CALIFORNIA ENERGY RESOURCES CONSERVATION

AND DEVELOPMENT COMMISSION

WORKSHOP

2008 CALIFORNIA BUILDING ENERGY EFFICIENCY STANDARDS

CALIFORNIA ENERGY COMMISSION

HEARING ROOM A

1516 NINTH STREET

SACRAMENTO, CALIFORNIA

FRIDAY, MAY 19, 2006

10:00 A.M.

Reported by:
Christopher Loverro
Contract No. 150-04-002

COMMISSIONERS PRESENT

Arthur Rosenfeld,

STAFF PRESENT

Ram Verma, Technical Lead

Bruce Maeda

Mazi Shirakh, Technical Lead

Elaine Hebert, Lead on Cool Roofs

Bill Pennington, Office Manager

Rob Worl

ALSO PRESENT

Hashem Akbari

Bill Mattinson, Sol Data

Jim Lutz, PE
Ernest Orlando Lawrence Berkeley National Laboratory

Mark Hoeschele, PE
Davis Energy Group

Fred Salisbury
Pacific Gas and Electric Company

Joe Mellot
Momentum Technologies, Inc.

Robert E. Raymer, P.E.
California Building Industry Association

Craig Leasl
Stockton Roofing Company

APPEARANCES (Continued)

ALSO PRESENT

John Goveia, President
Pacific Building Consultants, Inc.

James Dunn, Sales Manager
FERRO

Ming-Liang Shiao, Ph.D.
CertainTeed

W. Lee Shoemaker, Ph.D., P.E.
MBMA

Kenneth T. Love, Market Development Manager
FERRO

John McHugh, P.E., L.C. Technical Director
Heschong Mahone Group, Inc.

John Miller, Vice President of Operations
DECRA Roofing Systems

Reed B. Hitchcock, General Manager
Asphalt Roofing Manufacturers Association

Jerry Greeves

Russ Huge
Elk Corporation

Mark Ryan, Technical Sales Representative
The Shepherd Color Company

Ronnen Levinson
Lawrence Berkeley Laboratory

Andre Desjarlais

Mike Hodgson
ConSol

Rick Cech, President
Coastline Engineering, Inc.

APPEARANCES (Continued)

ALSO PRESENT

Philip D. Dregger, Principal, P.E., RRC, FRCI
Pacific Building Consultants, Inc.

Pat Eilert
PG&E

Tim Kersey
Siplast

Philip Dregger
Pacific Building Consultants

John Crowle, Regional Low Slop Product Manager
ABC Supply Co., Inc.

Jerry Vandewater, Technical Service Manager
MonierLifetile

Robert Scichili, Consultant

Domenic J. Morelli, Executive Vice President
Thermo Materials

John Pohorsky, Director Codes and Testing
GAF Materials

Michael D. Fischer, Director of Codes &
Regulatory Compliance
WDMA

Carl Hiller

Ken Wittler

Jerine Ahmed, Market Advisor-Codes and Standards
SDGE

Marc Hoeschele
Davis Energy Group

Bruce Wilcox

APPEARANCES (Continued)

ALSO PRESENT

Karl Kurka
California Urban Water Conservation Council

Yun Kim

David L. Roodvoets, Technical Director
SPRI

I N D E X

P R O C E E D I N G S

10:00 a.m.

MR. SHIRAKH: We are going to started. My name is Mazi Shirakh. I'm the technical lead for the 2008 Building Energy Efficiency Standards.

We are having a two-day workshop this week. The first day was yesterday. It was mostly devoted to non-residential issues. Today's topics are going to be mostly residential. There is a non-residential cool roof topic that will be discussed.

Good morning, all. Yesterday when I was going through the agenda, I misspoke. I mentioned that we would be talking about cool ducts today. That is not the case. The topics are only cool roofs. If you have traveled here for cool ducts because of my comment yesterday, I apologize. It will be brought up at a later date.

I would like to introduce some key staff who are involved with the 2008 Standards. To my left is Commissioner Rosenfeld, one of the two Commissioners that is overseeing the standards along with Commissioner Pfannensteil. Bill Pennington, the Office Manager, Ram Verma, the other Technical Lead, and Elaine Hebert, who is our lead on cool roofs.

The topics this morning on Nonresidential Cool Roofs (Steep Slope), Residential Cool Roofs (Steep Slope), and Residential Cool Roofs (Low Slope).

Hashem will be presenting all three topics, and after each topic, we will have about ten minutes for questions and answers, and then more substantial comments will be held later for the day.

Before I start, I'd like to turn this over to Elaine Hebert. The Commission has recently completed a proceeding related to the 2005 Standards Cool Roofs, and Elaine would like to provide and update on what happened.

MS. HEBERT: Good morning. I think I am Elaine Hebert because Andre Desjarlais is here, so share our French pronunciations of our names. I grew up hearing it as "Dejarlis" in my town that had a lot of French Canadians.

Anyway, I work here at the Energy Commission, and I think what I am about to tell you, you all know already, but I just want to make sure that as you look at the 2005 Standards to suggest changes for 2008, that you know that we've been involved in a rule making to make changes to the 2005 Standards, and these changes were adopted by the Energy Commission on April 26. They do not take effect just yet. The effective date is yet in the future, probably in August because from here it has to go to the Building Standards Commission for adoption by them. The first meeting we can get on their agenda is July 19.

Assuming they approve and adopt, they file with the Secretary of State, and the effective date is thirty days after filing with the Secretary of State. That puts us somewhere in mid to late August if that all goes smoothly.

The changes we made are related strictly to liquid coatings that are applied in the field on roofs on low sloped roofs. I have some copies of the final language here in this folder, but I'm hoping that you all have seen it, but if you want to take another look, I have some copies here.

Mostly the changes are these, we took away the minimum dry mill thickness of 20 mills and are replacing it with coverage recommended by the coating manufacturer taking into consideration the sub-straight on which the coating is applied. This is Section 118(i)3 in the Standards.

We also added the phrase "Liquid applied roof coatings applied to low sloped roofs." just to clarify that. That was always our intent, but we put that phrase in just to clarify. We also broke up the mill thickness requirement from meeting the minimum performance requirements in Table 118(c) into two sections (a) and (b), and then the exceptions to this section are exceptions just to 3(b) so that the aluminum pigmented and the cement-based roof coatings exceptions apply only to the new 3(b), which is the Table 118(c) or similar ASTM Standards. We have added some ASTM Standards there.

Then when we look at Table 118(c), we added ASTM Test Procedure D-522 Test B, which is a manual flexibility test, as an alternative to initial elongation at low temperatures, accelerated elongation at low temperatures, that is aged weathering 1,000 hours, and initial tinsel strength at low temperatures.

The other changes represented here are a little bit of clean-up and adding the ASTM Standards, all of them that are referenced in this section, to two places we've listed our referenced documents in the standards, so we have added the

ASTM Standards to Section 101 B, the Definition Section, and Appendix 1A at the end of the standards.

Hopefully, you all know that already, but I thought I should go on record saying that you are looking at making changes to those things, assuming everything goes well with the Building Standards Commission on July 19.

If anybody needs a copy of the language, I have it here. That's it. I'll turn it back over to you, Mazi.

UNIDENTIFIED SPEAKER: That date's been changed to July 27.

MS. HEBERT: Oh, thank you. Let me get that on record. The date has been changed to July 27 for the Building Standards Commission meeting. I didn't know that. Thanks, Bob.

MR. SHIRAKH: Thank you, Elaine. When you came in, there is a sign-in sheet. We ask everyone to sign in, or you can attach your business card. That way we know who is participating in the workshops if we need to get a hold of you.

Also, today's workshop is being recorded. We have a court reporter. It will be transcribed and posted on our website in about two weeks, both today and yesterday. For that reason, when you have a question, I am going to ask you to come up to the podium. You need to check your name and affiliation every time. It would be helpful if you handed the gentleman your business card, so he can get the correct spelling of your name.

With that, I am going to turn it over to Mr. Akbari.

MR. SALISBURY: I actually have a few things I want to share first prior to the Nonresidential Cool Roof Presentation. My name is Fred Salisbury, and I am with Pacific Gas and Electric Company.

I just want to go over briefly PG&E's involvement in the 2008 Code Enhancement Cycle. For those of you that were here yesterday, I apologize for the redundancy. Obviously, we all know of a need to reduce statewide energy consumption. California has seen an incredible population growth over the last several decades.

As we all know, the energy consumption tends to track that growth. It is important for us to make every effort to conserve energy.

Typically, other states will follow California's lead in this regard. There are a number of options to save energy, efficiency is what we are all concerned with here today.

The reason that we like to go for energy efficiency and that PG&E is involved in energy efficiency is because as we know, it is extremely difficult to add generation and transmission capacity. This is because of high cost and the lengthy regulatory process required.

PG&E's energy efficiency programs have come about as a result of state policy, which requires that we look towards efficiency before we create additional generating capacity.

The investor-owned utilities contribute to this statewide attempt at energy efficiency in several ways. One is that the CPUC awards ratepayer dollars to the IOU's to promote energy efficiency.

These energy efficiency programs take place during funding cycles. The current three-year funding cycle began on January 1, 2006, and there are very specific mega-watt hour, mega-watt and therm goals for each of the investor-owned utilities for these programs.

PG&E's energy efficiency programs have various of achieving energy efficiency goals, including incentives and rebates. Now with this cycle, the investor-owned utilities get energy savings credit towards meeting these goals for codes and standards work, which brings to where we are today.

PG&E's 2008 Title 24 Codes and Standards Enhancement Reports focus on the technical and feasibility information on energy savings proposals. The technical information is basically how does it work, how much does it cost, and how much energy is it going to save us.

The feasibility has to do with market share, whether or not the market can respond to the measures and the interaction with the current code and practices.

Thank you. Now Hashem I think.

MR. AKBARI: Good morning, all. I am not Fred Salisbury, I am Hashem Akbari from Lawrence Berkeley Lab. This is a presentation that Fred was planning to do, but on the last minute knowing the water may be a little bit rough, he asked me to do that.

The study we have conducted is funded by

Pacific Gas and Electric Company, and the focus of this study is to look at the cost benefit analysis of implementing roofs with high solar reflectance on high thermal emittance on steep lope on commercial or nonresidential buildings. Any questions or comments that you have, Fred's name and e-mail is there. Please forward it to him.

On this slide, I would also like to acknowledge the contribution of my team and LBL, Ronnen Levinson, who is here, Craig Ray, who is here, and Tim Shew is not here at this time. These two gentlemen are here, Ronnen and Craig in case that there are going to be some detailed questions that my memory would not allow.

There are three almost identical presentations and some boiler plates material or general background that it is common on all of them. So, I have already talked to Mazi, and he has asked me to spend a little bit more time on the background on the first presentation and then skip them on the second and third presentation. Chances are on the first presentation, we would go over the thirty minute slide, but I would assure you that we would catch up on the second and third.

This is a standard manner that we know that if we include the solar reflectance of the roof, we would be able to change the heat balance of the building. Basically, what it is happening, when the sun energy is on a roof, on a dark roof, most of that energy is absorbed. On a roof which is having a high solar reflectance, the amount of the heat that it is absorbed by the roof would be lower. Of course, if we have a lower amount of heat absorbed by the surface, the temperature of the roof would be lower.

Similarly, if you have a roof that has a high thermal emmittance, it has the ability of easily emitting radiation, thermal radiation back to the sky and that would keep the roof also at the lower temperature.

If you have a surface that has low emissivity, the only way that the surface can balance the radiation exchange is to raise its temperature so it would be able to emit radiation to the sky.

Lowering the roof surface temperature definitely would reduce the heat conduction into the building and, therefore, it directly saves cooling electricity and roofs get hot during the peak hours of the day, so the roofs with high solar reflectance are ideal measures in order to reduce the peak demand of the building and also peak demand of the utilities.

Finally, if a surface is at the lower temperature, it would become less of the heat into the air as a result of that the heat would not -- the air would not be as hot or whereas compared to over a hot surface.

Other benefits, the environmental impact of cooling a roof is that in warm community if the surfaces are cooler and they is a lot of vegetation, it turns out the warmest or that community be cooler by a few degrees, and that few degree may be the biggest factor in increasing the human comfort.

The formation for the chemical smog is highly temperatured depending on lower temperature, air temperature, the smog formation would be significantly retarded.

The lower air temperatures (indiscernible) in the summer, and that would have an indirect effect on energy, the cooling energy benefits for the buildings.

Finally, if the cooler roofs have a

longer life, there is an amount of the waste from the roofs over the life cycle would be reduced.

Potential penalties, environmental penalties for roof with the higher solar reflectance is that during the winter, there is a slightly higher winter time energy use. If happens that energy use is coming from the local area, then all the people are using some other fuels such as wood for heating of their houses, that would degrade the winter time air quality. That is a fairly minor issue.

Up to now, we are basically talking about the issue of solar -- increasing the solar reflectivity of the surfaces. The terminology cool and haul are going to be fairly relative and fairly fluid over time. The surface that it is point has the solar reflectance of .25 compared to a surface that has a solar reflectance of .1 is cool, but that same surface compared to a surface which has a solar reflectance of .4 is hot.

For that reason, we tried to keep that relative view in introducing the market -- relative products that are in the market for the cool options.

The chief factor here is that this is a

very very young market, however, it is growing very very rapidly. The materials that are available, but probably not on a very large scale are clay tile, concrete tile, coating, metal roofings, and fiberglass asphalt shingles.

At this time, the Cool Roof Rating Council has a data base of rated products over 650 if I am not mistaken, perhaps close to 680 that they have labeled their initial solar reflectance and thermal emissions, and this is a lot of both samples are in the field for the aging, and they will be shortly posting the three year age solar reflectance and thermal emittance. Just for your background, the website has tons of updated information, please rely on that for the most updated information.

Let me go through some examples of standard or warmer product versus surfaces or products that are having higher solar reflectance or cooler. This particular template shows color matched for roof coatings for six samples, the lower one or the coatings that are used on concrete tiles range from solar reflectance of about 4 percent or .04 to .33. The identical solar reflectance for the cooler options are all over .4.

These products are fairly young, but they are finding their ways into the market. The interesting point is that these are the first attempt of the manufacturer to produce these products and they are assuring us that with a little bit of ingenuity, they would be able to easily raise the called the solar reflectivity of these materials to .5 or slightly higher.

The other factors that I would like to mention in here that is very important is that the amount of the gain or the difference between the warm air and the cooler solar reflectance are about the highest for darker surfaces.

For instance, if you like at the black, you would find that the solar reflectance has increased from 4 to 41 percent. You do not see this same difference say in gray color.

Here is another template available for products that BASF is calling it ultra cool. These are all available, and they are producing these coatings that are used by the middle road manufacturers that they provide their own metal, painted rolled metal to the roofing manufacturers and they use those in order to manufacture roofing products.

It is a little bit hard to see these things, the numbers, but all the colors that are on the first lefthand column in here have a solar reflectance of .4 or higher. The materials on the second column are having a solar reflectance between .3 to .4. The third one are having solar reflectances of between .2 to .3.

The next one please. The amazing advances have really been made in increasing the solar reflectance of clay tile roofing. These are very fairly dark roofing material from the MCA clay tile, red, green, tobacco, which is basically dark brown, and all of them have solar reflectance of .4 or higher. However, if one is interested to go to something that these lighter in color like the white, the solar reflectance approaches .7.

I managed to find this slide yesterday, and this is some products from new Lifetile coating. These products have been tested by my friend at Florida Solar Energy Center, Danny Parker, and the colors here unfortunately are not presenting the true colors, but it shows that there are few products from the concrete tiles that can easily achieve solar reflectance of .4.

This one, this one, this one approximately, and this one. As I said, these colors are not really the true color.

The most advancing break through has been in the shingle market. This particular product is marketed by Elk, and it is called Prestique, and they are available in three colors: weathered wood, gray, and I already forgot the third one, but take my word for it, they are available in three colors.

This products are being manufactured from the granules that are obtained from the granule manufacturing companies. In here I am showing samples of four products fairly dark in color that all have solar reflectance of .27 or higher. For instance, if one is interested to have the dark brown cool shingle or dark gray cool shingle with solar reflectivity of .27 and the other choices of color or architectural issue is not a factor. Those products are readily available.

We have been working with some of our manufacturing partners of constantly improving solar reflectance of material at the level of the prototypes. These particular samples have been produced for us by ISB Minerals, and as you see, they are becoming lighter in color, but their solar reflectance in some cases approaches .35 or higher. So, there is room to improve.

Let me tell you what I would be talking in the form of a time table in the three presentations today. For the 2005 market, California standard, we do have prescriptive standard for low slope roof nonresidential building.

If you divide the world of the roofing market in California into residential and nonresidential and the roofing of it into the lowest slope and highest slope roof, that creates four cells of metrics. This particular metric cell is already being addressed in the 2005 cycle.

This presentation that I am talking about is nonresidential steep slope, so I will talking about this one that we are hoping to persuade the staff and the Commission to adopt language for accepting standards for nonresidential steep slope roofs.

The scope of this study is that introduced requirement for steep sloped roofs on nonresidential building, we propose minimum age value for solar reflectance until another maintenance. This is a slide variation from the current 2005 version, but it is 100 percent compatible with the existing 2005 requirement, and I will get to that momentarily.

This reason for this recommendations are coming from the analysis of the building energy use and a cost benefit analysis. We are also updating casually the requirement for the 2005, for the lowest sloped roofs to go to, again, this is currently based on the initial values, but we are recommended that the Commission to go based on the age value and I will give some reasons later on.

The technology that we have used is the following. We looked at the measure of availability in terms of the technology market share. We have basically turned every single stone that we could turn them. I know that there are a lot more private data that are available here and there, but if they were not available to us, they were no data.

We use all the available data in those type of analysis. We looked at the manufacturers and the distribution cycles and channels. We looked at the availability and the cost premium based on a lot of formal and informal discussions that we have had with our different partners and different sources.

Finally, we looked at the useful life of these things. with a lower intensity basically. We performed a cost benefit analysis looking at the energy savings. We simulated the cooling and heating energy use of proto-typical buildings that are being used in California Title 24 analysis, and all of our savings and data that are being shown are showing the net savings, which is the cooling savings in dollar minus the potential heating penalty.

Finally, we projected these savings from individual buildings to the state. The cost effectiveness of increasing the solar reflectance of the steep slope buildings based on the analysis that we have done, it looks that it is cost effective everywhere, and here are the results. We simulated the increasing, the three year age solar reflectance of the steep slow roof for the nonresidential building.

We used three roofing products. These roofing products, we had base case and what we call it "cool chase". For fiberglass asphalt shingles, we had a base case of .1. We looked at the cool case of .25, the difference between these two energy savings in these two or energy impact in these two gave us the similar results that we wanted.

For concrete tile, we went from .1 to .4. For the metal surfaces, this is painted metal surfaces, we went from .1 to .4. In all of these analysis, the emissivity were assumed to be .8 or .85. I think it was .85 if I am not mistaken.

Then to estimate the cost premium for the cool products based on the data that we had, we basically came up to the conclusion that the premium in the cost is anywhere between zero to about 20 cents, so we took 20 cents per square foot as our criteria for the cost effectiveness.

We found out based on this result that the thirty-year net present value for all these products in all the sixteen California climate zones for all type of variations was more than 20 cents per square foot.

Here are some results. This is looking at thirty-year net present value unit is $1.00 per thousand square foot and it looks for a shingle roof. What we have in this plot, the table in here basically shows the bar charts that are plotted.

What we have in here is a light blue is the TDV of energy savings. The dark blue is the incremental cost because of the savings in downsizing the equipment. The red marks have three levels. One is five cents per square foot, the other is ten cents per square foot, and the top one is twenty cents per square foot.

It clearly shows that in most climates, the amount of the savings that we have is $500 per thousand square foot. The cost is about $200 per thousand square foot, therefore, there is cost effectiveness everywhere.

In Climate Zone 1, it is still cost effective, but it is fairly marginal at the higher level of incremental roofing prices. The same story for concrete tile roofs. The savings this time ranges, again forgetting about Climate Zone 1, anywhere between $1,000 to $2,000 per thousand square foot of thirty years net present value of the savings.

Metal roof, same story, slightly higher saving potential. Again, from about $1,000 per square foot to about $2,200 per thousand square foot. Our assumptions for the incremental cost estimates are the same in all three cases.

So, projecting these savings to the statewide, we are finding out based on the data that is available to us, the amount of the roof area in nonresidential building annually increases by about 80 million square foot per year.

Remember that this is the amount of the roof area, not the floor space. We have taken the floor space data and adjusted based on the number of stories of the buildings and came up to this number that about 80 million square feet of nonresidential roof area is added every year.

Of that, about 14 million square feet are steep slope roof. That is our estimate, and that estimate, you know, is accurate data of going from here to here is not that much available. So, if this number can be plus or minus four or five million square feet.

The electricity savings, time dependent savings that we estimate is 15 giga-watt hours a year. The natural gas time dependent deficit is about four giga-BTU per year. The net source energy TDV savings is 46 giga-BTU. The amount of the peak demand saved per year is fairly small. It is about 1.4 MGW. The amount of the savings in the down sizing of the equipment in the addition of the new space is about $4 million. The total time dependent net present value of the savings is about $10 million a year.

Our data shows that the amount of the re-roofing is about between 3.5 to 4.0, that of the new roofing markets. In our calculations we have come up with a number of 3.85. We are finding out that the applicable air conditioning steep slope nonresidential roof in the most new construction and re-roofing is about 70 million. If you remember from the previous slide, the new was 14 million square foot. The difference between the 14 million square feet and 70 million square feet, which is 56 million square feet is the re-roofing market.

Again, reading from this graph about 70 giga-watt hours electricity savings, the deficit is about 20 giga-BTU. Net source energy savings is 200 giga-BTU. The peak demand saving is slightly over six MW. The equipment savings is about $2 million a year. The total energy savings, time dependent energy savings is about

$50 million, $48 million a year. So, adding these things together, this measure can potential save the State of California $50 million a year.

What we are proposing is that for the standard to be updated to adopt the following provisions for the solar reflectance of roofing material. The reason that we have selected the aged values for the solar reflectance and thermal emittance is the following. A lot of manufacturers have petitioned that the products would not age or would age differently than the other products that the formula has adopted in the California Title 24.

The idea in here is that everybody would use the aged value. If the aged value is available, we would use it. If it is not available, there are alterations. At this time, we would like to propose to use the aged value of solar reflectance of .25 for fiberglass, .4 for all other products, and if the thermal emittance of products are less than .75, use these equation to estimate the aged solar reflectance required for the product.

Here is the formula. There are three cases. Case 1, CRRC aged values for solar reflectance and thermal emittance is available on labor. The answer to that, you must use it.

Case 2, new products are coming to the market. They have initial value, but they do not have aged value. Use these two equations to estimate the aged value from the initial value and then use these things in this (indiscernible).

Case 3, the product doesn't have the CRRC label. Let us assume that it is what it is in the market, a solar reflectance of .1 and a thermal emittance of .75.

So, with this provisions, we need to update the languages in many part of the nonresidential Title 24 standards, Section 101, which is the definition and rules of construction. Section 118, (f) which is mandated requirement for installation and cool roofs. Section 143 prescriptive requirement for building envelope. It does have two sub-sections (a) and (b) envelope component approach and overall envelope approach.

Section 149, which is addition alteration and repairs. Finally, the alternative calculation manual has to be modified.

We have been constantly talking about solar reflectance and thermal emittance. For the people who are in the business of (indiscernible) and understanding the concept of the solar reflectance and thermal emittance and they can use that in the building simulations, that is very very comfortable index. However, on the average, I get one call a day and three e-mails a day that people are confused about the solar reflectance and thermal emittance.

For a long long time, we have been saying that life can be simpler, why are we not making it simpler. Everything that we said in the previous slides can be simplified in these two numbers. For fiberglass asphalt shingles, SRI has to be greater than 23, for all other products, SRI should be greater than 43.

This concludes my comments for the first presentation. As I said, it would take a little bit longer on this one, but I would go shorter on the others.

MR. PENNINGTON: I have a question. Can you explain? Could you go back to the last slide, can you explain how you calculate SRI?

MR. AKBARI: Solar Reflectance Index is a relative quantity. There is ASTM standard called ASTM Standard E1980 and that standard does have a calculation approach for an even solar reflectance and a given thermal emittance, one can use simple equations to estimate the SRI.

The SRI is a relative parameter, goes between anywhere slightly less than zero to a slightly more than 100. Zero is assumed to be a standard black surface, with a solar reflectance of 5.05 and a thermal emittance of .9.

White is assumed to be an upper limit of solar reflectance of .8 and a thermal emittance of .9. So, if you have a product that has that requirement of the white, it has a solar reflectance index of 100. Now if you have a product that is slightly more reflective than the base white, their solar reflectance index can be higher than 100.

If you have a super collector that the surface is very dark and very very low in emissivity, this is material that is used for the hot water solar collectors. The solar reflectance index can be a negative value.

MR. SHIRAKH: Any questions or comments on Hashem's presentation, raise your hand?

UNIDENTIFIED SPEAKER: Can we get a copy of that because some of the earlier calculations, he was going really fast on the slide presentation?

MR. AKBARI: I think these presentations are all posted on our website. If you go to the 2008 Standards Proceeding and you will find a page that has all the presentations, so it is all there. Plus, in addition to these, we have also posted the case initiatives that is the more comprehensive study.

MS. SHIRAKH: If no questions, Bruce Maeda.

MR. MAEDA: Bruce Maeda, CEC Staff. I have a question on when you are doing comparisons, especially cost effectiveness, I am assuming you are using aged values. What happens to aged values of the base material? I would anticipate that aging would affect lower reflectivity things to actually raise the reflectivity up because everything tends towards gray, but --

MR. AKBARI: Excellent question. Basically based on our experience of playing around with a lot of data, and one of these days we will write a paper on that probably, we are finding out that around .2 solar reflectance is a neutral warmest. If you have materials that have solar reflectance graded on .2, they probably aged to a lower value, probably. There are some materials that actually may increase in solar reflectance.

If you have materials that are below .2 solar reflectance, they probably age to a higher value toward that .2. That has been our experience. Thank you.

MR. MELLOT: Joe Mellot, Momentum Technologies. On your calculations for the cost benefit, you use a base number for reflectivity for metal to be .1 then to elevate to .4. .1 metal, isn't that a relatively dark metal, red metal surface that you are using as a base number, and is that something that is a prominent product that is used in California, a very dark metal as a nonresidential roof?

MR. AKBARI: Let us go to that slide please. First of all, when we are saying metal in here, it is painted metal. For many of the standard products that we have seen -- in here there are some numbers shown, the solar reflectance -- there are on each cell, there is a solar reflectance of the cool product and in parenthesis, the solar reflectance of the standard products of the same color is also given.

Once we looked at this, we find out that there are a lot of materials out there that are painted metal varying between .05 to .15. For that reason, we took a base of .10 as the base cases. Now this is the Part A of the answer of your question.

Let's go forward to the other slide. In here, the amount of the energy savings as you would see here, it is estimated based on a Delta increase in solar reflectance of .30. All the savings of directly proportional to this Delta.

If you decrease that Delta from .30 to .25, which is the equivalent of assuming the base case is .15. This numbers would be decreased by the ratio of .25 to .3, but still they are going to be highly cost effective everywhere.

We have generated a data base or an active data base that one can use a combination of the initial and the final case and look at the cost effectiveness analysis.

MR. MELLOT: From looking at the numbers on the previous slide, I don't know if .10 to .40 seems to be the more appropriate numbers to use for that cost calculation. I was just --

MR. AKBARI: This is metal. You mentioned metal. Are you talking about other things now?

MR. MELLOT: No, I am only talking about metal.

MR. AKBARI: This is metal.

MR. MELLOT: But if we go back to the slide before --

MR. AKBARI: The slide before is not metal.

MR. MELLOT: The slide that we looked at before we looked at this slide.

MR. AKBARI: This one, okay.

MR. MELLOT: There is only a couple that are down in that .10 range. A lot of the metals available in the marketplace are up and higher.

MR. AKBARI: Let us define them as cool.

MR. MELLOT: Well, a lot of these wouldn't be defined as cool.

MR. AKBARI: The point that I was trying to make is that even if you reduce the amount of the incremental increase in the solar reflectance by half, still it is cost effective. Let us go back to that slide again, to the next slide. Now in here, let us decrease every single bar by 50 percent. The lowest is 500, it would be going to 250. The highest is 2,200, it would go to 1,100. So, it is cost effective.

MR. RAYMER: Bob Raymer with the California Building Industry Association. About ten to fifteen percent of our members are involved in commercial construction. I know that one of our close allies, BOMA and the Business Properties Association are going to be very interested in this proposal.

For the short term, I'd like to pose a couple of questions, and I doubt you will be able to give me an immediate response. Have you bounced any of this off of the Roofing Contractors Association of California, a very large association?

MR. AKBARI: We have been working with various associations over the last twenty years, and this particular proposal that is coming in here, it is just the analysis becoming complete, and we are posting it and we are more than happy to get any feedback to see how we can update and improve our analysis.

MR. RAYMER: Our association has been interacting with them very closely for the last four years on a number of Cal OSHA issues, fall protection and such, and I was talking with a couple of the administrative leaders of the association a couple of days ago. He had no idea, but that doesn't mean that some of his members weren't aware of this, and so, I would kind of like to maybe work with staff to get some dialogue going so that they get up to speed on this very quickly because they just didn't have a clue in this.

Regarding getting certification from the national entity, could you describe what is entailed in that, how much time if I am a manufacturer, and I am taking a product to get certified, what time limit or what amount of time is involved, what cost, etc.?

MR. AKBARI: Everytime that I wear this class, I would show I am member of the CRRC Cool Roof Rating Council. Now as them, I would respond the following. CRRC, who both Ms. Hebert and I we are serving on the Board, they do have a very fast track of obtaining initial solar reflectance. They do have several labs that are accredited to make the measurement. All one has to do is provide the samples to the lab, and then the results of that to the CRRC, and then the CRRC, there is some kind of processing fee, it is available on the CRRC.

It can be done very fast, and they are immediately required to provide the same sample for aging. Then the three-year aging would be available once it is becoming available.

MR. RAYMER: I don't mean to be overly persistent, but very fast. I am familiar with other regulations, fire retardancy for decking materials, things like that, very fast can be a couple of years --

MR. AKBARI: No, no, no, no. Let me tell you something, the CRRC first saw that the product labeling, if I am not mistaken -- by the way, I should also say that Andre Desjarlais is on the Board of the CRRC too. The first data base became available in January 1, 2004 if I am not mistaken. At that time, there was something like 100 products. Now we do have something at CRRC over 650 products.

MR. RAYMER: Great, if I start tomorrow, if I drop my material off, if I've given them adequate samples for both aging and --

MR. AKBARI: I see that language --

MS. HERBERT: I asked this question when Ted Pope from CRRC Administrative Staff was around, and I think from the time you contact CRRC, make the appropriate arrangements, give them the fees and all that, you can get a rating within a month.

MR. RAYMER: Great, that is good.

MR. AKBARI: It is fast, real fast.

MR. RAYMER: Thank you.

MR. LEASL: I'm Craig with Stockton Roofing L&L Suppliers, and I am a contractor and a manufacturer of white cement roof coatings. I was just telling the gentleman that it is a three-year test to see how far you drop from the date they get the test, your samples, and three years reflectance after the three years, and I believe they are in Phoenix, Florida, and Chicago, Ohio.

MS. HERBERT: You can get an initial reflectance and emittance within a month. Hashem is proposing a formula by which you could estimate the aged reflectance and emittance, and then you would leave your product on the sample test farms to get a three-year result, but you would leave it on for three years.

MR. SHIRAKH: Does it take three years

to get the three years other than --

MS. HERBERT: That is a darn good question.

MR. SHIRAKH: (Indiscernible).

MR. RAYMER: Is there an accelerated test like --

MS. HERBERT: Not at this time.

MR. PENNINGTON: Excuse me, the three-year test is supposed to be an accelerated test, right? I mean it is supposed to be representing the long term performance of the product. Right?

MR. AKBARI: The three year test is three year performance in the field. There is unpolled data out there showing that the reflectivity of the material changes within the first one or two years, so the chances are after about the third year, it would not change that significantly. That is the reason that the CRRC has adopted the three year aging.

MR. RAYMER: I just remember in the lab many many years ago when we did everything with rock and dirt, you know before the computers came along, the reflectance dropped like a rock in just a short period of time. So, in the meantime, for the quickness of industry, you can use the calculated or the estimated age reflectance and at some later date if you find that you are tested value is lower, do you ultimately end up using that or how is this going to work?

MR. PENNINGTON: Put your sunglasses on and answer him. The answer, Bob, is that you use the tested value whether it is higher or lower than the default.

MR. LEASL: I am Craig again. They base everything else on the initial reflectance, so you have your initial and that will get you through the process, then get all your samples to the testing farms, and then go forward from there.

Most of them have been there two and three years already. Two?

MS. HERBERT: We were at about a year and a half when we looked at this in January, so the longest -- the samples that have been out on the test farms the longest are not more than about two years at this point, and there are not that many that have been there that long.

MR. AKBARI: Thanks. We have two more years through 2008.

MR. GOVEIA: I am John Goveia from Pacific Building Consultants, and I am here on behalf of ARMA. Question, Hashem, on the calculations that you did for the steep slope, did you use the 2005 insulation values in the calculation, the R value or the U value as compared to what was maybe proposed yesterday?

MR. AKBARI: The answer is that all the analysis are being done based on the current 2005 standards. All the parameters and the building characteristics are based on that.

MR. GOVEIA: So should the Commission decide to move to more insulation value, that would change the calculations, the benefit value, right?

MR. AKBARI: I would actually encourage the Commission to go to a lower insulation because in terms of the cost effectiveness, the cooler roof would save dollar more for you for the initial investment of your money.

MR. GOVEIA: The second question I have is more so regarding cost because that is the basis, the premium cost, and so far in the steep slope, what I found is -- I didn't find anything at 20 cents a square foot except for maybe painted metal. Items that have granules, for example, metal tile that use granules as a surfacing, is closer up in the range of 60 cents a square foot premium charge. Clay tile going from conventional clay to what I'll call the MCA cool clay is more in the range of 40 to 50 cents a square foot. So, the numbers I've not seen anything in that 20 cent range, other than metal paint.

MR. AKBARI: For MCA products are widely available with a wide variation of colors and basically the incremental cost between what would identify a standard color and the cool color is zero. Now the reason that there are differences in the cost premium in the different products can be perhaps in the other characteristics of the products such as I do not know their quality whether it is the factor.

For the metal, I think we are in agreement for the shingles. I know of one manufacturer who is marketing these things, and I have heard repeatedly from them that the current cost carries a premium of 25 cents a square foot, and they also are good in general is good marketers if the market condition changes, that cost may be dropping.

MR. GOVEIA: Okay, so we obviously have different sources of information, maybe different manufacturers.

MR. AKBARI: I would appreciate it if you show me your sources. I have identified very clearly what our sources, the data are in the report that we have done. We have contacted almost every potential source that can give us data over time, and I am glad that today I received a memo that is apparently from you addressing such a cost.

Our data base are coming from the relative cost everywhere that it is available, and we will definitely use your data and update our data base.

MR. GOVEIA: Well, good.

MR. PENNINGTON: Could I ask you, John, to clarify your comment a second for me? You are saying that the MCA type tile that they make has a cost premium compared to less expensive tiles of 40 to 60 cents, is that what you are saying?

MR. GOVEIA: Yes, the MCA tile, which is considered -- I'll call it the premium clay tile of California, when compared to the more commonly used clay tile of the same shape and style, the MCA material is much more expensive. The second issue that we have at least right now with MCA --

sure, go ahead.

MR. PENNINGTON: Is there any physical reason why that is the case that you know of?

MR. GOVEIA: There could be a combination of reasons, where it is manufactured, how far it has to be shipped from the production point. For example, Northern California, we pay a lot more for product that is manufactured in the south.

MR. PENNINGTON: So, is this a heavier material? I mean is there anything inerrant in the material of the tile that would drive that cost difference, or is this some market situation?

MR. GOVEIA: No, I believe it is a heavier tile, a thicker tile. I am not sure about the moisture ratings.

MR. PENNINGTON: I think someone in the audience wants to comment on this.

MR. GOVEIA: Yeah, if somebody is here from the tile industry, they could probably explain it better, but the most recent discussion which was in the last two weeks regarding availability, even getting pricing on this tile, I had received some pricing from a Southern California supplier on the MCA, they will not even quote Northern California, and they say they won't quote providing product to Northern California for at least two years. That is a backlog. We were told from a supplier within the last two weeks.

MR. AKBARI: That is very encouraging to hear them that they have a two years backlog.

MR. DUNN: I'd like to speak on behalf of both the people that just -- my name is James Dunn. I am with FERRO Corporation. I actually developed those cool pigments and colors for MCA and worked with OSHA.

One of the reasons that you might see a difference in cost is that glazed tile with those codings versus a non-glaze tile can be much more expensive. You also have to compare the quality of tile and the manufacture if it is an imported tile versus California manufacturing.

If you compare a glazed tile that MCA made before versus a cool tile now, as Hashem said, there is no difference because we changed the pigments only, not the manufacturing or the cost. They were the same cost. On a cost basis, if you compare an old glazed tile that is non-cooled versus a new glazed tile that is cool, it is the same price. It just so happens that MCA, and I am not here to promote them or not promote them, they are an expensive tile to begin with. I think the glazed tile can be twice as expensive as non-glazed tile.

To also comment on the backlog of clay tile, you are right, it is about a year backlog, and it is a problem for their industry because clay tile is now becoming vogue and the demand is out of stripped manufacturing. So, I don't know if that helps out the committee in making a choice, but we did work with them on the cool ceramic glazed tile, and it is a lot different than paint, and so the technology is different, and that is why there is very few glazed clay tile that are cool.

MR. PENNINGTON: So, a question, sir. You said the demand is significantly higher now for MCA's tile?

MR. DUNN: I think just clay tile in general, and, yes, all the manufacturers are backlogged.

MR. PENNINGTON: Why is that?

MR. DUNN: I think just the building needs or the --

MR. PENNINGTON: What is valued now

about clay tiles that is valued much more than it was a couple of years ago?

MR. DUNN: I think just the style and the builder's choice of materials and people like it, they like the mission style, and it is popular just like other things become popular.

MR. PENNINGTON: So, its popularity has jumped recently?

MR. DUNN: Yes, and also there is not that many manufacturers in the United States that make clay roofing tiles, very few versus other types of products.

MR. PENNINGTON: Okay, thank you.

MR. DUNN: Really I can't speak on behalf of the whole industry. I can speak better on behalf of the cool ceramic tile, and that is very limited as far as manufacturers. I think that is one of the reasons that it is limited supply right now.

MR. AKBARI: I also would like to mention one point that I forgot to mention in the price difference. Terra cotta cool tile, terra cotta by itself, it is a naturally cool tile, it has a solar reflectance of .4 or higher unless it is being contaminated by some clays that are reaching iodine oxide, their reflectance can be .4 or higher and basically carry no incremental cost to what it is known as a standard terra cotta cost because it doesn't come lower than that. So, one can use that one.

MR. SHIRAKH: Okay, I am going to take two more questions and stop, and then we have to move on please.

MR. SHIAO: I am Ming Shiao from CertainTeed Corporation. Just a few questions about your cost analysis, cost -- CertainTeed, yes. Basically, the cost analysis model that you have here, the reflectance is based upon the aged, which is only a wait of two-years data, and we are running a three years net present value of savings. I found that this is a little bit sort of aggressive on the analysis, and typically, I strongly give you an analysis based on the life cycles of a product.

Given a product, given a life cycle as for example might be shorter than what you have shown here, and the cost analysis might be different.

The other thing is, I don't believe running your analysis against changing insulations because that might be even more cost effective because the $20 per square of manufactured I think to lots of products might be low, where I think that assumption might be low side.

The service property as we understand, you know, industry it will change over times, and I think just less than two years data might be too short to make decisions say, well, you know, aged three will be a good number to use. So, just some thoughts.

MS. HERBERT: Question for you. Did I hear you say that you thought that increasing insulation might be more cost effective?

MR. SHIAO: Yes.

MS. HERBERT: Because the prices are here are low?

MR. SHIAO: Premium costs are putting a cool products on roof might be higher.

MR. SHOEMAKER: Thank you. I am Lee Shoemaker. I am the Director of Research and Engineering for the Metal Building Manufacturers Association and also serving as a Technical Director for the Cool Metal Roofing Coalition.

I know you have three presentations here this morning on different aspects of cool roofing in terms of the applications with low slope, steep slope, nonresidential and residential, and all these are kind of rolled into one report that I didn't see until yesterday. I guess it was posted on the website at about 10:30 yesterday morning. So, I'm trying to decide at what point here I want to bring questions from the report to which of the presentations, so I think I have a few questions that I can ask you now, and then there may be some later as you get into some of the other areas.

I guess I am mostly concerned with the inconsistency in the methodology that is being used by the various researches that the California Energy Commission is going to relying on to perhaps make changes in Title 24.

A good example is the life cycle cost study. In your proposal, Hashem's proposal here, the report, you basically from what I garner from looking through the report took reflectance values that are available in current products and did a life cycle cost study to see if that would prove cost effective.

The report we saw yesterday on insulation requirements, that also did a life cycle cost study, but they did a J curve where they looked at every possible way to insulate the building and then came up with the lowest cost, life cycle cost, which seems like a much more appropriate way to do it if you are really looking at energy savings as opposed to just pulling a number because we know that there are products that can achieve that, seeing if it is effective, but not really seeing where the bar should be set and whether it is justifiable to have a different reflectance for different products.

So, that is my first point. The other inconsistency is I think you included equipment costs in the insulation report yesterday I believe said they did not include equipment cost. So, again, there is this inconsistency which concerns me that why are we using the same methodology as we look at cool roofs, as we look at insulation and so on.

The other thing that I would like to point out is the equation that you show here for if you have a product that emits less that .75, the equation to calculate the required three-year age reflectance, I don't know if you realize this, but bare galvalum would actually pass that equation, given the three-year aged values if you plug in a .1 emissivity into that equation to reflectance required comes up to be something like .5 I believe -- .5 something, and so bare galvalum at a three-year aged number would satisfy that equation.

That is great, that is what we have been saying all along, since we came here two years ago that bare galvalum achieves the same surface temperature as the other cool roof properties, even though it has a low emissivity, so we are glad to see that you have recognized that. We may want to, based on what we have seen from the Liquid Coating Association, we may want to even pursue that with the 2005 cycle. Maybe that door is not completely shut on that. We were under the impression that we couldn't do anything until the 2008 cycle. So, we are glad to see the direction that some things are going, but feel like we still are being extremely penalized with the current 2005 standard.

Also with regard to the bare galvalum, the question on the low emittance products, which I just referred to, the equation there, the Cool Metal Roofing Coalition sponsored a study at Oakridge National Labs to look at the low emissivity products and later sometime today, I am sure at what point in the agenda, but Andre is going to make a presentation on that, and that may have some bearing on what is considered by the Commission here.

MR. AKBARI: You made four points, and I would like to respond to all of them. In terms of the methodology, the methodology is the one that the Commission has adopted to use and it is being documented in the life cycle cost analysis, and that is exactly what we have done.

Unfortunately I was not here yesterday, so I cannot comment on what you saw yesterday, and I would not take that as a criticism to my analysis.

To point number two that you mentioned that the equipment cost is included here and is not excluded there, I think that is totally irrelevant. If you look at this chart, you would find that the equipment cost savings is a very very small component of the overall savings, and with and without that, the cool roofs are cost effective.

The third point you mentioned that the formula that we have put there, I am glad that you are happy with that, we are here to make you happy. So, I think that number four point there, I am looking forward to be educated on any occasions that I can get. Thank you.

MR. SHIRAKH: Maybe a quick point.

MR. LOYE: Ken Loye from FERRO Corporation. Hashem, you had said that your proposal here for SRI for the asphalt shingles was a SRI of 23 and for other products about 43 for the three-year aged.

Assuming an emissivity of about .85, what would be the reflectivity at SRI of 23 and 43 be?

MR. AKBARI: Those numbers correspond exactly the numbers that we proposed on several slides before that one. If you go forward please.

MR. LOYE: Yeah, .25 and .4.

MR. AKBARI: Yeah, so these are -- that's the one.

MR. LOYE: If we go back to just for the sake of clarity here, go back to the metal slide that you had with the different colored chips on the thing from BSF. Okay. So, what you are saying then is that whole right column and the whole center column would be totally negated from color space for any -- what you are saying is only light colors are going to be acceptable under this proposal?

MR. AKBARI: These are the colors that I have picked up, they are bought. There is a slight inconsistency between these plate of data and other data that we have because I have seen some very very dark color coming up from our partners from BSF that their solar reflectance approach is .40.

This is just showing an example of one manufacturer that has products in the market. The other point that I would make is that this is a prescriptive requirement, a prescriptive requirement, one does have the option of going to the compliance approach. As an example, if one would select -- the performance approach, thank you.

If one would like to go the middle column and they also have a lot of deeper color, then the difference between .40 and those numbers are fairly small, though the compensations would also be accordingly small.

MR. LOYE: My concern was I live in the Cleveland area, and most of the midwest is very

very dark colors are the aesthetically pleasing colors. I don't know what they are particularly in the California area that you are proposing, but it would appear to me that you are kind of negating the dark colors in this proposal, and that was my concern.

MR. MCHUGH: John McHugh on behalf of PG&E. Yesterday we presented a proposal regarding nonresidential insulation, and indeed we showed the entire J-curve, but it should be noted that we are interested in trying to maximize energy savings, and that as we go forward, we probably will look at trying to optimize energy savings at the same life cycle cost as the current standards.

Some of those insulation levels may go up especially in regards to being in concordance with the EPAC requirements that Title 24 be at least saving as much energy as ASHRE 90.1, so as a result, we will be reviewing issues about insulation levels to be at the same level or greater levels than the ASHRE 90.1 levels.

MR. SHIRAKH: Thank you.

MR. MCHUGH: Sure.

MR. MILLER: Thank you very much. Just very briefly, my name is John Miller, I work for a company called Decra Roofing Systems, and we make stone regular coated metal roofs. I have two points to make.

One, I can confirm that the price of the granules, the difference in the price of granules is just about where Mr. Akbari has said so. It looks a lot because the price of granules per square foot of roofing is about a nickel, and it is going to go up to about 20 to 25 cents if we use the reflective ones from 3M.

The second point is I would like to request the Commission consider not just fiberglass asphalt shingles, but any granular coated surface for the .23 SRI or the equivalent formula. It is the surface that matters.

If you have a granular coated surface, there is no way we can get to .4 with granules. I am sorry, but all granular coated surfaces could be the same as asphalt shingles, then it would work just fine for us. Thank you.

MR. SHIRAKH: Hashem, do you want to respond to that?

MR. AKBARI: Thank you. I am happy that, you know, one manufacturer actually confirms publicly of those lower numbers that we have been hearing here and there. I agree about the second point that perhaps we should find a way to address the granulated materials all collectively together and put them in the same category as the asphalt shingle. I haven't thought about it, but perhaps we should do that.

MR. SHIRAKH: I think that would be a good idea. I would like to move on to the next topic. There will be several opportunities if any of you have more questions, you can come up later today and ask a questions or talk off-line to staff or Hashem. So, we are going to move to Residential Cool Roof Steep Slope.

MR. AKBARI: If by now you do not know, my name is Hashem Akbari, and that is my telephone number and e-mail address if you choose to contact me or write me.

This next presentation is going to be talking about the steep slope roofs for the residential buildings. There is going to be a lot of similarity between the first few slides in here and the slides that I just presented, so I am just going to skip through them one by one please.

First not to skip through this very important one, to acknowledge that this study is sponsored by California PIER Program, and my project manager is Chris Scruton is here to help us to go through this testimonies.

We covered this slide, next please. We also covered this one and this one, this one, and this one, this one, and this one, and this one. This one we also covered, please go forward.

The scope of this study is that remember that I showed that four cell metrics, how we basically covered the nonresidential steep slope, now we are covering the residential steep slope.

It is a new study that we are evaluating and trying to propose language requirement for the steep slope roofs on residential building, and it is based on building energy analysis and life cycle cost analysis.

The methodology is exactly the same as before, looking at the market, performing cost benefit analysis, projecting savings.

What we are finding out in here is basically in terms of the materials and the simulations that we have done, we have taken three roofing types, fiberglass asphalt shingles, concrete tile, and metal roofing collectively these three types of product cover over 80 percent of the roofing market in California.

We are using these cost premium numbers that would just confirm what your manufacturer that in fact we are a ballpark correct, and we are finding out there is a big difference between the nonresidential and residential Title 24 requirement.

Title 24 requires radient barrier for residential buildings in some climates, and I would be talking these things a little bit further on, but assuming the current Title 24 in all the climate zones, we are finding out that the cool roofs for all these three roofing products are cost effective in climate zones 9 through 16.

Basically, the climate zones 9 through 16 are those climate zones in here that are not coastal. In the coastal California climate, most buildings do not have air conditioning, and if they have air conditioning, they only operate it for a few hours a year.

The numbers that are being presented here or the plots that are presented here, there are two pairs of plots per roofing proto-type. One is an analysis is being done with radient barrier, the other one is being done with the radient barrier.

The reason that we are doing without the radient barrier is that in the reroofing market, one should recognize that a lot of existing buildings do not have radient barrier on the roof. As a result of that, the projected savings that we would estimate in here assumes that every single building that installing a new roof, either it is an existing building or a new building would have a radient barrier. So, all those numbers are going to be extremely conservative.

With saying that, the first important thing to note in here at the bottom here, those green cells are the cells that according to California Title 24 2005, radient barrier are required.

So, basically when we are looking at the case that it is without the radient barrier, we are finding out that in this climate zones without radient barrier, it is cost effective, but that is not the thing that this is showing.

Once we look at it in here with radient barrier, we are finding out that the amount of the energy savings becoming smaller as the expected radient barrier blocks the radient or retards it, it transfer exchange between the condition zones and the outerspace. As a result of that, the savings are smaller, and then we are finding out that there is cost effectiveness between in all climates from 9 to 15 in here.

It is cost effective for all climate zones 9 through 15 that have radient barrier. We add to that Climate Zone 16 that doesn't require the radient barrier, so it is cost effective there too. So all together the statement that I made, therefore, fiberglass asphalt shingles, the inclusion of reflective roof, it is cost effective through the climate zone 9 through 16.

The same story goes for radient barrier on concrete tiles. Note that the only thing that is really relevant in here is that this one that doesn't have the Title 24 doesn't prescribe radient barriers, so it is cost effective in Climate Zone 16.

Now with radient barrier, it would be looking at Climate Zone 9 through 15, it is also cost effective in here. It is also cost effective on Climate Zone 8, but if you take the higher level, it is fairly marginal. So, again, the same conclusion that concrete tiles is cost effective for cool concrete tiles or reflective concrete tiles are cost effective in Climate Zones 9 through 16.

Metal, you know, the savings are in Climate Zone 16 it is highly cost effective. Without that, it doesn't require a radient barrier. For a lot of existing buildings that are in these climates that they do not have radient barrier, it is also highly cost effective.

For Climate Zones 9 through 15, Title 24 requires radient barrier, it is cost effective, then again the same conclusion. Cool metals or reflective metals are cost effective going from Climate Zone 9 through 16.

Also I should again immediately mention in here the comment that the gentleman made that the base case was too low. Even if you reuse these things by 40 percent or 30 percent, it is cost effective everywhere.

Here is the family of the projected savings. In the new construction based on the data that we have, there is 180 million square feet of new roof area added in residential market every year.

Other than that, 55 million square feet

of it is steep slope that are air conditioned. There are two factors in here going from 180, there is a fraction of them that are a (indiscernible) slope, and then there is another fraction of that which is air conditioned. So, that reduces 180 to 51, the net electricity savings -- not the net electricity, the electricity time dependent valuation savings are 11 giga-watt hours per year.

The natural gas deficit because of incremental heating requirement is about 60 giga-BTU per year. The net TDV savings is 30 giga-BTU for year. The amount of the peak power saved is about 2.5 MW incremental each year. So, in a period of ten years, that would be 25 MW. Equipment savings, they are one billion, and the net present value of the time dependent savings is about $8 million in the new construction.

If you recall, the ratio of the reroofing is about 3.85 times that of the new construction, so that increases the market to 250 million square feet of residential roof area that are air conditioned and the amount of the giga-watt hour time dependent TDV savings is 50. The deficit in natural gas TDV is 27 giga-BTU per year, net source energy savings is 140 giga-BTU.

The peak power demand is 12 MW, and this is a very important thing if you assume that the life cycle of 20 years or 30 years for the roofing. In a period of 30 years, the amount of the savings that you would be having is multiplying these 12 MWs by 30, which would be 300 MWs in the State of California.

The equipment savings is about 4 million and the total net present value of TDV savings is 38 million a year.

The proposal stays the same in all those climates that are cost effective and select solar reflectance of .25 for fiberglass asphalt shingles or I do not know, perhaps mineral products. For all others .4 as the minimum requirement for the aged solar reflectance.

If your products is below -- as an emissivity of .75, Dr. Shoemaker is happy now that some of the products would also be passing the prescriptive requirement under this equation.

Again, three options are possible. First of all, we are relying on the CRRC to provide initial and aged value of solar reflectance on thermal emittance. If it is available initial and the aged value of the solar reflectance and thermal emittance.

If the aged value is available, one shall use it. If it is not available, only the initial value is available, use this equation to estimate the aged values. If none of those are available, use a dark base, which is a solar reflectance of .1 and a thermal emittance of .75.

Once that proposal is accepted, there are sections of the standards have to be modified, and we have tried to propose language in the Attachment 2 of the reports that we have prepared. The sections that are to be modified are Section 101, the finish and rules, 118(f) Mandatory Requirements, 115 Mandatory Features for Residential Building, 151 Performance and Prescriptive Compliance Approaches for Residential Building, 152 Addition and Alteration of the Existing Buildings, and finally the ACM Manual has to be changed.

Again, my page, which I make a lot simpler if we choose, the aged solar reflectance for fiberglass asphalt shingle to be 23 or higher and all the other products to be 43 or higher.

That concludes the second presentation.

MR. SHIRAKH: Questions, comments on the second portion. Bruce Maeda of the staff.

MR. MAEDA: Bruce Maeda, Energy Commission Staff. We are using micro pass with a proposed new attic simulation model for this analysis?

MR. AKBARI: The answer is absolutely yes, and I should have mentioned that at the beginning of our presentation. The Energy Commission has supported the development of these advanced features in the micro pass, and in the October workshop, results were shown in comparison with measured data were presented for micro pass. We have been using micro pass throughout all these analysis for the residential and small nonresidential steep slope buildings.

I have to acknowledge the contribution of the developers of the micro pass to be working with us persistently throughout this cycle and providing us with various alteration to micro pass that would satisfy our needs for these simulations.

MR. SHIRAKH: That would be Ken Knittler, sir.

MR. AKBARI: Ken Knittler and Bruce

Wilcox.

MR. HITCHCOCK: Reed Hitchcock representing the Asphalt Roofing Manufacturers Association. I'll try and be quick.

First I wanted to thank the staff again and Commissioner Rosenfeld for the workshop process. We are finding it educational as Hashem said. We are all learning as we go.

A couple of points that I wanted to make or things I wanted to bring up. Number one, at the October workshop and again in March, we stood up here and pled for time to respond. The proposals or the proposal on steep slope I guess was posted yesterday morning. We would still be looking for three months to respond to it to have time to really put some analysis into what you are proposing and bring back well thought out responses either in support or alternatives to what Hashem is presenting.

I've heard through the grapevine that you are talking about another workshop. I don't know if that is the case, is that on the radar?

MR. SHIRAKH: We may have another workshop in July. That would be our last staff workshop.

MR. HITCHCOCK: So, we are looking more two months from now is what you are saying.

MR. PENNINGTON: Right. So, we are expecting to adopt these standards about a year from now, so you need to get your comments in within a year.

MR. HITCHCOCK: A year might be enough. Might, might. Point two, although nonresidential, and forgive me if I am reading, although nonresidential low slope wasn't on the agenda today, in looking through the proposal that was on the website in Attachment 2 specifically, there is a number of items in there that address low slope nonresidential, and I just wanted to bring that to your attention from our perspective it is confusing. The draft overall is confusing, not only in that it includes residential/nonresidential steep slope and low slope in one bit of language there, but also that it does address items that were not officially on the agenda today. I would wonder if all the stakeholders are able to be here to respond.

MR. PENNINGTON: I am not following you, Reed. What is in the report that is not on the agenda?

MR. HITCHCOCK: The proposed language in Attachment 2, there is a number of items in there that affect low slope nonresidential.

MR. PENNINGTON: That is moving from an initial value to an aged value and how you would address those?

MR. HITCHCOCK: That is certainly in there. I'd have to look and see what. I think there were a couple of other things that were inadvertently affected. I may be wrong, but at a bare minimum that is affecting --

MR. PENNINGTON: That is a procedural kind of thing to -- so, okay.

MR. HITCHCOCK: In Hashem's first presentation, he said nonresidential low slope. Again, just pointing out that it wasn't on the agenda officially.

MR. AKBARI: I need to also add a little bit of comment. The structure of the language for Title 24 is that in some of the part that are definitions, it doesn't distinguish between residential and nonresidential, and it is general. Once change is being made to the part of the definition, it would apply throughout the entire system.

Besides that, there is no other change other than from going from the offering a three year option in addition to the initial value. So, the reason for that has been that a lot of manufacturers coming and offering data that their products age differently over time. So, that additional option is also being provided in the language.

MR. HITCHCOCK: I just want to make sure that everybody who is affected by that knows about it. For example, the coatings folks.

The third point, second to last, also in Attachment 2, there is still a calculation for the overall envelope approach, which as people more technical than I reviewed it, it is still applicable for low slope, but there are variables and factors in there that don't relate at all to steep slope, so the calculation would not be appropriate to steep slope roofing.

COMMISSIONER ROSENFELD: I don't understand.

MR. HITCHCOCK: You've got, for example, the insulation trade off. You've got the overall envelope calculation. There are variables in that calculation that are specific to low slope roofing application that have nothing to do with steep slope, and I'd invite -- I don't know where my technical -- to speak to the specifics of the calculation. I don't speak sigmas and calculations, but the point that was made to me is that the calculations there were basically copied over from the low slope to be applicable to steep slope, although and it may even be a better deal for somebody with lower reflectance, but it is not appropriate to the steep slope application.

MR. SHIRAKH: It would be helpful if somebody could actually point out what those differences are.

MR. HITCHCOCK: I will ask them to do so. Finally, and I've spoken with Elaine and Hashem about this, I'd like to offer -- at the last two hearings or workshops, I also made an offer of some data that ARM has collected related to shingles sold in California and the reflectance values and the emittance values associated with those products. I have that here, I've got a few copies for you as well as an electronic copy. We submit this on the record for your consideration. If you have any questions about it, by all means, please let me know. Thank you, that's all, thank you.

MR. SHIRAKH: Thank you so much. Next please.

MR. GREEVES: Good morning, my name is Jerry Greeves, I am with Owens Corning. I just had a quick question. Hashem, in your first presentation, you said that the cool roof is effective in all of the climate zones, which I understand was steep slope nonresidential. In this one, which is residential steep slope, it was only effective in I guess it was 9 through 16. I was wondering if you could comment on that difference?

MR. AKBARI: Sure. It is basically based on the operational schedule and the internal loads of the buildings. Office type buildings operate on air condition throughout the day for a longer period throughout the year, and they have higher internal gains. So, they have to reject that heat from the building. That is not the case for the residential buildings.

MR. GREEVES: Okay, thank you.

MR. SHIRAKH: Next please.

MR. HUGE: My name is Russ Huge with Elk Corporation in Shafter, California. I have a request and a comment. The request is that since you are both members of the Cool Roof Rating Council that you reconcile the labeling requirements for cool roof rating with whatever the Board adopts the standards. Theoretically, we have products that are Cool Roof Rating Council labeled that may not comply with the three year standard. So, I would just like to ask that you guys resolve that, and that we end up with a labeling standard that matches the California building requirements.

The second comment is --

MR. PENNINGTON: I am not sure I understand that comment. The Cool Roof Rating Council doesn't establish a standard and so they rate continuously whatever values are applicable to the product. So, we are setting a standard, so it is quite possible for the CRRC rating to be different than the standard either higher or lower since the Cool Roof Rating Council doesn't set a standard. It is just a test procedure basically.

MR. HUGE: But the labeling requirements to have the CRRC label on our products establish the 25 percent as an initial reflectance, so we could have a CRRC label today that does not comply with the proposed requirements. I am just pointing that out.

MR. PENNINGTON: So, we would encourage you to get your products labeled by the CRRC regardless of whether they meet these proposed levels.

COMMISSIONER ROSENFELD: Bill, I think he is making a comment (inaudible).

MR. PENNINGTON: The CRRC doesn't do what he's asked them to do and doesn't intend to do what he has asked.

MR. HUGE: So, forget the request.

MR. AKBARI: CRRC, let me for the record make this thing very clear. As Bill being saying it, CRRC puts a label and that label says what is the emissivity of this product, what is the reflectance of this product, what is the initial value, what is the aged value, and that is it. Then it is up to the Commission to select standards. That label I do not know what exact question you are asking us to take to them. They are producing label, and that label says what the values are.

MS. HEBERT: I'm not sure if you understand that if a product doesn't meet our prescriptive numbers, the product could still be used, only you would use a different compliance path. Do you understand that?

MR. HUGE: I understand that, yes, and we mentioned that. I understand that, yes.

MS. HEBERT: So, the product could still be used, but the product may or may not meet our minimum prescriptive, but --

MR. HUGE: Right.

MS. HEBERT: So, is there still a problem in your mind?

MR. HUGE: No, actually there is not. The other one is that the standard you are proposing does specify a three-year rating, and as you mentioned, there are no granulated products that have three years of testing data completed yet. I am just pointing that out.

MR. AKBARI: Was there an equation provided there?

MR. HUGE: Yes.

MR. AKBARI: That equation in order to satisfy .25 three year aged, if I am not mistaken, you should start with about .26. It may be .27, but I would bet you it doesn't have to be .70. So, it is a very small -- remember that .20 is the inflection point, so you are not far away from that .20.

MR. HUGE: Okay, thank you.

MR. SHOEMAKER: Thanks. Lee Shoemaker, and I have my Cool Metal Roofing Coalition hat on at this time. Just a few questions and comments. The first has to do with the cost premium that you use.

You mention that the cost premium for the various products were from nil to higher and I got the impression that you used 20 cents per square foot as an average for all the products. If that is the case, I didn't understand why you didn't use the actual cost premium for which product you were doing the life cycle costs on.

MR. AKBARI: For all the products that we saw, we saw a range between zero to about .20. We used the maximum of .20 for all those products to be conservative. Of course, there would be probably one percent in here that would say that maximum is probably a dollar per square foot, which in that case, we have a serious disagreement.

MR. SHOEMAKER: I guess it seems like it would be a fairly simple thing to use the actual cost premium for the product that you were analyzing, but if that is not, you have to use an average like that?

MR. AKBARI: I have to repeat, there is no average used. We find a range. Let me give an example. For clay tile, we find incremental difference of .0 to .2. For all different products from different manufacturers. So, we use that .2 as the maximum and the same thing we did it for metal.

MR. SHOEMAKER: Use .2?

MR. AKBARI: .2 as the criteria for the --

MR. SHOEMAKER: (Indiscernible) nil for metal.

MR. AKBARI: If it is nil, then you know, then in that case, it is cost effective everywhere.

MR. SHOEMAKER: We would like to see that in the zones that you currently say it is not cost effective.

MR. AKBARI: I would be a very very happy person if the industry gives me one message that the cool products or the reflective products really don't cost, but they do not have a high incremental cost. So, you know, that is the encouraging news to me.

MR. SHOEMAKER: That is a good point as far as consistent information about the cost. In this case, we are talking about painted products that we are just painting with a different color. Before our problem was we were talking about an unpainted product that would be painted, and that is a big cost difference. That was that difference there.

The other thing is we fully support going to the aged properties and the three year aged values and we understand why you are entertaining the idea of allowing someone to calculate their three year aged value if they only have the initial value from the CRRC. They haven't had their product tested long enough to have that value established, but it seems like if the Commission was to approve that, it is really giving an extremely long window for products to use that initial property and calculate a three year property. I think we know that there are products out there that weather much more than the assumption that equation would give you of .55. It seems like it would be appropriate to have either have -- if someone is going to use that alternative, at least show that they are product is currently being tested or give some sort of a deadline for using that because you are talking about 2011 as when this is -- someone would still be able to use their initial value rather than the actual three year aged property. So, we think that is something that should be considered.

The other thing is going back to this .25 prescriptive requirement for fiberglass asphalt shingles and .40 for all other products, I have to reiterate that really seems to be, you know, selected based on the available materials and that there is more to consider than that. I think the point was made earlier, and I think it is even more important for this discussion on residential steep slope, and that is the aesthetics, the color that a homeowner is going to be satisfied with.

The .40 requirement for other roof products, they are going to be looking at lighter colors than the .25 for asphalt shingles, and we don't think that is fair. As far as the cost effectiveness, we stood before the Commission talking about bare galvalum roofs and how they would not meet the prescriptive requirement that was set for low slope nonresidential and that it would not be cost effective to paint it, and we basically were told, well, you have the trade-off option, you can just put more insulation in the building.

Why don't you set the bar at .40, and if you don't meet that prescriptive requirement, you have to put more insulation in the building or set it at .25 and if you do have a product that has more reflectance than that, give some credit for that. Having these two values just is not going to be fair in the marketplace. It may prove out in the life cycle cost study, but it doesn't prove out in terms of the aesthetic consideration and how that might affect the marketplace. So, I urge you to consider that. I think Mark Ryan is going to give you an example of what the shades that are involved and where the level is set now.

MR. SHIRAKH: Hashem, did you have any reaction to any of that?

MR. AKBARI: There were suggestions that we would think about those and there was some comments about that really applied to the low slope roofs and requiring also values, the same values for different products. That is something that we have a strong goal for many many years, and it just so happens that this instance of the time we do not have fiberglass asphalt shingles that have reflectivity approaching .40 at this time.

The options for other products are there, and we should take advantage on that one. So, we will think about those comments more.

MR. RYAN: My name is Mark Ryan, I am with Shepherd Color Company, also an IR pigment producer. This is what a typical IR reflective black, the color is a nice deep dark black. To get to the .40, you get to this gray kind of down here.

MR. SHIRAKH: Could you show that to this side?

MR. RYAN: I'm sorry, this is about .25 here up in the corner, the dark black. This is .40, so you are losing -- all of this is just with black, and it happens with a number of different colors and how you formulate them.

I guess our point is that for metal especially and for a lot of other painted products, we are going to really restrict the color space by having .40 as the requirement.

MR. PENNINGTON: So, you said that holds particularly for metal, so is there a different effect for tile than for metal?

MR. RYAN: That kind of was my question was the .4 reflectance for the tile.

MR. DUNN: Jim Dunn with FERRO. When you are looking at all the sub-straights, they become just a canvas when you are coloring something, the sub-straight is just a canvas, so the color you put on it, you are limiting the color space when you are going to the .40, and it holds true I believe in cement tile, shingles, and also ceramic tile and other things because color becomes the selling point. That is what we are talking about. You are limiting the color space.

MR. LEVINSON: I'm Ronnen from LBL, that actually isn't quite true. Believe it or not, the sub-straight does make a difference, and if you -- could you please go back to the slide showing pictures of concrete products, coated concrete products near the beginning? Keep going please, stop there. Thank you.

Okay, you can see there as an example, you have a jet black in the top row on the left hand side with a solar reflectance of 41 percent. That was achieved using an organic rather than inorganic black pigment. For disclosure, I don't want to add any confusion about that.

That was done using an organic rather than inorganic pigment, and one can discuss durability, a perfectly valid concern. However, we would point out that some inorganic pigments are commonly used. They will assign you pigments for example. It is a little more technical than we need to get into right now in coating roofing products.

The sub-straight does matter. Metal and clay tile have terrific properties as sub-straights because they provide a good background reflectance over which if you apply a suitable color coding that doesn't have certain bad properties, you can achieve quite high values.

The solar reflectance achieved by these various samples here depends not only on the pigmentation used in the color top coat, but on the nature of the sub-straight. So, if you have, for example, a zinc alum steel sub-straight, you will get one result. If you have a hot dipped galvanized sub-straight, you will get another. It also depends on the various treatments that are used. Some manufacturers like to show off how good their products are putting it over straight aluminum, which gives you the very best results.

If you were to put it over some low grade steel, you get a very bad result. So, there is a lot of engineering here. I should also point out that the results shown for the metal, I don't know whether they are shown over galvalum or over hot dipped for that industry picture that we presented came from a BSF website, but those are not necessarily final results that can be achieved by using different pigments and using different sub-straights, you can get results that look darker and have higher reflectance than those that were exhibited earlier today.

We are just trying to show you what's being sold right now, and sometimes these graphics that we show may be a year or two old.

MR. RYAN: Thank you, Ronnen. Once you have a fully visibly opaque sample, you can get a couple percent by changing the sub-straight. All IR pigments are larger reflective, they don't absorb, they scatter. These organic pigments are largely transparent in the IR, so that is how you are getting a .41.

Weatherability, that is definitely going to be a big question. You are right, some organics are used in roofing products, but the standard products used along a number of different systems always have been inorganic to get the 15 to 30 year warranties. That is a really broad generalization, but I mean I think it would be kind of dangerous to set prescriptive levels at .40 based on kind of unproven technology.

UNIDENTIFIED SPEAKER: Could you elaborate on (inaudible)?

MR. RYAN: How exactly?

UNIDENTIFIED SPEAKER: Weatherability.

MR. RYAN: Well, the inorganic pigments have been used in a lot of -- a great example is the (indiscernible) type finishes a lot of people are familiar with, and they've had 30 year weathering down in South Florida. Fixtures over there with (indiscernible) blue after 30 years, and it is pure white. I mean that is the kind of time frame, and I don't want to get into specifics, but that is a generalization.

MR. LEVINSON: Actually, we are in general agreement, in fact, we have been working with these folks to try to make better products. I just wanted to point out that in this pallet that we are seeing here, as it happens, like I said, the black, that is an inorganic, and the issue for everybody else out here is that inorganics are considered more durable than organics, so that is why we are making this distinction here.

The blue happens to be an organic, but we had an inorganic blue with about the same reflectance and very similar appearance too. That happens to be (indiscernible) blue, but we also actually also did the same thing with an inorganic cobalt blue. All four on the right hand side are inorganics.

You see solar reflectances there for that gray, the terra cotta, the green, and the chocolate in a range of 41 percent to 48 percent.

MR. RYAN: Obviously, those are what we would call in color space higher L value colors just inherently. They are going to be more reflective.

MR. LEVINSON: Sure, but ask yourself, do you consider those colors suitable. I think that chocolate, that brown on the far right hand side is not what you consider to be an especially light color, nor is that green or the terra cotta.

MR. RYAN: It is getting near lunch, so it is just making me hungry, but I think aesthetically pleasing colors. If you want durable aesthetically pleasing colors that we are pretty sure on right now, the .25 is definitely a good level.

MR. SHIRAKH: Okay, Andre.

MR. DESJARLAIS: Hi, Hashem, I have two questions for you. I guess my first question is -- I am Andre Desjarlais (indiscernible). In your calculation of emittance through reflectance trade off, are you using the same procedure that that you used in your '02 report or are you using a new procedure for doing that?

MR. AKBARI: The basics of the formulations are the same. It was published in a journal paper that calculates the coefficients of the equivalency depending on what the initial value would be. Then if you take the .7 and .55 values that were in 2002, it is exactly the same, 2005. If you are looking at the other one which is .4, it is different. The equation is slightly different.

MR. LEVINSON: Sorry, the methodology is actually just the same. Ronnen again. we are using the same methodology. It just happens to be for these lower reflectance requirements for the cool dark materials, they happen to achieve different temperatures in the sun, so you have slightly different numbers to get into the formula. The physics, the approach is the same as documented last time.

MR. DESJARLAIS: No, I agree with what you just said, I just wanted to make sure the procedure is identical to what you had done in '02?

MR. AKBARI: '05.

MR. RYAN: The '05 --

MR. DESJARLAIS: '05, yes. It is in the '05 code, but the report is the '02.

MR. AKBARI: Sure, absolutely.

MR. DESJARLAIS: My second question refers to your method of calculating aged data. and I guess the reason I am concerned about it, I can see a manufacturer having an initial data forever, two and a half years into the process, he changes his product enough to prevent him from testing.

The equation you show, I think assumes about the 20 percent de-rate which is kind of consistent with our experience for low slope roofing, but may not be appropriate for steep slope roofing because I think most of what we find is a steep slope, their surfaces clean more readily, but, yeah, you are using an equation which is going to de-rate those products in the same manner as the low slope products.

I kind of wonder whether or not that option is fair. I appreciate the problem with not having a product for three years, and I can understand that, but I wonder if we are allowing gainsmenship by having an alternate path that.

MR. AKBARI: I think that -- thank you, Andre for that. I think the first comment that you mentioned, that is a dread that we have, but I generally believe that the American industry is so honest that they never play that game that you mentioned. So, that is my response to the first comment that you made.

The second one, I fully concur with you that the aging of the slope roofs may be different from the non-slope roofs. What we have done in the previous equation is that taking the several points we had through some regressions, finding out that .2 reflectance tends to be the inflection point and .75 or .7 decreasing by about .15 and then having linear fit in between all these things.

For the slope roofing materials, that equation may be a slightly different, but still seems to be working out within a smaller lower value of the solar reflectance. The incremental difference between a new equation and an old equation may not be that significant, but once we have the new data, we would definitely try to -- once we get new data from CRSC, that we have some aged values, we go to more analysis and we try to improve our equations in time.

MR. DESJARLAIS: My last comment deals with the overall envelope approach, which was brought up earlier. The real person to answer this question is Charles Ealy because he is the one who developed that procedure initially, but my understanding of how that was generated is that he took a large data base of go to simulations of low slope roofs and did a lot of curve fitting to come up with these temperature factors and solar factors and waiting factors that are embedded in the overall envelope approach.

Since that data base was exclusively low slope roofs, I find it very hard to believe that you would get exactly the same coefficients not that you would apply to steep slope roof.

Though I think what is there is appropriate for low slope roofing, all of those coefficients being empirically derived would have to change if you are going to a steep slope configuration, so I think that option needs to be revisited and reworked, there is some work I think that needs to be done there.

MR. AKBARI: Andre, if the staff would correct me, to the extent that I understand, there is for the residential buildings, there is no requirement for the -- no provisions for alternative overall envelope approach. So, that puts aside all the residential. However, that overall envelope approach applies to the steep slope nonresidential buildings, but we know that is a very small component of it, and if we need somehow Eli and Associates need to update that over time, they would do that. For residential, I have to say that the overall envelope approach does not apply.

MR. DESJARLAIS: Okay, it is in the report. If you look at the -- it is in the attachment for the proposed change, and it does talk about low slope and it does talk about steep slope. It has different values. Whether or not it applies to residential or not, you know, I didn't get that from my first reading. It reads as if it is in the residential report as an attachment.

MR. PENNINGTON: You are both correct, okay. Hashem is right about the standards, and you are right about what is in the report.

MR. DESJARLAIS: Okay.

MR. PENNINGTON: There is no such alternative under the residential standards, and we don't intend to create one.

MR. SHIRAKH: It is just in the nonresidential standards.

MR. DESJARLAIS: So, then we need the wrong report, I guess we need to --

MR. SHIRAKH: The report needs to be corrected if there is an incorrect citation.

MR. DESJARLAIS: I guess then I'd like to just throw in my one cent and say it would be awful nice if that alternative approach existed because I think it gives people who are doing reroofing, again, an opportunity to meet code requirements without having to re-engineer the entire building.

I don't think the performance approach applies in any reroofing application, so what effectively you are saying was whether you say or not, you would be mandating cool roofs at these levels for the State of California in a reroofing application if you don't put in a prescriptive alternate approach.

MR. PENNINGTON: We do have in the residential sector a lot of people that use the performance approach for complying for alterations and additions. There are consultants out there that serve that market. So, it is a little bit different than nonresidential buildings, but I understand your point.

MR. AKBARI: I would also like to add, Andre, there is a good reason that the proposed language change is coming as an attachment. If you look at the both reports that we have, that Attachment 1 and 2 are exactly the same.

MR. DESJARLAIS: No, I understand that.

MR. AKBARI: The reason is that that is

the structure of the Title 24 codes, and once you move, there are some general areas that applies to the roof and then there are parallels for residential and commercial. Once you move one section, you have to repeat everything.

MR. DESJARLAIS: No, I understand. I guess it just was there, and I assumed it was there. Thank you.

MR. AKBARI: Thank you, Andre.

MR. SHIRAKH: We are running quite late, and we have one more topic to go unless you guys want to skip lunch, I am just going to limit the number of comments to the four people who are standing there. I am going to ask you to summarize it as much as you can. Mike.

MR. HODGSON: Good morning, Commissioner and Staff, Mike Hodgson representing the honest California Building Industry Association.

I have a question about some of the square footage of roofs in new construction, Hashem. The number that you say is 51 million square feet that is going to be effected, and just doing some back of the envelope math here while we are sitting here, the math that I come up with is more like 260 million square feet.

Just to go you through the numbers very quickly and then I'll make a comment and I will be quick. We have about 200,000 starts a year, single families in the 2,500 square foot range multi-family attached products around the 1,200 square foot range. You are doing Climate Zone 9 and recommending 9 through 16, that is about 65 percent of the starts in the state, about 65 percent of the starts in the state. Assuming 2,000 square feet, which is a very ballpark number per start, it comes up to 260 million square feet.

I'd like to understand, not now, but how 51 came out and we may think it may be closer to 200 million. 51 million versus 200 plus million square feet, and that leads me to my comment. You really need to convince the building industry that the manufacturers of cool roofs can supply product because we are not convinced. We don't see it in the industry. We know it is a very interesting technology, but it is not in our marketplace, and the market is not ready.

The building industry has a history of proposing any requirement and building standards that are not market ready. We think this looks like a very promising energy efficiency feature, especially at no additional cost or very minimal cost, so this could be a very ideal strategy for market pull in which there is a compliance credit developed in the 2008 standards that is enticing the market to build supply and then as markets build supply, products become more diverse and more varied, and they are more manufacturers in the marketplace, then it can be considered as a requirement in the standards.

MR. PENNINGTON: We have had credit for compliance for these products since 2001.

MR. HODGSON: You also changed the attic model, correct, for 2008?

MR. PENNINGTON: Right.

MR. HODGSON: These credits are getting probably more of an impact in 2008 than in 2005.

MR. PENNINGTON: Clearly.

MR. HODGSON: In the last two or three years, we have personally tried to purchase fourteen cool roofs for a research product and could not find the material. So, one of the reasons, Bill, you are not finding it in compliance is it is not in the market. So, we really encourage you to become in the market. We think this is very promising technology, but it is not there, and it not appropriate to propose as a standard.

MR. CECH: Hello, my name is Rick Cech, and I am representing the Roofing Contractors Association of Southern California and also the State Association. I would just like to bring up a couple of practical points before the break because I have time constraints on travel and if it is appropriate right now.

First off, on the 2005 code, it has been eight months since that was enacted. Some of the practical experiences that we are experiencing out in the field as contractors, I'd like to hedge those issues when the 2008 code comes into effect, and maybe we can more forward from here.

We established after the 2005 code a steering committee of industry and also a subsequent ad hoc committee that is in the process of developing the training syllabus for 2005 regulation.

First off, has there been any money allocated for the 2008 code for the training side of this issue to get out to the building officials and to the various entities that are going to have to enact the regulation?

What we are currently experiencing out there in the practical side is we've got issues with contractors that are trying to pull building permits and they keep to the 2005 standard and the building departments have no knowledge on how to implement it.

I think we are in the final revision of the training syllabus that the steering and ad hoc committee is currently working on, and hopefully that will be released very quickly because I see it as a tantamount point that critical mass is hitting with us contractors out there because now the building departments are asking that we comply with the 2005 standards, and they don't know how to interpret the regulations. So, I think it is very important that on the 2008 regulation that the some thought is put into it that before it becomes effective, we have in place some type of training syllabus and a method to disperse that information throughout the industry, both to the building departments and to the architects, building owners, and what have you so we can plan for it ahead of time this time.

I really want to thank the Commission, Elaine and Bill, for bringing us in the fold after the 2005 regulation. I want to be sure that hopefully we can move forward with that same steering committee or one like that with industry to come up with the syllabus that we can get out for enforcement after the regulation itself.

Some of the issues we are dealing with on a contractor's side is I've got contractors calling me that aren't bidding apples to apples. Some are going and bidding the built up roofing on the low slope side that are not in compliance with the regulation because the building departments are not enforcing it.

You have another contractor and even consultants that are writing specifications that are not in compliance with it or requiring it to be in compliance with it, and the burden is all going to come back onto the building contractor.

When the lawsuits start hitting, and they are not going to hit for several years down the road, it is not going to be the Commission, it is not going to be the building departments that are going to be held viable, it is ultimately going to be the roofing contractor. If we have contractors out there and owners that are looking for low bid and that are going after just the bottom line dollar figure on a non-compliant roof, I can tell you emphatically what is going to happen is the lawsuits will ensue, it is going to come back on the liability because it is not going to be the general contractor either.

The segregation clauses in the contracts now put the onus back on the subcontractor which is the roofing contractor. You are going to have roofs out there that are non-compliant that have been installed that have permits issued because the building departments do not have the knowledge for the enforcement side of it.

Our insurance companies are going to -- there is going to be a new wave of litigation. It has already been proven that with whatever disclosure statements you add to your contract that this may not be a compliant roof. A case study has already shown that the roofing contractor will be held liable.

If it comes to court and you are pulled in front of that judge and he says, well, did you install that roof according to the regulation, irregardless of the disclaimers, it has been case studied that they made the roofing contractor go back and tear that roof off at his own expense to bring it up to current standards. I think this is one thing that once we get through all the technical side of it, we have to look at the practical side of it and the implementation of this regulation.

I am just really beg you that we continue and plan ahead this time and work together with industry, with our association, with the Western States Roofing Contractors on the technical side that we come up with the answers before it is enacted and that we find if there is no money that has been allocated through legislation for this part of it, that you work with us and that we can help you get the word out.

Ultimately, it is just going to benefit ourselves. That is the main thing. As far as lead time generation of product, what we are finding out here on the clay tiles and stuff on the bidding process, we are trying to bid projects that product is not going to available for six months down the road. We think that is driven by numerous factors including but not limited to the real estate boom that we've seen in the California area that everybody thinks is a bubble that is bursting. We think it is flattening out.

Now you are seeing migration from the West Coast to the Midwest to the East Coast. We have 75 million baby boomers that are going to be coming of retirement age by the year 2020. So, right now what we are seeing is down in Arizona, Florida, Tennessee, all across the Midwest housing developments spurting up to answer the demand of the people that are going to be leaving California.

I think that is a driving force of one of the factors that is hurting availability of product along with obviously the price of gas that is driving up the cost to produce the product and also with the China going to be hosting the Olympics coming up and a lot of the concrete and stuff is being shipped overseas.

So, that is a couple of points I wanted to get on record and see if we could work together and move forward. Thank you very much. Any comments?

MR. PENNINGTON: Rick, the Commission really has to thank you for your efforts to work on this training issue with the contractors and for the very strong positive attitude the contractors have had about this responsibility, they need to get with it, and they need to work with the Commission to help us square away this problem. So, thank you very much. It will be great to continue to work with you on this.

MR. CECH: Thank you very much.

MR. GOVEIA: I'm John Goveia from Pacific Building Consultants here on behalf of ARMA. Two things that came up in discussion. I need to revisit the granule cost again because i went out and cross checked some of the granule information, and since we went from nonresidential steep slope to residential steep slope, I can reiterate again the costs to the marketplace will not be 20 cents a square foot.

This individual may be able to supply his product. I am not sure whether that is market rate, but the information I just got from multiple sources is it is not in the range of 20 cents a square foot. It is between 30 and 40 cents a square foot.

The other thing about granules, when we talk about metal roofing versus maybe asphalt roofing is use two to three times the amount of granules, cap sheet roofs, if they are cool granules, and so the cost of the granule is what drives up this extra added premium cost.

Second, I just heard Andre asking Hashem and as I understand it, there is not going to be an overall envelope approach alternative for residential. Is that just for steep or is that for low or is that for both?

MR. AKBARI: I made the comment that in the current Title 24 send out, there is no such provision for the overall envelope approach for the residential buildings. That is only an observation.

MR. GOVEIA: Okay, so it is not that it is not being proposed, it is just not there right now?

MR. SHIRAKH: It is not there for any reason. We are not planning to create one at the time.

MR. GOVEIA: As a roof consultant and someone involved in the construction community, I think that alternatives somehow needs to be there. I heard someone mention earlier that there are consultants out there, energy consultants that can run calculations.

MR. SHIRAKH: That is the performance model.

MR. GOVEIA: I understand, but for a reroof job, it is not an alteration of the point that normally the only thing you are doing in that kind of environment is the roof covering. You are not changing out other components in a building that might warrant spending that $500 or $1,000 whatever it is to run some kind of calculation to see what you might be able to do different.

I think somehow you need to think about having some method of an alternative provision for residential.

MR. SHIRAKH: Each one is $1,000?

MR. GOVEIA: What's that?

MR. SHIRAKH: It costs $1,000 to do a performance run?

MR. GOVEIA: Well, it depends on which energy group is running it and how much information is being provided to them. If it is less, fine.

UNIDENTIFIED SPEAKER: It is a little bit cheaper --

UNIDENTIFIED SPEAKER: 20 cents a square foot.

(Laughter.)

MR. SHIRAKH: I am in the wrong

business.

MR. PENNINGTON: Comment or question. It seems like you think there is more of a need for low slope versus high slope, is that what you are getting at?

MR. GOVEIA: No, are you talking about for the option availability. I think it needs to be there for both. I mean --

MR. PENNINGTON: You are asking about low slope versus high slope, and that was just a question of clarification that you were asking?

MR. GOVEIA: Yes, I am saying since we are on steep slope right now, I think it needs to be there for steep slope. I think it also needs to be there for low slope, just like we have it in the nonresidential right now. Thank you.

MR. AKBARI: May I add a comment in here, please. I think that I would like to be on the record to say that within the last 20 odd years that I have been involved with Title 24, I have seen more of a problem with the overall envelope approach than anything else within the Title 24.

Nowadays with all these various computers that are out there, it is as easy perhaps even easier to do performance approach for an entire building either a roof or any application than doing overall envelope approach. So, I one would actually may consider not offer that sometimes in the future rather than adding it for residential.

MR. LEASL: Yes, hello, my name is Craig Leasl, I am with Stockton Roofing Company and L&L Suppliers. Our companies were started in 1912 and 1959. We started producing white cement coatings in 1960 for thermo. We've started producing our own coatings for about 17 years now.

I have a comment from Ray Darby this morning. Back in 2001 and 2002 he was the Co-Program Manager for the Energy Commission. His (indiscernible) roof coatings are durable, energy efficient, long lasting, cost effective approach to making a built up roof last past 40 years, and putting heat shell cap sheet on my office building for my company, Sustainable Energy Group, in a few weeks and doing my house composition roof at my house later this summer.

There were some questions as to my coatings being controversial, and not having "good adhesion" and "my coatings are poor performance" from another competitor. So, I went out and had it adhesion test run on four major acrylics. I won't mention who. The conclusion of adhesion on a pounds per square inch of the four acrylics came to 32 pounds per square inch to pull them apart. The adhesion to break the adhesion.

This is the heat shield on the cap sheet, which was called poor performance at 30 million square feet out there, and my adhesion came in at 290 pounds per square inch compared to 33, and 365 for the gravel. It is a 45 year old roof right here. I had it tested by Momentum Technologies. It is jet black asphalt, and my roof has lasted over 45 years, have one full adhesion eight and half times that my competitor said.

Thank you very much, and I'd like to thank you for all your work, Hashem. I appreciate it.

MR. SHIRAKH: You have a quick one?

MR. EILERT: Yes, Mazi. It is Pat Eilert from PG&E. I know I am breaking your rule, but I would just like to share that the IOU's have become more interested and are increasingly aware of the need for education and training around compliance issues. So, we are planning to do more work in that area and we are quite interested in working with folks in advance of the effective date of standards. Sometimes in the past, it is hard to get people interested well in advance of the standard, so we are quite interested in working with industries that are.

MR. SHIRAKH: Utilities have provided a lot of training opportunities for standards, and I am sure they will continue to do so. One quick comment.

MR. LOYE: A quick comment. Ken Loye again from FERRO Corporation talking about the black and the transparency issue, you know the industry has known about the transparency. Many of you may remember the candy apple colors where you would put over bright aluminum or bright sub-straight, and you would get that very nice metallic looking effects.

We have known about this transparency issue. The problem is that durability is really what is key for something that is going to be on a roof for 20 or 30 years where you have total impingement of solar radiation over that total period of time and where the customers are demanding you have that durability of pigments.

While the effect can work in certain cases for, again, using a transparent technology putting this over white, and as Hashem and Ronnen have said, if you take this particular or black pigments per say, and you put them over a white sub-straight, yes, they would read very high as you put the organics over a black sub-straight, they would probably read very low. If you put it over a moderate sub-straight, they would be where everybody else is.

The problem is the technology in the pigment business for high durable long lasting pigments is certainly not in the 40 percent range as yet. I think many of us in the room have been working on that. We would like to get there, but for durability reasons, you know, it is not viable at this time.

We are hoping that although you get some of these numbers, I think the durability may not be there for long periods of time.

MR. SHIRAKH: Your reaction to that?

MR. LEVINSON: Just what I said before. You can put that slide back up, please, that was the right slide. The four colors on the right hand side are inorganic, those are the durable ones.

Also like I said, things are improving, so what you see now is not necessarily what the state of the art will be in a year or two.

MR. LOYE: Generally, what happens if you take that black or typical pigments and organic type we are picking on right now, but they generally start turning toward that gray, the third panel over, as they age. As the solar radiation or UB radiation specifically from the sun attacks that particular pigment, they start to lose their chromofor or color. Where inorganics typically do not do that, so they last much much longer.

If we could develop a coating that had that kind of reflectivity with the long term durability, that is what we are trying to get to, but we are not there yet.

MR. SHIRAKH: For the black color, but he is telling us that the four on the right, they already have, they are inorganic.

MR. LEVINSON: The four on the right are probably inorganic type technologies, okay. I don't know that to be fact because I didn't formulate those colors, but typically speaking, those would be typically what you would get with an inorganic type pigmentation.

What the difference between organic and inorganic, the inorganic pigments, these pigments are actually like synthetic minerals, they are actually fused calsigned at temperatures up over 2,000 degrees fahrenheit to make the color or make the chromofor, that is why they are so stable.

I just also want to thank these folks for all their efforts they put in. Really, these colors, it is the FERRO Company, the Shepherd Company, and some other companies who aren't here right now, but really that is the driving technology behind all of this. I don't want to contradict anything they are saying, these are the good guys.

MR. SHIRAKH: Thanks for your clarification. We are going to move to the last topic for this morning which is Residential Cool Roofs Low Slope.

MR. AKBARI: Typically when it comes to the last presentation, and I apologize because I would be the person standing between you and the lunch, but since there are going to be half dozen people making comments, I would let them apologize for me later on.

I am Hashem Akbari from Lawrence Berkeley Lab, and this particular presentation would be talking about the application of the solar reflectance, high solar reflectance material and making them a prescriptive requirement for the lowest sloped roofing market in California.

This study is not separate study from the previous one. It is part of the overall scope of the project that was funded by California Energy Commission, and it is a PIER funded project, and Chris Scruton is managing this research.

Let me talk about the availability of the materials for low slope roofs. Basically low slope roofing materials are cool materials for low slope roofs have been a longer history than they are available in forms of coating in, single prime membranes, as well as painted metals.

We have basically the same market that applies to these roofing sector also applies to the nonresidential low slope roofs. So, there is already a precedence for this requiring this thing also for the residential buildings since it is already as part of the standard for the nonresidential low slope roof in 2005 cycle.

So, the 2005 cycle covers the green which is lower slope nonresidential. We already discuss the application of the nonresidential steep slope and we also discussed the residential steep slope. This is the last part of the cells that we are trying to cover, which is low slope residential.

The study is based on a cost performance analysis, and tries to propose a minimum value for solar reflectance and thermal emittance. It is being done based on simulations using micro pass the tool and life cycle cost analysis.

The methodology is exactly the same, review the availability of the measure, which in this particular case it is widely available and performing cost benefit analysis I am finally projecting a statewide savings.

We would require the same level of performance, minimum performance for the solar reflectance and thermal emittance as the same. It is part of the current standard of 2005 cycle for nonresidential low slope. The only addition in here is that we are basing everything based on the eight solar reflectance, also aged thermal emittance.

This analysis we have assumed that the existing low slope roofs residential have reflectivity of about .2 that we can increase that to an aged value of .55. We've also assumed that the emissivity of the materials are those of the characteristics of the non-metallic surfaces.

We have estimated in our humble view higher or conservative estimates of the incremental costs of 20 cents per square foot for low slope roofs, and we are finding out that based on the 30 year time dependent valuation savings, we are having cost effectiveness in Climate Zones 10, 11, 13, 15, and 16.

This is a smaller number of climate zones and the prime reason that we are having this not to be showing cost effective at the level of 20 cents per square foot is the ducts are located in the conditioned space.

Here is the results of the analysis for a build up roof without radient barrier, so the only thing that applies in here to the standard is this last one. It clearly shows that in Climate Zone 16, this measure is cost effective. Current

California Title 24 does not require radient barrier for residential buildings in Climate Zone 16.

MR. SHIRAKH: Hashem, there is a question. What is the difference between the blue bars and the black bars?

MR. AKBARI: That white bar should be basically ignored for all practical purposes in here. It is supposed to show the time dependent valuation of savings, but that non-time depending are based on the 2002 numbers, the blue ones are based on these recent numbers that the Commission has posted as recently as April 18 if I am not mistaken. I think it is only for a reference here, but for all practical purposes, I would encourage you to ignore the white bars and only look at the blue bars because those are the ones that are applicable.

If you look at the residential buildings with radient barrier, you would find out that it is cost effective with Climate Zone 10, 11, slightly cost effective in Climate Zone 12, but 13, 14, and 15. So, all together we are finding out that it is cost effective in Climate Zone 10, 11, 13, 14, and 15 and 16 which doesn't require a radient barrier.

Here is our estimate of the new construction roof area. This is very much consistent with the numbers that we see from the gentleman who was making the comments that number is around 250 million square feet per year, but that is the total area, this is the roof area. So, it is being corrected for the number of the stories of the buildings.

We estimate 180 million square feet of roof area is being added every year in residential buildings. Out of those, only 13 million square feet are low sloped air conditioned buildings, so there are two adjustments in here.

Once you count that, this is the rating factor or this is the market to extrapolate the energy savings to. The amount of the electricity time dependent savings is slightly more than 3 giga-watt hour. The amount of the natural gas deficit is about 4 giga-BTU per year. The net source energy TDV savings is about 7 giga-BTU per year. The amount of the peak power saved is about half a MW per year. The time dependent net present value of the savings including the equipment is about $2 million a year.

The reason that it doesn't extrapolate to a higher number is that the market of the low slope residential roof is not really a big market. However, there is a single building that it is there, still it is going to be cost effective in the climate zones that I mentioned.

Adding up the new construction and the reroofing, we are finding out that about 60 million square feet of the area of roof that residential low slope that are air conditioned, the amount of the savings are 16 giga-watt hours electricity savings deficit 20 giga-BTU, in natural TDV deficit net source energy TDV savings is 33 giga-BTU per year. The amount of the peak power savings is about 2.8. All together equipment and energy savings, we are saving about $9.5 million a year.

What we are proposing in here is the exactly the same thing as we proposed for the low slope nonresidential building. To have solar reflectance of .55 for non-metallic surfaces, those are having the aged thermal emittance of .75.

For all other ducts that have lower thermal emittance, these are metallic surfaces, one shall use this equation in order to estimate what will be the corresponding effective solar reflectance for non-metallic surface.

The proposed language, again, the same as that being proposed for the other two studies. If the CRRC labels of the aged solar reflectance and thermal emittance are available, use them. If the initial values are available and the products are in the field to be tested for the aged values, use the following equations to estimate the aged solar reflectance. If the product does not have a CRRC label, use the aged solar reflectance of .1 and aged thermal emittance of .75.

Like the previous presentation, the following sections of the standard shall be updated in order to account for acceptance of this proposed measure. It includes definition and rules and mandated requirements for insulation and cool roofs, mandatory features Section 150, 151 Performance and Prescriptive Compliance Approach, Section 152, which is Addition and Alteration. Following that, the Alternative Calculation Manual.

My pitch is that one can make the life simpler if one wishes to accept the solar reflectance, eight solar reflectance of 64 for the low slope roofs, and this would be the same applied for both nonresidential and residential low slope roofs.

This concludes my comments on this third presentation.

MR. KERSEY: Good afternoon, I am Tim Kersey with SIPLAST, just asking which convective co-efficient did you use on the SRI?

MR. AKBARI: This is the medium convective co-efficient of 12, correct.

MR. KERSEY: Okay, good. That's all, thank you.

MR. DREGGER: Good afternoon, my name is Philip Dregger, Pacific Building Consultants. I am here also on the behalf of ARMA. I want to say that ARMA in general is very supportive of the goals, energy savings and especially energy savings in light of the constraint of being cost effective for the state and for the individual.

In fact, I want to speak to that cost effectiveness question. I guess I want to say the premise is as you go through the report, that we downloaded it, and also, Hashem, thank you for your clarifications today that the cost premium, which is obviously the comparison, you take the net present worth savings over the 30 years and you compare it to the 20 cents which I understand is the cost premium for installed cost.

MR. AKBARI: Correct.

MR. DREGGER: It was also clarified today that wasn't intended to be an average, it wasn't intended to be like I say typically, but it was intended to be a maximum. Did I hear you correctly?

MR. AKBARI: That is my presumption.

MR. DREGGER: I feel compelled to address that assumption, and, darn, I handed out yesterday of some costs and I am going to use that. I do have some additional copies, anybody on the Board like me to get those for them now?

MS. HEBERT: If it is all right with you, Phil, we will be posting these to the internet website?

MR. DREGGER: It is my understanding, but I am going to ask ARMA's designated representative, Mr. Hitchcock, is it going to be posted?

MR. HITCHCOCK: As I told (inaudible).

MR. DREGGER: Okay, pending.

MR. HITCHCOCK: (Inaudible).

MR. DREGGER: For those who didn't hear it, I was clarified is that in the affirmative that, yes, it would be able to be posted. I guess I am going to start with just a couple of highlights, and I will try to be brief, but, again, I feel compelled to understand how we -- where we came with the conclusion that 20 cents a square foot was the maximum.

I am going to look at Table 1 on the report that we downloaded, and then for comparisons, you can go to Table 2, and let me just back up before I get into it, that we had a question. What is the cost premium associated with going from non-cool to cool, and there was information that we could obtain by a variety of sources, but we thought we would make it what we thought was the fairest test, actually ask some well established contractors in the State of California to estimate, to pretend you have a hypothetical project, lay out the parameters and tell them exactly what they are, what would be their cost estimate for the non-cool version and the cool version and ask them to give us the information, which we have five contractors, two in the San Francisco Bay Area, one in Fresno, one in Sacramento, and one in the LA City area.

The information we received it back and we averaged it, and that is in these various tables, and I am just going to Table 2, and you can take a look at it, I should say over top of this, there is a cementitious coatings is often referred to as one of the methods of making the roofs cool, and we requested information from a specialty contractors and supplies of various -- you may recognize him. He provided us that information.

Go to the Table 1 in the report, and just going down we are looking at built up roof, warmer option, you know, built up system with smooth asphalt surface, and then let's go over to the right hand column. I'm sorry, this is not in the material that I handed out, it is in the report that we downloaded. Let me just say, I'll read it. The option with gravel and cementitious coating is listed.

On the top of this table, it indicates and correct me if I have an interpretation wrong here, but it shows that there is a five cent cost premium for these options. You are familiar with the table. Let's say it is 20 cents. To have a cementitious cool coating at that 200 mills over gravel, and it says with gravel and cementitious coating with 200 mls of cementitious coating cannot be put down for 20 cents a square foot.

Correct me if I am -- $1.00. Okay, it is in the example.

MR. AKBARI: May I just interject a point. That is the incremental cost comparing when putting a layer of asphalt coating and rather than putting the layer of asphalt coating, you put the cementitious coating. That is the way to interpret that.

MR. DREGGER: The asphalt coated roof is not a fire rated roof, but maybe that doesn't really enter in here, but we are talking about an aggregate surface roof, built up roof, which is a perfectly legitimate roof system, but it is not cool.

To make it cool, we have a number of options, one of which we are very familiar with, which is cementitious coating, and that can be done, and it is durable. I think it is very good, a great idea, but it is not 20 cents. That's all. It is just not 20 cents, but it is great.

For to go to a white acrylic coating compared to say an aluminum coated roofing, it is not 5 cents, it is not 20 cents. Our snapshot data would suggest it is on the order of 37 cents.

Then just further on here, we have a Table 4. It seems a little bit of a rehash of the same information, and I guess I don't want to belabor this, but in Table 4 -- I'm sorry, not my Table 4, it is the PG&E studies Table 4. We are still probably going to be using Table 2 in that information that I handed out.

Again, it is indicated that the cost premium is 10 to 20 cents. Our information suggests that the cost premium, and now we are not talking about an aggregate surfaced roof, but we are talking about either a smooth or a cap sheet roof, and our data would suggest that the cost premium in that scenario would be not 20 cents, but more like 37 to 60 cents to make those kind of systems cool. Again, viable, great suggestion, but if we are going to ask a serious question of cost effectiveness, I suggest that we look at those data.

Just for one example to bring in another one again on the report, there is a line item, modified bitumen, SBS and APP, and in the cool variety, it says use white coating over mineral surface, so the white coating is the element that is making it go from non-cool to cool. The incremental cost indicated on this table is 5 cents. I do not believe you can get a factory coated material or a field coated modified material for 5 cents or 20 cents. Our data suggests it is 60 cents to a dollar.

Food for thought. I would request the cross effectiveness of the proposed cooler variations of their systems be revisited in light of perhaps more current data because the data I believe originated in 2002.

MR. AKBARI: I have a question for you in here.

MR. DREGGER: Certainly.

MR. AKBARI: I can go and buy high grade fiberglass shingle at a cost of 60 cents a square foot, and you are telling me that the cost of the manufacturers to increase the solar reflectance of modified bitumen that they are covering it with something, with something that it is reflective is more than making fiberglass asphalt shingle all together?

MR. DREGGER: I need to back up. I am talking about installed cost, okay, because that is where the rubber meets the road. It is the installed cost. I am also directing my comments to membrane roofing, membrane roofing that is installed above 2 and 12, which can be, either way.

What I am saying is when we ask a contractor for a modified roof system with a conventional cap sheet, and then use that same system, but use a factory coated cool sheet or field apply a coating, whether it be a cementitious coating or be an acrylic coating, or again, the factory manufactured. The cost difference between those two options installed was in the range of 60 cents to a dollar, and we know that the dollar -- so 50 cents would be for -- implied that cement, but the bottom line is I believe we need to revisit that rationale.

In light of more current data and perhaps getting the data from contractors so it can be in an installed environment rather than information from a manufacturer, which doesn't consider maybe some distribution, mark ups, and maybe some labor differences between keeping a system white and cleaner versus one that is not.

Also, we would request that the analysis, since we are proposing it for 2008, be completed with the anticipated insulation levels associated with the 2008.

I'm sorry, I need to move on. In Table 5 of this document, it talks about the useful life, and we've seen how we are comparing 30 years net present value of 30 years of energy savings to an initial premium cost. These systems require coatings and they put on roofs. Even in this list of the membrane roofs, the surface life is less than 30 years.

I think you can argue persuasively that the Delta modified surface life on average may very be in that range of 15 years. So, to do a cost comparison only with initial costs, seems to be missing a major element. That would suggest that the life cycle cost include incremental costs throughout the years.

Let's just confirm to ourselves that we are doing what we want, saving energy and being cost effective.

Then I guess my final question is in Attachment 2, there is a reference on page 90, and this again to your report, refers to two parallel studies. I was wondering where I might find the report for the other parallel study.

UNIDENTIFIED SPEAKER: Website.

MR. DREGGER: I was on the website this morning, and it wasn't there. Is it there now?

UNIDENTIFIED SPEAKER: Should be.

MR. DREGGER: Thank you very much. Any other questions regarding my comments? Thank you for your attention.

MR. CROWLE: Good afternoon, I am John Crowle with ABC Supply. We are the largest distributor of roofing products in the country and had the pleasure of putting in a lot of seminars with Elaine to kick off the Title 24 and I serve on the Western States Board of Directors Technical Committees dealing with the energy products.

Phil touched on a couple of things that are really important to consider, and that is that the standard of the industry, the best warranties that we can get for low slope are typically 20 years. There are some boutique products that go longer, and the 30 year comparison really falls short of that.

The 10 to 15 years is much more typical

of what we see for performance on a low slope products, residential or nonresidential, the cost that you have initially as a premium, I think really can't be amortized over that long period of time.

I think the more important thing is with the exclusion of single ply roofing, which is going to remain as a thermal plastic product, white for the entire performance of the product. The major manufacturers of built up roofing that have a cap sheet roof with a gray on it, that are providing an in-line process where they coat the product and then ship it to the field with a reflectivity and emissivity that meet the standard, that roof will last the 20 years that are guaranteeing it to be water tight.

The coatings on those are -- I'll look at it as a maintenance item, and they are excluded from the warranty. While they may make the three year aged value, they are not going to go much longer. They could be as low as five mls. of coating, the previous standard I think until you changed it or going to change it was a 20 dry ml. coating.

That being the case, the exclusion of

that from warranties are going to say, okay, that roof will last a period of time, but the useful and effective benefit is going to be really curtailed because it is not going to be there for very long if it made five years at the rate that they are putting it out, I would be kind of surprised.

The better option is the fuel applied coatings, the acrylics go on out there. Let's say a responsible manufacturer didn't lower the bar since the regulations are getting changed, they put on 20 mls., the average recoat for those is recommended in the industry is a ten year increments.

In a 30 year period, you are going to have to put that coating on three times. I think pretty accurately, Phil stated the cost of 60 cents to a buck a square foot is what we are seeing those products go down for to get 20 dry mls., you are going to have to install at least two gallons per hundred square feet in a competitive price in the market for a contractor is about $15.00 a gallon, which is called 30 cents a square foot. That is in the pail in the drum in the tanker. They've still got to go up and prepare the roof and install and coat it.

I think that on the low slope side especially because the shingle warranties do go 30, 40, 50 years lifetime warranties, the low slope roofing products and their performance really are a much more abbreviated period of time that I don't think are given just consideration.

That's all, thanks.

MR. VANDEWATER: Good afternoon, my name is Jerry Vandewater of Monier Life Tile. I am representing the Tile Roofing Institute. This topic of discussion has been very interesting this morning. We have been involved with the PIER Program for a number of years now, and we have also very supportive of the whole concept of cool roofing.

As a matter of fact, we got involved in having our products tested for the cool roofing at the Oakridge Laboratories. In the process of that testing, we found that there was more to it than the reflective emissivity. As part of the study conducted by Dr. Miller at Oakridge, we found that there is a significant value by the assembly and most significantly the air created by the application of the tiles, which was referred to in the studies, the vented air space to meet the tiles.

That air space varies significantly between the method of application and the profile of tile. My purpose for being here is we've already taken the first step to present a measure for consideration into the codes to recognize the data that has been developed regarding the value of this air space.

Our parent company, Letharge Building Materials International Company, has been doing this for over 20 years, and we have a considerable amount of data worldwide about the value of the air space. We really want to get this introduced as another option for cool roofing.

One of the things, and I've heard a lot of the conversation about cost and about three year studies and aged testing and all this, and we are fully committed to having cool roof products. Hashem showed some of our products in Florida, you can see have very high reflectivity ratings. The problem with being in Florida is we also have a high growth of algae that impacts that.

There are ways to have tiles cool coated. Our experience here in California, however, is that the lighter colors that are very popular in Florida are not mainstream products here in California. Likewise, the coatings that have been discussed and the pigments that have been used, we have evaluated them and their effectiveness on clay and concrete rooftops, more so concrete than clay because clay can have them baked in.

They have to be coated on the surface, and the trends in California in the last 20 years have gone to intricately colored products that do not lend themselves to the reflective coatings. So, consequently, we were very excited about the data that came back that showed upwards of 50 percent reduction in heat flow into the attic by merit of the air space itself, irregardless of the color of the tile. So, we really would like the Commission to consider this element of the cool roofing system to be included into the codes.

Some of the advantages we have is that once that space is recognized, it remains effective indefinitely. Clay and concrete roof tiles have a standard product warranty of over 50 years and sometimes the life of the structure. That would address the other concern about having reroofing product going to the land fills.

So, this is truly a permanent position. It is not something that requires maintenance. Once you have that air space underneath the tile, it remains static indefinitely. There are things that can be done to enhance it. We've looked at radient barriers, we have looked at various elements to aid the flow of air between the tile and roof top.

We know we have data to support this. We know it is a valid concept, but the most significant thing is it is sustainable. It is not something that requires periodic recoatings, it does not diminish its effectiveness as time goes on, whereas the colors will.

Some of our tiles actually get better reflectivity as they get aged, but the air space is a constance. We think this is a very significant issue. The other thing that comes up is product availability. As we evaluate the prospects of adding colors to our products, it is a whole different process for our manufacturing.

As you've heard other people comment today, there is a huge crisis of product availability for clay and concrete roof tiles throughout this country. We are in the process of building new plants, but it takes awhile.

The thing of it is, if we have this natural air space that really is already in place with the tile, it is just a matter of recognizing what is already being done, we are not looking at any significant increase of the cost of the installation. We are not looking at specialized products, we are looking at the products that are immediately available and are commonly used throughout California.

If you look throughout California, concrete and clay tile roofs make up over 80 percent of all new construction. So, it is product that is readily available, it is not significantly more expensive than what is currently being used, and it is sustainable.

At any rate, we are going to proceed with this. We are very anxious to get recognized, we are doing it on two levels. We are going to our cool roof colors, we are going to be introducing and getting Cool Roof Rating Council approvals. I had a meeting yesterday with the Technical Committee for the Tile Roofing Institute, which represents all the major manufacturers in California. All of them are going to be moving forward on getting product available in the cool roof spectrum.

We are very very much interested in getting recognition for the assembly performance as well.

MR. PENNINGTON: Jerry, I really appreciate your effort to have tiles rated by CRRC, that's a very good step, so thank you for that.

Question, you said 80 percent of new construction is tile. Do you have some published data source for that?

MR. VANDEWATER: Yeah, we can provide you with that. It depends on what part of the state it is. New construction is where it predominates in Southern California in particular, but there is data available for that.

MR. PENNINGTON: Hashem's work, you know, has been hamstrung in terms of trying to get a good estimate of that because of the problem when finding published data related to that. So, if you have a source, that would be excellent.

MR. VANDEWATER: Yeah, we can certainly give him some updated data. We keep very close tabs on that.

MR. AKBARI: I think definitely we need that data. I also have the following question. This is an honest question. If 80 percent of the new construction are already using tile, what does Title 24 accomplish in saving California more energy because it is already in the base case?

MR. VANDEWATER: What happens is as a result of the studies, we found that there is significant value to increasing the air space underneath the tiles, particularly here in Northern California for instance, a large percentage of the tiles being used in Northern California are flat profile tiles, have minimal amount of air flowing, and depending on the method of installation, may have no air flow.

Tile fastened directly to the roof deck or onto a batten strip that is fastened directly to the roof deck has very minimal almost negligible air flow in a vertical position direction.

By elevating those battens up off the deck, which would be a change from what's currently being done, that is where we saw the values based on the data developed out of the

Oakridge testing.

Our point is there would be some incremental cost increase, not a major change, certainly not in the product itself, but the method of application by putting the battens further up off the roof deck would allow more air flow which is the air movement is what has been shown to be effective in reducing the heat gain into the building.

That is a big change because if you look at all the new construction in this area, you drive around you will see a lot of flat tile roofs being put on houses, those are not going to be effective cool roof assemblies in and of themselves, they only would be in the event that they would be elevated up above the deck to get more air flow available.

That is some of the information that we are looking -- we are going to be doing additional testing to define how much air and what is the model if you will for the amount of air required versus the roof slope and products as well. So, there is more work to be done.

We are not done, we think the information developed by the studies is incredibly positive. We think it is good. We have always known anecdotally that this is true. We get a lot of feedback from customers I have in my own home. I have seen significant difference in my cooling cost, both in my home in Arizona and in California by putting a tile roof on. We know it is valid and having the Oakridge study that it is good data that substantiates it. I sent that study off to our Latharge Laboratories in England, and they said it is exactly just validates what they have known for years.

We would just like to get recognition so people would have an incentive to go these improved systems that do give better value. It is a nice solution because it doesn't hamstring people who have to go out and get a certain kind of special product. It makes it something that could be recognized as a product that is currently available and in strong supply.

Thank you.

MR. SCICHILI: I know it is late, so I will take very little time. I am Bob Schichili, and I am with Robert Scichili Associates, and I am here representing the Metal Construction Association and Jerry just adequately spelled out the things that have been done in this study at Oakridge, and so I won't cover those issues except to say that metal tile that is stone coated has been thoroughly tested there and is part of that study along with all of the painted systems that were subjected to the same testing.

I won't go into the colors and the assemblies, I think he pretty well spoke through that, but I think the important thing here is to understand that there is a readily available product right now and stone coated dome-shaped or "S" style product available in California by a bunch of companies, so we have product available, colors that are available, and the fact that this study has shown extremely good data, and he mentioned up to 50 percent and some of the metal tiles showed as much as 70 percent taking care of the heat gain and heat flow through the ceiling to the conventional asphalt shingles that were tested.

What we are really getting down to is the fact that product is available. I think he adequately explained some of the things that were going on in that testing, but the real issue here is this, that it has not been modeled. The model is being taken care of at this point by Oakridge, and the modeling that will then ensue from that is work that has been funded now, it is going to be on-going, and we estimate that in 90 days, we will have the data to the 16 climate zones in the State of California readily available for presentation to this body.

We are asking you to consider openly a place for us to come back and give you a template that has that data, has the authenticity that you are looking for to the 16 climate zones and at that particular point, it kind of reinforces what I am saying to you. You want to meet your goal, and there are products readily available and here is some testing that augments the fine work that you both have done in the PIER Group, which fortunately I had the opportunity to work with you in the past. So, it is not -- it is an augmentation to a cool roof. It is not a replacement for a cool roof, it is a compliance to it if you will that we think should be considered heavily, and I think Jerry kind of echoes that, and so I am echoing back so to speak. We thank you for hearing us out. If there are any questions, we would be glad to answer them.

MR. PENNINGTON: This is raised batten system as well, is what you are talking about?

MR. SCICHILI: All the testing that was done with his system, with the metal systems that were either painted or stone coated, were all done on batten systems, and the results are quite handsome, so I think it should be one of those kind of things that is a win/win, and it increases your opportunity to meet your goals. In this case, we have metal that is there right along with his product, that is readily accepted in the state.

MS. HEBERT: This may be a stupid question, but has anybody tested an air space underneath asphalt shingles?

MR. SCICHILI: I don't know the answer to that, but it certainly can be done.

MS. HEBERT: I am not sure what that does for the fire rating, but I thought I'd ask.

MR. SCICHILI: Well, there you go.

MR. SHIAO: Hi, I am Ming Shiao again from CertainTeed. Two comments. Actually, first just borrowing what we've been discussing, and first of all, if the air flow is that important, and I think the attic ventilation already ventilated deck not need to be considered as a means to improve the energy savings because it is not recognized. It could coat, and I think that is something -- if that is important, and especially for asphalt shingles, there is not much air get beneath it, but they are ventilations designed to the envelope.

From what I am hearing, that might be something very important to consider, which is not in current code right now.

The second comment I have already is at this point, it seems to me that where I am getting pressure now, we can get the same color with high solar reflectance with reasonable cost, and I just want to say that might not be the case for the granule products. I am not sure if we can find the slide with that four different granule colors in there. If you can find it, you would notice there is nothing black in there. The best is just a gray.

The reason for that is, well, it is (a) if it can be made, it is probably not very high reflectance, and (b) if it can be made, it is going to be hundred times expensive. I mean we have to put that into account. When we try to raise the solar reflectance, you will indeed lose some color space. You will indeed lose some color choice. That might be the direction I see that she wants to go, which is all right, but what I am saying is, you know, we just need to clarify this point.

Again, I mean as an industry, we are always being pushed by CEC, but we are doing all we can to work with Hashem and Ronnen, and they did do a lot of excellent work. I really want to just say they are doing excellent work and we are trying to work with them. When we try to implement something, it just -- you know, this is like this technology is really completely changed the way we mix things. It can be very difficult, and it takes time. So, I just wanted to say when we consider moving the numbers, we have to consider time that we need to address that.

Now we are looking at the aged number, and so I just feel like that might be a little pushed. Maybe we can look back when we started in the low slope where we have an initial number and three aged number where in between we started learning how this product will perform over the years.

MR. AKBARI: I have a question. You mentioned that the cost of the granules is going to be a hundred times more or the cost of the shingles is going to be a hundred times more?

MR. SHIAO: Probably cost of shingles. The reason for that is first you can see it is a specialty product which you have to separate out from your regular productions, and there are lots of issues along with these things. So, a hundred times is just a number, but I think that is probably not an estimate.

MR. AKBARI: In the way that the current cost of a shingle, assuming 60 cents a square foot is going to be $60 a square foot?

MR. SHIAO: If you want to make (indiscernible).

MR. MORELLI: My name is Domenic Morelli with Thermal Manufacturing. We have been in the cool roofing industry since 1948, so we have a lot of history with cool roofing. I know I've heard a lot of comments today about costs and comments also about aesthetics and different roof systems.

I give you credit as a Commission on what you are doing because it is a lot of work, and you are trying to make everyone happy, and that is not always easy. The bottom line, though, is the goal is to save energy, and I think the steps that you are doing are very important. We are going to support our products in part of the market.

We know that we are not going to support them in all parts of the market. The bottom line is to save energy, so if we can save energy with our products, I know these other manufacturers with some work can do this. I know you've been working on this for a few years, this hasn't just happened over night.

I think what has happened over night since October of last year when it was implemented, then all the hysteria starts and now everyone is trying to run and try to get their products approved, and we are no different. We are adding products, we are changing products.

The goal, though, is to save dollars or energy, and owners are very interested in this. So, the owners in the marketplace, they are going to make some changes in their facilities to save energy because it is going to save them dollars.

In reference to the application of the products, and I know cost has been up many times today -- I'll give you an example of an owner that we dealt with that went to a cool roof, and they took a long time to go to a cool roof because of the cost. They kept saying cost cost cost. In changing to a cool roof, they found out how they could do it and still save money installing it on their building.

They were a large box company, and they saved by changing their HVAC equipment, which would save $80,000 when they installed the building on tonnage. So, by adding a cool roof, saving dollars on HVAC, and yet still they saved dollars installing the roof, and then they saved money every month from then on out on energy savings.

There are ways to do it, and I know the envelope maybe that is something you are going to implement, but as people that are trying to save energy, if we look at this effectively, we can save energy on all of our buildings. Maybe not just in one aspect and several aspects, but it can be done.

MR. SHIRAKH: What has your experience been with cost? We've just heard estimates from 20 cents to $6,000. What is the --

MR. MORELLI: Again, it all depends. If you are going to install a roof system, my roof system doesn't cost any different because we are a cool roof. So, our cool roof cost is zero increase. Now what was mentioned also earlier is about a coating, and we have liquid restorations every ten years. That is the recommendation. In certain areas of the country, a coating is going to be every ten years, and some areas can be ever 20 years. It actually all depends if it is an industrial area or not and what is coming on and settling on the roof.

What has also been mentioned is maintenance. Maintenance is important on every part of the building. People talk you don't want to maintain your roof. Well, you have to maintain your carpet, you have to maintain your driveway, you've got to maintain your windows. Everything has to be maintained. A roof is no difference.

If a manufacturer is telling you it doesn't have been maintained, they are wrong because owners go up there and change things on the roofs all the time. They see people up, they bring electricians up, so things always have to be maintained because those people don't know what keeps a roof water tight. So, a roofer has to go up there. We work very closely with the Roofing Association to go up to make sure the roofs are maintained properly. If they are maintained for water integrity, there is no reason they can't be maintained for energy integrity. That is just a normal aspect.

Any roof system has to be maintained. I don't care what the manufacturer is. The roof systems can be extended. We have roofs that are sixty years old that have never been replaced and have only been maintained, and those are cool roofs. We can show you those roofs. In fact, we took Elaine to show her some of those roofs. We know this can be done. Sure, it is going to be difficult because it is change, nobody wants to change.

The bottom line, nobody wants the black outs either. You had them here, we had them in the Midwest, it happens. So, we have to address this. This is an important issue, and we know each of us are going to have to have some pains unfortunately with the change. We have to spend money on testing that we don't want to do, but the testing has to be done.

We have to spend money on the new products that we don't really want to do, but wee have to do that. The bottom line is, keep doing the right work, keep going in the right direction. Energy savings is the most important thing that we have to do.

MR. AKBARI: Thank you.

MR. POHORSKY: Good afternoon, I am John Pohorsky from GAF Materials Corporation. A couple of comments. One on the air space between the shingle and I believe it was the radient barrier that you are discussing here, or at least the insulation beneath the duct.

MR. PENNINGTON: The air spaces between the top surface of the roof and the deck, that is what they are taking about.

MR. POHORSKY: Okay, we don't have -- there is really not much of a test that we have done the air space beneath the deck is critical, and I think that is code compliant that you have to have the right ventilation. We do, however, make a high profile shingle that does have granules on both sides of the top and the bottom. We have done some testing with that, and there are some advantages as far as longevity and reducing the heat load to have some air movement just between the under lament that is on the deck and the bottom side of the shingle itself.

A comment. I know there has been a lot of discussion, and I think there is one man that is being picked on up here as far as his 20 cents a square foot, so I don't want to belabor the point, but we make different products. We make a modified and a regular built up, both SBS and ABP granulated sheets that are non-Title 24 compliant, and we also make that are Title 24 compliant. It is a lot more expensive than 20 cents a square foot for us to make a Title 24 compliant sheet that has the same physical properties.

MR. SHIRAKH: How much more?

MR. POHORSKY: It is about twice.

MR. SHIRAKH: 40 cents?

MR. POHORSKY: 60.

MR. SHIRAKH: That is about three times, yeah.

MR. POHORSKY: No, no, twice as much as what -- if you bought a non-Title 24 compliant membrane from us, and then you wanted the same exact membrane as Title 24 compliant, it may be about double, depending on the product.

The other thing -- our question was is when we are looking at a market for this, and I am talking it is twice as much for the built up products, obviously the same applies to PBC's, the TPO's, the thermal plastics, the thermal sets that are already white are going to have that requirement, so you don't have to change anything.

When we did our analysis, we said why would anybody buy a sheet that is twice as much and not go to an already Title 24 compliant or CRRC rated single ply sheet. In Southern California, the contractor base, it is the experience that they have and the equipment that they have already invested in the type of roof systems that they install. Most of the contractors in Southern California and quite a few of them up here in the Central Valley have a lot of money, and they are work pool is for the asphalt applied, and they can't convert readily to a single ply roof system.

We are selling an awful lot of our Title 24 asphaltic based versus (indiscernible) where we are selling a lot of single ply as well. I think there is a spot for both, but I do think it is a lot more expensive, and I think as competition comes in, the price will start going down. I don't know if it will ever get to the 20 cents a square foot price that you have been citing. Thank you.

MR. PENNINGTON: A question about you said that you put the granules on both sides of the shingles, so what purpose is that serving?

MR. POHORSKY: It is a higher profile aesthetics. It is on the bottom and the top and it makes it thicker, so when you look at the shingle, it looks thick. It looks like a shake or a wood shingle. It is all aesthetics, it is a triple lamanent versus a double lamanent.

MR. PENNINGTON: So, does that relate to ventilating underneath the shingle?

MR. POHORSKY: No --

MR. PENNINGTON: It doesn't relate to that.

MR. POHORSKY: What we are finding as an upside to it, a windfall if you will, there is enough -- we make some other vending base sheets for low slope products that we are doing the same principle with the granule side down, and we have found that we believe we are going to get a little bit more longevity on that shingle because we are going to have enough -- it doesn't seem like a lot and it isn't, but it is enough to make a difference versus that shingle being directly stuck to an under lamanent that is directly mechanically attached to the wood deck.

We didn't anticipate a windfall in the quality of the shingle or the life span of the shingle, but we think there is going to be a little bit of a trade off there, and it is going to help. Thank you.

MR. RAYMER: Bob Raymer with CBIA. There has been now three mentions to an air space in a variety of capacities here and that this would be outside air. My understanding the opening to this air space would be larger than a quarter inch square. That being the case, the State Fire Marshall Office recently improved in the Building Standards Commission adopted the Urban Wildland Interface Fire Safety Regs, and it would apply to about I would say one-fifth the states starting in January of 2008. I don't think that would be allowed in those areas.

MR. PENNINGTON: We tried to find out about this a little bit by talking to a few building officials. What we are hearing is there is probably not a fire problem with this space.

MR. POHORSKY: I am hoping there isn't, yeah. Okay, Kate Dargon, the Assistant State Fire Marshall, I know has a good access to the guys in Southern California that got us the cost numbers as we went through that three year adoption cycle, so she could definitely help you out with any of the questions here. I am hoping it won't be a problem.

MR. VANDEWATER: Jerry Vandewater again. Just to comment to that, yeah, we have met with the Fire Chiefs on it. Tile roofs have always had a space. There is a limitation, you cannot have an opening at the eave that will allow embers to drawn up into the roof area. So, there are definite criteria that limit air coming in, but the air space we are talking about naturally occurs by the air permeability of the product where air naturally filters between the tiles. Once it is underneath the tile, the amount of movement you can get is done.

The same thing if you are using an eave element that is vented in a fire area, you definitely have to make provisions for fire resistance too. That is definitely something that has to be considered.

MR. MILLER: Again, John Miller from Decra Roofing Systems. The other issue that came up regarding fire was metal roofs over old wood shakes. There solution there is that you have to fire block the upper surface of the old wood shakes, it is in the code already.

Again, you have to prevent embers from entering the -- the whole idea of this ventilation over the deck is, yes, air will enter the eave and exit at the ridge and remove the heat, but the point is, you've got to -- if you have a combustible surface, it needs to be covered. It is in the code already, and you need to prevent embers from entering at the eave so you don't get a fire going in.

MR. PENNINGTON: In general, how would you block that?

MR. MILLER: Basically, the bird stop needs to be a mesh type, a wire mesh type grill or something so you get the air through, but no embers.

MR. SHIRAKH: I don't know about you guys, but I am kind of getting light headed, why don't we meet back at 2:30, and that will make us about an hour late. We have five water heating topic areas and an evaporative cooling. I am going to start it at 2:30 sharp.

(Whereupon, at 1:40 p.m., the workshop was adjourned, to reconvene at 2:30 p.m., this same day.)

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AFTERNOON SESSION

2:31 p.m.

MR. SHIRAKH: We had an interesting session this morning, and it took longer than we had anticipated, and we are about an hour late.

We have several key topic areas that are going to be presented this afternoon. The first one is Residential Window Performance Requirements.

This is a CASE initiative that is funded by utility partner PG&E. After that, we have several water heating projects and Jim Lutz will be presenting those. We also have an evaporative CASE initiative. Mark Hoeschele will be presenting that.

I am going to turn this over to Fred Salisbury if you want to introduce Bill.

MR. SALISBURY: Sure. My name is Fred Salisbury, I am with Pacific Gas and Electric Company. For the CASE proposal funded by PG&E that is being presented today. It has to do with residential windows and revising the standard for residential windows and to present that is Bill Mattinson.

MR. MATTINSON: Thank you. Now that all

the honest guys have left the room, we can get down to business.

This is a pretty straight forward initiative. The goal is to take a look at the present values and the standards for residential windows and to evaluate whether they are appropriate to take a look at the products that are on the market and are commonly installed and available or perhaps coming to market, and to consider whether those products that are being used now are better than the standard and would be an appropriate target for the next set of standards.

So, that is what we did. We looked at what is in the standards now, what is going on, how much savings would we get by changing those values. We worked closely with a lot of the stakeholders. We have had conference calls and discussions back and forth with staff. Ken Knittler and I went to the (Indiscernible) Conference and presented it to the Title 24 Energy Alliance to get their feedback.

We went to the Western Region Window Manufacturers Association Meeting last week in Southern California and shared it with them, and we've had a lot of conversations and e-mail discussions back and forth. Then finally, we presented the measure template, which is on the CEC website.

Just to take a look at an overview. Most of you are probably completely familiar with this, but for residential Title 24 compliance, you were allowed to use either a simple prescriptive or a performance method. The performance method is a computer analysis. It is what is most used because it is the most flexible.

The computer calculations have to show energy equivalence for the proposed design with a home built with a prescriptive package requirements. So, Package D is a reference package that sets the standard so to speak for everything else.

Package D with our last round of changes for the 2005 standards level the playing field at 20 percent glass area in all climate zones, and that package prescribes different U-factors and SHGC values for those windows in each climate zone depending upon their weather situation.

It is the conclusion of many people has been that the current standards, the values are very soft on windows, and that is what we were looking at is where to go with that.

In the current standards, there are three different U-factors, the lowest one being .55, which is the mountainous region Climate Zone 16. The slightly more moderate sort of in-between zones, it is set at a .57, and then in the mildest coastal central Southern California climate zones, it is a .67. All those, particularly the .67, has easily been achieved with almost any window frame type.

The package also set two different SHGC values for cooling. No requirement in the mild and coastal zones, and then a .40 SHGC in Climate Zone 2, which is Santa Rosa, Ukiah area, Climate Zone 4 San Jose area, and then 7 through 15 the warmer climates up and down the valley and Southern California.

These Package D values you can mostly comply with, or at least you can comply with them in most climate zones with an aluminum window with double pane low E glass. Of course, using the computer method, you can use any window type that you can get energy equivalence with Package D, be it single pane or whatever because of the trade offs.

What's been happening, though, is that for most of the state, the prescriptive value is a .57, so that is the value that the standard house has in the computer performance trade off method, but the greatest majority of windows that have been installed in this state over the last five or ten years have been improved products, most commonly a vinyl frame window with double pane Low E glass where the U-factor is actually more like .35 to .40. Builders who have been installing the popular product have been getting the credit, and thus have been able to either increase their window area or perhaps delete other conservation measures and still achieve equity with Package D. That is one of the key factors that we looked at, is that correct, and why are we there when we could be at a better place.

How to evaluate how to select the new values proposed for 2008. I took the reference house. There are now some new reference houses, but the standard house that we have used to evaluate proposed residential changes has been the 1761 square foot conventional house.

I ran that house in all 16 climate zones using the current Package D values to set sort of the benchmark for where we are now, and then reran them in each of the climate zones with various combinations of U and SHGC factors.

Pretty much starting with that most typical product, the non-metal frame product with Low E glass, and look at how much energy savings we achieved in each of the climate zones trying to hone in on values that worked and achieved positive TDV savings in each climate zone and then compare the net present value of that TDV savings against any incremental cost.

What we've come up with, and I will sort of show you the results before we get into how we got there any further, it looked like a .40 U-factor is cost effective in all 16 climate zones from a mild San Diego to a Lake Tahoe and everything in between.

That proved to be cost effective compared to where we are now. We ended up with three different SHGC values. We maintained no requirement in the coastal and primarily heating climate zones where there was very cooling load because SHGC actually reduces solar heat gain when you want it, perhaps in the winter in Eureka.

Rather than set a number -- now we considered setting a number that you can't go below, but because the standards have consistently said thou shall install a product with this number or lower when it came to U-factor and when it came to SHGC, we thought it would be perhaps confusing to specify in Climate Zone 1 for example that the SHGC would be .50 or .60 or higher.

So, in one jurisdiction, you might be saying it is a .40 or lower and in another one it is a .60 or higher. We considered that, and then we started asking window manufacturers, California window manufacturers what kind of Low E glass they sold because you may or may not know that the common product that we get in California is a low solar heat gain Low E, it has a SHGC value typically below .40, but there are other flavors of Low E glass that give you the reduced U-factor.

The reduced heat loss heat transfer conductively, but aren't low solar heat gain. Unfortunately, I want to say nobody -- I am going to say virtually nobody in California provides those products. Some of them list them in the catalog. We called the biggest window manufacturer in California trying to order some.

Their sales reps either didn't understand what we were asking for or said, yes, we have it, here it is and what they had was really the low solar heat gain product.

I've had builders that I have worked with who have tried to build passive solar homes where they wanted high solar heat gain, Low E, ordered it, were told they got it, and when I went out and inspected the windows, they were in fact low solar heat gain products. It is hard to get in California.

So, we sort of took a pass in Climate Zones 1, 3, and 16 where you don't really want low solar heat gain, but you are probably going to get that. The performance method will give you credit if you have the higher solar heat gain in those climate zones anyway. In the rest of the state, we settled on a .40, which many of the climate zones already have that.

A couple of them that had no requirement, we nudged down into the .40 solar heat gain, and then one climate, Climate Zone 15, the very hot desert climate, thinking Palm Springs area, we went a bit lower with a .35.

We did not full around with the standard

20 percent package area. It seemed that had been widely accepted and applauded by the industry and didn't see any sense in changing that.

Computer calculations, we will still reference Package D. One of the key points, though, is that most conventional aluminum products will not hit that .40 U-factor. There may be a few thermally broken advanced frame technology products that could get close to it or maybe beat it, but normally they won't.

Given that, we will go on to the next slide and here you see the numbers I just alluded to. It is a .40 straight across the board on U-factor. It is a black .40 in the climate zones that already have that in the current standards. A red .40 in Climate Zones 5 and 6 where we believe that the low SHGC is now cost effective, and then over in 15, it got dropped to a .35.

Because there is still an aluminum window industry in California and they serve a purpose, they have a nitch that has migrated. It used to be the low cost production homes, builders all used aluminum windows with the penetration of vinyl products into the marketplace in a massive way. The cost of vinyl came way down, the cost of aluminum have risen faster. There are very few if any production builders using aluminum windows anymore, and the aluminum survivors in that industry have pretty much migrated towards the higher end market, the custom market, bigger houses, bigger windows.

We wanted to see if there was a way to give them a place at the table in the prescriptive method. We understand that most houses using aluminum products will use the performance method, so we took a look at creating a new package that would allow them to participate on the prescriptive level, and we set a .57 U-factor in most climate zones. There was a couple of the more colder Climate Zones 1 and 16 in particular that it just wasn't cost effective.

The goal of this package was it had to be energy equal to or better than Package D. This is not a give away. This is not a handout to that segment of the window industry. This is an alternative where they can if they want to go to their clients and say the Commission allows aluminum windows under these circumstances.

Of course, to offset that higher U-factor, we had to find other energy features to upgrade, and so we ramped up the insulation values in a bunch of climate zones that currently set a nominal 2X4 walls with R-13 were bumped up to R-19, the insulation in ceiling was bumped up. In some cases, the duct insulation was bumped up. I ran and reran the reference house over and over to try and achieve parody with Package D in each of the climate zones.

The aluminum industry say that there are some buildings that need big windows or have high wind loads and aluminum in their estimation is structurally superior. That is what they've told us, so we were looking for a way to recognize that, and we tacked on a requirement that is not an energy rating. That was, the windows to use as prescriptive package would require a LC-25 a light commercial rating. It is a structural design pressure combination rating, and the rating we reference is the AAMA WDMA rating system, and there are experts here in the room who I am sure want to speak who can tell you lots more about the rating than I can.

From an energy standpoint, from an energy conservation standpoint, whether we have that structural criteria in there is irrelevant.

It was really trying to work with the aluminum guys to give them something to work for them. I don't know that it is essential because without that, they still qualify.

So, what happened here is you can see sort of the ceiling lines some of the climate zones that had R-30 got beefed to R-38. Climate Zone 16, the mountain zone which had R-38, got kicked up to R-49. Under the walls, wood frame walls, some of the R-13 values went up to R-19.

The U-factors are .57 in Climate Zones 2 through 15, but it had to come down to a .50 in one and a .45 in 16. Then a couple of them the duct R values got ramped up from R-6 to R-8.

With those numbers in there, virtually every climate zone is on a par with the Package D. There may be a few decimal points difference on some climate zones, but certainly on average, it all works out.

If we can look at the next slide. What you see in this table is climate zone by climate zone. The proposed TDV savings for Package D compared to where we are now in each climate zone in KBTU per square foot per year and the same savings in Package S.

Some of the climate zones you get greater savings in Package S, there I think two of them were at slightly lower but overall it is more than half KBTU tougher than Package D. Again, to reemphasize, it is not a give away, it is not a loop hole, it is not an easy out for anybody to comply with a window that doesn't have the performance characteristics of the Package D product.

The next slide. Getting back to Package D, which is really the heart of the matter because that is the reference package for all compliance for residential, it is what the performance method has to achieve equality with.

Looking at the U-factor aspect of it, the justification for dropping the U-factor from 57, 55, 67, whatever down to .40. We found that there is apparently no cost differential to go to a thermally improved frame, a vinyl frame as opposed to aluminum.

We contacted a number of manufacturers. One of them said we make both. We can give you aluminum for a couple of dollars less a window, but it is going to take you two months extra to get it because we hardly ever make those windows.

That would probably translate into higher cost to the builder.

As I said, most of the remaining aluminum market has migrated to the custom high end. I have talked to some of those people, one of them who builds products right here in Sacramento and has appeared in this room many times. They said not a strict quote, but our windows cost two or three times as much as vinyl. So, there is really no cost differential and really no need to prove that vinyl is any more cost effective.

The reduced U-factors as you saw saved TDV energy in every climate zone, and if there is even a small differential to go to a vinyl product, the TDV savings, the net present value would be overwhelmingly in favor of that.

As I said, production builders select vinyl for most projects. The wood, the aluminum, the fiberglass often are used in higher end custom home markets. By the way, everything I said about the thermal benefits of the vinyl frame apply at least equally to other non-metal alternatives, such as wood, fiberglass, or composites.

As far as reducing the SHGC in the

climate zones that weren't previously set at .40, we looked at Climate Zone 5 and 6 where we chose to drop it. For all the other climate zones that already have .40, 2, 4, and 7 through 15, back during the AB 970 cycle of code changes, Low E was shown to be cost effective then, life cycle cost effective then at an estimated cost of $1.50 per square foot beyond what it would cost for clear double pane glass.

We found a number of manufacturers who didn't even offer clear double pane glass. Their standard product was Low E and those that did told me two things. One, one regional manufacturer quoted me a price of 15 cents a square foot extra. You can see it has come down by a factor of 10 since we introduced in those other climate zones.

The other local Sacramento manufacturer said two or three bucks a window, which pretty much matches up with the 15 cents a square foot. So, there is a very high net present value, even in Climate Zones 5 and 6 that were no requirement before, but do have a cooling load. These numbers are all in the paper, which are on the website.

Our conclusions are as I said, let's set the U-factor of .40 statewide. That is cost effective everywhere. Let's set a low SHGC, but not do it in the non-cooling coastal climate zones, and we set an extra low one in the hottest climate zone, and then we are proposing to create a new Package S for special cases. It is honestly targeting, trying to establish a nitch for the aluminum industry.

May 1 priority make it energy equivalent to Package D, allow buildings to fit into that package with higher U-factors, but require them to upgrade other measures to achieve equivalence. So, that is what we proposing. The Commission has looked at these numbers. We have traded ideas back and forth, it is still a work in progress.

In fact since we published this or since we submitted a measure template to the Commission, I've heard from several different stakeholders with comments. One of them is to -- a minor tweak, looking at Package S, we have a -- this is the new package, we had a .25 U-factor for Climate Zones 11 and 13. I landed on a .30 for Climate Zone 12 because that easily achieved equivalence with Package D.

The suggestion is, make it a .25 in all three of those climate zones because they adjoin each others and the builders and the suppliers and the suppliers and the contractors and the consultants serving those areas overlap. Let's make it consistent at a .25. In fact, that will yield greater energy savings, so that has a certain attraction. Also, it simplifies that we only have two SHGC values rather than three.

The second suggestion was from an energy consultant who said that he looked at the NFRC tables, he looked at some of his product literature, and he thought that .57 was a bit too low for the U-factor for the new Package S and wanted to know if we could tweak that up to .60 to get more aluminum products to fit in there, to give builders more choice. That was his suggestion.

Then another comment that we've gotten in a couple of different ways from a couple of different people. They have problems with the non-energy requirement, the structural rating in the Package S. They want to make it I believe. They would like to eliminate that to make the package more product neutral and avoid reference to standards that aren't the Commission standards. Another entity that may change their standards, which we would have to change.

If we can go to the next slide. My response, this is my personal response, Commission staff will undoubtedly let you know about theirs. I think changing the Package S Climate Zone 12 to .25 would be beneficial. It would give consistency and simplicity and save more energy.

Raising the Package S U-factor to .60 from .57 in the climate zones that have .57, I am willing to look at that. I have time, and I think we have budget in our contract to go back and revisit those numbers, rerun the micro pass runs with a .60 if there is a will to do that.

The third comment is to eliminate the Package S, the non-energy requirements, the reference to the AAMA/WDMA LC-25 rating. I am personally willing to consider it. I think we should have further dialogue with the stakeholders to evaluate the benefits. Perhaps someone from the aluminum window industry will give us arguments why they might want to retain it. Others may have equally valid arguments why they would want to eliminate it.

That is where I am at so far on this. Still one more slide I think. Of course, submit your comments to staff. If you have any questions about the report if you get a chance to read the study and you have questions, you can contact myself or Fred or staff, and I am open to any questions you might have now.

MR. SHIRAKH: Thank you, Bill. Bill has a question for you.

MR. PENNINGTON: I am sorry I was late coming back from lunch. I don't know if you mentioned the notes to Package D.

MR. MATTINSON: Excuse me. There is a handout out on the table that probably nobody's got, and, yeah, it shows the current Package D, the proposed Package D, and the Proposed Package S. Maybe they could run out and grab those or Ken and circulate some of them. It is an excerpt from the report, but very good point.

Package D currently sets the values for the entire building, and in all cases it requires tight ducts to fit in prescriptive Package D type ducts and TXV on the air conditioner which require a HERS field verification by a HERS rater to sign off that stuff was actually installed.

At the time that came into the standards, there was some concern by various parties that there weren't enough HERS raters out there or they would be erroneous and we didn't know the process, and so some footnotes were added to Package D that allowed many climate zones, allowed compliance without HERS verification by utilizing offsetting improvements, and they consisted of lower U-factors and lower SHGC values, and in most cases either a more efficient furnace or a more efficient air conditioner or both.

We believe, Commission Staff and myself believe that we don't need to retain that exception anymore, that it is probably not used much anyway, and at last count, there were over 1,500 certified HERS raters in California throughout the state, and that there is plenty of people there to field verify compliance with the prescriptive Package D has required. So that it is an important deletion.

One other thing that I didn't mention that you will see on the tables is Package S in Climate Zone 1 and Climate Zone 15 where there are lower U-factors because we just couldn't achieve parody within the bounds of what's in that table.

There is an option to upgrade the

furnace efficiency and still use a .57 U-factor. That is the only place we touched anything outside of the normal prescriptive package values. Thank you for reminding me of that.

MR. SHIRAKH: Package D has fourteen footnotes and footnotes 18 through 14 will be eliminated. Any other questions for Bill?

MR. MATTINSON: Mike, do you want to come up here and join me.

MR. HODGSON: I just want an explanation, Bill, on your -- Mike Hodgson, CBIA. Bill, I don't understand in your power point this table, which we could go backwards and find the KBTU equivalence table I think. Yeah, TDV energy savings for new packages, and this is the proposed Package D if you have this on page five on the bottom, it says 2.79 Climate Zone 1, 3.19 Package S. I am unclear what that is.

MR. MATTINSON: The basis for both of those numbers was just a straight compliance run of the standard reference house using 2005 values. That was zero obviously. Each of these tables shows you the KBTU per square foot savings compared to that for the Package D house and for the Package S house.

MR. HODGSON: I see. So, a larger number means you are further above cut.

MR. MATTINSON: The bottom line is that the average for the Package S is more than half a KBTU greater than Package D, which indicates it is tougher.

MR. HODGSON: Okay, thanks for the clarification. Then the base case house was 2008 proposed Package D?

MR. MATTINSON: No. Well, the one in Package D is the 2008 proposed Package D. I must confess that I didn't have the tools with all the bells and wheels for 2008, so I didn't play around with attic ventilation and those things, but we are going to revisit that when I have that software and make sure we are still on track here and we haven't lost anything.

UNIDENTIFIED SPEAKER: (Inaudible).

MR. HODGSON: Okay, all right, because I am curious what that package is, but that is a different issue.

MR. MATTINSON: As I know it so far, it is pretty much the same as it has been with window adjustments and then some fine tuning off on the side.

UNIDENTIFIED SPEAKER: (Inaudible).

MR. MATTINSON: There is water heater distribution things. No, I didn't --

MR. HODGSON: Don't go there.

MR. MATTINSON: -- (indiscernible) of that stuff.

MR. HODGSON: One further follow up clarification, are these tables for Package S applicable to additions?

MR. MATTINSON: I haven't really considered it, but aren't -- why not, I guess. The thing is, to use them, which I think the reason you would want to use them is because you want to put in an aluminum window. Does the rest of your house have all that other stuff, R-49 or R-38 or R-19 in which case you are not there if it doesn't. I think that your introducing a point which is what about all those houses that already have aluminum windows and want to add a couple of more. That is a whole different issue.

MR. HODGSON: (Inaudible).

MR. MATTINSON: Yeah, the addition could comply with the whole package except for the two climate zones where you have to upgrade the furnace to get there I think unless you want to do that, or you put in a furnace for the addition that is 92 percent. What are you asking about additions for anyway. Thank you.

MR. SHIRAKH: Any other questions for Bill? Please come up to the podium please.

MR. FISCHER: Mike Fischer representing Window and Door Manufacturers Association. Can I ask you to scroll back two slides, maybe one? Right there. I guess during lunch time, which for me being from New York was dinner time, I am a little confused about the timing, but I made it through the roast beef.

We talked about this slide, Bill and I did during the break, and particularly the third item, but before we do, I just want to say that it is really refreshing to hear a proposal that actually includes a discussion of the market and the reality of the industry and what is happening. I don't represent more than maybe two or three manufacturers of aluminum windows. The primary membership of WDMA is wood and vinyl manufacturers. Nonetheless, we obviously want to make sure that we keep everybody at the table and not right code that deselects products. I am fighting that with the EPA in California now on other issues. We want to try to markets open.

I think this is a reasonable approach. Therefore, I am pretty confident that given these revisions, especially the third one, that I will be able to sell this to our committee to send in a letter of support on this package. As far as the solar heating package, consistency is huge.

There are a lot of costs and I'll have indirect costs of dealing with these issues, and one of the indirect costs is inventory and streamlining. I think what we are going to find is that has zero cost and only benefit to both the industry and to the energy usage in California for the solar heat gain.

As far as going to the .60 U-factor, I think the appropriate way to deal with that is to take a look at certified products through the NFRC data base and try to determine what are we talking about, what are we bringing in, and what is that going to do the average U-factor.

There are ways to do these analyses, I've done them before to evaluate similar changes to the EnergyStar Program that the USDOE has done, and I know that would be pretty easy to figure that out going forward.

The thing I really wanted to speak on was the LC-25 and Package S. I don't really want to spend a lot of time today talking about all the structural issues, and probably the basic lesson from that is we shouldn't be talking about structural issues today. There are windows sold in the most extreme wind climates in the country in South Florida that are made of aluminum. There are windows sold in that market that are made from wood. There are windows sold in that market that are made of vinyl.

If the Miami Dade authorities are able to develop structural codes that are material neutral, then I don't see any reason why California should do it any differently in an 85 MPH zone.

I think that is important that we eliminate that part of this discussion. Otherwise, we should be talking about other performance features than structural. We should be talking about whether the window is an emergency escape and rescue egress opening, or is it a forced entry. What other things do you really want to bring into this discussion.

There are a lot of other political

reasons why our group doesn't want to see LC-25 brought into the mix in terms of being able to update the standard and not have to deal with what language might be left over in Title 24 in California. So, in order to freely provide upgrades and improvements to the industry standards, we would prefer that those types of ratings do not make their way directly into code language, that they be handled through the reference, which is what we expect concurrently to be occurring with the Building Standards Commission in California adopting Title 24 updates that will include the 2006 IBC that will include reference to those standards.

If there is a LC window under the new IBC --

UNIDENTIFIED SPEAKER: (Inaudible).

MR. FISCHER: LC stands for light commercial. That is a really good question, and the 25 refers to pounds per square foot pressure. In the paper that was presented, the reason for doing this on behalf of the aluminum industry is that represents a structural step up.

Now in the case of California where the wind loads are relatively lower than the rest of the country in most cases, that would be a slight step up, but that window would not meet any code requirements in any coastal areas throughout the Atlantic or Gulf Coast. So, to make a statement that we are moving forward on that basis with a LC-25 rating is really not necessarily a true measure of what it does.

I live in New York State as I mentioned. A few years ago, New York adopted the International Codes it brought in impact resistance requirements in relatively cold climate zones, it required higher energy performing windows on the tip of Long Island in the Hamptons. There are windows being sold there today that meet not only high structural requirements of all frame types, but also the energy performance requirements that are necessary in that climate.

I think the lesson is let's let energy be its own discussion and not drag in other performance features that are going to do nothing but cloud the issues here. If that reference to LC-25 is removed, understand the political reality of the aluminum industry and certainly not wanting to preclude any product from a place at the table, then I am certain I can sell our members on voicing their approval of this proposal.

I would also suggest and actually request that even that letter S be taking away so that we don't have that structural connotation to it. Call it MLEP, I don't care, but you know, let's not try to make a stated implication about a product that is not necessarily going to provide any benefit to the code user.

Other than that, I am glad to see the changes that Bill is recommending here, even if they are on your own personal behalf as you stated. I'll give my own personal approval of those as well. Obviously, I haven't made a phone call between now and lunch to any of our membership, but I am pretty confident I know where they stand on this position. Thank you very much for your time, and, again, my kudos to the group that worked on this in terms of actually listening to the marketplace, and that is a great step. I wish other states would follow this example.

Thanks.

MR. SHIRAKH: Thank you. Any other questions or comments related to residential windows? Boy, this was easy.

Next we are going to move to a bunch of

water heating issues. Jim Lutz of Lawrence Berkeley National Labs, he is going to present, and then we talked about this with Jim, and he is going to stop at the end of each topic and ask for public comments and then move on to the next one.

MR. LUTZ: We were undertaking a bunch of research on hot water and water heating issues for PIER, for Title 24. We got a late start, so what we have here is not maybe a final one, but it is what we could get together in time for this.

There is four measure implementation templates we submitted. They are up on the website. They cover revisions to distribution, system multiplier tables, some requirements for PEX parallel piping, change for tank-less gas water heating, and water and waste water tariffs.

I'd like to start with the next slide. Are there any other slides in there?

UNIDENTIFIED SPEAKER: (Inaudible).

MR. LUTZ: Oh. What he's got is not what I thought I gave him. Can you show all the slides, maybe it I scrambled it somewhere. Oh man.

I wanted to sort of step back and give everybody a view of conceptually of what sort of the different parts of the hot water distribution system. On this we are mixing in water, water heating and energy, and the part that Title 24 covers right now is the water heater itself, the energy to the water heater, and the effects of the hot water distribution system.

Right now, Title 24 doesn't cover the cold water and doesn't cover the energy to appliances that use hot water like dishwashers and clothes washers, so there is a -- there is no provisions for recovering heat or water and using it in the way the house is designed.

What Title 24 does right now is just the water heater and the hot water distribution system, so that is what -- given our time and the late time we got started on the research, we are focusing on changes that we know should be made to the way Title 24 treats hot water now. It leaves out a lot of other things that maybe should be addressed.

The energy use in Title 24, I'll step through a few equations to show this, right now it is the hourly adjusted recovery load that is the energy in the water divided by the load dependent energy factor. We didn't look at the heat pump or the wood stove boiler adjustments. Just these two as sort of a simplifying one.

The next slide. The hourly adjusted recovery load has an hourly standard end use which is the hot water. The distribution loss multiplier which is how different distribution systems, whether it is a trunk and branch or parallel system or point of use, or recirculation system, this is where that gets in.

Again, we didn't look at the solar savings multiplier. We haven't touched that at all. The hourly recirculation losses between dwelling units is for multi-family buildings, we hope to have that. Nehemiah Stone's been working on that. I hope to have that for the next round, but we don't have it ready yet.

The hourly standard end use is the specific heat of the water times the draw volume times the Delta T. The Delta T is assuming hot water use temperature of 135 and the cold weather inlet temperature is assumed to be the ground temperature, and that is what it is for the different climate zones here, and it varies annually.

Since Title 24 is an hourly system, the

daily use is divided up into an hourly hot water schedule. This is not a natural hot water schedule. It is sort of a diversified demand over lots of days and lots of uses or lots of houses. That is the hourly standard end use.

The multiplier is basically one and then for other systems, it is the difference between the end use and that. So, it is added on to the fraction for the distribution system multiplier.

The hourly load dependent energy factor is to adjust the energy factor from the DOE test procedure results to differences because of the draw volumes and to make it match the field use more. So, then that is the background of what is going on in Title 24 for water heating right now.

Then we looked at on the agenda, there were five items: Under Slab Pipe Insulation is the one I will be talking about now. The big question of whether it should be mandatory in soil for any in soil hot water piping. The other question is to make sure that the insulation is installed in a way that avoids water get into it, and avoids insulation degrading.

The multipliers are on the next table. This is in the distribution system multipliers measure information template, so the next table. There wasn't any accounting for piping systems buried in the soil in the current, the 2005 Title 24. Oakridge National Lab has a simulation model. They looked at a range of prototype houses and a range of draw patterns, and came up with a fairly wide range of distribution system multipliers.

I've got those reverse. It should be with insulation is one. The insulation should be up there not down here. If insulation, it should be one, no major change. Without insulation, it is the 3.8. There is a wide range of values, but they are look very bad or quite a range. The impact is pretty bad.

If there is any questions on this right now before we move on to the next one. Yes?

MR. SHIRAKH: I guess the question is the insulation level, you are recommending R-4, correct?

MR. LUTZ: Right, right.

MR. SHIRAKH: Bruce Maeda.

MR. MAEDA: Bruce Maeda, Energy Commission Staff. Is the pipe in direct contact with the soil because my only anecdotal experience on this is the pipes were actually sitting in a rather large one to two inch gravel or rock rather than the soil.

MR. LUTZ: In the simulation models, right now they were done with a range of soil types I believe, but we haven't had any chance to validate or calibrate the model. They are standard heat loss calculations for pipes in soil. We do have some testing going on right now.

Carl Hiller is testing pipes in sand, but we don't have the results yet, so we can't compare the results with the model. The implication is the soil loss, the heat loss to soil, un-insulated pipes in soil is so large we expect it to be cost effective to apply the insulation no matter what he finds.

MR. PENNINGTON: Jim, while he is walking up here, I haven't been watching your research for the last three months, I am sorry if I've kind of lost track of what you are doing a little bit, and I thought that basically the under slab recommendations would ultimately be based on Carl's findings rather than on simulations.

MR. LUTZ: Correct -- well, they will be based on simulations validated with Carl's findings. Right now they did a range of prototype designs system types in tight draw patterns, and in all cases, it was cost effective to use insulation.

MR. PENNINGTON: There was an issue about whether it is a good idea to be running hot water piping under slabs period, right?

MR. HILLER: We will find that out too.

MR. LUTZ: It looks like without insulation, the answer is no.

MR. HILLER: In my lab right now, I have a gigantic sand box filled with 25 1/2 tons of sand inside my lab where I am going to start testing any day now. I just calibrate my instrumentation.

I was just going to comment on that piping in gravel issue. This is Carl Hiller from Applied Energy Technology. Technically, you are not supposed to let the pipe be in touch with gravel because it will expand and contract as it changes temperature. If it is against a hard angular material like gravel, it can wear holes through the pipe. Not that they don't do it.

MR. MCHUGH: John McHugh. Just a quick clarification. For piping that is insulated, you have a distribution system multiplier of 1?

MR. LUTZ: Yes.

MR. MCHUGH: Does that mean there is no heat losses --

MR. LUTZ: No.

MR. MCHUGH: -- because it is being multiplied by your end use?

MR. LUTZ: It means that insulating a pipe -- if you put a pipe in soil and insulate it, it is the same as running pipe somewhere else in a normal system.

MR. MCHUGH: It is the --

MR. LUTZ: It is no worse than a standard trunk and branch system above the slab.

MR. MCHUGH: So, it is assuming that above -- this is un-insulated pipe that might be in a joyce space or something like that?

MR. LUTZ: Yes.

MR. MCHUGH: This HSCU is based on the total end use energy consumption of water heating system including the distribution losses in those un-insulated pipes in the joyce space?

MR. LUTZ: Yeah, that is sort of the Package D of the hot water distribution system.

MR. FISCHER: Jim, how is this multiplier going to be used, is it going to be multiplied against the entire budget or against some lineal foot --

MR. LUTZ: Can you go back one more? There is a distribution loss multiplier that is already in the hot water system calculation, and so what we are doing is saying this number if you are using an un-insulated system, this number is going to be 3.8. If you insulate, it will be 1. The standard distribution loss multiplier is based on the size of the building, number of square foot, so this is adjusting that.

MR. FISCHER: I don't know how accurate this number is, but let's say right now we have a 20,000 KBTU budget for water heating, just to pick a number. It could be 100, it doesn't matter what the number is. Then that budget would go from 100 to 380 if you had an un-insulated pipe in the ground?

MR. LUTZ: No, because part of that budget is for what the hot water is used for. So, this is just affecting the multiplier.

MR. FISCHER: Could you give me kind of a relative feel then of what would happen with the budget with the multiplier?

MR. LUTZ: I'd like to be able to, but I

can't.

MR. KNITTLER: Ken Knittler, Just to answer that question, Mike. Things like recirculating systems have SDLMs similar to the 3.8, so it is going to be more like some of those recirculation systems.

MR. FISCHER: Thanks.

MR. AKBARI: This is Hashem Akbari. Jim, I am wondering whether there is cost benefit on all of this being done like everything else to find out whether the amount of energy saved is being paid back or the investment that it is being made in the additional insulation is being paid back by energy saved in time?

MR. LUTZ: It is. It is in the measure, it is in the template that we submitted.

MR. AKBARI: Can you tell me what is the payback?

MR. SHIRAKH: Mark, can you research that while we continue with the rest of the presentation?

MR. LUTZ: Benefit cost ratios of like depending on the insulation costs by using a couple of estimates somewhere between 4.6 and 7.6, so it is not payback, but it is benefit cost ratio real high.

MR. AKBARI: Thank you.

MR. SHIRAKH: Any other questions on this topic? Okay, let's move on to the next one.

MR. LUTZ: The next one was Tank-less Gas Water Heaters. What we are proposing is a change to the energy factor of tank-less gas water heaters to multiply the energy factor, the certified energy factor by .912.

The tank-less gas water heaters, the current energy factor, the test procedure energy factor, is based on a test that six draws of 10.7 gallons an hour apart in actual use in a house, you are probably going to see more like 20 to 40 draws a day and a lot more smaller draws.

What happens with the tank-less gas water heaters is the heat exchanger cools down between draws, and when you have small draws, the energy to heat up the heat exchangers is going to be a much larger fraction of the energy use, so for small draws, you can actually have a much lower efficiency than you would on a large draw. The test procedure is based on larger draws. The next slide shows this.

This is from a test of a model that Mark tested in the lab at the low volume draws, half a gallon to one gallon, if you haven't drawn hot water -- haven't used the water heater previously, the efficiency drops off dramatically. So, what we are doing is using the draw pattern from the 2005 analysis and sort of dividing it into long -- applying these efficiencies to those draw patterns, and came up with the .91 multiplier. So, this is to correct the tank-less gas water heater energy factor as is already done to account for differences between field use and the test conditions, which is already done for the load dependent energy factor for tank type in the standard right now. This is basically what we are saying on this one.

MR. PENNINGTON: There is a factor for tanks that is similar magnitude?

MR. LUTZ: No, no. The load dependent energy factor for tanks is when you draw over a day less and less water, it is in standby more and more of the time. The load dependent energy factor formula in there accounts for that difference.

What we are saying is instead of using load dependent energy factor for tank-less gas water heaters, you use the rated energy factor multiplied by the .912 to account for the typical draw pattern.

MR. AKBARI: Hashem Akbari, are these tank-less tanks also available in electricity, fueled by electricity or mostly they are gas?

MR. LUTZ: There are whole-house electric tank-less water heaters. I don't know of anybody using them much in California. The drawback on those is to supply a whole house's hot water on a single pass, you need about 28 KW, and that is pretty extensive wiring and rewiring, so it is not likely to be used.

MR. AKBARI: The second kind of follow up question is are these heat exchanges located in the conditioned space or unconditioned space? If they are located in the conditioned space, would the added benefit that they would contribute to the heating of the house at the same time they may add to the cooling load of the house is included in the analysis or needed to be included in the analysis?

MR. LUTZ: By code, they have to have combustion air which is drawn from outside. So, usually they are installed in garage or a basement, and there are restrictions on putting gas-fired appliances in living space. So, the ones I have seen have all been in an exterior wall or outside. So, I don't think the load on the space conditioning is going to be a major impact.

MR. SHIRAKH: Jim, are you done with your presentation? It seems like we are getting to Q & A before your presentation is done?

MR. LUTZ: No, I am done with the tank-less.

MR. SHIRAKH: There is no natural gas, then people can use propane?

MR. LUTZ: Yes, yes, there are propane versions of these available.

MR. SHIRAKH: Jerine, you have a question?

MR. AHMED: Jerine Ahmed with Southern California Gas Company and San Diego Gas and Electric. We had a few concerns about this proposal. I talked to Jim this afternoon about it also. One of them was I had asked him if company manufacturers or manufacturers units were tested, and he said there was only one that was tested.

The standard is applicable to a whole family of tank-less water heaters, so maybe it might be better to do some more testing to find out how the other units perform.

MR. SHIRAKH: Testing in what sense?

MR. AHMED: All these draw schedules that they have come up with is based on one or one model of a single manufacturer.

Then the second concern that I had was these tests were simulated based on real world schedules, where other appliances are tested based on I think the DOE's approved testing methods. I was wondering why is there a change because I know there is some work that is proposed, more research kind of work to come up with the characterization, use characterization of single family homes as well as multi-family homes. Maybe we can wait and see what those results are and try to implement this in the study and see how it effects.

MR. PENNINGTON: Comment on that, Jerine. We have a precedent for accounting for actual energy use for air conditioners as they perform relative to outside temperature that we don't take exactly the result that comes out of the test procedure as the sole determinate of the energy use. We try to account for whatever research information we have related to the energy use. So, this is not the first time we've ever done this. We try to account for the energy use we can explain.

MR. AHMED: In the air conditioners, we do use (indiscernible) values, right?

MR. PENNINGTON: We --

MR. AHMED: And the EER's which is I guess --

MR. PENNINGTON: We model -- for example, there are a lot of air conditioners that don't have EER information readily available. So, in the absence of EER information, we have calculation for how to default to an EER that would apply to those. We calculate expected performance for a variety of temperatures as a function of the SERN and the defaulted EER. We get results for those situations that are substantially less optimistic of what the energy performance of that unit might be than you would otherwise get. That is based on field research that we have done.

MR. AHMED: Are you talking about (indiscernible) values or is it applicable to residential or is it more to the nonresidential?

MR. PENNINGTON: This is a residential

calculation.

MR. AHMED: The other question --

MR. PENNINGTON: I don't know, there are probably other examples where we have done something like that.

MR. AHMED: I know there are some water heater research projects that are proposed to find out what the hot water use patterns are in homes, and I think Southern California Gas Company is proposing one of those projects.

What I am seeing here is maybe we can try to use some of those results which might be more applicable in the scenario.

MR. PENNINGTON: I am not sure when that research is going to be available to us.

MR. AHMED: Right, I don't have a definite date on that.

MR. PENNINGTON: Not this cycle, right? Not this cycle of code changes.

MR. AHMED: No, not for the 2008. I will also try to get in some written comments, and if you are going to have more stakeholder meetings on that, we would like to participate, so we can give our input. Thank you.

MR. SHIRAKH: Is this going to be

compliance option, mandatory, what he is proposing here, what is the change?

MR. LUTZ: It would be a --

MR. PENNINGTON: It is a change to the calculation and the ACM Manual.

MR. SHIRAKH: It would capturing then in compliance options, I mean software.

MR. LUTZ: If you were using a tank-less water heater instead of the standard 40 gallon gas-fired water heater, you would have to use this modification to the ACM calculation.

MR. VERMA: Just like the DXV and (indiscernible).

MR. SHIRAKH: Any other questions on tank-less water heaters? Let's move on to the next topic.

MR. LUTZ: The next topic was Parallel Piping Systems. The parallel piping is where you have a pipe from the water heater to a manifold and then from the manifold, there is a small half inch diameter usually plastic cross link polyethylene 2 to every hot water fixture.

What we want to propose are some requirements, I guess they would be mandatory requirements for this type of system that there be limits put on the distance from the water heater to the manifold that the plumbing distance that only ten feet of pipe be allowed between the water heat and the manifold, and that section of pipe between the water heater and the manifold be insulated.

It turns out a large fraction of the water in the distribution system is in that section of pipe because it is a much larger pipe than the individual ones going off. So, we want to keep that hot as long as possible, so the next draw, even if it is not from the same fixture, will pull from hot water instead of cooled off water. That is what this one is.

MR. SHIRAKH: Is that a mandatory measure that you are recommending?

MR. LUTZ: Yeah, I believe that is how it would be implemented. Then we had a change to the distribution system multiplier, but it is mostly just saying that given the information we knew about the systems and the behavior of the systems going out two decimal points was a little beyond what we could really justify.

So, not changing the multiplier, but adding requirements so that system is done in a way that is adding energy consumption unnecessarily.

MR. SHIRAKH: Questions on parallel piping? Bruce and then Mike.

MR. MAEDA: Bruce Maeda, CEC Staff. How big are the manifolds usually? How much water do they hold?

MR. LUTZ: A couple of gallons or a gallon, something like that.

MR. HOESCHELE: Mark Hoeschele, Davis Energy Group. The typical manifold inside is about an inch and a quarter in diameter and roughly a foot and a half long. So, it is holding a little more water than an one inch "X" line. Off the top of my head, I don't know exact amount.

One comment I want to add to Jim's discussion here is that these measurements were made on sixty house statewide looking at the hot water distribution system layouts before the drywall went up on the walls. So, pipeline and layouts were measured, and we found twenty some houses that had these parallel piping manifold systems, and all these houses, more than half of the water was between the water heater and the manifold. The remainder was between the manifold and the fixture despite the fact that might be 60, 70, 80 feet away.

The advantage of the parallel piping is using the small diameter 3/8 or 1/2 lines. So, this proposal just aims to improve the performance of these systems. The homeowners will benefit also by having much shorter hot water waiting times and less complaints from the builders too.

MR. AKBARI: Hashem Akbari. I just did a quick back of the envelope calculation, the manifold holds about half a liter of water.

MR. LUTZ: Then the pipe between the water heater and manifold is also like one inch diameter, one inch or three quarters, so that is where the bulk of the water is in the system.

MR. SHIRAKH: Mike.

MR. FISCHER: My concern about the mandatory requirement of the ten foot maximum between the water heater and the manifold is the practicality of that. We see a lot of systems that are over ten feet just because you have to have a good surface to put on it for the distribution system and the manifold to go from there. I am not sure how typical it is, it is greater than ten feet, but I can think of examples right off the top of my head that it is. So, I think it is going to be a difficult issue limiting it to ten feet.

MR. LUTZ: What we were trying to get at is usually the manifold is mounted on a wall next to the water heater, you know, a few feet from the water heater. The pipe from the water heater, the manifold, instead of just sort of going straight over, would go way up and then over and then back down. It seemed like a very unnecessary extra length of pipe, so we wanted to try to put some limit on it.

If there is installations where the manifold has to be a long distance away from the water heater, then maybe there had to be some change or something, but what the parallel piping system is designed to do is have a skinny pipe straight from the water heater to each end use.

If you have a lot of pipe between the water heater and the manifold, you are defeating that purpose for that benefit of the parallel system.

MR. FISCHER: I don't know if you guys have noticed, but construction is getting expensive, and we have a very tight efficient use of space in the garage, and water heaters are no longer traditionally right up against the garage wall. They can be placed on side walls, and the manifold many times goes on a large header somewhere, which is entering in through the garage wall, and that distance many times can exceed ten feet.

I agree with you, if you are looping something around and you are not paying attention, but if you are just making an efficient run, I would like to look at some plumbing layouts and make sure that ten feet on a Pec System is sufficient.

MR. SHIRAKH: Say on examples that you are giving a planned view, what would be the distance between the heater?

MR. FISCHER: Maybe 12, maybe 15. I mean it is not 30 feet, but it may not be 10. It is going to be a little bit more than 10. Not frequently either, but there are just those, the Z Lot Lines, which we are doing. We have an unusual water heater placement with a gas line there, and then where this header goes, you know, is where we put the manifold, and that has to have access directly into conditioned space though the attic area, and that can exceed ten feet.

What we would do is we would like to give you some examples and maybe there are some solutions. I don't know the solution, I just think right off the top of my head 10 feet is a problem.

MR. WORL: Rob Worl from the Energy Commission. One of the options to this concern is one of the problems we also noted is that in parallel piping systems, we saw tremendously long supply runs that contractors were opting to run the lines all the way up into the attic, distribute, and then come down to even the first floor.

We opted not to propose any limits on that side of the system because of our consideration to the length to the manifold. So, there may be an option of looking at the other side as well. We have some observations. Carl saw some rather interesting installations, and he may want to speak on that. It is up to him.

MR. HILLER: Carl Hiller, Applied Energy Technology. Mark might want to comment on this too. I went around in the beginning of my work for the Commission and surveyed a bunch of construction sites. I would say that in general, any site that I saw with a manifold distribution system, the manifolds could have had ten feet or less of piping between the manifold and the water heater if that is what they had to do.

Since they didn't have to do it, they didn't do it. I didn't ever see anything where you couldn't do that. I suppose those could rise, but you are better off running the gas line a little bit longer or the cold water line a little bit longer or something to minimize the energy impacts of the hot water lines. Over time, those energy impacts of the hot water line are going to dominate everything else.

Yeah, there are other gains to be had in the manifold systems. This proposal only addresses one piece, a pretty obvious gain at relative low cost and big benefit to everybody.

MR. SHIRAKH: Maybe Mike can identify some examples and we can look at them and see if it is actually possible to reposition the water heater.

MR. HOESCHELE: Mark Hoeschele, Davis Energy Group. I mean I can see Mike's point, but I think there are also in situations where you can put the manifold close to the water heater, I think it might be an option where you want to not consider using that type of system.

Vanguard, who manufacturers both the Pex piping and the manifolds commonly sold, recommends eight feet maximum distance between the water heater and the manifold, and I think that is an important thing to strive for. If you are going to be in a situation where for whatever reason it is going to be 20 or 30 feet, the system performance will suffer.

MR. SHIRAKH: Any other question on manifolds, parallel piping? Let's move on to the next topic.

MR. LUTZ: This is a mandatory requirement on the On Demand Recirculation System Multipliers. Again, Oakridge did modeling for a bunch of different plumbing layouts and a bunch of different draw patterns. In no case did they see an on demand distribution system multiplier effect worse than a standard, so we are recommending that the distribution system multiplier for on demand recirculation systems not be greater than 1. We are saying it should be 1 because we don't know for sure what it should be, but we are saying it shouldn't be greater than 1.

Then we wanted to put some eligibility requirements on it as well, and that was to exclude motion detectors as means of control. If the motion detector is on, it is in the kitchen or the bathroom and somebody walks by or walks into the bathroom and has no intention of using hot water, the pump for the recirc system will come on and fill the recirc system with hot water, even though nobody actually wanted to use that.

So, we are saying that should not be allowed because it over runs the recirc system way too much. The other requirement we were recommending is that there be push button controls in the kitchen in all full bathrooms where anybody is going to want to use hot water, they should be able to call it with a push button control or something similar to it.

MR. SHIRAKH: Questions or comment on recirc?

MR. PENNINGTON: In terms of the half baths, where someone might be using hot water for handwashing, you think this requirement is not justified in that case?

MR. LUTZ: No, it is the other way

around. We said you would want the push button in the kitchen and all full bathrooms. I would make it optional if you want it in the half bathroom, but not required. So, if they really want hot water, they can get it there, but if they don't want hot water and they just want to wash their hands, they don't care as long as the water is not too cold, then they will use just use whatever comes out of the faucet.

COMMISSIONER ROSENFELD: (Inaudible.)

MR. LUTZ: For California water most of the places, no. If you really wanted hot water in that bathroom, you could either wait or you could install a control for the on demand recirc system.

MR. AKBARI: Jim, that actually begs this question. Why are you not recommending to have the cold water distribution system to go through the conditioned or semi-conditioned space because then it is kind of warm or lukewarm and nobody would need to have hot water? A cooler house during the summer too. I am serious about it.

MR. LUTZ: You put it in the attic, you want to insulate it because sometimes you do want cold water.

MR. AKBARI: It is cold water. What we are talking about whether the temperature is 70 degrees or whether the temperature is 45 degrees. 45 degrees may be uncomfortable for washing hands, but 70 degrees water is very very comfortable for washing hands.

MR. LUTZ: We haven't looked at that.

MR. SHIRAKH: I guess we can perhaps consider. Any other questions on demand control?

MR. VERMA: Jim, can you explain what will turn the pump off?

MR. LUTZ: Oh, it turns off by there is a temperature sensor, so when hot water gets to the control point, meaning the recirc line is full of hot water, then it turns off.

MR. VERMA: Thank you.

MR. SHIRAKH: What you are suggesting if somebody uses recirc system, then they have to provide this push buttons in the bathrooms, full baths, but not in all cases if people don't have a recirc system, then they don't have to use this.

MR. LUTZ: If you don't have a recirc system, you wouldn't install this at all. If you had a recirc system that did not use an on demand control system, had some timed temperature system, you get a really bad multiplier for your DSM multiplier, and what we are saying is if you do an on demand system, you want to make sure that the controls are set up this way so they will work appropriately and not --

MR. SHIRAKH: That you don't get penalized as bad.

MR. LUTZ: Right.

MR. SHIRAKH: Any other questions? Then I say let's move on to the last water heating topic, pipe installation.

MR. LUTZ: This is just to make sure that the pipe insulation is installed. The requirement to have it installed is the pipe insulation manufacturers recommend. It actually shrinks a little bit over time so it should be compressed a little bit before it is put on. It is supposed to be sealed and insulated and taped at the elbows just to make sure that it is done the way the manufacturers, the pipe insulation manufacturers, recommend that it be done.

This isn't on the agenda, but we looked at water and waste water tariffs. We haven't included it in any calculations yet or made recommendations for it, but any change that reduces the amount of water that is wasted by people purging cool off hot water before a shower or a long sink draw, we came up with a -- we collected water and waster water tariffs and figured out what the -- we put in a recommendation for the price of that water to add to the calculations when we get to there, but we haven't got there yet. We are just saying here is what the cost of the water is, it is $2.00 per hundred cubic feet.

The next couple of slides are explanations of how we did that. Since we are not proposing changes, we are just saying if we do calculate the water savings, here is how to price it.

MR. PENNINGTON: You are saying indirectly that none of these things that you have suggested so far save water, is that correct?

MR. LUTZ: No, I am saying that we haven't gone through and calculated the water savings that are implicit in the demand system multipliers.

MR. PENNINGTON: That is ahead of you?

MR. LUTZ: Yes, yeah.

MR. SHIRAKH: Any questions on the last

two topics? Mike. Because you are behind Bill, I can't see you.

MR. FISCHER: Is it the intention to put that in the cost effective calculations for water heating? It is, and that is going to be true for what appliances?

MR. LUTZ: It would the distribution system effect of the hot water piping. If you have a long thick pipe between the water heater and the shower and the first person to use that shower is going to drain that entire line to get hot water to the shower so they can use it, and that water is wasted and should be accounted for compared to say a manifold system where you have a skinny pipe with not nearly as much water in it.

MR. SHIRAKH: Bruce.

MR. WILCOX: Bruce Wilcox. Is this for life cycle cost savings, you are not going to do this for compliance in the ACM, put a value on water savings I assume?

MR. LUTZ: Not for the base case, no. It would be for alternative -- yeah. It would be for --

MR. PENNINGTON: There is no current proposal to do that, Bruce.

MR. WILCOX: Okay, I was just trying to clarify. It is easy to do for life cycle cost, but it is not so easy to do -- there is no TDV value for water.

MR. LUTZ: No, we are recommending a constant value for water.

UNIDENTIFIED SPEAKER: (Inaudible).

MR. LUTZ: Any design option that saves water, saves hot water, you should add to the life cycle cost calculations, the cost savings of reduced water use. That is what we are trying to get to, but we haven't figured out how yet.

MR. SHIRAKH: Any other questions or any other hot water topics? Miraculously, no, we are only 15 minutes behind. We might actually have a Friday night.

The next topic is Marc Hoeschele, and he is going to talk about evaporative coolers.

MR. HOESCHELE: Marc Hoeschele, Davis Energy Group, and I am here to talk about Residential Evaporative Cooling, a case study supported by the Southern California Gas Company.

Basically, with evaporative cooling, we have a technology that is very efficient cooling technology with energy intensities comparable to the air handler unit of a standard furnace, so we are talking on the order of .2 to .4 watts per CFM for delivering cooling. It is a very efficient technology, but it certainly has a nitch market in California. Most of the units installed are on existing homes, but as we see the standards improving in the years ahead, the ability for evaporative cooling to meet the full loads of a house improves, and the technology deserves to be fairly recognized for that.

What we are doing with this is basically cleaning up within the ACM how the technology has been handled over the years and what has happened with the January raising of the SEER efficiencies to 13 and how that has affected evaporative cooling.

The technology is clearly best suited for dry climates which is most of California. The lower design wet bulb temperatures, the more favorable the performance of the system.

This is a simple schematic of your standard direct evaporative cooler, which in the past, people have associated with swamp coolers and low quality equipment. The quality of the hardware is improving. In this schematic here, what we see basically is a blower, a pump for circulating water from the sump at the base to the evaporative media on the sides, and a float system for refilling the water reservoir.

The evaporative cooler is 100 percent outdoor air system, so you are pressurizing the house, so you have to relieve that air. You can exhaust it into the attic, which gives you benefits in terms of keeping the attic cooler and you are typically moving more air than with the standard air conditioner to get your cooling benefit because the supplier temperatures are typically higher.

Supplier temperatures will vary with the outdoor conditions. The lower the wet bulb, the lower supplier temperatures.

Two-stage evaporative coolers are products that have been around for several years. There in increased interest in the technology. What you are doing here basically is adding an indirect heat exchanger upstream of the direct media, the direct media being where you evaporate the water directly into the supply air stream.

The indirect heat exchanger pre-cools the air before it reaches the direct heat exchanger, and this allows you to get low temperature air out of the system and also slightly less humid air, so it increases the cooling capacity and the capability to achieve comfort.

On a cycro-metric chart kind of diagram some cooling processes here. For those of you familiar with this, on the bottom access it says dry bulb temperature. On the sloped access on the left is wet bulb or dew point temperature, and on the right hand side is basically the pounds of water contained per pound of dry air.

The green line on the plot shows what a standard air conditioner would do in terms of taking return air at 80 degrees and 50 percent relative humidity and sensibly cooling it, again, depending on the conditions in the house, but sensibly cooling it down to the dew point, and then condensing some moisture out of the air stream.

In this example, we are taking 80 degree air, 50 percent relative humidity to the house as we follow that line to the left supplying 55 degree air that is roughly saturated. This is the green line here, so this is return air condition.

When we go through the cooling coil, we've cooled it, condensed the moisture out, and we end up at that condition.

A direct evaporative cooler as denoted by the blue line here is an outdoor air system, so we are not dealing with return air, we are dealing with outdoor air. In this case, 100 degree dry bulb and 70 degree wet bulb. With a typical 85 percent effective system will take you 85 percent of the way to the wet bulb temperature, and you will get air delivered to the house at approximately 75 and close to 90 percent relative humidity.

The two-stage cooler first does the indirect stage where you pre-cool the air without adding moisture, so you are just sensibly cooling, and then you go through the direct stage so the air entering the direct stage is cooler and therefore is able to absorb less moisture in the direct stage. You get cooler dryer air to the house. This contrasts the different system types.

What has happened with the federal change to 13 SEER is what was before a credit for evaporative cooling has now become a penalty under the 2005 standards. So, prior to 2005, the standard package house at a 10 SEER air conditioner, a direct evaporative cooler was modeled with an 11 and the indirect direct was a 13, but now with the change, we have a situation where there is no credit left for evaporative cooling. That was the main goal of this was to address that situation.

As well as there a new change in the appliance standards has been the addition of evaporative cooling to the appliance standards where products sold in California must be tested and listed. At this time, there is no minimum standard, but the Commission effective January of this year was interested in getting data from the manufacturers to know how these systems perform so that we could move to a standard at a future time.

Equipment to be sold in California must provide saturation effectiveness or cooling effectiveness, and the distinction being whether it is a direct or an indirect direct system. The total power of the unit when it is operating at full speed, the air flow rate at .3 inches of static pressure, and then from there, we calculate and evaporative cooler efficiency ratio, which is basically taking the cooling capacity under these test conditions which are 91 degree dry bulb, 69 degree wet bulb, and dividing that by the total system power.

As well as that, the manufacturers are to list the type of evaporative media used in their particular system. With the rigid cellulose being the high performance media that gives you higher effectiveness and higher performance.

The approach of this effort was to suggest changes in the performance method. We are not proposing any mandatory changes, but we want to propose a methodology which uses the Title 20 listing data primarily the system air flow and effectiveness and working with Ken Knittler at Intercomp and support from PIER, we developed an hourly algorithm that was implemented into the micro pass 7 model.

We also wanted to, given the high real world efficiency of these systems, we wanted to keep an eye on the integrity of Title 24 and be sensitive to the fact that high credits could be a problem and how trade offs are used. Not only for diminishing the performance of the rest of the building envelope, but also what the implications are for the performance of the evaporative cooling system.

If you degrade the windows, use lower solar heat gain co-efficient, or higher solar heat co-efficient windows, or more windows, you are hurting the performance of your evaporative cooling system.

We also wanted to take into account the fact that water is an issue that is important and will become increasingly important in the future, and we wanted to make strides in the direction of improving the water efficiency of these systems.

This is probably a little hard to read, but this is a simple flow chart of the algorithm that was implemented in the micro pass model.

To run through it verbally, each hour the program will calculate the hourly cooling load and simultaneous with that, it will calculate the capacity of the evaporative cooler system that the user has input into the program.

The user has entered effectiveness and air flow level for a particular evaporative cooler. To recognize the fact that evaporative coolers do add moisture to the indoor air and do raise the indoor humidity, we needed some proxy to represent conditions when the evaporative cooler may contribute to unfavorable indoor humidity.

What we have is a outdoor wet bulb filter. Any hour the wet bulb exceeds 69 degrees, we would not allow the evaporative cooler model to generate a credit for that hour.

The middle decision point here is asking whether the capacity of the evaporative cooler is greater than the hourly cooling load. If it isn't similar to the wet bulb filter, we are going to run the standard 13 SEER air conditioner model for that climate zone. So, for that hour there would be no credit generated for the evaporative cooler.

If the wet bulb is less than or equal to 69 and the cooler has sufficient capacity, then we would calculate an energy use for the cooler based on a fixed EER assumption. We can also run a true hourly model where we utilize the power input of the cooler, the Title 20 listed power, but that generates the significant credits that we are concerned about, so we wanted to come out of this with credits comparable to what was originally set up with the 11 and 13 assumptions relative to the 10 SEER prior to the raising of the Federal SEER level.

This fixed EER, which I will talk about

more in a minute is then used to generate an energy use for that hour, and from there, we calculate the time dependent evaluation and go through the hourly model for each hour of the year.

Each hour as the weather conditions change, the cooling capacity of the cooler will change and the model will determine whether a credit is calculated for the hour.

The benefit of this approach is that we are modeling a real piece of equipment relative to the loads of that house and the climate and so we are getting pretty accurate feedback on the performance of the system, when it will meet the load and when it won't.

MR. PENNINGTON: Can I ask a question, Marc, on that logic diagram? Will there be cases where the wet bulb, the outdoor wet bulb is less than 69 and the evaporative cooler would be adding more humidity to the inside space than you really want?

MR. HOESCHELE: That is certainly possible. That is one limitation of any of these models is accurate moisture balance inside the house and transfers through the envelope. So, you know, the 69 is a little bit arbitrary. It is the Title 20 wet bulb condition that is used for the testing. It will vary in some climate zones and the current weather, there are a fair number of hours over 69, and in some climate zones, there aren't. It is a point that there will be conditions where the system will be running a lot at more favorable conditions, and you might have humidity problems. That is just a tough nut to crack.

MR. AKBARI: Marc, around that line, it is also important to note that there are two ways that water is being transferred to the indoor. One of them is through the evaporated water in the air stream. Then the other one is through the droplets of water that goes through the filters. There have been studies, at least my literature review is about 15 years old I have to admit that, but there is studies showing that the droplets that are moving along side the stream of the air carry about the same amount of moisture that is being evaporated into the air stream. So, you might want to look into that looking at the models.

MR. HOESCHELE: Is that with different

media types, you know, Aspen Pads versus the rigid media? I mean I am just curious.

MR. AKBARI: I made my observation over a comment condition that my literature review is about 15 years old, so please take it with that.

MR. HOESCHELE: This is trying to get a cross idea of how the hourly model will work, and it is a little bit of a simplified representation, but what we have on the X access is outdoor dry bulb temperature and the Y access is hourly cooling load, and the dots are micro pass projected cooling loads for a 1,600 square foot house.

There are two lines shown on here, and one for -- this is not terribly quantitative or rigorous, but it is just supposed to demonstrate how the model works conceptually. So, I have shown two lines here, one for a single stage or a direct evaporative cooler and the orange upper line is for a two-stage direct/in-direct which would have typically have higher capacities. That is the whole idea.

What we are showing here is how the capacity in this example I am assuming linear, but this into taking into account outdoor wet bulb, but how the capacity would fall off with raising temperatures. Hours above either of these lines, depending on which unit you are looking at being modeled, would indicate what hours of the year there wouldn't be credit generated using this algorithm. So, that would be cases where the load is greater than the capacity for that hour.

Additionally, I've shown some circle points here which maybe conditions where the wet bulb is greater than 69 degrees, and those would be additional points where you wouldn't get any credit from this approach.

In this methodology, using an fixed 11 SEER, and I am using the term SEER generically here, but using 11 SEER for direct and a 13 for indirect direct and running it through the algorithms, these are the type of credits we would generate on an annual basis in the cooling climate zones. Climate Zone 1 isn't shown, so we have for direct evaporative coolers Zones 2 through 16, and indirect direct on the right here.

The blue line is the reduction in the cooling budget, the darker red line is the reduction in the total cooling water heating, heating budget. So, direct evaporative coolers are generating about on average a 10 percent credit, but it is going to vary by climate zone and cooling. Indirect direct are I think 29 percent is average, but again, Climate Zone 14, the dry desert, you are going to get the biggest credit here.

In terms of total budget impacts, it is roughly -- let's see, cooling budget 9 percent direct, and roughly 26 or 27 indirect direct. The total budget is up to 19 percent in Climate Zone 14.

MR. SHIRAKH: This was relative to SEER 13 you said?

MR. HOESCHELE: SEER 13. These credits are comparable to what was originally in the standards when we had a 10 SEER air conditioner minimum 11 SEER direct evaporative cooler and 13.

What we do gain with this is an approach which will take into account the sizing of the system relative to the loads. The previously slide where we had those two evaporative coolers superimposed. If you put in an undersized or an inefficient low effectiveness cooler, your credit will be significantly reduced.

In terms of eligibility criteria, we are requiring Title 20 listed equipment. Right now to our knowledge, there are two manufacturers who have listed equipment with the Energy Commission. The equipment must be permanently installed, no portable coolers would be eligible for credit.

Automatic thermostats and relief are required consistent with the current requirements, and automatic relief is barometric dampers in the ceiling preferably or exterior walls to relieve the air.

The duct system is shared with an air conditioner or a furnace requiring backdraft dampers to make sure you are not blowing heated or air conditioned air up through the evaporative cooler if it is a roof mounted unit.

No bleed systems are allowed. Those are most commonly installed. Some jurisdictions are starting to eliminate them. We are going to require a pump out system, which operate on a timer to pump the water out after six hours of operation of the system. These are more water efficient than bleed systems, and bleed systems aren't terribly reliable to begin with anyway.

The sump overflow line basically the evaporative cooler has a line, a pipe penetrating the water sump that serves as an overflow and we want to make sure that line is visible to the homeowners in case the float valve is improperly set, so you don't have a situation where you are just dumping water. The final is to have a maximum 3/8 inch water supply line to the unit.

In summary, we strive to develop a model which gives us more accuracy in how an evaporative cooler is modeled and takes into account how the system is sized relative to the load and the climate and delivers appropriate credits.

The credits I showed before on that bar graph are going to vary with the size of the system and the efficiency of the system. That would have to be taken into account in the design, and you would get feedback from your compliance run on how the unit will perform.

We strive to keep the credits in a level where they are reasonable, but still offer an incentive for the technology, especially as we move to the future and evaporative cooling may become an approach that makes more sense for a broader spectrum of the market.

Finally, on the water side of things, we have eliminated bleed systems, required the pump down, have the overflow line visible to the homeowner upon installation of the unit, and the methodology in itself rewards more water efficient systems by generating higher energy credits.

Systems with rigid media are more effective and therefore have higher cooling capacities and lower water use per BTU delivered. Those units would get a bigger credit than less efficient Aspen Pad systems.

MR. SHIRAKH: Questions for Marc?

MR. PENNINGTON: Was any consideration given to limiting the size of any conventional air conditioner that might be installed in the same house if you have an evaporative cooler that is generating credit?

MR. HOESCHELE: No. I mean I guess the standard approach, thinking of Palm Springs and that area where bill systems are more common, is that you utilize the system in the shorter months to do the cooling for 60 percent of the cooling system. In the middle of the cooling season, you are relying on the vapor compression system, and therefore, you would need the full sizing on that.

MR. PENNINGTON: The other question I had was I know the water agencies have been concerned about evaporative coolers. Where do they stand now on reviewing this proposal?

MR. HOESCHELE: I know Ram received something from the California Urban Water Conservation Council.

MR. VERMA: Yeah, I received a letter from them today, and they want to limit that water use to three gallon per ton hour. That is their main concern.

MR. PENNINGTON: Is that feasible?

MR. HOESCHELE: I think that is too low. I mean one situation, with the discussions with the California Urban Water Conservation Council prior to this, there isn't a lot of data out there on water use and our point of view was that this is something that I mean we need to collect data from the manufacturers on this before we set a standard, so our suggestion was that the Title 20 process should address water use in more detail. I mean to set a standard at this point without enough information, is difficult.

MR. PENNINGTON: You are suggesting hold off on this compliance credit until we have a couple of years of Title 20 data?

MR. HOESCHELE: On the Title 24 credit?

I think the situation unless you want to provide a dis-incentive to evaporative cooling. I mean the current process doesn't work with negative credits, so the goal of this was to get back in line to where we were before.

MR. PENNINGTON: I guess the answer to my original question is we don't have a resolution yet with the water agencies?

MR. VERMA: We have a person here from the water agency. Yeah, please.

MR. KURKA: Hi, my name is Karl Kurka, I am the Assistant Director of the California Urban Water Conservation Council. Yes, we do sense some comments today on the evaporative coolers, direct evaporative coolers. We are suggesting that as part of the eligibility criteria that a minimum water efficiency for these units should be three gallons per ton hour for a 1,600 square foot prototype home.

This is based actually on the calculations prepared by Adobe Air in the Appendix B of the report pertaining to direct/indirect coolers, which shows that the calculations that they did, that indeed they could meet that standard or meet that efficiency for a 1,600 square foot home.

We note that on a perfectly water efficient system, it would take 1.4 gallons of water per ton cooling hour and we are looking at three gallons per ton cooling hour, so that is only about 50 percent water efficient.

We don't know of many features on these systems. We appreciate this, it's not a non-bleed system, and we are starting to make some efforts at making them more water efficient, but there are probably other things we can do, in particular, the sump flushing or the sump dumping on the units is based on time when really the parameter of interest is water quality. You need to flush the sump on these so that the water doesn't get too high in total dissolved solids.

The units are going to be set to dump on just a run schedule. We know from doing research on cooling towers, we found that cooling towers are typically set at a level three times greater the cycles of concentration of flushing that they do are three times greater than necessary. There may be potential in reducing the flushing frequency and still allowing the units to get the necessary water quality that they need.

If we can't base the dump cycles or the flushing on some sort of water quality, which incidentally we have a large statewide program starting to go on in this state to retrofit cooling towers, commercial and industrial cooling towers around the state, to try to make them more water efficient by installing a flushing conductivity, making the cooling tower cycle based on the ionic concentration in the cooling tower water.

So, we are already doing a retrofit program, so we are just kind of leery if this becomes really widespread throughout the state, another water using device and, in fact, it is going to coincide with the largest peak demand for water usage for these devices will occur at the same time that the water peak demand for water will occur during hot days when people are irrigating like crazy.

MR. PENNINGTON: Can I ask a question about the control you are talking about for cooling towers?

MR. KURKA: Sure.

MR. PENNINGTON: Is that a control that is reading this concentration continuously and --

MR. KURKA: I'm not our technical guy, so I am not exactly sure, I think they call them conductivity meters. Maybe this isn't feasible for a residential device, but we should talk about -- I know in the eligibility criteria, you have a maximum time not to allow dumping to occur, but there probably ought to be a minimum time. Maybe we can still base it on time, but that could be tweaked so that we are not wasting more water than we need to be.

I just had two other comments on the eligibility criteria. One is that we could go to a quarter inch diameter water supply tubing. I think it is 3/8 inch right now, and we would like to see some type of excess flow valve in case the sump refill mechanism fails or leaks.

I don't exactly know what the mechanism that is used in these devices to refill the sump, but if it is anything like a float system in a toilet tank, those leak all the time, and when it is in your home, you might be more willing to fix it than if it is outside and you never see it.

If there is some type of automatic shut off in case the water supply mechanism fails, that would be excellent too. Those are my comments.

MR. SHIRAKH: Okay, thank you. Hashem.

MR. AKBARI: I have a question. I am wondering whether there is any else issue concerns regarding the growth of mold and mildew in an evaporative cooling system, whether both on the positive and negative side that is being studied in promotion of this measure?

MR. SHIRAKH: Do you want to take that, Marc, or someone else?

MR. HOESCHELE: Yeah, specifically, I can't really address that. I know typical maintenance procedures involve start of season and end of season. You know, media cleaning and some cleaning. I think typically additives aren't recommended for evaporative coolers, but Yun Kim from Adobe Air might be able to shed some light related to water quality in the sun.

MR. AKBARI: No it is not related to water quality, it is related to the mold and mildew and the air that is being pushed into the conditioned space when people breathe.

MR. KIM: I think that actually deals with condensation inside, when you have water that has been evaporated into the air, then the mildew problem is not really should be a concern.

MR. PENNINGTON: I didn't understand, could you say that again.

MR. KIM: I believe that mildew forms because of moisture that condensating, condensation, not because of the evaporative in the air basically.

MR. PENNINGTON: If you have a cold surface, it is going to condense on the cold surface?

MR. KIM: Right. That means you have to reach the dew point inside a house, which relatively is low and it is hard to reach a dew point inside a house unless you are in the winter time and you don't have any heating.

MR. SHIRAKH: I guess what he is saying direct/indirect, the air doesn't get introduced into the house, it is used to pre-cool --

MR. KIM: No, it kind of relates to the question that you asked earlier when you have entrainment which is water carry over, then basically you are introducing water droplets into the air inside. In that case, yes, you will have to be worried about the mildew problem. When you have correctly sized and designed evaporative system in your house, you shouldn't have any entrainment problem.

The entrainment problem will happen when the cooler is not maintained properly and the size of the air from outside gets reduced because of the calcium build up, then you will have to worry about the entrainment problem and the mildew problem.

MR. AKBARI: A recent observation that I had -- not recent, but last summer observation by visiting Department of Defense facility that had several evaporative coolers on the roof and in some of the areas of those roofs, it was really significant growth of mildew. That air was being blown right into the space and no wonder there were a lot of concern and a lot of people inside the zone that were constantly complaining and coughing and they didn't know what was the reason for it. That is only an observation.

MR. KIM: I think that the mildew problem they had is because of a leak they had on a unit, not because of the actual function of the evaporation.

MR. AKBARI: You are definitely right.

MR. KIM: My name is Yun Kim with Adobe Air. If I may, I think you were earlier asking about the excessive humidity level even if you are below 69 degree wet bulb temperature. The usual average humidity level inside a house when the evaporative cooler is sized correctly should be around 60 to 70 percent.

Right now in this room, the humidity level here is 50 percent, so that gives you an idea of what kind of humidity level you are dealing with. If you install the evaporate cooling for that, then that is a different story, you will have a relative humidity of excessive 80 percent and you will probably feel uncomfortable.

MR. PENNINGTON: You are saying normal condition for an evaporative cooler in our climates, you have a 60 to 70 percent relative humidity?

MR. KIM: Right, 60 to 70 -- yeah, that is correct.

MR. PENNINGTON: Is there any sense of what is the healthful level over long term?

MR. KIM: I think that the recommend that the humidity level inside a house I believe is 40 to 60 percent that is the recommended level.

MR. PENNINGTON: So, this is outside that bound on average for a good number of hours of the year, is that accurate?

MR. KIM: I'm sorry?

MR. PENNINGTON: If you are at 60 to 70 percent, and you are trying to be less than 60 percent, well presumably you have some hours beyond 60 percent. You know, I am trying to understand.

MR. WILCOX: Bruce Wilcox. I don't think there is any upper limit on humidity that specified for health reasons. There are a lot of people -- there are many millions of people who live in climates where it is above 80 percent all the time. It is not a problem.

MR. KIM: I think a call from the water conservation group spoke about them, the water usage limit of they are putting three gallon per hour per ton. So far, we don't have any unit that can perform three gallon power per ton, including ICM units period.

Basically, when they introduce three gallon per hour per ton, that means any evaporative cooler will be denied of any credit. We supplied the data to the last meeting with the Water Conservation Group with Marc Hoeschele presenting. Our worst performing evap cooler is evaporating and dumping water at the rate of 7 1/2 gallons per hour per ton, and the best unit or best performing, most efficient unit was in between three and four gallon power per ton.

We are actually very willing to work with the Water Conservation Group and come up with a certain numbers that we can all agree on. I think last time we agreed that Title 20 should handle the limitation of water usage, which we are actually in favor of that suggestion.

MR. PENNINGTON: So, it is not a trivial thing to change Title 20 to regulate the water usage. You've got to wait until Title 20 gets changed. Might be a problem.

MR. KIM: Also if I may, basically evap cooling depends on the wet bulb temperature. That basically sets the limit or the maximum cooling that the unit can supply. So, when you have a 69 degree wet bulb temperature, that means when the unit is 100 percent efficient, then it is going to supply 60 degree of air to the inside.

Evap coolers that the efficiency ranges from 70 to 90 percent. With ICM units added, we can go up to 95 to 100 percent. So, with that information, I think the Title 20 sets the limit or the test condition to be 91 degree dry bulb and the 69 degree wet bulb temperature which is not really favorable condition for evap coolers.

Normally in Phoenix or in dry climate zones, the wet bulb temperatures will range from low 60's to mid 60's. That is going to change the efficiency of the cooling dramatically. The unit that we have, for example, our whole house cooler, it is going to depending on the weather condition will produce SEER A70, that is maximum, to SEER probably 15 at the very humid days.

When we set the SEER rate for the evap coolers to say 11 or 13, it would not be fair in our point of view condition to be compared to an AC system or energy credit program.

MR. HOESCHELE: In our template, which is posted on the web, we have some monitoring data from studies that we've done, mostly in the mid to late 90's and we have indoor RH monitored in those houses. These were all older houses, you know, not very thermally efficient. So, we would expect the cooler would run more in these houses.

There about 20 or 25, and it averages probably in the low 60's relative humidity during times when the cooler is operating, not including times when it was off, ranging from 50 and in one house up to 74.

Related to Karl's comments, the three gallons per ton hour and Yun was talking about this too, I mean, it is a difficult number to set because we need a point to specify at and the industry doesn't have this kind of data to my knowledge at this time.

It just seems -- I understand the water concerns and the need to advance that, but the reality is that evaporative cooling is very much a small nitch technology at this point, and to set it back further, it just doesn't seem like the right decision to me. I think we need the data to make a decision on, you know, what this level should be.

The analysis Adobe did, they found 3 gallons or 3.8 gallons per ton hour at one condition, but 8 gallons at another, so, you know, where do you define that.

MR. MAEDA: Bruce Maeda, Energy Commission Staff. Joe Wang of LBL has expressed some concerns about our weather data, especially with regards to its wet bulb numbers and the accuracy of those numbers. I think partly because in 1992, they were adjusted. The adjustment was primarily based on dry bulb adjustments, and then I am not sure how the wet bulb adjustments were done.

Also for the nonresidential situation, for the local weather adjustor, there is an adjustment for wet bulb, which I believe maintains the wet bulb depression, which is arguably -- well, it is arguable where you should do that or maintain (indiscernible) or something in between.

At any rate, Joe has expressed concern about specific values of the results in our weather tapes about wet bulb temperatures. This is not very important prior to some recent situations such as Saprias System and now evaporative cooler analysis as to whether those numbers are accurate or not.

In fact, I believe Joe thinks that many of those numbers are quite high in several climate zones. So, they are inappropriately high, so you may be getting some unusual numbers coming out in the analysis. So, we probably need to reexamine the wet bulb numbers in particular for the weather data files.

MR. SHIRAKH: Any other comments related

to evap cooling?

MR. VERMA: This is Ram Verma. I would like to respond to the comment. Right now, anybody can use evaporative coolers, they can use 7 or 8 gallon per ton hour. With this compliance option, it will actually improve water conservation because there are so many requirements for this particular area.

Their number 1.4 gallon per ton hour is based on totally operation. It doesn't include flushing. Even in an ideal case, if you have equal amounts of flushing for 1.4 times 2, that is very close to 3 gallons per ton hour. That is kind of an ideal case I think.

Practically I think 4 to 5 gallon we should fall like that kind of number, 4 to 5 gallon per ton hours. We are willing to work with the water agency and will come up with some number which is more reasonable.

MR. KIM: The 1.4 gallon per ton hour, if it was just considering the evaporation rate that also depends on the weather data. In different wet bulb temperature, the outside temperature, you will have a different evaporation rate. So, you have to define the weather condition first and set the efficiency, the water efficiency level I would suggest.

MR. VERMA: 12,000, why 980, 12,000 BTU's is one ton?

MR. KIM: Right.

MR. VERMA: Why isn't 980, so they came up with like 12 pound which is about 1.4 gallon.

MR. KIM: I see. I thought we were dealing with the sensible cooling down, 12,000 ton. So, 12,000 latent doesn't really mean anything.

MR. VERMA: Yeah, but this is how they came up with the 1.4 --

MR. SHIRAKH: I suggest we carry this conversation in off line. I think we need to work to come up with some resolution. Any other evap cooling questions? Seeing none, I am going to move to the last segment which is the public comment. How many people are planning to make public comments? Just Pat, okay.

MR. EILERT: I suspect there will be another comment when I am done here. I'm just today reviewing a brief case study by NRDC. NRDC is proposing that in residential housing that the option for dimming be removed in hallways and bedrooms.

Noel Horowitz makes a couple of points which seemed pretty logical to me. By the way, I am Pat Eilert from PG&E. The first is that dimmers will more often than not be chosen in houses since they are cheaper by builders.

The second point that he makes is there is really no study to support the idea that there is significant savings from dimmers in houses.

On the negative side, there is some danger that people who had dimmers will shove fluorescence in those sockets and damage them. Noel Horowitz has some energy savings calculations here based on 2, 3, and 4 hour scenarios per day. It seems pretty logical to me. So, I just wanted to put this on the table. It seems like a fairly case study that we should discuss.

MR. SHIRAKH: You convinced Mike and Chad, we will go along with it.

MR. ROODVOETS: I am Dave Roodvoets, and I represent SPRI. Talking about roofing just a little bit more today if we can, just to go back and Hashem has left I guess unfortunately. I think he has been highly criticized about some things that may not need as much criticism as he has received.

One of the things that has been said by several and SPRI recommends that if CEC revises the insulation requirement that the economic justification for cool roofs be reevaluated. We think that is critical in that scenario.

Several discussions on cost have occurred. With slope roofs, there are several no-cost options out there. They have been there. These options may end up replacing existing products in the California market with other products for the same or less installed cost just to start with.

Many of the current non-sheet membrane products, that is products that are fabricated on the roof, are replaced every ten years, sometimes even more often. These roof systems with short lives cost as much or nearly as much as sheet membrane systems combined with the prescriptive requirements of Title 24 that last 15 to 30 years. So, there is some issues that may need some more looking at.

A large loop hole now exists in the 2000 version of Title 24 based on current interpretation which allows reroofing without increasing the roof insulation to the present code level for new construction. This interpretation misses a great opportunity for increasing the insulation and creating savings in heating and cooling requirements.

SPRI and DOE have funded some pretty extensive research on these that verifies the ballasted systems provide equal energy savings and reflective cool roofs. Although, they do not prescriptively meet the requirements, the systems meet the goals of the program. That is, reducing the use of energy for cooling.

Also I would like to say that SPRI members that manufacture sheet membranes have responded to Title 24 Roofing Prescriptive Requirements by increasing capacity, and if product available that meets the prescriptive requirements at very competitive costs.

Just thank you for your time. I think you've got a good cause, keep it up.

MR. SHIRAKH: Thank you. Any other public comments. Mr. McHugh.

MR. MCHUGH: John McHugh. Related to the NRDC proposal, I think one of the other things that for residential lighting that should be considered is an alternative to hard wired lighting is compact fluorescence that have a different base that can be screwed in, but cannot be replaced with an incandescent. I know that there has been some work in the past on a different socket and mechanism on the lamps so that we can get the benefits of replacing the compact fluorescent and its ballast allowing different wattages of lamps in the same fixture, etc.

MR. SHIRAKH: I think they exist and language allows that. Basically this allows Edison medium based, what is that 2614 or something which is the medium base. If you have a different lamp that has a different base, that should --

MR. MCHUGH: Oh, okay. Okay, great, thanks.

MR. SHIRAKH: Any others? Seeing none, thank you for coming to the workshop. As I said yesterday, we are probably going to have another workshop in mid July. We will run the dates by all those who are interested and make sure there are no conflicts and we will confirm them, and then we will announce it. Thank you.

(Whereupon, at 4:55 p.m., the workshop was adjourned.)

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CERTIFICATE OF REPORTER

I, CHRISTOPHER LOVERRO, an Electronic Reporter, do hereby certify that I am a disinterested person herein; that I recorded the foregoing California Energy Commission 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 business meeting, nor in any way interested in outcome of said matter.

IN WITNESS WHEREOF, I have hereunto set my hand this 1st day of June, 2006.

Christopher Loverro