metal Building Manufacturers Association.

And later this afternoon when we have the public, I have some additional comments to make at that time. But I would just like to ask a couple questions on this study.

Charles, you mentioned that the proposal would include going to U values rather than R. And as you know, the metal roofing jumped that barrier in the 2005 cycle and are required to use U values for the assemblies rather than the R value.

And it made me wonder, looking at your analysis, where you came up with the required U values for the different roof and wall systems, and looking at the metal building roof and walls in particular. How did you then go from the U -- did you just take the reciprocal of the U that established the R in terms of the costing of the insulation?

Because I'm concerned because metal buildings are quite different in how you increase that insulating value. It's not a matter of just putting additional inches of R and looking at the cost factors involved with that.

There are substantial costs involved in additional ways to insulate metal buildings. And I'm just concerned that maybe the costs didn't capture all of those considerations.

MR. ELEY: Well, I'd invite your comment

on the numbers that we used. Essentially what we did is we did not create any new constructions that didn't already exist in joint appendix 4.

So in the case of metal building roofs or metal building walls, we looked at the insulation cases that are there, published already. And we attempted to price each one of those, and then evaluate their performance.

So, you should take a look at the cost numbers that we used, and offer your comments. We didn't want to try and expand it because, as you know, heat transfer through metal building roofs and walls is quite complex. The numbers that are in joint appendix 4, I think, are the NAEMA numbers. And we didn't want to mess with those or try to add new cases. So we just stuck with the stuff that's there.

DR. SHOEMAKER: Right. Of course, --

MR. PENNINGTON: Could I comment on the question and response? It sounds like the question was did you use some sort of simplifying factor of evaluating the overall R value and sort of have some sort of linear projection of cost as a function of overall R value for the assembly.

And I think the answer to that is no,

you did not do that.

MR. ELEY: No, we didn't. We looked at each column and row in joint appendix 4 as a particular construction. And so that's what we looked at.

MR. PENNINGTON: So basically the insulation costs are, you know, completely dependent on the assembly and how you would add insulation logically in that assembly.

DR. SHOEMAKER: Right. The only -- I'll look at that and give you some additional input if I have some. But in the tables you're talking about where it has across the top the amount of continuous insulation, and our wall systems that are screwed to the girds, you can't use that continuous insulation in that table.

The only practical way to insulate is the column with zero insulation. So if any of the systems fell over in that we might have to take a closer look to see that.

MR. ELEY: Okay. I don't remember for sure. I think the results all showed up in column one, though, which are the ones that are, as you say, more feasible.

DR. SHOEMAKER: Okay, thank you.

MS. HEBERT: I'm not sure which one of you got there first, but go ahead, Hashem.

DR. AKBARI: Hashem Akbari. Very short question. You said that you used the economizer cycle. Can you tell me what was the setpoint for the economizer cycle temperature?

MR. ELEY: Well, the short answer is we used the specifications in the ACM manual. Now, my memory's not good enough to cite those back to you, but I think it's what, --

DR. AKBARI: It's 55 degrees Fahrenheit.

MR. ELEY: -- 55 degrees or something, yeah.

DR. AKBARI: Yeah. So if it's 55 degrees Fahrenheit, I would like to --

MR. ELEY: But I think it's maybe even integrated economizer, so you could partial outside air up to the return air temperature. So, whatever those assumptions are is what we used.

DR. AKBARI: Okay, thank you.

MS. HEBERT: Okay, Dick.

MR. GILLENWATER: Dick Gillenwater with Carlisle. Question dealing with insulation, but is not specific to what we've been discussing here. It deals more with section 149 where we get into additions, alterations and repairs. But since we're talking insulation it's a good time to bring it on and put it on record.

And there's been a fair amount of discussion around when we're coming up to do a reroof condition of how do we address the insulation. And I think discussion at this point has been if I don't expose the insulation I don't have to bring the roof up to the stated R value or U value of the project.

And I find that kind of interesting that back east if you have to go and do a reroof you have to bring it up to code for the U value, R value. And I think that really needs to be looked at, because insulation is really a prime driver in the performance of the building.

And 70 percent of the construction in roofing is reroofing. And there's a much bigger inventory out there of existing buildings than what we're building new. And if we don't have -- if we talk about the construction in California, where 80 percent of it is wood deck, and the bat insulation is underneath, you're not going to expose it when you do a reroof, even if you tear down. Because normally you're not going to take the deck off when you do that, so you're not going to expose the insulation.

So, most buildings aren't going to get a new R value. And again, most roofs are going to go ten years or longer, so we're talking about buildings that are over ten years old out there that are going to be even a far lower requirements than what we've had since '99 or 2001, that kind of thing.

So, I think it's something that we need to take a look at.

MR. ELEY: Thank you for that.

MR. PENNINGTON: Let me ask you a question. You said -- I want you to be a little bit more precise -- you said when we build back east. Are you referring to a requirement in the international building code?

MR. GILLENWATER: No, normally state codes. Massachusetts, Connecticut, New Jersey, all the way down along. These states have their own codes and --

MR. PENNINGTON: Could you provide us with specific references to those state codes?

MR. GILLENWATER: I could do that; I don't have it off the top of my head, --

MR. PENNINGTON: I understand.

MR. GILLENWATER: -- but I can get that information for you.

MR. PENNINGTON: Great, thank you.

MS. HEBERT: Go ahead, Bruce.

MR. MAEDA: Charles, you said when you adjusted means data for California, you used different areas within California. How was that, were they weighted by valuation or floor area or --

MR. ELEY: It was weighted by projected construction volume.

MR. MAEDA: What do you mean volume?

MR. ELEY: Well, in California there's approximately 160 million square feet of nonres buildings built each year. And we know approximately how much of that 160 million is built in each of the climate zones. And that's what -- each of the areas.

MR. MAEDA: Okay, so it's by square footage only.

MR. ELEY: Yeah, yeah, square footage of construction volume.

Is that it?

MS. HEBERT: All right, it looks like no

more discussion. It is now 12:11. My stomach's growling.

We have not yet gone through all the five-minute overviews. Charles is going to come back, I think we're going to do this after lunch, and finish talking about the overviews, topics we're looking at for 2008.

We're going to have Hashem also talk about cool ducts after lunch.

And so let's give this an hour today instead of 45 minutes, or how about an hour and five, 1:15. We'll start precisely at 1:15.

(Whereupon, at 12:11 p.m., the workshop was adjourned, to reconvene at 1:15 p.m., this same day.)

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AFTERNOON SESSION

1:21 p.m.

MS. HEBERT: We're a couple minutes after 1:15, but let's get going. This afternoon the agenda, you may have noticed, the agenda got shifted a little bit. We originally had the talk on insulation levels for the afternoon; and that happened before lunch. What we didn't get to in the morning was the rest of the Energy Commission's list of items we're looking at for the 2008 standards. And we're going to start that now.

First, we're going to have Hashem Akbari talk about cool ducts; and then Charles Eley will take it from there. So, Hashem.

DR. AKBARI: Thank you, Elaine. This is cool ducts with a "t". Actually you can review my slides -- if you're a scientist, you can review my slides from the last slide to first. If you are a policy and decisionmaker, this is a summary of the slides.

I would like to propose to have cool ducts to be mandatory requirement for all rooftop exposed duct systems.

And the exposed duct systems are using

about, depending on how one gets the statistic, between 10 to 30 percent of the commercial floor space. It is primarily the way that it's being used in spec buildings like in Silicon Valley, that they need to have a very manageable and alterable systems for heating and cooling.

So they typically put the walls around and all the interiors are being designed by the occupant. And then they put the rooftop packages right on the roof. And then run the ducts right unexposed on the roof. And since the energy is a fairly small components of their business, they want to be able to expand their business in a period of one month if that's need to be.

So, the proposal that we do have is that for cool ducts I specifically would like to propose white material, has a reflectivity of 70 percent at a thermal emissivity of 75 percent. Have an effect on reducing the cooling energies of the building, and also directly reduce the peak demand on the building.

The scope of this work, this is a PIER-supported work. They have many years ago there were some claims by contractors that after they have coatings on their ducts they have find out that the duct, the system have improved the efficiency significantly.

There are several ways that these cool coatings have helped them. One of them is to fix some of the small leaks in the duct system. But this is the one that we are not addressing here. We are only addressing here the amount of the solar gain by the duct system that are exposed ont he roof. And if you eliminate that solar gain, how much energy efficiency improvement you will get.

And there are occasional number of residential buildings that they may have a rooftop duct system, air conditioning with duct system, but it primarily applies to the small and large commercial buildings.

The way that we would do a complete analysis that it is in hand, we would look at the market availability for cool ducts either in the new market or the retrofit market, and that would include the cost, the availability and the useful life of the cool ducts. That most of them are metal sheath at this time.

And we would perform a cost/benefit analysis for all the climate regions using DOEII model. We would look at the net savings, cooling savings, and minus heating penalty. Some of these air conditioning systems are package units that they do have their heating devices on the rooftop, too. So the effect of the cool ducts should be looking at potential heating penalties. And then we would be looking at the statewide impact.

Why we are proposing this thing. We made measurements, careful measurements, on three systems. All three of those systems happen to be in Sacramento at the CalState University.

This was an initial dark system, and we put coating on it. Before we installed coating on these ducts, we put temperature sensors out around the ducts at the entrance of the duct and at the entrance to the zone.

And we also measured the ambient condition; we measured incoming solar radiation, wind speed, wind direction and any other data that we can obtain.

The data was collected at 30 Hertz and was average at 30-second interval. For most of my analysis I chose to present, present the data at the hourly level, but the data are available at the high resolution, if you are interested.

The bottomline is this. By the way, I'm going metric here. In these three systems the amount of the thermal load reduction was ranging between 5 to 20 megajoules per meter square. For those people who would like to convert this thing to per foot a square, you divide this thing by 10, you get it by foot a square. If you want to change it to the thermal load, divide it by 3.6, you get kilowatt thermal.

Then the amount of the energy savings that we have in here was something between 6 to 13 kilowatt hours per meter square. Remember that these savings are the savings on the air conditioning load that are resulting from this reduction in the shell of the duct system.

By the way, I should also mention that all these three duct systems have a nominal R6 insulation. We have no way of being able to measure the insulation on the ducts. What we did was just measure the thickness and the property, and also asked them what the installed value of this insulation is. The number was R6.

So after doing all this calculation, in a new application the simple payback that we got an estimate for these three system, on a new application, that's a very important point to remember, was between two to five years.

What is a new application? I went to -- I got the statistical data by going into two hardware stores and looking at the price of galvanized sheetmetal versus painted white metal. The differential between these two was 25 cents a square foot. So I used those numbers in order to estimate what would be the payback in years.

And now in a retrofit application the story is totally different. Typically a duct system like this actually is a single duct, has something like 10 square meter of surface area. And if you pay $10 per a square meter of surface area, that's $100. You would not even be able to attract a contractor to come and see this thing for $100.

So for a retrofit application one has to think about if such a measure would like to be incorporated, to be done either at the time that the system is being completely changed, or some major work on the roof is being done that require dismantling this HVAC system, or this duct system, and installing it again.

Here are some of the measure data. On

the duct surface temperature, these are the horizontal surface temperature before the coating, after the coating. There are three data in here. The blue one shows the actual measured data. The purple one shows my model, calibrated model, for this based on the solar insulation, the temperature rise. The scale of this thing is surface temperature minus the ambient temperature.

Where on the hot days, typically at noontime, the surface temperature is about 35 degrees Celsius, about 65 degrees Fahrenheit, warmer than the air.

So that would mean, you know, in an August or a July, if the outside temperature here is 42 degrees Celsius, this surface temperature is about 75 degrees Celsius.

When you install the coating the maximum surface temperature reduce to about 7 degrees Celsius. So during all this period that the sunlight hours, this difference is the thermal load on the duct.

So, there are two data here shown -- or two plots in here shown. It's showing the temperature rise in the duct, looking at the temperature of the air when it is entering the zone, minus temperature of the air when it is coming out of the air conditioner. That is where the duct is having an influence on it.

And there are two plots shown. One of them is the measured data. The other is the calculated results based on my calibrated model. And as you see, prior to the installation of the cool coating, the temperature rise in the duct was something around between .8 to slightly over 1 degree Celsius, about 2 degrees Fahrenheit in this period of about ten feet of the duct.

And then after the coating was installed this temperature increase was reduced to about .2 to .3 degrees Celsius, about half a degree Fahrenheit. This difference are the changes in the load.

And going back when you do all these calculations, you summarize them and analyze them, the amount of the thermal load reduction in these three systems range between 5 to 20 watt per megajoule on the savings; kilowatt hour savings if 6 to 13 kilowatt hour per meter square.

Comments? Questions?

MR. SHIRAKH: On your next slide --

MS. HEBERT: Come to the microphone,

Mazi.

MR. SHIRAKH: I'm sorry, it's Mazi Shirakh. This temperature here are actually negative, the surface temperatures?

DR. AKBARI: Correct.

MR. SHIRAKH: How could that be? How could you have surface --

DR. AKBARI: Surface temperature is cooler than the ambient temperature. For early morning hours of the day, the surface temperature can be cooler than the air temperature.

MR. SHIRAKH: Radiation to the space --

DR. AKBARI: Radiation and nighttime cooling -- this is typically between here there is about one hour.

MR. KELLEY: Kevin Kelley with DuroLast Roofing. I'm curious, just a general question about the metals that you're talking about. You want to replace the galvanized metal with coated metal. Well, what does that matter if you're going to bury it with insulation?

DR. AKBARI: If you look at the picture in here typically what's happening is that there is an outside metal chasing for the duct. So, currently most systems, or all the systems in

California State University are like this.

They can choose if this is a new system to have white metal rather than galvanized metal.

MR. KELLEY: But in your other system isn't that -- is that blown-on foam? Maybe I just misunderstood that part.

DR. AKBARI: This is exactly the same system. The difference here is this is coated and it's becoming like this.

MS. HEBERT: Hashem, is the insulation on the inside of the duct?

DR. AKBARI: The insulations are all inside the ducts. That's the way --

MR. KELLEY: Oh, I'm sorry, I thought this was blown-on foam.

DR. AKBARI: No, no, it is only coating in here, correct.

MR. KELLEY: And this would be further enhanced by the cool roof being present versus just retrofitting the ducts on top of a roof that's not cool, so to speak, so --

DR. AKBARI: That is, you know, I would -- that's another part of our study to look at the effect of the cool roof on the duct system. And that result is not yet out there. But it's not as conclusive as we wished it would be.

MR. KELLEY: Thank you.

DR. AKBARI: Yes.

MR. ELEY: This is Charles Eley; I have a question or comment. If you look at the industry that manufactures sheetmetal duct work for nonresidential buildings, I don't think you're going to see any product in their shops that's painted. It'll all be galvanized.

And so I think we should look mainly -- we should look at, for this situation, we should look at field-applied coatings as the predominant situation. I doubt very much that the sheetmetal industry is going to switch over to painted metal products, as opposed to galvanized metal products.

I think this is an important situation and there's clearly some energy savings. But if you look at the square footage of their product in buildings, I think still most of it's probably internal to the building, and would use the galvanized product.

DR. AKBARI: I see that Commissioner Rosenfeld would like to make a comment. I only ask the question why do you think that they would not be able to buy painted metal from the same manufacturer.

I know that they are not doing it at this time. There's no question on that one. I also agree with you that what they have in their store, probably it is galvanized metal.

But why can't they buy it painted metal?

MR. ELEY: Well, they could but I just don't think they would. They want to standardize -- I mean these things are huge, tons of these rolls of steel.

And, you know, if they're doing a little piece of duct that's up on the roof, they're not going to want to pull off five tons of steel and put on another coated version of five tons of steel just to do that one little job. They're just going to crank it out, in my opinion.

I just don't think the sheetmetal industry is going to shift over to a painted product.

DR. AKBARI: Again, I understand your concern, --

MR. ELEY: But maybe you could do -- go visit some of the shops and talk to them about it and see if my perception is warranted or not, but I would doubt very much that they're going to shift over.

DR. AKBARI: I'm understanding that, you know. Let me take, you know, one of the Silicon Valley as an example. There are, if you go by highway down the San Jose area, you would find out that there are tons of this exposed ducts on the single story spec-type, flat-type office manufacturing.

So what we are suggesting is that from now on every single one, or what I would like to strongly recommend is that from now on every single one of those have to be white. So that every time they're in use, -- is going to be real. You do not take up the galvanized metal, you take the painted metal. And that's all the duct systems that are out there.

COMMISSIONER ROSENFELD: But, Hashem, the problem seems to be that, if Charles guesses right, that the majority of the ducts are still internal, I guess what Charles is telling us is that galvanized is still cheaper than white paint.

MR. ELEY: Well, yeah, it is.

COMMISSIONER ROSENFELD: And so then the idea that the industry would just flip over isn't realistic. And then you become a niche item, and then that's not popular.

MR. ELEY: The other thing is these duct shops are incredibly automated. You basically draw your duct thing out and this laser comes around and cuts it out and folds it and puts it together, and sears the seams and everything.

And it's all set up for this big huge spool of galvanized metal coming off. And I just don't see the industry shifting over. Maybe they would, but my hunch is that for this to work it's going to have to be a field application.

MR. PENNINGTON: Let me ask a question, Charles. You say duct shops, so you're imagining that these ducts are manufactured in a warehouse or something like that, is that right? And then taken to the field by the warehouse?

MR. ELEY: Yes.

MR. PENNINGTON: So it seems like in that kind of application it would be easier to have two spools of metal and run your piece, you know. That much duct is going to fill a truck anyway, you know, or more. So, why couldn't one or two of your truckloads be white?

MR. ELEY: I think what probably is a realistic solution is maybe they can spray it white in the shop and bring it out to the field already white.

But the machinery that fabricates these ducts, it's very expensive, very automated, and it's all set up to just crank it out. Puts those little x creases in there for reinforcing and, you know. There's another machine that makes the spiral duct at whatever diameter you specify.

MR. PENNINGTON: So the problem is to change out these two rolls in that process.

MR. ELEY: Yeah, but it's not like changing thread on a sewing machine.

MR. PENNINGTON: No, I understand.

MR. ELEY: The spool is as big as this room, you know, it's a very -- and very heavy piece.

Just investigate it. It may -- maybe they will shift over, I don't know. But I don't think there's any duct shop right now that's using painted metal. They're all use galvanized.

MR. RIEDEL: This is Randel Riedel, CEC Staff. My experience in regards to going to many of these HVAC manufacturing shops is that they're actually in the manufacturing process, just as you said. They're welding, they're doing other things. And I think what would happen is that any painted surface would, you know, probably crack and be destroyed. Or maybe even not allow those type of sealing processes to take place.

MR. ELEY: Well, I mean the industrial coated sheetmetal is pretty durable. You can fold it and bend it, and you can work with it the same way you can Galvalum. It's just a matter of whether they're willing to, you know, shift over to that product in the process.

MR. SHIRAKH: Well, I guess what Charles is suggesting, we should contact some manufacturers and get a flavor from them.

DR. AKBARI: Absolutely, absolutely.

MR. ELEY: I mean some of the big sheetmetal like Linford Air and Oakland and Scott and some of those places have it. They're all set up to do these jobs.

DR. AKBARI: This is well taken; these are the things that definitely we got to do. Obviously if the manufacturers are not going to do it, we are not going to go anywhere.

You know, basically from a fundamental point of view I know that the same manufacturers I'm going to name, say (inaudible) as one example, who is selling galvanized product at the same time they are also selling the colored sheetmetal with the same mechanical specification. And these colored sheetmetals are all being used, you know, in many machineries in order to shape them in the way that they want.

So if such a -- what would happen in the future if that if such a thing takes place, they are there, the manufacturers of this duct system would be having two sorts of metal shapes at their facilities. One of them is the galvanized for the interior application and then the other one is white-painted for the exterior application, if such a system would work.

MR. PENNINGTON: It seems to me Charles is also suggesting that there be a look at field coating the ducts, or maybe addressing his problem in the factory by coating in the factory.

So, are those things -- it seems like those are things that you should look at in your study, also.

DR. AKBARI: Oh, I think that coating in the factory is an excellent idea, because, you know, the biggest issue that make this thing not very attractive is the labor costs to go after and put the coating on a single duct. But if it is a factory installed paint, that definitely makes sense.

COMMISSIONER ROSENFELD: Hashem, I just want to ask you, I am not good at remembering megajoules per square meter. Can you say a percentage roughly what you save by this trick?

DR. AKBARI: I think that on an annual something like about, I would say, 5 to 7 percent. It depends how -- if your system is running continuously the percentage saving is smaller. If the system is running intermittently the percentage savings is higher.

COMMISSIONER ROSENFELD: But still like 5 percent? That's good, that's --

DR. AKBARI: Five percent, correct. Yeah, it is like, you know, having an SEER 12 going to a SEER 13.

MR. PENNINGTON: It must be better than that. That's a joke.

MS. HEBERT: I have a question, Hashem.

DR. AKBARI: Yes.

MS. HEBERT: The photograph that you're showing of these ducts shows that they're above the roof surface by two or three feet or something like that.

Is the coating applied to the underside as well as the other three sides?

DR. AKBARI: For this particular application two of these systems were only about six inches above the surface. In those cases we didn't paint the underneath.

But for this particular one we also painted the underneath.

And these are square meter that are being measured in here is the surface of the duct area.

MS. HEBERT: So in the case of the photograph you're showing, that meter square includes the underside, is that right?

DR. AKBARI: Absolutely.

MS. HEBERT: Further discussion? And were you finished, Hashem?

DR. AKBARI: I'm done.

MS. HEBERT: Okay. Charles, you're up next. After Charles and the discussion we'll have on the rest of the topics, there'll be a time for the public to come forward to the microphone and address us. I forgot to mention that earlier.

Mazi's asking if we're going to do the

blue card system. There are cards out there. We didn't use them yesterday, so maybe we'll just have people raise their hands. And perhaps we'll batch the comments by topic, because I know there's lot of people here who want to speak to roofs, cool roofs. And that will be one discussion and then we'll cover other topics, as well.

MR. ELEY: Okay, so these are the loose ends that haven't been picked up by a CASE study or one or the other researchers. And there's four topics I'm going to cover.

The first one is the reference, the computer program. I mentioned this yesterday in the context of residential buildings. It's also an issue with nonresidential buildings. The same gaps are there, the gap between commonly available engineering information and inputs required by EnergyPlus.

Work is continuing on this, and the goal is that the ACM requirements for '08 will at least enable EnergyPlus-based compliance tools to meet those requirements.

Ventilation for indoor air quality is also a topic with nonresidential buildings as well as residential buildings. ASHRAE standard 62.1 2004 has been released. There's a users manual for that. It has lots of requirements in it.

It's not just outside air ventilation rates anymore. It has that, of course, the outside air ventilation rates. But it also has requirements in there for, for instance that the condensate drain pan under coils slope positively towards the drain, rather than being dead flat, so that there's less likelihood that there will be algae or other kinds of growth in that drain pan.

There's requirements in there having to do with the position of the outside air intake relative to the position of the outside air exhaust, so that you're not just recirculating air into the space.

And there's a whole host of issues like that that are addressed in standard 62.104.

Also there's a proposal to incorporate most of 62.1 2004 in the California Mechanical Code. So, when that happens we may be able to simplify the language in the title 24 ACM manuals and the code, and simply make reference to the California Mechanical Code. So that's what's going on there.

The next one is nonresidential ducts. I'm not sure this one's going to go anywhere because I understand that the funding has been discontinued on this research. But this was a project at the lab to study duct sealing requirements in large nonresidential buildings. We're talking about big, 15,000 to 25,000 cfm air handlers and big trunk systems with VAV boxes around and so forth.

Whether this materializes into a standards change I think is going to depend on what happens at Lawrence Berkeley National Laboratory. The researcher there is Craig Wray, who's been doing this work. The last word we got is that there was no more funding for this effort, and that it may not materialize.

The next one is we will be looking at other codes and standards, and for nonresidential in particular we'll be looking at ASHRAE standard 90.104 to see if there's anything in there that would be appropriate to incorporate into the California standard.

One idea came up this morning, or perhaps it was yesterday, about possibly requiring energy management systems in larger buildings. I think this is something that's in 90.104; 100,000 square feet, I think, or 10,000 square meters. See, you've got me talking SI units now.

And so that's one example. But there's some other things in there. Mainly in the area of HVAC. I've talked with Jim and we don't think there's too much in the lighting area that we need to bring in. But in terms of HVAC there are some things.

Another example of requirements in 90.1 that's not in title 24, there's a requirement that buildings more than three stories in cold climates have a vestibule at the entrance. This is not in title 24, but it is in ASHRAE. That's another example.

There's a number of little -- maybe they're not so -- John Hogan would say they're not little things -- but there are a number of items like that that are in 90.1 that are not in title 24. We'll be taking a look at all of those.

Oh, question?

MS. HOLLERAN: Judy Holleran, Henry Company. One of the key things is coming up in the 90.1 is about the unintended exfiltration/ infiltration of air.

This is an area that's already code in Massachusetts. And it's an area of additional states are also taking it on.

There is now more and more evidence of savings, even in our more air conditioned climate. So I would advance this, and the Air Barrier Association of America also has a lot of information that could be provided.

MR. ELEY: That's another example. Now, that's not actually in 90.104, but it's on the table for the next version of 90.1, which will --

MS. HOLLERAN: Yeah, it's coming through probably in the next --

MR. ELEY: -- 2007 or whatever it's going to be.

MS. HOLLERAN: I'm hearing probably next 12 months that that --

MR. ELEY: Okay. Basically what this is, what they've discovered is in large buildings you need -- they're recommending a combination vapor barrier and air barrier. And typically what you use is if you've got metal studs you have exterior sheetrock. And then there'd be a peel-and-stick combination vapor barrier/air barrier on that. And then you'd have rigid insulation outside that.

So the vapor barrier is in the right position in terms of the thermal properties of the wall and it works as both a vapor barrier and an air barrier.

The next -- there's a lot of things to clean up on the acceptance testing requirements. This was a new feature of the 2005 update, except it's testing is required for VAV systems, constant volume systems, package VAV systems, economizers, and so forth. As well as some lighting controls like occupant sensors and daylighting sensors.

There have been a few issues with that. There's a requirement for calibrating thermostats and there's, I think, a problem there with that particular requirement. Some thermostats are not capable of being calibrated in the field.

And there's also some issues with the flow measurements that are required for hydronic systems. So, it's mainly little cleanup things.

But another thing that we will be looking at here, I don't think this came up in the PIER research reports, but PIER's been funding systems of fault detection and diagnostic software for air handling units. And even packaged rooftop units.

These are systems that continuously collect data. The data can be analyzed; problems can be detected prior to an equipment failure.

And so this might be a feature that would enable you to waive the acceptance testing requirement. So that's an option. Martha Brook may have spoke to that this morning.

MR. SHIRAKH: Can I ask you a question? Is there any acceptance testing for the automatic fault detection equipment, itself?

MR. ELEY: Well, perhaps. It's not clear exactly how that's going to -- whether it's going to be factory-installed or whether it's a field-installed device, or just what it is.

There's a couple of forms of it right now. One is like the technician comes to the field with a suitcase full of sensors and hooks them up temporarily and kind of analyzes the problem. Kind of like when you take your car into the shop and they plug it into the computer and it tells you everything that's wrong with it. There's that option.

And then the other option is to have sensors installed in the equipment at the factory with some type of communications protocol where that data can be passed back to the energy management system, or maybe to the service contractor. It's not clear quite what direction this would be going in, or what physical form it would take.

There's a number of nonresidential lighting improvements. We always look at the nonresidential lighting, and we always seem to achieve some of the largest savings in the area of nonresidential lighting.

This is a list of some of the things that we'll be doing this round. We looked at ceramic metal halide sources last time, and they were close to being cost effective, but not quite. So we'll take another look at that. Because that would affect retail display lighting for the most part.

We will also take a look at our models. When we did the models before we did a simplistic conversion of Lux to footcandles by dividing by ten, when you should divide by 10.76. So that might affect the outcome a little bit in a few -- Jim's shaking his head now, but probably not a big deal, but we will take a look at that.

MR. BENYA: IES divides by ten in their standards.

MR. ELEY: Okay. We'll also look into ASHRAE and see how the lighting power densities in title 24 compare.

And we may also place some conditions on, there's a dimmable ballast requirement that gives you a 25 percent power adjustment factor. Right now there's not many conditions or requirements on what that dimmable ballast needs to be. We may add some conditions there, specify in more detail what you have to do to qualify for that power adjustment factor.

MR. BENYA: (inaudible) reduce the factor.

MR. ELEY: Yeah, and maybe reduce it from 25 percent to some other number.

The next one is maybe a fairly big thing. Maybe Jim can speak to this, but there have been some significant improvements in large wattage metal halide lamp systems that could significantly affect the lighting power density numbers for like big box retail, manufacturing, spaces where you have high ceilings and HID applications.

MR. BENYA: Very quickly, and we met over lunch with Gary and Mazi and Tom Tolen and I talked about this, but the evolution of the high wattage, it is not highest wattage, but the very important 250- and 400-watt class metal halide.

What's going on is ceramic lamps are now becoming the way of the future very clearly in this wattage class. But probably more importantly the electronic ballast is now here. And that combination of the electronic ballast and the ceramic lamps is showing a 25 percent, give or take, improvement over current pulse-start technology. It's a very very big number, and we expect to be able to move forward with that, because we're using it today in projects already.

MR. ELEY: And that'll likely bring down the lighting power density in some of the tables.

MR. BENYA: Um-hum.

MR. ELEY: The last one I think Steve already covered. It's one of the CASE initiatives you're going to be looking at retail lighting, in particular, the tailored method.

The last one on my list is one that we're going to look at, I think. One of the subcontractors, Taylor Engineering, will probably be the one to do this work. But, in certain types of spaces like hotel function rooms, shopping malls, big box retail, these are basically single zone spaces, meaning there's one thermostat that controls maybe 20 to 30 tons of air conditioning load.

Yet in these spaces the thermal loads can vary quite a lot. A hotel function room, depending on whether it's occupied or not, or whether the lights are on or not, and other factors, it can vary from 20 percent to 100 percent of its design load. Same with big box and shopping malls.

So, the measure here would be to identify the class of buildings or applications where it would make sense to require variable air volume in these single zone applications. They would still be single zone applications, but instead of providing a constant volume of air for all of the hours that the space is conditioned, the volume of air would vary in proportion to load.

And for this system to work the cooling capacity would also have to modulate in some way. There would either be multiple chillers or compressors that come on one at a time. Or some type of scroll compressor with variable speed or something of that nature, so that you can get some modulation.

The more common modulation is you'll have a 20 or 30 ton system and there will be six or so scroll compressors there that can stage on one at a time in proportion to the load.

So this is another one that we'll look at, and probably it would show up as a prescriptive requirement, probably, in the nonres HVAC section.

I believe that's it, Elaine.

MS. HEBERT: Questions, discussion? Yes, please come forward.

MR. RUBENSTEIN: I'm Francis Rubenstein with Lawrence Berkeley Lab. I was going to bring this point up later but since you brought it up in your slide, Charles, I thought I'd bring it up right now.

With regards to the dimming ballast, as you point out there is a 25 percent power adjustment factor for dimming ballasts at this point that was put in place because the dimming ballasts have been quite a bit less efficient than the standard ballast that you otherwise would use.

It now looks as though there's been some improvements, which have happened over the last few years. And then also very recently another improvement that's been made.

So since you're in a situation now where the two major ballast companies in the U.S. now make a dimming ballast product which is considerably more efficient than what was the case, let's say five or six years ago. So, I would say that you could now, in terms of adding an additional criteria to the 25 percent ballast, sorry, PAF factor, that you could do it in terms of a ballast efficacy factor, and actually draw a efficacy must-exceed limit for dimming ballasts.

And I get -- if you use about 1.48 that would pretty much allow the newer generation dimming electronic ballast, but would preclude the dimming ballast from the last century, which I guess is a safe way to do it.

(Laughter.)

MR. ELEY: Good suggestion.

MR. BENYA: Yeah, Francis, the only caveat here is that these ballasts are just coming into the marketplace. We're going to have to be getting a little bit of experience with them.

I'm a little bit concerned about the full dimming range in certain applications. There's a number of little considerations, but I've been -- thanks to you I've been tracking this. And you're absolutely right, for whatever reason -- I know this is one of your pet projects or pet concepts, but it's something that we have desperately needed.

And thank you very much for staying on top of this, because you've really made a difference here.

MR. RUBENSTEIN: Well, the thing which did surprise me was that I've been beating up the ballast manufacturers for quite some time about the performance of the dimming ballast, and it did surprise me to find out that the largest company, in fact, had already gone ahead and improved its product. They simply -- we never realized it basically, so I just wanted to bring that to the staff's attention.

MR. SHIRAKH: And Francis has graciously agreed to propose some performance language we can incorporate into the standards.

MS. HEBERT: Further comments?

Questions?
All right, I guess that's it for that part of the presentation.
I need a moment here with Bill Pennington for a second, excuse me.
(Pause.)
MS. HEBERT: Okay, there's one other thing that was in my notes that I just pointed out to Bill, and it has to do with what we have in mind for hospitals, and Bill's going to address that.
MR. PENNINGTON: So currently title 24, part 6, that the Energy Commission has authority over, I occupancies, institutional buildings are outside the scope of the Commission's authority.
So that includes hospitals; it also includes correctional facilities, for example.
We think we're in pretty good shape related to correctional buildings in the state. But there aren't any requirements now for energy efficiency in hospitals.
And Commissioner Pfannenstiel has met with the Director of the Office of Statewide Health Planning and Development to talk about a joint project with the Commission to identify

those portions of the energy standards that would be directly applicable to hospitals and to skilled nursing facilities.

And so we're optimistic that we're likely to get into a joint project with them, where the Energy Commission basically sponsors the technical work. And we vet that work through the public process and rulemaking process that the Office of Statewide Health Planning and Development normally conducts for establishing code requirements for hospitals and skilled nursing facilities.

So that work will not be within this proceeding. It will be, you know, conducted in parallel. But it's something that we hope to accomplish during similar time frame. And plan to use some of the Commission's resources to try to accomplish that.

MS. HEBERT: Any questions or discussion there?

Okay, thank you. If there's nothing else that we have, we're going to now open the microphone to the public for your suggestions and comments.

And I did have one person fill out a

blue card, and because of that I think I'm going to let him go first. And this has to do with cool roofing. So, Craig Smith, are you in the room?

MR. SHIRAKH: Can we show how many people want to talk, just might show --

MS. HEBERT: Good idea. Show of hands on how many people.

MR. SHIRAKH: I count about eight people, thanks.

MR. PENNINGTON: All of these people on roofing, is that right?

MS. HEBERT: How many people on roofing out of those?

MR. SHIRAKH: I count about eight people, thank you.

(Laughter.)

MS. HEBERT: Great. Okay, Craig. Please step forward, introduce yourself and give your affiliation.

MR. SMITH: My name is Craig Smith; I'm with Superior Products International. Just as a off-the-cuff statement in regards to the cooling vents and things like that, this is something that our company has been doing for several years now. And it is very effective.

The thing, I guess, was questioning in my mind when we were talking about more of an OEM situation as compared to an applied retrofit or something like that, is that obviously the criteria has been changed for the roofing. And a certain portion of that is going to be coated already.

So I guess my contention is is that while someone is up there coating it, why not have them coat the duct work, also. Because it meets very similar criteria, if not more.

MS. HEBERT: Question on that. Can you use the same coating that you would on a, you know, whatever, a builtup roof or an asphaltic surface or something? Can you apply that same kind of coating onto the metal duct?

MR. SMITH: We have. I can only speak for my own, --

MS. HEBERT: For your product.

MR. SMITH: -- yeah.

MS. HEBERT: Thank you.

MR. PENNINGTON: I'm wondering, do you find that to be a significant increase in the total time for a job?

MR. SMITH: Not really. Especially if

you're coating a roof, because that makes it --

MR. ELEY: Probably costs more to mask it off.

MR. SMITH: Yeah, absolutely. Or drop-cloth it, or whatever. You just go ahead and spray; and spray under it and over it and move on. So, yeah, it's very very quick.

MR. PENNINGTON: So do you do some cleaning on the duct work?

MR. SMITH: Yeah, you would want to, of course. Do a power wash generally with TSP, you know, trisodium phosphate, or (inaudible) cleaner. A lot of times to remove city, you know, debris or whatever. Or especially on coastlines.

I'm from Missouri, so I'm not on the coast. But on coastlines where you have a high salt content, also. A lot of times we use a product called ChlorId, which actually takes the salts, the chlorides sulfates, nitrates and makes them soluble that power washing and detergents will not get off. And a lot of times that will also cause a coating to fail. I don't know if you're familiar with that product or not.

We don't make that product, but we do -- we are distributors of it, so.

MR. PENNINGTON: It seems like the standards might offer an option for cool ducts that allows either the duct constructing firm to provide the product, or to allow the cool roof company to apply the product in the field.

MR. SMITH: Right. You're saying either to get it OEM or applied, either one, yeah. And that was my point.

In our experience in talking with steel companies, cold rolled steel and so on, to get them to convert over to applying a coating onto it, are you talking about a lot of different things that you're talking about, whereas a lot of your steel it's just pumped off so fast.

Whereas if you start adding a coating it slows that line down. And most of these steel companies are not very interested in doing that.

But then you're also talking about the expense of adding ovens, drying, heat lamps, you know, a lot of different elements there, spray equipment, measuring, you know, to be able to get the proper mil thickness, all these issues on there.

And then, again, if it gets scratched or something out in the field, then you're going to have to go back and touch it up anyway, to be ideal.

COMMISSIONER ROSENFELD: Craig, Hashem quoted a cost premium of something like 25 cents a square foot, if I remember, for the factory-coated steel. Did you have a top-of-the-head estimate for how much it would cost to do it while you're doing the roof?

MR. SMITH: Oh, well, I suppose it all depends on the product. What I believe that -- I'm not really familiar with what he looked at. I know that there is some powder-coated material out there, things like that, that generally won't stand up out in the weather like some other coatings, but --

COMMISSIONER ROSENFELD: Maybe I didn't make it clear. You're proposing just to coat the duct at the time that you're coating the roof?

MR. SMITH: Yeah, or come in, even if it isn't a coated roof. But I would suggest it, because why have all that heat, you know, coming up and bombarding that ductwork. I mean to me it goes hand-in-hand, doesn't it?

COMMISSIONER ROSENFELD: Right, --

MR. SMITH: I mean --

COMMISSIONER ROSENFELD: -- but my question is while you've got somebody up there doing the roof, would it be 10 cents a square foot extra, or --

MR. SMITH: Oh, well, of course you just go by basically the square footage that you're charging. You know, and it also depends on the system that you apply, you know, as far as that goes.

So, I mean it's very difficult for me to give you an answer, but I'm not sure that to go and say, well, he's saying 25 cents a square foot, but he's not talking about installed. See what I mean?

I mean, if I'm correct. I mean that's not an installed square foot that is on the shelf by it. It's not paying anybody to install it; it's not paying anybody to get it there or anything like that. So there are other, you know, factors to consider, I think.

COMMISSIONER ROSENFELD: I thought Hashem's estimate was -- Eley says it won't fly, but I thought his economics of two- to five-month payback was on an installed cost of 25 cents a square foot.

There's some confusion here.

MR. PENNINGTON: You can sit down, Hashem.

DR. AKBARI: Okay, thank you.

MR. PENNINGTON: Sure.

DR. AKBARI: I appreciate that. The 25 cents estimate of my price was assuming that the labor cost would be the same, and only the incremental cost in retail store, that's what I saw in the difference in the price of a galvanized sheet versus a painted sheet.

And that is, as I said, it is statistics of two observations only in two retail source.

COMMISSIONER ROSENFELD: And, Craig, you're not able to say whether your technique of doing it onsite would be comparable?

MR. SMITH: I would say, you know, I mean if we were to go and give a bid, let's say one of our distributors go give a bid, probably installed, you know, and everything, of just coating the existing, you'd probably be looking at maybe 85 to 90 cents, something like that.

COMMISSIONER ROSENFELD: So worse, okay.

MR. SHIRAKH: But you are already there

to do the cool roof.

MR. SMITH: Right, exactly. And that's why I'm saying --

MR. SHIRAKH: Then that's what the Commissioner --

MR. SMITH: -- if you were --

MR. SHIRAKH: -- is asking.

MR. SMITH: Yeah, now if you're already there, sure, your range is going to go down, obviously. So, because, you know, you're going to be power -- you know, if you're there doing a roof already, you're going to be power washing the roof, you're going to be doing all that.

Ordinarily, and it's been my experience from being on roofs, is that you go up there and most of the time what you see is corrosion on those jackets. And regardless of whether they're galvanized or not, that galvanization does not last very long.

And it's been my experience that we, again, speaking from my own company, we go over it with a material that is for encapsulation of rust. We would at least cover the areas that were rusted first, and then we would go over it with the other material.

MR. PENNINGTON: So Charles made a comment earlier that it might take you longer to mask the thing off than it would be to actually do the coating, which implies a negative cost perhaps.

MR. SMITH: Well, not necessarily. I mean I think it should be left -- personally I think it should be left up to the consumer, you know, because of the fact that if you're going to implement it on new buildings and things like that, fine, but let him make the choice. Don't make the choice for him. I'm just saying give him an option, since there are materials out there.

Say, for instance, if I recall, that the thermal emittance was .75 I believe and the reflectivity was .70?

DR. AKBARI: That is the proposed, yeah, after coating is installed --

MR. SMITH: -- proposed criteria --

DR. AKBARI: That's right.

MR. SMITH: Well, if the thermal emittance is, let's say, .75, our material is a .91. Okay, so obviously we wouldn't have any problem meeting that criteria. But how much better is our coating than just putting on a basic white paint.

DR. AKBARI: May I make this comment. That recommendation that we have there for thermal emittance of .75, reflectance of .7, is there in order to be consistent with what it is already in the title 24 standard.

The paint that we applied coating those material had a reflectivity of about .8 and emissivity approaching .9 when we measured it. So, it was very much comparable to the other products that you use.

MR. SMITH: Okay. One of the other questions in regard to this. I was curious when he was talking about, I believe it was about an R6, I think is what you're using as a --

DR. AKBARI: The R6 was the quoted insulation on those buildings. When we put the drill into the duct system, the drill went for about, I believe, slightly more than one inch going through the insulation. So, we estimated that that level of thickness, an R6 are consistent.

MR. SMITH: Okay, maybe I didn't understand. Is that the fiberglass, alone, is an R6? Or the fiberglass with the coating over the jacket was an R6?

DR. AKBARI: The coating does not have any insulation value. It is the insulation value of that polyurethane foam inside.

MS. HEBERT: It's a rigid foam insulation product.

DR. AKBARI: Is a rigid, correct; there is a rigid foam, absolutely.

MR. SMITH: Okay, just curious on that. This I would like to read, which I've given you copies of, is actually some information that has been, through some emails and letters with the title 24 and with Bill Pennington's office and so on. And I would just like to state this, I suppose.

Superior Products International II, Incorporated, which is the company I work for, or SPI, of Shawnee, Kansas, offers the following comments for your consideration on the revision of the proposed California code regulations, title 24, part 6, section 118(i)(3) concerning the required dry mil thickness of 20 mils as the top surface of a roof coating.

MR. PENNINGTON: Craig, could I interrupt you?

MR. SMITH: Yes.

MR. PENNINGTON: What you're commenting on, this letter, is related to the separate rulemaking that we're doing related to coatings. And so this particular workshop is not related to that proceeding, which is halfway through or three-fourths of the way through.

So, what you're trying to address here is a matter of that other proceeding, rather than of this workshop. This workshop is going to result in changes to the standards that would go into effect in 2008.

MR. SMITH: That's correct.

MR. PENNINGTON: The rulemaking that we're conducting now, we're hoping to have the results of that in effect shortly.

MR. SMITH: Right, I understand.

MR. PENNINGTON: And so there isn't value here in having you tell us all these comments for the purpose of this workshop.

MR. SMITH: Well, there is because of the fact that if what gets passed, I mean I'm afraid is going to get approved now, I want to be able to get into the documents for the 2008 decision. That was my whole purpose of coming here.

So this is regarding not only now, if you want to take it that way, but also for the 2008.

MS. HEBERT: The 2005 standards have a minimum dry mil thickness for roof coatings of 20 mils. And he may be addressing --

MR. PENNINGTON: I expect we're going to resolve your comments in the other rulemaking.

MR. SMITH: Say that again? I'm sorry.

MR. PENNINGTON: I expect that we're going to resolve your comments in the other rulemaking. If we don't -- maybe another way to put it is if you're not completely satisfied in the other rulemaking, then there will be future events relative to 2008 that you can come and --

MR. SMITH: Well, is that not what this is for?

MR. PENNINGTON: Well, we're going to have --

MR. SMITH: I mean I thought this was an open forum to --

MR. PENNINGTON: -- we're probably going to have --

MR. SMITH: -- discuss the 2008

criteria.

MR. PENNINGTON: We're probably going to have eight more public events on 2008 standards at a minimum.

MR. SMITH: Okay.

MR. PENNINGTON: And so, you know, it's a little premature for you to be talking about the comments relative to the other proceeding until we actually finish that other proceeding, you know.

MR. SMITH: Well, my hopes were, was to get a fresh start on the 2008 model, if you will; and possibly have some influence on what is happening with the 2005 at the same time.

MR. PENNINGTON: I don't know.

MR. SMITH: I guess if you want --

MR. PENNINGTON: I'm not --

MR. SMITH: -- to call it preventative maintenance, but --

MR. PENNINGTON: Well, okay, --

MR. SMITH: I guess my point is --

MR. PENNINGTON: Is there some way that you can summarize --

MR. SMITH: -- this, is that --

MR. PENNINGTON: -- this without reading it all, and hit the high points or something?

MR. SMITH: Well, --

MR. PENNINGTON: As I say, I think we're going to resolve your comments in the other proceeding. We're certainly going to make an effort to do that.

COMMISSIONER ROSENFELD: Yeah, Craig, maybe you can feel comfortable that by submitting this here you've got your toe in the door in case you are not satisfied with the '05 results. And just save us a little bit of time by summarizing what the problem is, which I'm unfamiliar with.

MR. SMITH: Well, all right, let me summarize it then, essentially.

Is that it's been proposed to us, and I have not seen the latest revision of the criteria, but as I understand it there's a possibility that it may include that if you do not want to go less -- I mean, I'm sorry, if you want to go less than the required 20 dry mils you have that option. But then you have to get ICCES approval, which sounds very simple, but, believe me, it's not. We've been working on it for two years and still have not got our scope finished yet, after about $12,000 to $15,000 of investment in it so far.

So, to think that that's a viable alternative, you know, we very much disagree with that.

The thing I think that -- one of the points, I guess, I was trying to bring out is that I think that by requiring the ICCES a lot of good companies, a lot of good smaller companies who don't have huge budgets to be working on this and, you know, doing a lot of different things, that that's going to eliminate or deter them from even getting involved in title 24. And how will, you know, how much good technology is going to be bypassed because of that.

You know, it's our thoughts that we should be able to let our history of that coding speak for us. We've had, you know, our largest distributor, which is in Japan, by the name of Daiko Shokai, and over the last 13, 14 years they've done millions and millions of square feet of roof coating out there using our coating at between 7 and 10 mils. We used to have them put it on at 7 mils. Now we've boosted it up to 10 mils.

But the point of that is is that they've gone out and done readings on the coating after ten years, and it's the same performances they got when they first applied it on the roof, with no variance.

Even in the California Cool Roof Program, where there's a lot of coatings out there, did very well on the reflectivity and so on, but, you know, we had an 80 percent reflectivity. Some of the coatings did a little better.

But if you look at it on a larger picture, most of the coatings on there had anywhere from a 9 to 21 percent decrease in performance after three years. We decreased 1 percent a year -- I'm sorry, 1 percent over the three years, or 3 percent if you want to extrapolate it out over 10 years.

So my point being is that I think that a company should be allowed, ours and other companies out there, who are using the 10 mil thickness, should be able to display what we've done historically, and proven facts or other testing that we've done, which I've listed a lot of it right there for you also in physical characteristics, that we be able to go ahead and present that.

And as long as someone meets the criteria between CRC and title 24, why is there a need to ask for more thickness if we can pass those tests?

COMMISSIONER ROSENFELD: Bill, do you want to say a word or so?

MR. PENNINGTON: We're going to address this in the other proceeding.

MR. SMITH: What proceeding is this?

MR. PENNINGTON: The coatings rulemaking proceeding is underway. It's kind of in hiatus based on discussions with the industry. And that's where we need to resolve your issue.

MR. SMITH: When you say based on discussion with the industry, aren't we part of the industry, too?

MR. PENNINGTON: Absolutely. I think you've been involved in our discussions.

MR. SMITH: Okay. I just want to make sure we're heard, that's all.

MR. PENNINGTON: Sure. I appreciate your comment. I don't want to give the impression I don't appreciate your comment.

MR. SMITH: So, okay. Yeah, and the main thing is we just don't want to, you know, we just ask that you don't deny our opportunity. Because if we are looking at being required to put it on twice as thick, you're talking about twice the amount of product and cost, twice the shipping, twice the labor of putting two coats on, which is just going to, you know, -- I mean after all the work that not only our company, but other companies have done, also, to be able to get their coating to a point where they can only apply that amount. And then you're going to require us to go back to that thicker coat for no reason.

COMMISSIONER ROSENFELD: Well, no, Craig. I think everybody in this room would like to see the affordability of white roofs to be as great as possible. No one wants to increase the costs unnecessarily.

I guess I didn't realize that it's hard to get the ICC approval, but --

MR. SMITH: It's very difficult --

COMMISSIONER ROSENFELD: -- Bill Pennington says that's being under discussion, so I'm comfortable to --

MR. SMITH: If you're familiar with the ISO 9000, it's practically like that. Almost. I mean it's very difficult to get it.

COMMISSIONER ROSENFELD: Okay, well, you're into the record, so.

MR. SMITH: Okay, thank you for your time.

MS. HEBERT: Thanks, Craig.

MR. SMITH: Was there any other questions?

MS. HEBERT: All right, I'm going to recognize Greg Crawford. He's been waiting patiently; and thank you, Craig. And now Greg.

MR. CRAWFORD: Good afternoon; my name is Greg Crawford; I'm the Executive Director of the Cool Metal Roofing Coalition. And I have several brief remarks about my organization, the Cool Metal Roofing Coalition and its role going forward with the California Energy Commission and California title 24 energy code.

My two colleagues, Chuck Praeger and Lee Shoemaker, will then provide salient facts and issues on the historical and future use of cool metal roofing.

The Coalition represents the metal roofing industry so as to provide a single voice on cool roofing issues. As such, we've already been in communication and met with the California

Energy Commission on several important issues in the 2005 energy code. We've sponsored workshops, studies and research.

And we're here today, as well as yesterday, to say that we look forward to working with the CEC and its partners during the 2008 revision cycle including Lawrence Berkeley National Laboratory and the Cool Roof Rating Council.

Let me describe quickly our membership and mission to show how our participation in the revision cycle process is both relevant and appropriate.

First of all, the Cool Metal Roofing Coalition is an association of associations, including the following sustaining members: the American Iron and Steel Institute, the Metal Building Manufacturers Association, the Metal Construction Association, the National Coil Coating Association, North American Zinc Aluminum Coaters Association; and we also have two affiliate members which include Oak Ridge National Laboratory and the American Zinc Association.

The Cool Metal Roofing Coalition mission is to educate architects, owners, specifiers and standards officials about the sustainable energy-related benefits of metal roofing. Our mission calls for us to address certain issues in the California title 24 energy code.

The code, in its present form, may cause building owners to abandon all together the use of unpainted metal roofing, that is Galvalum, because of complexities and assumptions that did not fully recognize its beneficial properties.

In our subsequent comments today we will describe how Galvalum may be categorically disadvantaged, restricted and ultimately eliminated in the marketplace unless remedies are incorporated in the 2008 title 24 code; and corrected within the 2005 code.

Galvalum and all metal roofing products not only has excellent reflectivity performance for significant energy savings, but it provides other key environmental benefits. Metal roofing has recycled content; recyclability at the end of a long service life. And this is an admirably long service life that reduces replacement and thus uses fewer resources.

Furthermore, metal roofing is not to be relegated to the solid wastestream, as it is recycled. Finally, it has a high strength-to-weight ratio presenting a small seismic profile.

We note that the energy savings property of Galvalum is persistent. That is it's initial reflectivity degradation over three years is only about 10 percent. And this level is stabilized for a very long-term performance with virtually no maintenance requirements.

Again, we look forward to working closely with the CEC during the 2008 revision cycle process, as the code expands into steep slope and residential applications, so the metal roofing properties are properly recognized, and so the problematic items in the 2005 code are corrected.

Thank you. If there are no questions I'll be followed by Chuck Praeger, Chairman of --

COMMISSIONER ROSENFELD: I've lots of questions.

MR. CRAWFORD: Yes, of course.

COMMISSIONER ROSENFELD: I thought that the problem with galvanized metal was that it had a low emissivity.

MR. CRAWFORD: It does have low emissivity, but it has very high reflectivity --

COMMISSIONER ROSENFELD: Doesn't matter; it just heats up under the sun. As long as it can't radiate to the sky, it's in bad shape.

MR. CRAWFORD: It meets the requirements -- it would meet the requirements except the initial reflectance is too low. And this will be discussed --

COMMISSIONER ROSENFELD: No, but emissivity I think is the problem. Could I ask Hashem to comment?

DR. AKBARI: There was that data shown the surface temperature for the duct, and as you noted the --

COMMISSIONER ROSENFELD: I'm sorry, the --

DR. AKBARI: The duct system, the data that showed --

COMMISSIONER ROSENFELD: Yes.

MR. PENNINGTON: Could I interrupt you just for a second? Sorry.

You said it could meet the requirements if a durable reflectance was used as a criteria instead of initial.

So, you're saying that the emittance requirements can be met?

MR. CRAWFORD: The emittance is very low for Galvalum, but the reflectivity is very high.

MR. PENNINGTON: Okay, so your statement was only about the reflectance requirements and not the emittance requirements?

MR. CRAWFORD: It's principally about the reflective requirements, that's correct. But, again, it should meet the requirement under --

MR. PENNINGTON: Because of tradeoffs relative between emittance and reflectance, it would meet it?

MR. CRAWFORD: Yes.

MR. PENNINGTON: That's your --

MR. CRAWFORD: And that'll be covered in more detail by Lee Shoemaker.

MR. PENNINGTON: You want -- you may be hear all of them?

COMMISSIONER ROSENFELD: Sure.

MR. SHIRAKH: He wants to talk --

COMMISSIONER ROSENFELD: As long as they address what temperature the darn stuff comes to under the sun.

UNIDENTIFIED SPEAKER: We will.

MR. CRAWFORD: All right. So, thank you. I will be followed by Chuck Praeger, who's

Chairman of the Cool Metal Roofing Coalition.

DR. AKBARI: Thank you for saving me the headache.

COMMISSIONER ROSENFELD: I didn't hear you, Hashem.

DR. AKBARI: I thank him for saving me the headache.

MR. PRAEGER: I'm Chuck Praeger and I'm with the Metal Building Manufacturers Association; and I'm also Chairman of the Cool Metal Roofing Coalition.

And, Commissioner, we wanted to present the whole concept and theme, and so we're going to talk about roof temperature with Dr. Lee Shoemaker next.

But the thing we wanted to help make aware with the CEC is that with title 24 currently configured, it is going to have a very significant, serious impact on our industry.

COMMISSIONER ROSENFELD: Well, you have to tell us whether it should or shouldn't.

MR. PRAEGER: Well, I will. And it shouldn't. That's what I'm going to get into here.

Our goal is the same as the CEC for

long-term energy savings on all building construction. So there is no conflict in our goal.

We think, though, that with the way that the code has been configured, with some minor shifts we can achieve the same goal, but we don't have to -- and we do that in a phasing process so that we're not being penalized at the front end. And I'll tell you how that works in just a minute.

But to give you an idea, 40 percent of all one- and two-story buildings built in the country are built with metal buildings. And all of them have metal roofs. And 90 to 95 percent of them have a metallic Galvalum coating on those roofs. Because in low-slope construction in the past the Galvalum coating has had extreme performance and durability characteristics that have made it a high performance.

As a matter of fact, over the past five years the steel industry has invested a couple hundred million dollars in being able to put in new equipment within their mills to provide an acrylic coating on Galvalum. So the state of the art is continuing to increase.

But with the way that the code is

currently constructed we're finding, as we do our analysis, that we're having a severe cost penalty which will actually eliminate Galvalum on all conditioned buildings. It will eliminate through-fastened roof system, which is basically 50 percent of our roof systems in the marketplace today.

And these kinds of penalties could, in essence, be insurmountable in the marketplace on a competitive basis.

And the really the issue is the initial values, the prescriptive values that we have to reach with Galvalum at that very beginning. Prescriptively, you need a reflectivity of .70 and an emissivity of .75.

But then if you look at three years down the road the code says reflectivity baseline is what, .55?

MR. PENNINGTON: The assumption for the initial reflectance for modeling purposes is .55.

COMMISSIONER ROSENFELD: Is how much, Bill?

MR. PENNINGTON: .55.

MR. PRAEGER: .55.

MR. PENNINGTON: So it doesn't say

anything about a criteria down three years hence that would be .55.

MR. PRAEGER: Right, .55. So Galvalum starts out with a reflectivity of .65. And with it's 10 percent degradation ends up at .60. So three, four, ten, 15 years down the road it has a higher reflectivity base than does the model or the baseline set up in the code.

But, because we have to work with the cost penalties using whole building or envelope tradeoff, those costs go into the front-end cost of the building project that you're having to quote and bid in the marketplace.

So we think that with -- and Dr. Shoemaker is going to talk about heat temperatures and the emissivity factor with regard to the product, but we think that if through some minor shifts in the way the code is written, we can basically reach the baselines that the code requires right now on a reflectivity basis and on an emissivity basis without being penalized as an industry at that front end. And that is what we would like to work with the CEC --

COMMISSIONER ROSENFELD: I think the crucial issue here is precisely the temperature of the roof. So, maybe you should -- maybe Dr. Shoemaker or Mr. Shoemaker should come up and tell us why the roof's cool, and then we can go on from there.

MR. PRAEGER: Very good.

DR. SHOEMAKER: Thank you. I'm Lee Shoemaker, Director of Research and Engineering for the Metal Building Manufacturers Association. And also the Technical Director for the Cool Metal Roofing Coalition.

And to clear up the question that was asked about how the lower emissivity for the unpainted Galvalum affects the temperature of the roof, this is the same analysis that we presented on September 4, 2003, at the final hearing of the 2005 provisions. So it's in the record now from that proceeding.

And the point we were making was the same as Mr. Praeger was making in terms of looking at the aged properties, and looking at the assumptions built into title 24 on the assumed age factor.

And we did the same analysis that was done to justify the cool roofing provisions that were added to 2005. And that is calculating the roof temperature based on the emissivity and the reflectivity.

And using the aged values for the Galvalum, that is assuming a 10 percent degradation of the initial reflectance and the emissivity actually goes up on bare Galvalum as it ages, slightly, not a great deal, but it goes up a little bit.

So, using those aged values, calculating the temperature of the roof using the same factors that were used in the title 24 analysis, would give you a roof temperature of 150 degrees Fahrenheit. And the target that title 24 was using for the roof temperature was 145 degrees Fahrenheit. That's if you use the assumed degradation of the roof and emissivity, and the target emissivity.

So, we would be 5 degrees Fahrenheit higher than what title 24 was aiming for. So we feel that our product, the bare Galvalum, does not qualify as a cool roof currently using the initial properties. But we feel that over the life of the project it's going to have very similar performance with regard to the temperature of the roof and the effect on the energy usage.

COMMISSIONER ROSENFELD: You folks can produce and market white coated metal roofs, right?

DR. SHOEMAKER: Yes. I'm going to address that further. At a cost --

COMMISSIONER ROSENFELD: So I guess the question is something about the payback time for going to white.

DR. SHOEMAKER: Payback time and the assumptions used in the analysis of what a white painted metal roof would actually cost.

I was going to address that a little more --

COMMISSIONER ROSENFELD: That's involved in the payback time, yes.

DR. SHOEMAKER: Um-hum.

COMMISSIONER ROSENFELD: I mean our job here is to reduce electricity bills and try to pay them back within five years.

DR. SHOEMAKER: Within --

COMMISSIONER ROSENFELD: About five years.

DR. SHOEMAKER: I thought it was 30 years.

COMMISSIONER ROSENFELD: That's the

service life, not the payback time.

DR. SHOEMAKER: Am I misinterpreting something? I don't know, maybe I don't understand that difference.

COMMISSIONER ROSENFELD: I invest a dollar and if I can save 20 cents a year in my electricity bill, my simple payback time would be five years. And we're aiming for at least relatively interesting payback times. We wouldn't want to ignore the possibility of short payback times, so we need to know something about that.

Go ahead, Bill.

MR. PENNINGTON: I was just going to say, you know, we have done our analysis on lifecycle cost basis --

COMMISSIONER ROSENFELD: Yeah, okay.

MR. PENNINGTON: -- and so that's the criteria we've used.

DR. SHOEMAKER: The 30 years?

MR. PENNINGTON: Thirty years is the building life for which we do life cycle costing.

MR. ELEY: Study period.

MR. PENNINGTON: That's the study period.

DR. SHOEMAKER: And that's not --

MR. PENNINGTON: So that's not a payback time period. That's the analysis period.

DR. SHOEMAKER: Okay. I learn something every time I come here. Thank you.

If I can just proceed with some other comments I'd like to make?

COMMISSIONER ROSENFELD: I still want to -- I'm sorry to be repetitious, but are you going to address the possibility of having -- you said your roof is nearly cool enough to comply. And I'm asking, but supposing you instead marketed a really cool coated roof, I'll use Bill's criteria and state, what would the lifecycle benefits be to the consumer? That's the primary question to me. So, just knowing that you come within 5 degrees of a target temperature doesn't really help me at all.

DR. SHOEMAKER: Well, we also -- I mean we definitely want to look further into the lifecycle cost analysis, the economic payback; not just the cool roof requirements, but of the insulation requirements that Mr. Eley presented earlier in the new insulation study.

So, our position is certainly that we also are in favor of energy efficient buildings.

We're not trying to fly under the radar of the requirements.

But we want to make sure that the studies reflect correct cost data, and that the building owner is, in fact, going to realize the cost savings that have been assumed in putting the provisions together. And if those costs data are correct, and in fact the analysis shows the building owner is going to save that money. And then we can promote that. We will promote that in our marketing.

But right now we feel that there's a little disconnect between the analyses that have been done and the cost data that have been used. And we just want to make sure that that is thoroughly reviewed in this next cycle as we go forward.

And we're prepared to work closely on that, provide data, and do whatever we can to make sure that everybody's interest is protected.

COMMISSIONER ROSENFELD: Okay, I have one question. Did you say that you are learning how to coat your galvanized metal with some low E film?

DR. SHOEMAKER: High E, I think --

COMMISSIONER ROSENFELD: With some high E films, thank you.

DR. SHOEMAKER: Yeah. We currently have the ability to form metal roofing out of prepainted Galvalum, or galvanized. It's some sort of metallic finish on the steel, whether it's zinc or zinc-aluminum. And then it's coated with any color coating you can want. If you're looking for the coolest properties, a white roof.

So the technology is there and we can produce roofing panels of any color. But there is a cost associated with that.

In the previous study that looked at the cost data, that does more, correct. We weren't involved in the process. It's unfortunate that we weren't. But we feel that there was a lack of understanding of how the costs would be incurred when you go to that type of coated roofing.

MR. SHIRAKH: So, how much does that coating cost? That's what the Commissioner is --

DR. SHOEMAKER: It's 25 cents a square foot is approximately what it costs to put a white coating.

MR. SHIRAKH: And what would the performance of the roof be once you --

DR. SHOEMAKER: You could classify as a cool roof using the initial properties that are in the title 24.

MR. SHIRAKH: So it would be .75 and .70?

DR. SHOEMAKER: Um-hum, yes. We could meet those values, that's correct.

MR. SHIRAKH: Sounds like that could have a pretty good payback period pretty quick.

DR. SHOEMAKER: That's one aspect, that's correct. There are other costs involved in meeting the requirement, title 24 requirements.

COMMISSIONER ROSENFELD: What other costs?

DR. SHOEMAKER: In terms of insulation. I mentioned earlier about how the title 24 2005 edition changed the provision where it said you could either qualify by providing a minimum R, or a maximum U, for metal roofing is the only construction type that was singled out.

And there was a reason for that, it wasn't just arbitrary. But, you decided that you wanted to look at the U value and not the R value.

Well, what that meant was in the 2001 title 24 you could comply by using R-19 fiberglass insulation in a typical standing seam roof. The 2005 title 24, where you have to now look at the U value and meet the .051 U value requirement in most of the climate zones in California, you would have to use an R-19 plus an R-11 insulation.

And now with the presentation a little earlier today on the new insulation requirement, the most severe climate zones in California that would be proposed with the U value are typical metal roofs, again standing seam would require R-19 insulation, fiberglass insulation, plus another bat of R-19 insulation, plus an R-11 rigid insulation.

So in three cycles we've gone from R-19 to R-19 plus R-11, and then to future potentially in 2008 of R-19 plus R-19 plus R-11.

Now, as we work --

COMMISSIONER ROSENFELD: I'm sorry, is this for roofs -- is all this because of the roof is not cool? I'm puzzled, Bill, can you --

DR. SHOEMAKER: No, this is separate --

MR. PENNINGTON: It's largely driven because the roof is very conductive. The roof assembly is very conductive without insulation. So, you know, the practices that have been shown by the most recent analysis in the most severe climates in California show that a substantial amount of insulation is cost effective.

COMMISSIONER ROSENFELD: But this is true for roofs other than metal?

MR. PENNINGTON: Well, he's representing metal roofs.

COMMISSIONER ROSENFELD: Yeah, but the extra R-19 --

MR. PENNINGTON: The analysis -- well, each assembly was evaluated separately --

COMMISSIONER ROSENFELD: Um-hum.

MR. PENNINGTON: -- for what was a cost effective insulation approach and amount. So that was part of the work that Charles presented earlier.

DR. SHOEMAKER: And we certainly are in favor of more energy efficiency and, you know, goals such as being 15 percent more efficient, 20 percent more efficient over a certain period of time we think are good targets.

We just happen to be hit with our form of construction with a huge, not only the cool roof requirement, but going to the U value. I'm not arguing that that is not perhaps the way we should be looking at it down the road at some point in time, but it was just a big bump in total cost. And really all at once.

And we're working on a lot of different fronts to make our type of construction more energy efficient, but that was just such a huge bump from 2001 to 2005, and now potentially 2008 that our industry is, I think, having a tough time dealing with that huge change. And coming up with cost effective ways to comply with the title 24 standard.

COMMISSIONER ROSENFELD: Bill, it sounds to me like this is more of a 2005 headache than it is a 2008 headache. Can you say a few words --

MR. PENNINGTON: Well, I mean what we're talking about is 2008, what we might do in 2008. And the analysis that we presented earlier today was related to what's cost effective with increased natural gas prices, increased electricity prices --

COMMISSIONER ROSENFELD: And time-dependent valuation.

MR. PENNINGTON: -- taking into account TDV. And, in fact, the analysis that Charles did used a early version, actually the 2005 TDV information and the 2005 natural gas forecast, which I think, in general, the full Commission would find unacceptable as a cost effectiveness basis, given that natural gas prices are going through the roof and TDV is --

COMMISSIONER ROSENFELD: Is there --

MR. PENNINGTON: -- getting more expensive, too. Electricity is getting more expensive, too.

So, I think maybe the standards are getting real about metal roofs. Maybe that's kind of what's happening at the moment.

DR. SHOEMAKER: I would agree with that, but maybe too real too quick was our problem. And I think the study that Charles Eley showed us earlier is a step in the right direction, because that's evaluating all construction on the same basis. And we see there that the U values are going to be affected for all forms of construction, you know, once that study is complete.

In our case, because of going from the R to the U we were the only ones that really got a big bump. So, that's where I think our biggest problem was.

So, yes, we do have problems with the 2005 standard. We're not trying to roll back the clock here. We're trying to work from that point on and make sure that, you know, the proper cost data is used and it's analyzed fairly.

COMMISSIONER ROSENFELD: Well, let's see, I have an apology. Charles, you presented these data this morning some time -- I had to step out for awhile, as you probably noticed. So I wasn't here for Charles' talk.

I guess I'm going to hark back to -- obviously this is an interesting technical problem which has to be looked at in some detail. I'm going to go back to Mazi's point. We certainly have to ask what's the optimum least cost solution. You're going to either pay more for the insulation or you're going to pay, what did you say, 25 cents a square foot?

DR. SHOEMAKER: That's for the cool roof cost.

COMMISSIONER ROSENFELD: For the cool roof cost. And that's something that I haven't -- I don't know if it's been addressed yet.

DR. SHOEMAKER: One corollary to that, if I might add, as far as that 25 cent differential, there are two forms of metal roofing. Standing seam metal roofing and through-fastened metal roofing. They're two separate constructions that are listed in the joint appendices at totally different U values. And the through-fastened roofs are not as energy efficient as standing seam roofs.

Now up until October 1, 2005, when the new provisions kicked in, a lot of the metal roof market in California was through-fastened, especially smaller buildings. Through-fastened metal roofs are more economical and really appropriate for smaller buildings.

Standing seam roofs offer better service, but they cost more and they are typically used on larger metal buildings.

Now, when we look at the U value requirement we find that through-fastened roofs really just can't meet the requirement. And so we have found, and we've looked at this very closely, looking at all the tradeoff options, and looking at cool roof versus insulation in the roof and the walls, and we've looked at that very closely.

And we've found that we're not going to be able to use a through-fastened roof even if it's painted white. We're not going to be able to use that anymore, because of the problem with insulating it.

So if you look at the projects that have been typically been through-fastened, unpainted, and now we're going to have to put on a painted standing seam roof, it's more than 25 cents a square foot.

What's the through-fastened, the standing seam, is that 50 cents?

UNIDENTIFIED SPEAKER: It could be about 70 cents.

DR. SHOEMAKER: Total. So, about 70, 75 cents would be the differential going from an unpainted through-fastened roof to a painted standing seam roof, which is what you're going to have to do in most cases to comply.

COMMISSIONER ROSENFELD: I'd like to ask Charles one question. Charles, was the more insulation requirement mainly a -- do you have a feeling for whether it was mainly a wintertime heating issue, or a summertime cooling issue? I know that the computer didn't distinguish --

MR. ELEY: I don't know exactly because with the lifecycle cost methodology --

COMMISSIONER ROSENFELD: Right, it doesn't tell.

MR. ELEY: -- used in this round we don't split out TDV in heating and cooling.

COMMISSIONER ROSENFELD: Right.

MR. ELEY: Traditionally, though, it's been justified more on heating than cooling.

COMMISSIONER ROSENFELD: Yeah, I think part of the problem there, Lee, is that the more insulation -- the computer called for more insulation because of a heating issue, which doesn't have anything to do with the white versus Galvalum.

I guess we just have to study this case seriously.

MR. PENNINGTON: I agree.

DR. SHOEMAKER: And then if I could just take two more minutes, a few other points I'd like to make. Different topics.

We recently sponsored, that is the Cool Metal Roofing Coalition recently sponsored a study at Oak Ridge National Lab looking at the impact of emittance on peak demand energy. And that study is complete and we would like to present that -- as these additional analyses are being done for

2008, we would like to see that also considered in terms of the impact on the cost effectiveness, looking at the lifecycle cost again.

So, we would --

COMMISSIONER ROSENFELD: But you understand that time-dependent valuation takes into account peak power?

DR. SHOEMAKER: Right.

COMMISSIONER ROSENFELD: Because it is precisely a science of high price on hot afternoons.

DR. SHOEMAKER: Right.

COMMISSIONER ROSENFELD: So obviously one should read the wisdom of Oak Ridge. There's an Oak Ridge guy in the audience, so I'll say that. Hello.

But I'm not sure that it would add anything except general understanding of the problem.

MR. DESJARLAIS: The question that is brought up on this particular issue is that built into the existing title 24 is a tradeoff that allows you to trade off solar reflectance and thermal emittance.

And the tradeoff that's built in there

was done using a steady state calculation during solar noon where you have the highest amount of solar radiation, so that the tradeoff built into title 24 onerously penalizes products that have low emittance.

We've developed some new correlations that we'd like to suggest gets put into title 24, which we think are a fairer tradeoff between solar reflectance and thermal emittance.

So it has nothing to do with peak demand or peak demand TDV calculations. It's simply new calculations that we think are a little bit more accurate in terms of making the reflectance-to-emittance tradeoff.

COMMISSIONER ROSENFELD: Sure. Thank you.

DR. SHOEMAKER: One final thing I'd like to -- and I, you know, this 30-year versus five-year, I think that will do it. But I was sitting here earlier and the 30-year is the projected life of the structure, roof, envelope. And it really seemed to me out of whack with what we know is the life expectancy of roofing.

Now, it might be appropriate for walls and other envelope components, but it just seems like the data that we've seen on average roof expectancy, any analysis that looked at a 30-year life would be -- could be looking at two or three reroofs in that period, depending on the type of roof.

And so that's just something I'm not quite sure I understand the logic. And obviously I didn't understand the difference between the 30-year and the five-year, so maybe I'm not understanding something. But I just wanted to mention that, and perhaps that can be explained to me later if it's --

COMMISSIONER ROSENFELD: Charles, what service life do you actually use?

MR. ELEY: Well, we used -- the analysis was done over a time horizon of 30 years. If we were evaluating a measure that affected the replacement costs or the maintenance costs, then that cost, ten years out or 20 years out, should be identified; and then discounted to present value; and added to the initial cost.

If we're just studying insulation levels in a metal building, then if the roof has to be replaced, it has to be replaced whether the roof is insulated or not. So the lifecycle of the insulation in that case would not be affected.

COMMISSIONER ROSENFELD: Okay, so I misstated it then. The horizon for the benefit/ cost calculation is 30 years; but the service life of the roof is whatever it is, could be ten years.

MR. ELEY: I mean for instance when we evaluate lighting systems, it's common, if you're comparing, say, metal halide with fluorescent, one you may have to replace the lamps every four years, the other you may have to replace the lamps every six years. So all that's accounted, and it's discounted to present value, and it's factored into the initial cost of the measure. So that's how we account for it.

DR. SHOEMAKER: So depending on the roof material, you've done different studies to come up with the lifecycle cost analysis?

MR. ELEY: Well, if the maintenance costs are not different then you don't have to consider them. They'll wash out because you're comparing option A to B. And if there's no differences into the future, then they basically can be ignored.

But if you are considering a measure that affects the maintenance and/or replacement costs, then they should be considered, yes.

DR. SHOEMAKER: Okay. And we certainly, as one of the issues that we brought up here is we support the use of the aged properties for determining whether a cool roof -- a building gets the benefits of a cool roof.

And we also support the new residential requirements that are being looked at, and requiring a cool roof prescriptive requirement there and using age values. So we intend to work closely with Dr. Akbari as far as providing the data that we have on metal roofing.

And I know you said part of the your first task is to evaluate the materials and the costing data, so we certainly want to help with that effort.

Now, the last thing I'd just like to finish with is just sort of a pet peeve of mine, I guess, about how the prescriptive cool roofing requirements are being portrayed.

Initially we didn't understand the difference between a prescriptive requirement and a tradeoff requirement. We came in and learned a lot, quickly. And we actually came to that first hearing thinking we would have to have a white painted cool roof. We didn't understand about the tradeoff options that were then explained to us, that we looked into further. And even the tradeoffs with other energy demands within the building. So we've learned quite a bit about the different compliance paths.

But as there was a question yesterday when the discussion came up about the residential and looking in the cool roof requirements, a question was asked, are these going to be required. And Bill Pennington answered not mandatory, but prescriptive requirements would be how he would see it going in.

And I understood that since we've been immersed in that over the past couple years. But I think there's still a lot of confusion about it. And the press release that came out on October 18th, just last week, from the CEC, it said, in talking about the new title 24 2005 provisions that went into effect, it says, when constructing new nonresidential buildings or replacing existing roofing, contractors will be required to install cool roofs.

And we've gone to great lengths trying to tell people that's not really true; you can do a tradeoff; you can come up with another solution that doesn't have a cool roof.

So we would just like you to be maybe a little more -- and I know press releases can't get into the details. They're generalizing this. But we think, we've had our members come to us and say, hey, we have to use white painted roofs in California now. And we say, no, you have to have the performance, the similar performance requirements, but there are some other ways that you could look at to comply.

And so we just ask you to, perhaps, make sure that that's cleared up and that confusion doesn't exist within the marketplace. Not only with the current 2005, but as you look at the residential requirements.

Thank you.

MR. PENNINGTON: I'm sorry for the confusion.

MS. HEBERT: John.

MR. GOVEIA: Good afternoon; I'm John Goveia from Pacific Building Consultants; I'm here as a consultant to the Asphalt Roofing Manufacturers Association. But moreso as a roof consultant and an ex-roofer.

I have the highest respect for all the efforts to reduce the energy usage. And as a consultant, I've done that. We specify cool roofs and prior to that, EnergyStar roofs, as well as coating ducts.

I found the information very helpful for an understanding and a perspective on what's going on. But there are some issues in the roof industry that I just don't believe that everybody really has an understanding as to what is happening in the industry and the concerns in the industry from various aspects, not just one segment of the roof industry.

And so some general comments. Right now there's a lack of long-term performance history on a lot of the products that are now, quote, "the cool roofs." While some of the products have been out awhile, there are many of the products that had formula modifications to come into compliance. And single-ply sheets that had to have a slightly greater reflectivity.

And so those formulation changes can have an impact on a long-term performance. And so that's one of our concerns with the net sheets.

Also, and, Elaine, you and I have talked about this in the past, there's a big concern about fire ratings on roofs. And unless you really understand the California building code and what requires an A, a B or a C, or a nonrated roof covering, many of the coatings that are listed at the CRRC may not have the fire rating that is required for that particular coating to be used over let's say a new asphalt roof, or to be used over an existing roof.

And unless those coatings are specifically tested with a certain kind of membrane beneath it, they would not qualify. As a consultant, we would not even consider using those coatings if they had not gone through the fire testing with that manufacturer's roofing material.

There also are some fairly stringent slope limitations as it relates to try to put coatings on roof coverings. And if you were to look in the Underwriters laboratory book for fire ratings you would see that most of the coated roofs have slope limitations in the nature of 1/4 inch to 3/8 to 1/2 inch of slope per 12 inches.

And beyond that it's my understanding that the slope limitation is a flame-spread issue; that the steeper the slope the more the flame wants to spread in a fire, external fire.

And so there are issues with that because when we did our original look at this project and the coatings on roofing, we were hard-pressed to find cool roof listed coatings listed by any of the manufacturers. There's a few, don't get me wrong. But the bulk of the industry and probably the bulk of the coatings that are up there, unless you're doing a whole system of that manufacturer's products, would likely not qualify or meet the UL fire rating, or they haven't been tested yet. So that's something to keep in mind.

MR. PENNINGTON: I could understand the not being tested part, but why would they not qualify?

MR. GOVEIA: External fire ratings on roof coverings and product- and material-specific. You cannot interchange. So --

MR. PENNINGTON: So that's part of the not-been-tested-yet part of your concern? Is that -- I'm just trying to understand you.

MR. GOVEIA: Yeah, they have not specifically been tested for use as just a roof coating, let's say. Some of them are, and they have listings in Underwriters Laboratory that says, yes, with this coating we can go over any existing class A, B or C roof covering and get the class A, B or C. Or maybe get even to A. But those are very far and few between, those that have done that type of testing.

MR. PENNINGTON: So what I'm hearing is that your primary point here is that there are coatings in the CRRC listings that have not been tested in combination with the layers that they're going to coat, or cover. And so they have not yet qualified for UL approval for fire ratings?

MR. GOVEIA: Right, or they have not been published yet. And, again, --

MR. PENNINGTON: So you're not arguing so much, maybe you have an argument, but you're not arguing so much that such coatings are unlikely ever to get approval?

MR. GOVEIA: No.

MR. PENNINGTON: You're primarily arguing that the testing has not occurred yet?

MR. GOVEIA: I believe that the testing, the products that you can use that are currently listed in UL are very limited in the quantity of them, and what they can go over. And also with regard to the slope factor.

Because if we have the cool roof program that goes up to and including 2-in-12 slope, we may find that the bulk of the coatings only can be used up to maybe 1/4 to 1/2 to 3/8 in 12.

COMMISSIONER ROSENFELD: So if I understand you correctly, the cool roof rating list would be far more useful to you as a contractor if it had two more data associated with each product. One would be the low-slope fire rating; and the other would be the high-slope fire rating. is that a message which you would convey to the Cool Roof Rating Council?

MR. GOVEIA: Yes. There should be two factors in there. One is the fire listing that it complies with. And second is the slope limitation, just as you look --

COMMISSIONER ROSENFELD: Well, I said low slope and high slope --

MR. GOVEIA: Right.

COMMISSIONER ROSENFELD: -- ratings for both.

MR. PENNINGTON: So the Cool Roof Rating Council is not in the business of providing listings for what fire ratings there are for products. That information should be available from the manufacturer.

COMMISSIONER ROSENFELD: Right, except just for convenience I'm thinking if you're running down a list and trying to --

MR. PENNINGTON: Then the Cool Roof Rating Council probably accepts some liability for the accuracy of that information if they list it, which is held by the manufacturer otherwise.

COMMISSIONER ROSENFELD: Hashem may have some words.

DR. AKBARI: I fully agree --

COMMISSIONER ROSENFELD: As a cofounder of the thing.

DR. AKBARI: I fully agree with what Mr. Pennington said. There are many other properties of many other products that are going on the roof. And CRRC has consciously made the decision that they're not going to be touching it. They would only responsible for the measurement and accuracy of the label for the optical properties of the surfaces. That is the emissivity and the reflectivity, thermal emissivity and solar reflectance, to be more accurate.

MR. GOVEIA: Yeah. My concern in speaking to some of the architectural community, as a consultant, is that the architectural community is likely to say, okay, I need to do a cool roof, or I need to consider doing a cool roof. I'm going to go to the CRRC list.

And they're going to find some reflective numbers and they're going to find some emittance numbers. And they're going to give them to the energy consultant. And they're going to say, okay, yeah, plug in this -- wow, here's a .91 and a .98, plug them in.

And then only to find out that that coating can't even be used for the roof system that they're designing the building around. And then they're going to have to all reverse engineer, go back again and rerun all those calcs.

I know, because I've spoken to a few architects that don't have that understanding. When you call for a product that's supposed to be a roof-covering product, the first and foremost is life safety. And that's where the fire rating comes in.

And so it's a primary function of the covering system. And so you can't just put a component on it that hasn't got the fire rating for certain kinds of systems.

DR. AKBARI: John, I have a positing question. Why a manufacturer of a coating product would go and pay CRRC to label the products, knowing that eventually their product, because of the fire issues, would not be applied on the roof?

MR. GOVEIA: I can't specifically speak for a manufacturer, but I think in some realms some of those coatings are valid as part of a certain kind of system. A small segment of the market, for example, that does spray foam roofing and does coatings. The final roof covering is coatings. And there are a lot of those manufacturers out there.

There are other manufacturers -- I don't know if Judy's still here --

MS. HOLLERAN: I'm in line.

MR. GOVEIA: Oh, you're in line, okay. Judy could probably speak to that better than I could, being that she's with a manufacturing firm, and answer that question better.

COMMISSIONER ROSENFELD: Well, unfortunately, Hashem, I can see an example of a manufacturer who produces something which is okay for low slope and gets a fire rating for low slope and really has never thought about using it for high slope.

So, there's a problem here --

DR. AKBARI: So in that case --

COMMISSIONER ROSENFELD: -- right, there's an information-flow problem.

DR. AKBARI: Fully understand, Art. My comment here is that at least there is a segment of the market that that manufacturer is going to the trouble of paying the fees to CRRC that they know that they have a market share.

So it may not be applied to those there conditions, that's the part that understand. But in principle, there got to be some market for that product, otherwise the manufacturer should be, if I use that word, damn stupid to go to get such a label --

COMMISSIONER ROSENFELD: No, but he may be able to sell it for low-slope roof.

DR. AKBARI: I understand your comment, yeah.

MR. GOVEIA: Yeah, I think the steeper the slope gets, the more limitations you're going to see on particular product kind of usage, short of metal or other kind of products.

I understand that some of the testing

that has been done with the CRRC has been done at possibly somewhere around a 5 percent slope, which is the equivalent of about 1/2-in-12, or slightly steeper.

Yet, a least from my experience, the bulk of the roofs that I've worked on in 30 years have often been in the 1/4-in-12 range. Now the lower the slope the greater the accumulation of dirt and debris and contaminants.

And so my only comment there without knowing specifically what they're testing to for the followup testing, the .55 concept of three years, that if it's not being done at 1/4-in-12, that I think that should come into the picture. Because the values may be reduced due to dirt accumulation.

DR. AKBARI: May I strongly recommend that, you know, you actually bring that issue to CRRC. CRRC is made of, I understand, over 100 manufacturers. And they have decided on two slopes that my colleague, Andre, mentioned this morning. One of them is 5 percent slope; and then the other is 4-in-12.

UNIDENTIFIED SPEAKER: I have confirmation from CRRC on email, it's 5 degrees.

MR. GOVEIA: So it's 5 degrees; so that's 1-in-12. So that's what the have decided. So I guess those are the experts that have decided on this application. And there's got to be a good reason for it.

MR. GOVEIA: I mean you'll get a lot more water runoff and dirt runoff on a 1-in-12 than you would 1/4-in-12. You got four times less slope.

But, you know, I'm bringing these up as food for thought, and wherever they head in further research and request and studies.

The initial cost impact, I heard you talking earlier about the metal roof industry, questioning, you know, well how much more is it to do a certain thing.

I can say that we just recently ran some numbers with contractors on what's the impact between what we would normally do on a regular roof covering in California for a plywood deck, which is the most common, as compared to doing a cool covering. Something that fell into the range of what is currently listed at the CRRC or that we're aware of.

And I can say that other than foam

roofing, because there's no cost increase for the coating that they put on, it stays the same, and some of the single ply membranes, the cost impact is between 15 and 45 percent.

Now how do you translate that into dollars, depends on the cost of the system. But, in some cases the system is $1 a square foot more expensive. That's on a system that was maybe about $3.50 a square foot is now $4.50 a square foot. Which is a lot of money.

And I'm bringing this up, and I'll be happy to share this data, at least that we found, with Mr. Eley or Hashem, in doing the lifecycle costing, because that's the initial value that needs to go in. And what is the initial impact on the system and the cost.

And then --

MR. PENNINGTON: What kind of roof is that that you're talking about?

MR. GOVEIA: The group?

MR. PENNINGTON: What kind of roof were you just describing in your example?

MR. GOVEIA: We actually looked at about 14, I think 14 different kinds of systems. We did cross-comparison between, quote, California common construction noncool, now cool. Everything from built-up roofing with aggregate surface, capsheet surface, modified bitumens with conventional granules for black as compared to cool roof granule, cool roof coating, cool roof granules with a coating. Specifically coating roofs separately from the roof covering.

And looking for ones that had fire ratings. We always tried to make sure we found ones that did have fire ratings, as a basis for that.

So, again, I'll be happy to share that. I don't want to bore everybody here, but I think they're important points to look at.

In terms of the lifecycle cost, I understand you're running a 30-year cycle. And I understand that, so depending on the roof age you have obviously salvage value. If I have a roof that's replaced in 20 years, and we hit the 30-year cycle. We have a salvage value of another five years or ten years depending on what the original age of the roof was going to be.

But one thing, Charles, I heard you mention earlier, well, if there are other things that go into the maintenance or preventative maintenance, we see that as a big issue, I think, in the industry.

Because first the power washing that you have to do will it damage the membrane in its life cycle. Will the power washing damage the membrane. How many times are you going to have to do it in a lifecycle of a membrane on, let's say, low-slope built-up roofing. How many times are you going to have to power wash that membrane in its total lifecycle.

And even more of a concern nowadays is the water capture. You can't run power washing water in many localities down the storm systems anymore. All that water -- there's a cost to capture. And I know because we did the Marin Civic Center, and the cost was astronomical, so that water didn't go down the storm system.

MR. PENNINGTON: How does the presence of a cool roof or the lack of presence of a cool roof affect those costs you were just describing?

MR. GOVEIA: If the roof needs to be coated or cleaned, either to renew its original reflective value, or if it needs to be cleaned for purposes of recoating. Because usually roof coatings on a builtup roof don't last the life of the roof. You have to do them one or two times in the life of that roof membrane.

COMMISSIONER ROSENFELD: And that's independent of the color?

MR. GOVEIA: I'm sorry, what?

COMMISSIONER ROSENFELD: That's independent of the color?

MR. GOVEIA: Yes. I mean color shouldn't have that much to do with it.

COMMISSIONER ROSENFELD: Right.

MR. GOVEIA: It's more a matter of the installation and the kind of materials that are used.

And so, yeah, I mean that has to often be done in the life of that membrane.

MR. PENNINGTON: It seems like both of those cases are not obligated by the standards and -- we probably need to hear from other people, so I probably should stop asking you questions. But I'd like to poke at your comments a little bit and see --

MR. GOVEIA: That's fine.

MR. PENNINGTON: -- if I understand them.

MR. GOVEIA: Yeah, I think that's, you

know, if the membranes go for longer or less time in the lifecycle, and then you have a replacement factor you still need to figure are you going to recoat that. Because if the -- part of the reason for the coating on some of these systems is that's how it gets the fire rating.

And so if the coating is allowed to deteriorate to the point it's no longer on the roof in all areas, you have technically lost your fire rating. And the building owner has a duty, under the California building code, to maintain the roof for life safety.

And so there's an issue there.

MS. HEBERT: And you're saying that in order to recoat it properly it needs to be washed before that coating goes on?

MR. GOVEIA: Oh, yeah. I can't think of any manufacturer that would not have you power wash that roof if --

MR. PENNINGTON: Regardless of whether it was a cool roof or not a cool roof?

MR. GOVEIA: Yes. If it needed coating to survive as a fire rated system, yes.

MS. HEBERT: And the coating needs to stick. It won't stick to dirt.

MR. GOVEIA: Well, not for very long usually.

MR. PENNINGTON: I don't know how that comment is relevant, that's my problem.

MR. GOVEIA: It's most relevant for the life cycle costing. When you look at payback, you know, and what do you have to do in a system for a lifecycle, what is its value over a lifecycle.

MS. HEBERT: It's a maintenance item that needs to be figured in.

MR. GOVEIA: Right. It's an inherent cost to the consumer ultimately down the road.

One thing that really hasn't been looked at a lot is how different do the roofers have to work. I mean if anybody in here has done asphalt roofing in the industry it's a hard, it's a dirty, nasty job.

And to think that you're going to have white sheets with asphalt put down and roofers keep this stuff white is a real challenge. I mean, it's hard enough doing regular roofing cap sheet. Coatings are different because coatings are a completed product when they're done on the roof. But working with asphalt and working with white sheets, reflective sheets that are supposed to have a reflectance value, and it's supposed to have an emittance value. And yet the dirtiness of the industry doesn't lend itself to that. So, --

MS. HEBERT: Educate us a little bit more. How does -- when do you have asphalt and a white roof at the same time, just tell us a little bit.

MR. GOVEIA: In a roof system that does not utilize a coating to get its white reflectivity, it would either have a sheet that is put down with special granules that meet the requirements, let's say, of the cool roof.

Or granules that have a special coating on them that would then, assembled in a sheet, meet the requirements. Or a sheet that just has a white reflective film on it.

And so working in the industry where you're always using asphalt to put sheets down, whether it's hot asphalt or cold, --

MS. HEBERT: Is the asphalt like an adhesive?

MR. GOVEIA: The asphalt is the ultimate adhesive to bond the pieces of the system together to make a completed roof.

And so working in that environment, I

can tell you, you track it everywhere. You step in it; next thing you know it's halfway down the hall, or in this case, halfway across the roof.

So if the values are being based on having this theoretical clean white roof, you're not going to have that. Or it's going to be very difficult, I think, to obtain by the contracting community.

So, there's an impact on the roofing contracting community. And there's a different kind of impact, I think, on the manufacturing community to come into line with products that are going to be CRRC listed. That are going to have a history already. I think most of what we see is now what we consider experimental. And that's going to be for some time now until we see long-term performance history.

I wanted to just briefly touch on the duct coating. We have done duct coatings in the past. One of the problems with trying to use white coated metal is that many of the -- and having done sheetmetal work, too -- many of the coatings are not capable of being bent, especially when you make a duct which starts out as a flat piece of metal. They have to do some crossbreaking to get the X shape that you showed on your slides for stiffening.

Then when they bring the duct around and have to do a hem-seam-interlock to put the duct together, the two piece of it, in many cases some of the coatings would not tolerate those type of bends or those angle of bends.

So in our case we've always, when we've done it, we've done coatings. You know, field-applied coatings.

DR. AKBARI: How does that differ from the standing seam application of the colored metal? They do exactly the same thing, that they bend it and they actually crunch it. The clip it together by pressing and the paint stays there.

MR. GOVEIA: Certain paints, and I'm not a paint expert, but certain paints can tolerate more bending and more forming than other paints. And I have had manufacturers say that if you plan to do anything more than 180 degree bend our material will not work well for that. You got to use a different coating.

MS. HEBERT: I think I heard earlier that the standing metal seam roofs are fairly more expensive, but maybe that's because they have more expensive coating that will take the bending at different angles?

MR. GOVEIA: I don't know, I'd have to, you know, rely on the metal industry and the painting industry to really deal with that.

But, it is feasible in field prepping metal, whether it's existing, galvanized or new galvanized, to do the coatings. Whether or not you're doing a cool roof coating, you could still do some other kind of cool roof and still coat your duct to, you know, obtain maybe some energy savings.

But we did it on some projects, and as far as I know they're happy with it. Or you could use down ducted units for the ones that downdraft straight down where you don't have the ducts on the roof.

That's all I have for now. Questions? No. Thank you.

MR. PENNINGTON: Thanks.

MS. HEBERT: All right, who is next? Please step forward.

MR. SCISLO: My name is Chuck Scislo, representing the National Roofing Contractors Association. I'd like to thank the CEC for allowing the NRCA to participate and witness these proceedings relative to the integration of cutting edge building technology into building code language resulting in a reduction of energy usage.

With that said, I'd like to apprise the CEC of a couple of undertakings that the NRCA is taking relative to this. We've initiated a lobbying effort with lawmakers in the United States Congress relative to a reduction in the depreciation schedules of commercial roofing systems.

Currently the statutes indicate roofs shall perform for 39 years. The NRCA understood a research report and conducted studies with Drucker Research soliciting corporate building owners throughout America. And the proceedings reveal that these building owners felt that it really was an unrealistic number of 39 years. And that roofs really were performing more along the lines of 20 years.

Hence we are going to undertake this effort with the lobbyists to see if we can get the tax law changed. We're confident that in the next year or two Congress will see fit and adopt a revision comparable to 20 years. And that's just relative to the comment that Mr. Eley has made relative to the 30-year lifecycle cost data. We understand where you're coming from with that, but.

The other thing I wanted to mention was there's been much talk here about roof coatings and the applications of roof coatings. And I would caution the CEC to at least visit with membrane manufacturers that are here relative to contractors going up to apply roof coatings without proper preparation.

Building owners, since they're responsible for building code, and they, having to adapt to it or comply with it, may unknowingly hire contractors that are not qualified to properly clean a roof. And if I understand correctly, if they're going to employ power washing at considerable high water speeds, you can do damage to roofs.

Nonetheless, unless roof membrane manufacturers are brought in, if the roofs are under guarantee by the membrane manufacturers it's an opportunity to void those roofs.

Thank you.

MS. HOLLERAN: Judy Holleran with Henry

Company. When John brought up the ULs that's when I got in line. Because this is an area that is definitely confusing the public.

By virtue of just a little bit of a lesson on UL fire ratings. One of the most difficult ratings to get is on steep slopes. I usually use the analogy that if you strike a match and you hold it horizontally most likely there's a high probability that light's going to go out. So what do we do? We tip the match and the flame runs up the match.

Same thing happens on a roof. The steeper the slope the more higher likelihood is that fire is going to spread. It's called spread a flame. It's always the test that a manufacturer will do first in determining what kind of fire, whether or not he's going to proceed with the next two phases of a fire test.

So getting a fire rating for steep slopes, for example, if you want to start going into a cool roof or steep slopes, I can tell you right now with the coating and most of the products out there it's going to be extremely difficult. Because once you start getting into, even getting a rating for 2-in-12 slope, is, at this point there might be one manufacturer has enough aggregate in it to get a rating.

At this point I would say probably 1.5 slope is the greatest that somebody might be able to get. But by and large, most of the ratings are going to be at a much lower slope.

We are a manufacturer of many different types of roofing materials. Roof coatings, of course, white coatings is one of our primary products.

We did, in fact, go to work on getting products that would, in fact, comply with all the physical properties. But one of the things that was very key was that we also got a product that, in fact, could be UL listed.

And for selfish reasons and for marketing reasons, of course, we wanted to be able to coat all the manufacturers in this room with our coatings. So we did go to the task of getting a rating that would be suitable for any existing class A, B or C roof with our coatings.

In one case we're up to a 1-in-12 slope; in another case I think we got a 1.5 inch slope. But we went to a lot of work to do that.

The public is so very very ignorant of

what the impact is of these coatings on that fire rating, even people that you would think would be smarter. One of the largest school districts here, I won't name names, I'll just give you their initials, LAUSD --

(Laughter.)

MR. PENNINGTON: That is one of the largest.

MS. HOLLERAN: That's right. Trying to get through to them to understand that just because first the product is listed in the CRRC webpage does not mean that it complies with the cool roof requirements.

And secondly, to try to get them to understand that he also needs to go and look at what the actual listing is for that manufacturer to maintain his fire rating. I mean that's completely -- that just isn't in his realm of thought. He's already written the spec, so he doesn't really want to change it. Okay.

Now, obviously I'm trying to educate, but we also need, as part of when we're looking for certifications, that these things be listed, so that the owner, and even the contractor, really knows that he's got his ducks in a row.

So, it's very important that we pull fire ratings into this as we move forward in forcing this new code change.

To try to add a couple more columns to the CRRC listing will be very very difficult. Because again we have all different types of membranes, in addition to slope, we also have whether it's on a steel deck, whether it's on a plywood deck. Because that also can change the rating.

The other thing is that many manufacturers will have UL ratings, but it might be on foam and not on that particular type of roof. It might be on a concrete deck or a steel deck, what we call noncombustible decks, but it's not going to be on what's the majority of roofs in California, which are combustible decks.

So that's another thing that again we in the industry understand, but again, owners, building departments, they aren't necessarily going to understand that.

One thing, too, is moving away from ULs -- unless you have some other questions on that --

MR. PENNINGTON: I do have --

MS. HOLLERAN: Okay.

MR. PENNINGTON: -- a comment or question. In looking at high slope roofs, we're anticipating that we're talking about shingles or tile, concrete or clay tile or metal roofs as primarily the products that are -- can achieve a cooler situation.

And it's not our understanding that whether or not they're cool will affect their fire rating. Those products already have fire ratings, and the manufacturers that are bringing forth cool products of those roofing types have not raised any concern related to fire rating.

MS. HOLLERAN: I would agree that in that majority of type of product that would fall into place. But we do have built-up roofs that would go up to 3-in-12 slope, and that would be where that would fall into place.

MR. PENNINGTON: So there's a range here that's kind of a danger zone here between low slope and up to, say, 3-in-12 --

MS. HOLLERAN: Right.

MR. PENNINGTON: -- where the products that tend to get used on low slope might also get applied on a higher slope, marginally higher slope. And there's some that's sort of a danger zone we need to be concerned about.

MS. HOLLERAN: That's correct.

MR. PENNINGTON: Okay.

MS. HOLLERAN: That's correct. Yeah. We talk about dirt pick up and so on, and certainly all these roofs will get dirty. They've built them to, you know, these coatings have been applied to achieve a value. HVAC equipment has been purchased and running based on being able to get those values.

So regular washing of the roof really will be something that I think needs to be anticipated. And so when we talk about collections of dirt and runoff, and it varies from city to city, you know. What you can do in Long Beach versus what you can do in Anaheim, versus what we can do here in Sacramento, definitely differs. So there could be a loss just because we can't keep the roof clean.

And certainly if anytime we're recoating, whether it be a new roof or a reroof, that roof does have to be washed off before we can apply it.

As an industry we have a training ahead

of us in terms of how to properly apply the coatings, when a coating is what is the selection. And I guess that's not necessarily your problem, that's our problem.

Any other questions? Okay.

MR. PENNINGTON: Thanks.

MR. GILLENWATER: My name is Dick Gillenwater; I'm with Carlisle. And there are two items that I'd like to go on record, that the templates have been submitted. Since the templates are submitted, again I will not go into a lot of detail on those. I'll just kind of give a quick summary of the items. And if there's any questions -- but I presume people will take the time to review those templates and go from there.

The first item I'm representing SPRI, the Single Ply Roofing Industry, and the template that was submitted to add a roof system to the cool roof category. And this has been kind of termed a cool ballasted system.

The template gives you a definition of what a cool ballasted system is that would go into the mandatory section of cool roofs in section 118. Defines it as a ballasted system that conforms to the ANSI standard RP4.

That the stone size is a minimum number 4 stone, or larger, which would also include pavers. And that the minimum weight for the ballast would be 15 pounds per square foot. And that's the definition of a cool roof.

The studies for this work were conducted by Oak Ridge National Laboratory. It was built off of an earlier study that they had done for SPRI, again where they had looked at the aging characteristics of cool roofs and how that affected their reflectivity.

The data from the study showed that the performance of this cool ballasted system matched very closely to the cool roof performance. Even though the reflectivity of the stone was in the range of .2 as compared to the control, which started out about .78 in reflectivity.

Also it showed that over time the ballast really didn't change in reflectivity, whereas the cool roof materials typically follow what was shown in the original study of the decay of the reflectivity, which is picked up in the equations you have for the overall envelope and the performance characteristics of the white material.

There's also an advantage with the ballast in the fact that it gives you the same maximum temperatures that you would see with a cool roof type of material. It delays the time when this maximum temperature is reached, up to about two to three hours.

This moves about 20 percent of the cooling load outside the peak timeframe and puts it into more of an evening area, which although it doesn't reduce the energy use, it reduces the cost to the consumer by moving that into a different timeframe of what's going on.

There's an appendix attached with that, although I noted that in the process of getting it converted over and put into the webpage, it didn't get there. So, Elaine and I are working on making sure that that gets put into that so there's an appendix there that gives more detailed explanation of the data that was developed in the study.

Again, there was a paver used that controlled this as a control in that. It's reflectivity was .5. What we really saw in the same weight characteristics of the stone versus the paver, no really difference in the energy performance. So it shows that mass becomes more the factor of control rather than reflectivity of the ballast, in itself.

MR. PENNINGTON: Could I ask you a question about that?

MR. GILLENWATER: Yeah.

MR. PENNINGTON: Are you moving along to the second one?

MR. GILLENWATER: Yeah, I was going to kind of say that if anybody had any questions on this particular one, to --

MR. PENNINGTON: Okay. Are the pavers that you're considering for this proposal similar to pavers that might be used on other kinds of roof types?

MR. GILLENWATER: That is correct. These were standard off-the-shelf pavers that were just supplied in the test from a typical, like a west tile manufacturer, which is their standard paver.

MR. PENNINGTON: So is it your view that if those pavers were installed over any roof type they would have the same performance that you're talking about?

MR. GILLENWATER: That is correct. That

is correct. It wouldn't matter whether it was say a EPDM or a TPO or a modified bitumen or an asphalt, if someone wanted a paver-type surface for a walking (inaudible) deck or whatever, this would supply the same kind of energy performance.

MR. PENNINGTON: Okay, thank you.

MS. HEBERT: Can you tell me exactly what a paver is, please.

MR. GILLENWATER: Typically it's a two-foot-by-two-foot-by-two-inch thick concrete product. It's typically made of 3000 pound concrete or higher, so it gives you good long-term weatherability and strength.

MS. HEBERT: Thanks.

MR. GILLENWATER: They weigh about 24 pounds a square foot.

COMMISSIONER ROSENFELD: And that's not a serious problem, 24 pounds a square foot?

MR. GILLENWATER: No, they work with that quite often up there on the roof. I mean they have to know how to handle them, but they do that on a routine basis.

MR. ELEY: You mean structurally?

COMMISSIONER ROSENFELD: Yeah, not your back.

MR. ELEY: Well, as an architect, you would have to use larger joists and beams if you --

MR. GILLENWATER: Yes, you'd have to take that into account. Depends on the area of the country. Some places it's --

MR. ELEY: Well, this would not be a retrofit thing.

MR. GILLENWATER: Because the further south you go the more that you have to make sure that the building is designed for the loads. And it varies. New construction, the architect usually takes that into account.

Any other questions?

The second item, there's a template that's been issued, also, to add highrise residential and hotels/motels under the cool roof banner. And this really only requires a minor word changing in subchapter 5, section 143. And, again, the template gives that recommended wording.

And the reason I think when you deal with a highrise building you can make a point that well, the roofing doesn't have a big factor in the overall energy demand of the building, because I got multi-stories and all that kind of stuff.

However, in these type of applications we've got individual units underneath that roof that are being controlled, climate controlled. And if we don't use that technology up there, we're penalizing the owner or the renter of what's underneath that roof in that area. So that's why the recommendation is there.

MR. PENNINGTON: So these would be for residential applications, 24-hour applications.

MR. GILLENWATER: Yes, highrise residential with a flat roof.

MR. PENNINGTON: And the analysis that was done for lowrise nonresidential buildings used a daytime occupancy and energy use profile. And the evaluation took into account not only the benefits from the cool roof of the cooling savings, but also the disbenefits of the cool roof on the heating side.

MR. GILLENWATER: Right.

MR. PENNINGTON: And for a daytime occupied building those disbenefits tend to be relatively small. So if you're moving to a 24-hour occupancy, you're likely to see grater heating disbenefits for the cool roof that will change the cost effectiveness outcome in some respect.

MR. GILLENWATER: You may and that may be more climate zone control --

MR. PENNINGTON: And it might --

MR. GILLENWATER: -- some places where it will be. And at the same time if I took a group of units, the question is what percentage of those would be empty during the day versus the family's there, the wife stayed home with the kids, or whatever. So we have to deal with those issues, as well.

Because it may not be 100 percent of the buildings are vacated during the day, although you have other programs that you've been talking about, even during the daytime you still make if they're on a controlled thermostat you could shut them off anyway. But that's going to be factored in in almost any kind of buildings.

MR. PENNINGTON: Right, so Hashem is going to be taking on this analysis for this category of buildings. And, you know, we may find somewhat different conclusions about the cost effectiveness in every climate zone.

MR. GILLENWATER: Right, I would agree.

You may see that when you get into the real detail, but we'd be willing to help with that.

MR. PENNINGTON: Okay, great.

MR. GILLENWATER: Okay. Thank you.

DR. AKBARI: Thank you for the assignment.

(Laughter.)

MR. PENNINGTON: Sorry, Hashem.

MS. HEBERT: Is there any other comment on roofing? Yes, Reed.

MR. HITCHCOCK: My name is Reed Hitchcock; I'm actually speaking as Executive Director of the Roof Coatings Manufacturers Association. And I just wanted, first of all, to thank the Commission and Bill and Elaine especially for the cooperative spirit.

As we heard earlier there is an ongoing rulemaking procedure. The industry has been working with the Commission and other stakeholders on that. Pursuant to that I just want, you know, there's been some talk about coatings and performance and things. And we have a lot of data now on performance, durability.

We have a durability study. The Midwest Roofing Contractors Association have a -- they completed a five-year study. We're on year three of the RCMA study, as well. Some good information in there that I think will be relevant.

MS. HEBERT: And you'll get us all those that we don't have already?

MR. HITCHCOCK: Sure. And also as questions come up on various things, I just wanted to reiterate our desire and willingness to work with you, to be responsive to questions that come up specific to liquid-applied cool process roof coatings.

That was all. Thank you.

MS. HEBERT: Yes, please step forward.

MR. HART: Hi, I'm Tim Hart from Duro-Last Roofing. And I just wanted to echo what Hashem had said. As a manufacturer there are a lot of fire classifications and ratings that manufacturers have obtained. There's fire retardant slip sheets that can be used both in low-slope and in high-slope applications.

And there is unlimited slope testing already. So you can get, with some of these fire retardant slip sheets, unlimited class A classifications on combustible decks.

So there are --

COMMISSIONER ROSENFELD: Can you educate me on what a slip sheet is.

MR. HART: There are slip sheets that will go down that are fire retardant, that can go down over top of plywood, either combustible or noncombustible substrates. And those will help to provide the manufacturer with the rating that they're looking to get on that slope.

So if they have tested with UL as an assembly with that fire retardant slip sheet and their product in combination, then the slope -- the spread-flame that was talked about here and the fire classifications obtained can be reached.

There are single ply, that with the use of slip sheets, noncombustible surfaces will get unlimited slope class A classifications. So there are products; there are manufacturers that are tested for these classifications. And you'll still be able to get the cool roof that you're looking for, and the class A rating that you're looking for with these tested assemblies through UL. And many of the manufacturers have them.

MS. HEBERT: You have some costing information for these slip sheets?

MR. HART: Yeah, a lot of the -- some of

the costing for fire retardant slip sheet can add, you know, 25 cents to 35 cents a square foot, depending on the classification you're looking for.

If you're looking for, you know, a class A, B or C, there are products called FR-10, (inaudible) Shield. For a class A rating on a combustible deck, depending on the slope, in some cases you'll need to add two layers. That will add maybe as much as 75 cents to obtain that rating.

But a lot of the manufacturers, again, for single ply have already went through that testing with UL and can meet that requirement.

Thank you.

MR. PENNINGTON: So what do these slip sheets look like physically, and how are they applied?

MR. HART: There are some that are rigid that will go down just like plywood would go down. So there's some specific installation requirements for those.

There are some that come in rolls and some of them are perlite type based. And they're very thin products. But they can down over less rigid surfaces and still obtain those ratings.

MS. HEBERT: I'm sorry, did you say they could go on high slope as well as low slope, or are they meant for --

MR. HART: They can go on high slope and low slope. It depends on what the slope is. For instance, we have unlimited slope on combustible decks, so if we're looking at going on a high slope residential roof, then we'll look at what we have tested. So it might be one layer of FR-10, two layers of (inaudible) Shield, a layer of Dense Deck.

But with that tested assembly we'll be able to say, we'll get a class A rating on this high slope roof using this assembly. And using these products in combination.

Thank you.

MS. HEBERT: Thanks. Did I see another hand? Okay. Craig wants to come back up. Craig, come forward, please.

MR. SMITH: Just wanted to make a few comments about the pitched and the fire rating and things like that, if I can.

It's been our experience that because we did test at a 2-12 pitch on the E-96 is the test for flame-spread on pitched roofs. And that may be a good criteria possibly to be able to held to.

The only thing that I would ask, since we've already done the testing, is that because this is an issue that we are running into, is that we have done, paid for and used certified testing for years. And then we go to some entities, including CRRC, or some that won't recognize that testing. And even though, you know, the tests were perfectly fine.

But my point is that I guess because of the fact that if you're going to put a coating over some type of a membrane or whatever, generally, especially like with PVC or TPO or something like that, you'll have to use some type of an adhesive or a primer before you put that coating on, that you would have to do it as a system. That it's also tested for maybe flexibility, adhesion. And then maybe do the E-96 test.

MS. HEBERT: Is that an ASTM E-96?

MR. SMITH: Yes. I just thought maybe that would be helpful.

MS. HEBERT: Thanks. I have a quick question for I'm not sure who. When Dick

Gillenwater was at the microphone I recalled the conversation I had with Jon McHugh not too long ago where he suggested that we relook at the prescriptive requirement for cool roofs for buildings that are heated only, and not cooled.

Is that going to be part of -- I guess that's a Hashem question -- is that going to be part of what you'll be looking at? Does it make sense to have a cool roof on a building that is heated only and has no air conditioning in it?

DR. AKBARI: I'm on record that if it's not because of the heat island and comfort and environmental issues, cool roof, there's no need for a cool roof.

So cool roof would only save air conditioning, reduce the ambient temperature and improves comfort. If you do not have any use for any of these you don't need to have cool roofs.

MS. HEBERT: And for folks' information, our definition of conditioned space includes heated or cooled. Air conditioned.

DR. AKBARI: Correct.

MS. HEBERT: Okay. Any other comments on roofing?

Okay, any comments on other topics?

Yes. Doug, why don't you come up, and then Bruce.

MR. MAHONE: Doug Mahone, Heschong Mahone Group. Now for something completely different.

I'm sort of relaying some comments from my colleague, Nehemiah Stone. As you may know, he has been leading an effort at our firm to work with multifamily construction, new construction and existing buildings through the utility programs.

And in the course of doing that work we worked with a lot of developers of multifamily housing. And have helped them to achieve designs that exceed title 24 by 15 percent or more.

And, of course, in doing that we've encountered the differences between the 2001 standards and the 2005 standards.

As a result of that experience we've been reminded once again of the kind of ongoing, might even call it festering problem that we have with title 24 in that we treat multifamilly buildings as kind of an after-thought.

If they're lowrise multifamily buildings we treat them as if they're single family residences in terms of the way many of the requirements are developed. And if they're four stories or higher, we treat them as if they're nonresidential buildings in terms of many of their requirements. And they're not the same.

It primarily revolves around the envelope and the HVAC systems, because when you go from three-story buildings to four-story buildings all the envelope requirements and the mechanical requirements switch from being residential standard requirements to nonresidential requirements.

The problem is that's right about the height of buildings where there's a lot of variability. Often a developer will have a building that's a three-story building, and then they sort of sharpen their pencils and decide, oh, let's make it a four-story building. And whammo, all of a sudden all this stuff that we've been telling them about the energy efficiency of their buildings changes.

For example, in glazing. We have been working with buildings that are trying to be 15 percent better than title 24. And we encounter the glazing problems in a couple ways. One is that if it's a three-story building or lowrise building, they can put in -- the multifamily buildings typically had 8 to 10 percent glazing, in terms of wall area.

If they're lowrise multifamily they can get up to about 20 percent without any substantial penalties. But if it's a highrise building, the requirements for the glazing area are different.

As the glazing area is increased, the shading coefficient requirements decrease. When it comes to trying to get 15 percent better than title 24, we've seen situations where building designs were 15 percent better than the 2001 standards. And then, you know, because of timing they're actually going to have to comply with the 2005 standards.

For lowrise buildings we've been able to essentially make one change, which is to upgrade the HVAC system to meet the federal standards. And the lowrise buildings are still about 15 percent better than title 24.

A four-story building, which is a highrise building, that was 15 percent better than the 2001 standards, we've put in the same HVAC system upgrade and run it. But it's 6 percent worse than the 2005 standards.

And trying to explain this to architects and developers about why things are so different because it's a three-story building or four-story building, you know, it often doesn't pass the laugh test. And, you know, we try to explain to them, well, it's a historical thing, you know, it's the way the Commission's always treated multifamily.

But it, a lot of cases it just doesn't pass the laugh test, those people who are actually trying to build the buildings.

So, this is a longer term thing. I don't think this is anything that we can fix for the 2008 standards. But, we've had this problem. We've brought it up multiple times, every time we get into the standards revision process. And, you know, the answer is always, well, you know, we're too busy trying to make the changes for the current standards. We can't possibly think about reorganizing the standards for multifamily.

But I really think it ought to be on the agenda, not for the 2008 standards, but for the next round of standards beyond that. And as soon as we can catch our breath, we really ought to get going on sort of doing the long-term adjustments that ought to be made to get an integrated multifamily version. Yes.

MR. ELEY: So, is anything -- a duplex and more multifamily then? Where do you cut off? What becomes multifamily? I mean you've got single family attached, you know, it's pretty -- row housing, you know.

MR. MAHONE: Right.

MR. ELEY: I assume that would be single family?

MR. MAHONE: Yeah, I can't say I've a thought-out answer to that question.

MR. ELEY: Well, need to define what multifamily is.

MR. MAHONE: Right. I mean another variation that might actually be simpler is just to take the nonresidential approach and apply that to all multifamily. Rather than having some of it fall under the res standards, some fall under the nonres standards.

It's another variation of how to do it. Like I say, I'm not coming with a fully, you know, fleshed out proposal for how to do this, but I think we've got to fix it.

So, I'll let somebody else have a

comment here.

MS. HEBERT: Doug, in your experience so far, is there any kind of breakdown between say a two-family unit and everything else, three-family and up? Is there a clear breakdown, just in your experience?

MR. MAHONE: Well, we have been dealing with larger projects, so we actually don't have any direct experience with duplexes. We generally deal with, you know, apartment buildings.

MS. HEBERT: Thanks.

MR. ELEY: It seems to me that attached housing is more akin to single family than multifamily, as you're defining it. Maybe the breakpoint is when you start stacking units on top of each other.

MR. MAHONE: Yeah or stacking them next to each other. I mean for most of these multifamily buildings there's, you know, certainly no more than two, and often only one wall of the unit that's facing the outside.

When you get duplexes, you know, okay, there's four -- or there's three sides that are facing the outside. And so that is more like -- that's probably where the transition. But when you start stacking them up either sideways or vertically, it becomes --

MR. ELEY: Well, a duplex is stacked sideways, right?

MR. MAHONE: Yeah, but only one stack. So there's still three sides on each unit that's facing the weather.

Like I say, I actually haven't thought about where you would draw that line, but we're having some serious anomalies showing up with the way we've got it now.

So let me just leave it at that for now.

MS. HEBERT: Thank you. Bruce Maeda.

MR. MAEDA: Bruce Maeda, California Energy Commission Staff. It would be highly desirable for the 2008 standards to at least do certain updates to the nonresidential alternative compliance manual.

At the very minimum it would be very desirable to have a complete and consistent set of ACM tests and have independent runs of those tests completed prior to the publication of the manual or adoption of the manual.

The second item, a little more extensive work, might be possibly feasible, possibly not,

would be to revise the sizing requirements.
Another item that is related is the possible revisiting of the weather files, what we should do specifically about the weather files, both in terms of localization and Ken's already brought up this for residential. There's some anomalies especially that are exacerbated by TDV things that come up now because weather is not localized.

And we have localization methods in the nonresidential ACM manual, but they apparently are not being implemented for the last several times around. And we've dealt with that problem a little bit, we've fixed it. It's possible to implement them, at least, at this point. But we need to make sure that they are implemented if that's what we want to do.

That's it.

MS. HEBERT: Any questions for Bruce?

Okay, who else has comments?

MR. McHUGH: I have a question.

MS. HEBERT: Yeah, go ahead, Jon. Oh, Bruce, Jon's got a question.

MR. McHUGH: When you talk about localization are you talking about just for sizing, are you just looking at design days, or are you looking at the whole 8760 hours of your simulation?

MR. MAEDA: Well, it's sort of in between. The method that's currently described in the nonresidential ACM manual is a stretching of the extremes of the weather data using a computer program which we did have some trouble with because it doesn't work on faster CPUs at the current time. But there's a patch available; and we applied that patch and now that file does work.

So we can do it, and it was actually described in the nonresidential ACM manual for the reference method. But in practical reality it hasn't been implemented. And it's very desirable to do that.

But it doesn't -- it looks at the whole 8760 hours based on the design data and stretches the extremes, but it does not affect all the weather data in that file. It only affects a portion of that weather data, about 10 percent.

MS. HEBERT: Kevin.

MR. KELLEY: I'm sorry, this is cool roofing related. I missed my chance earlier. But I was interested that you asked about the price --

MR. PENNINGTON: Could you re-identify yourself?

MR. KELLEY: I'm sorry, Kevin Kelley for Duro-Last Roofing, Incorporated. You'd asked about the price step up for using fire slip sheets.

We can achieve ratings of 2-in-12 class A with an additional say 20 cents a square foot. We can go to an unlimited slope for another 8 cents a square foot. So really, the step up there is about 8 cents a square foot. And, you know, I think Tim overstated that a little bit. I think it's an important point.

Immediately after Tim, a coatings representative came up and said, you know, he could coat TPOs and PVCs and talked about acrylics and primers. We don't require coatings to get our fire ratings or get our reflectivity. So I just didn't want that issue blurred in there.

Thank you very much.

MS. HEBERT: Thanks. Joe.

MR. HUONG: One of the disadvantages of being behind you is I didn't get seen. I was trying to follow up on what Bruce said, and so we're going to jump around in topics. This is back on weather data.

MS. HEBERT: You know what, identify yourself, again, please.

MR. HUONG: Oh, Joe Huong, LBNL. I'm fairly familiar with the weather data that's being used right now for title 24, and the topic that Bruce mentioned about adjusting it. I think there's been sufficient amount of adjustments that's been made to the weather data.

You need to take a good look at what you're dealing with right now, because first the original weather data was done in the early '80s by Loren Crow, and those are actual weather data from 16 sites.

And then they were adjusted about 15 years ago to reflect the regional average. And then there is the adjustment that Bruce mentioned to stretch the peaks.

And one concern I have about all this stretching --

COMMISSIONER ROSENFELD: I'm sorry. Joe, can you say what stretching peaks means?

MR. HUONG: Oh, that on the weather file there would be a design temperature of the hottest day or the coldest day. And then what the staff person at the Commission did was wrote a computer program that said, if you were running another location, if you're trying to do a run for another location within that climate region, you look at the design temperatures for that location; and you somehow adjust the temperatures on the hottest and the coldest days and you kind of shift them so that they would match the ASHRAE designed temperature for that location.

And I'm not very clear because I haven't looked through the source code, but it stretches it for the peak day, and then also stretches it for a number of other days, and also stretches around the peak.

One big concern I have about all this is that all this stretching, manipulating, is only done on the dry bulb temperature. And I've had extensive discussions with Chip Barnaby who did the first stretching for the regional average.

And I said what did you do with the wet bulb. He said, well, he just tried different things to basically pass the laugh test. If you keep the same wet bulb it doesn't look right. So he just ended up taking the same wet bulb depression.

And one big concern I had when that was done was if you go to CTZ4, which is Sunnyvale, it has been stretched significantly, moved up in temperature, so that you get wet bulb temperatures for CTZ4 that's higher than the design wet bulb for locations in the Bay Area.

But anyway, I'm not here to criticize any of that. I'm just saying that there's been enough manipulation done of the weather data over the years, and the fact that they were done for -- the weather data was developed for a different purpose, just for average annual energy calculations. And now we're using them also to do, you know, the peak analysis.

I think enough work has been done on the weather data and enough time has passed that I really support Bruce's suggestion that that weather data at least should be reevaluated and possibly updated.

COMMISSIONER ROSENFELD: Joe, let me make a comment, too. In addition to the details, the hourly details, there's the issue that sort of by definition these temperatures are 15 years old, or 20, or 25.

MR. HUONG: They're probably 40 -- well,

they were done in the early '80s, so they were probably done for -- taking raw data from 1950 to 1980. So, on average, you're using data that's like 30 years old.

MR. ELEY: Yeah.

COMMISSIONER ROSENFELD: And if we believe the heat islands data, then Los Angeles has gone up one degree every ten years. So, it's up by 4 degrees. And that's going to continue, and global warming is going to add another one degree every ten years.

So, your proposed committee or something should simply look at just doing, if nothing else, straight-line extrapolation of the temperature so that we're looking at temperatures 20 years in the future instead of 40 years in the past.

MR. HUONG: Yeah, I agree completely. I mean we're using this weather data hopefully to predict, you know, what will happen in the future. We're doing it with things from 40 years in the past.

COMMISSIONER ROSENFELD: And 60 years is a long time difference.

MR. HUONG: And one thing I've been advocating at ASHRAE, but it's had mixed reaction, is I don't think it's necessarily better to use more data to get the TMY. I think the best thing is to get the most recent 10 years or 15 years, so you have enough years to capture the random variations, but you don't make it so long that you smear out the heat island effects, the global climate change effects.

So I mean, if I were to do it over again, I would just take the last 15 years of recorded data and then come out with a TMY. And then I would also check to see if we're getting the peaks right. And then look at all this stretching stuff, and see how valid it is.

Thank you.

COMMISSIONER ROSENFELD: Just don't sit down behind Elaine next time.

(Laughter.)

MS. HEBERT: Sorry about that. I'll stand up and look for hands up from now on. Is there anyone else who wants to speak?

Go ahead, Charles.

MR. ELEY: Well, I have to make one comment about the weather files. Being one of the older people here, the original climate zones that were adopted in 1978, one of those climate zones had Walnut Creek in the same zone with Truckee. So, while they're imperfect, they're a lot better now than they once were.

COMMISSIONER ROSENFELD: Bravo.

MR. ELEY: Right.

MS. HEBERT: Anyone else?

Okay, great. We will be in touch by email. And also we have several mailing lists for hard copy emails, as well. So we get the word out for future meetings several ways.

And we expect the next public meeting to be in February. We haven't picked dates yet. There will be a lot of work between now and then going on. We'll be processing all the comments; putting a lot more stuff up on the web, all the presentations from these two days, other comments we've been getting by email and other forms. It will all go up on the website, as we can.

And thank you for your participation and attendance, and I guess we're going to call this meeting closed.

(Whereupon, at 4:21 p.m., the Staff Workshop was adjourned.)

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CERTIFICATE OF REPORTER

I, PETER PETTY, an Electronic Reporter, do hereby certify that I am a disinterested person herein; that I recorded the foregoing California Energy Commission Staff Workshop; that it was thereafter transcribed into typewriting.

I further certify that I am not of counsel or attorney for any of the parties to said workshop, nor in any way interested in outcome of said workshop.

IN WITNESS WHEREOF, I have hereunto set my hand this 3rd day of November, 2005.