STAFF WORKSHOP

BEFORE THE

CALIFORNIA ENERGY RESOURCES CONSERVATION

AND DEVELOPMENT COMMISSION

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| In the Matter of: | ) |
| | ) |
| 2008 Building Energy Efficiency Standards | ) Docket No. |
| | ) |
| Re: Goals, Plans and Expected Scope | ) Residential |
| | ) |
| | ) |

CALIFORNIA ENERGY COMMISSION

HEARING ROOM A

1516 NINTH STREET

SACRAMENTO, CALIFORNIA

MONDAY, OCTOBER 24, 2005

10:02 A.M.

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

COMMISSIONERS PRESENT

Arthur Rosenfeld, Associate Member

STAFF and CONTRACTORS PRESENT

Elaine Hebert

William Pennington

Mazi Shirakh

Randel Riedel

Smita Gupta

Martha Brook

Charles Eley
Architectural Energy Corporation

Snuller K. Price
Energy and Environmental Economics, Inc.

Jon McHugh
Heschong Mahone Group, Inc.

Ron Hofman
Office of the President
University of California

Dave Watson
Lawrence Berkeley National Laboratory

Bruce Wilcox

Max Sherman
Lawrence Berkeley National Laboratory

Ken Nittler
Enercomp

ALSO PRESENT

Matthew Wheeler
Connerly & Associates, Inc.
Roofing Contractors Association of California
California Building Officials

ALSO PRESENT

Hashem Akbari
Lawrence Berkeley National Laboratory

Robert Raymer
California Building Industry Association

Gary Fernstrom
Pacific Gas and Electric Company

Douglas Mahone
Heschong Mahone Group, Inc.

Mike Hodgson
ConSol
California Building Industry Association

Joe Huang
Lawrence Berkeley National Laboratory

Noah Horowitz
Natural Resources Defense Council

Carlos Haiad
Southern California Edison Company

Danny S. Parker
Florida Solar Energy Center

Steve Blanc
Pacific Gas and Electric Company

Don Aumann
California Lighting Technology Center

David Wilds Patton
David Wilds Patton Lighting Design

Andr, O. Desjarlais
Oak Ridge National Laboratory

Rick Cech
Roofing Contractors Association of Southern
California

Reed B. Hitchcock
Asphalt Roofing Manufacturers Association

ALSO PRESENT

Fred Salisbury
Pacific Gas and Electric Company

Mark A. Hoeschele
Davis Energy Group

Jon Null
WattStopper

Mike Day
ICE Energy

Richard J. Gillenwater
Carlisle SynTec, Incorporated

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P R O C E E D I N G S

10:02 a.m.

MS. HEBERT: Good morning. It's 10:02 according to the official clock; I think we'll get started. Welcome to the first public workshop on the 2008 California Building Energy Efficiency Standards.

This workshop will likely go all day today and all day tomorrow. Tomorrow we'll be starting at 9:30 rather than 10:00. I'm going to remind you that if you want to keep in touch with us, have us keep in touch with you in the future, there are sign-in sheets out on the table outside this room. So, please either sign-in or staple your business card and we'll have your contact information.

My name is Elaine Hebert or the alternative pronunciation, Hebert. You can call me either one, just don't call me late for dinner. I'm the Energy Commission's Contract Manager overseeing the work of our prime contractor for the development of the 2008 standards. And our prime contractor is Architectural Energy Corporation, AEC.

Before I introduce other key staff I'd

like to remind everyone that we are being recorded today and tomorrow for the public record. And a transcript will be available and posted to the project website within a few weeks.

We are also being broadcast over the internet, so I'd like to remind everyone who speaks today and tomorrow to get close to a microphone so that the internet audience can hear; and introduce yourself and state your affiliation. And please have your business card handy so you can give it to the recorder so he can spell your name and affiliation correctly in the transcript.

This is a staff workshop, which means it's a little less formal than a Committee workshop or a meeting of the full Commission. The two Commissioners who form the Committee overseeing this work, Jackalyne Pfannenstiel and Art Rosenfeld, and their Advisors, will participate at this phase as their schedules allow. You see we've reserved front-row seating for them here today.

My Energy Commission colleagues who are most involved in the 2008 standards are here with me. To my right, this is Bill Pennington, the Project Manager. Two people over from me to the

right is Mazi Shirakh; he's the Technical Lead. And heading the AEC team, sitting between them, is Charles Eley. You will meet other key players from both our staffs as the workshop goes on.

Let me talk a little bit about the phases of this proceeding and how this works. The initial phase, which we're in now, is for vetting to the public our ideas and the public's ideas for changes to the standards for 2008.

We expect to have two more multi-day workshops like this one, after this one, during the first phase. Most likely those two will be in February and April.

The Energy Commission, California power utilities and other entities sponsor research to back up changes that we and they propose for the standards. Our prime contractor, AEC, will help us determine the cost effectiveness of proposed changes. We will continue to take comments from the public throughout the first phase.

In the second phase, AEC will work with us to take the proposals and public comments and compile a draft, and write draft language for the 2008 standards and three accompanying documents. These three documents are the residential and

nonresidential alternative calculation methods, or ACM, manuals and the joint appendices.

We will have at least one public hearing on the draft language, so we will again take public comment during that second phase. However, it will be difficult to accommodate brand new proposals for the 2008 standards at that point in time.

The third phase takes place after we process the comments on the draft language. This is a formal rulemaking process that ends with the Commission's adoption of the 2008 standards.

During the fourth phase AEC and we develop the residential and nonresidential compliance manuals and the Commission approves compliance software. Bill Pennington will address, in his remarks, the expected timing for these phases.

We have printed copies of the agenda for this workshop for those present; and it is also posted on the project website. What we'll be doing today is going over the drivers, the objectives for this round of standards. We'll show you the templates and fill out for formally proposing changes to the standards. We'll show

you the lifecycle cost methodology we intend to use for the proposed measures.

We'll be giving you an overview of all the measures the Commission has already identified as possible changes to the standards. And some of those proposals will be presented by the researchers who are doing or have done the work. And we'll be giving you a more indepth presentation on a couple of those measures for which the research is completed and a formal proposal is being made.

Later on, on both days, we will open up the floor to you, the audience, for your suggested changes to the standards.

This morning we'll talk about demand response and time-dependent valuation proposals. And this afternoon we'll talk about proposed measures for residential buildings. Tomorrow will be dedicated mostly to the nonresidential sector.

The agenda is approximate and a little bit flexible but we'll try to stay with the schedule to the extend possible.

For the public comment portion later today and tomorrow, if you wish to speak we'll have you fill out a blue card. The blue cards are

out on the table outside the room here. And you'll give them to us and then we'll choose people to speak in, I don't know, random order; I don't know how we'll decide, but we'll figure that out.

So this bring us to the end of my comments. Do any of my colleagues here at the table have anything to add?

Okay, I'm going to hand it now to Bill Pennington to talk about the objectives and drivers for this round of standards.

MR. PENNINGTON: Good morning. Thank you, Elaine. I've been at this for quite awhile. The first round of standards that I -- I never can get this mike thing right -- the first round of standards that I worked on was in 1980. And there's a couple other people in the audience that have worked on the standards that long, Charles Eley, Bruce Wilcox, Ken Nittler, I believe that long. So, been around for a long time. Charles just leaned over and whispered to me, how many more times are we going to do this.

(Laughter.)

MR. PENNINGTON: And I don't have a good answer for that. But I'm really looking forward

to this round of standards.

I want to go over the goals and objectives of the project. Next slide, please. Okay. There's several areas of state policy that identify the building energy efficiency standards as an important tool for accomplishing state energy policy. And these are listed here.

The first bullet there is describing actually two different vehicles, the Energy Action Plan, which is adopted by the Energy Commission and the Public Utilities Commission, with active involvement of the other state agencies that have some energy responsibilities.

The Energy Action Plan was first adopted in 2003 and was recently updated in September of 2005. The Energy Action Plan-2 calls for the Commission to put into effect, in 2008, updated standards that include new energy efficiency measures, demand response and encourage photovoltaic systems.

The Integrated Energy Policy Report is a biennial report that the Energy Commission submits to the Legislature and the Governor. And it evaluates energy trends and issues and recommendations for conserving resources,

maintaining energy system reliability and protecting the environment, among other things.

The Energy Commission released a final draft of the 2005 version of the IEPR in September. And in that document the Commission expressed an intent to continue upgrading the standards to reduce electricity use and peak demand, and make special focus on natural gas use. All of those energy systems are under some exposure to reliability risks and prices are going up substantially for all those fuel types.

The IEPR also placed a priority on the need for the combination of energy efficiency and water efficiency. And directed the standards to consider that.

Other initiatives here primarily originate with the Governor's Office. In November 2004 Governor Schwarzenegger joined with the governors of Washington and Oregon to approve the West Coast Governors' Global Warming Initiative. That initiative commits to a series of tri-state collaborative efforts, including aggressive updating of state building codes in each state, with a goal of at least 15 percent additional savings by 2015 in each state.

In December 2004 Governor Schwarzenegger issued executive order S-20-04, the Green Building Initiative, which lays out a comprehensive set of actions for California to take to improve the energy efficiency of nonresidential buildings.

There's a whole host of strategies including a commitment to upgrade the efficiency of state-owned buildings, and also a call for the private sector to upgrade nonresidential buildings.

One of the elements in the Green Building Initiative is a direction to the Energy Commission to increase the efficiency requirements in the building standards for nonresidential buildings by 20 percent by 2015.

And the final one here is in June 2005 Governor Schwarzenegger issued executive order S3-05, the Climate Action Initiative. And this initiative, for the first time, adopted greenhouse gas emission reduction goals for California. California is one of very few states that have done that. And basically the intent of the Governor was for California to become a world leader in reducing greenhouse gas emissions.

And that initiative set targets of

reducing greenhouse gas emissions to the 2000 levels by 2010; to the 1990 levels by 2020; and a reach goal of reducing the 1990 levels by 80 percent by 2050.

So, accomplishing these goals will require significant societal changes in all sectors. And one of the items that is included in the, you know, long list of things that need to be done to possibly accomplish those goals, is to continue to update the building standards.

Next slide. In terms of process here, we intend to have this project be a major collaborative among these particular groups. And this is actually a continuation of long-standing policy, in particular with the PIER-focused research and the PGC-funded codes and standards where that collaboration has been going on since 1998 or thereabouts.

We expect to rely heavily on the substantial research that the PIER program has conducted for the 2008 standards. And on the codes and standards enhancement initiatives that are sponsored by Pacific Gas and Electric Company, Southern California Edison and the Sempra Company.

And we expect to conduct a very open,

public process that provides an opportunity for active stakeholder input throughout this process.

Next slide. So this is the general project schedule that we intend to be on. For the standards development phase we expect the project to be developed into three parts. And Elaine has described those in her opening comments.

We expect to have a vetting of proposals for energy efficiency improvements to the regulations. That will happen over the next six months. We expect to have public workshops today and tomorrow; again in February, and again in April to hear all the background work of that technical work, and to provide an opportunity for public comment.

The second phase that we see in the process will be a phase where we will be reviewing markups of the actual regulations. So, not only the regulations, but the associated documents, the alternative calculation method approval manual, the joint appendices, would be marked up and we would be holding workshops to review marked-up changes to those documents.

This would be still a relatively informal time in the project in which we're

seeking all comment. And we would be attempting to respond to comments as we hear them.

The final phase of the standards development portion of the update is the formal rulemaking and adoption process. And we've allotted about six months for that. If things go well we'll do it in shorter time than that, by a month or two maybe.

But basically that's where we will have a formal proposal on the streets for public comment. And that will be kind of the final chance for people to comment on the actual proposed language, and before the Commission, to try to address what remaining comments might need to be addressed at that point.

We roughly update these standards on a three-year cycle. And we roughly split that cycle into halves; so the standards development is the first half, and the post-standards adoption is the second half.

So in that second half we provide substantial notice to the building industry and to all parties regarding the changes that are in the standards. And we develop compliance tools and get them approved by the Commission.

These compliance tools include a compliance manual for the residential standards; a compliance manual for the nonresidential standards; and also updating of software that's used for showing compliance with the performance standards, and the approval by the Commission of that.

We expect to have those compliance tools developed and approved by April of 2008 at the latest. And that creates an opportunity for us to have an effective date for these standards of November 1st of 2008.

So those are all the comments I have. I'd like to welcome Commissioner Art Rosenfeld who has joined us. And I'd be glad to take questions if there's questions.

COMMISSIONER ROSENFELD: And I want to apologize for being late. I got held up on a conference call.

MR. PENNINGTON: Thank you.

MS. HEBERT: Does anybody have any questions? I know we used some acronyms there. I don't know if everyone's familiar with all our acronyms. We throw them around not very carefully because we're so familiar with them.

But PIER is Public Interest Energy Research, that's a project out of the Energy Commission. PGC, public goods charge, funding item research and other items. No one? Okay.

Okay, if you want to -- why don't you approach the microphone, Hashem, please.

DR. AKBARI: Hashem Akbari. I'm wondering whether the copies of all these presentation material will be available on the site.

MS. HEBERT: We will put all the presentations on the website. Thank you for asking.

There was another question. That was it? Okay. Thank you.

Okay, next on the agenda we're going to start looking at lifecycle cost methodology for 2008; and that's Charles Eley. And, Charles, you have a choice of either staying at your seat and asking Randel -- by the way, thanks to Randel Riedel of the Energy Commission for doing audio/visual today. You can stay seated or you can go up to the podium, yourself, and control the computer. Whatever you want to do, Charles.

MR. ELEY: Well, I'll just stay seated

if that's okay.

MR. PENNINGTON: That's okay with me.

MR. ELEY: This is going to be a two-part presentation. I'm going to deliver the first part and explain the procedure for lifecycle cost analysis with the standards. And then the second part will be Snuller Price, who will be explaining how some of the curves were developed and how the data was actually developed.

The lifecycle cost methodology is important. It's important because the Warren Alquist Act, which is the statute that guides us in this process, says that the standards must be cost effective. So this method that we're about to cover will lay out what we mean by cost effective.

Next slide. With the 2005 standards the Energy Commission shifted from source energy to time-dependent valued energy. And the lifecycle cost method that's recommended for the 2008 update is based on TDV energy. This is a very significant change from the past because measures that are effective in reducing electricity use, in particular during peak periods, will be worth more than measures that maybe achieve the same total

savings, but do it during offpeak periods.

Time-dependent valued energy for electricity is a series of values for each climate zone, each of our 16 climate zones, and also for each hour of the year. And it's key to the weather files that are used for energy simulations in California. So that when it's hottest and when we would anticipate the greater likelihood for a system peak or a possible emergency, the price or the value for TDV energy is higher. And you'll hear more in a moment about how that was developed.

This graph I borrowed from the HMG website, thank you, guys. And this illustrates the principle of TDV energy for electricity. For gas and propane it's not an hourly variation, but rather a seasonal variation. It only varies by month with gas and propane.

Next slide. So, basically the goal is, if you want to show that a measure is cost effective with the process you have to show that it reduces lifecycle cost relative to a basecase.

And we've adopted a very simple equation for showing this. The change, or the delta lifecycle cost, delta-LCC, is equal to the cost

premium associated with the measure, minus the present value of the energy savings. So if the present value of the energy savings, the net present value of the energy savings exceeds the cost premium associated with the measure, then that measure is deemed to be cost effective.

Now, the delta cost is, I think, fairly straightforward, although we'll talk about that in a moment. We are asking that you use 2008 dollars for estimating measured costs. This is so that everything is consistent.

The net present value of energy savings depends on the change in time-dependent valued energy. And the table at the bottom there -- now, in the handout this is labeled table 1, not table 2 as the slide should say table 1. Your handout, of course, is correct.

What we're saying is, for instance, for lowrise residential buildings the value per unit of TDV savings is 24 cents. So you'd estimate the total TDV savings for the measure; multiple that by 24 cents; and that would represent the net present value of future energy savings.

These numbers are based on the 2008 TDV curves. Those are available at the website shown

there, www.e3.com.tdv2008. So all the data is available at that site; and Snuller Price will be explaining in a moment how it was developed.

For nonresidential and highrise residential buildings the net present value figures are a little different. It's 22 cents approximately for a 30-year time horizon. And just over 12 cents for a 15-year time horizon. I'll explain in a moment when you use the 15- and the 30-year time horizons.

So the equation is very simple. And if you use the 2008 TDV curves, it's extremely simple.

Now, we realize that some people have already begun the analysis and they've calculated the data based on the 2005 curves. So, to accommodate that there's an alternate method that's acceptable. And with the alternate method it's necessary to break out TDV energy savings separately for electricity, gas and propane.

And in this table, which is table 2 in your report, gives the net present value for 15- and 30-year time horizons. And for electricity you'll see that the net present value actually varies by climate zone. When the 2008 curves were

developed, everything was normalized, so there's no need to make adjustments by climate zone.

In terms of period of analysis it's the Energy Commission's policy that all lowrise residential measures be evaluated over a time horizon of 30 years. And from the previous tables you saw there were no net present value figures for 15 years for lowrise residential.

Nonresidential building envelope measures are also evaluated over a period of 30 years. However, lighting and HVAC and water heating measures are evaluated over a period of 15 years. So you'd use the 15-year net present value numbers if you're looking at a chance to the HVAC, the water heating or the lighting requirements.

And net present values from tables 1 or 2 would then be selected accordingly, according to the time horizon and the building types.

Another issue is that sometimes a measure that's being evaluated will have a different maintenance cost or operation cost from the basecase. Lighting is always a good example of this. If you're looking at a different lamp ballast system, that lamp ballast system may need to be replaced more frequently or less frequently.

And the maintenance costs might be different between the two options that you're evaluating. Same is true with HVAC measures and other measures.

So, if the maintenance costs are different between the basecase and the measure that's being evaluated, then the difference in maintenance costs needs to be identified throughout the 30- or 15-year life of the measure. And then those cost differences are then discounted to present value at a rate of 3 percent. And that's added to the initial cost of the measure.

So that would either -- if the measure has a lower maintenance cost that would bring down the additional cost; if it has a higher maintenance cost, that would bring up the initial cost. So maintenance costs are handled in that manner.

Next slide. Demand response measures are also going to be considered as part of the standard. You'll hear more about that later, so I'll be very brief. Some of the examples are communicating thermostats or other similar measures.

When evaluating demand response measures the alternate '05 curve should not be used, but rather the 2008 curve should be used because they more accurately value the savings for demand response measures. You'll get a little bit more detail on that in just a moment.

Sometimes there's a whole host of measures, like tomorrow you'll hear about some analysis that's being done on nonresidential building envelope measures. And in a case like this there's 50 or 100 different ways to insulate a wall, so you're not comparing just two measures, but you're looking at a whole array of measures.

And when you have a situation like this where you're looking at measures that are incremental or continuous, like insulation, the approach is to evaluate the lifecycle cost of all of these measures, and then chose the one that has the lowest or the minimum lifecycle cost.

So that means that it would be possible, for instance, if you were comparing to the basecase to justify something that might be even more stringent than that minimum point. But as a matter of policy, the idea here is to set the insulation level at the minimum point.

And we're also considering a tier 2 residential standard which is also on the agenda, I believe, this morning. And we're still working out how the life cycle cost procedure will work for that. There's a couple of options that are still being evaluated. And we're not ready, as a team, to commit to one approach or another yet on how the tier two is going to be developed. But I'm just putting it in here as a placeholder so you can think about that when the tier two standard comes up.

Is Snuller Price there? I think I saw him. Snuller's going to tell you how the 2008 TDV curves are developed, and how these net present value figures were developed. Snuller is with E3 and they are a subcontractor to AEC on this project.

Yeah, Bob?

MR. RAYMER: Bob Raymer with California Building Industry Association. I know that this is a placeholder for now, but can you at least describe the variations that you're considering?

MR. PENNINGTON: We're going to be talking about that a little bit later.

MR. RAYMER: Okay, thanks.

MR. ELEY: Yeah, it'll be later on the agenda.

MR. PRICE: Good morning. My name is Snuller Price; I'm with Energy and Environmental Economics. In the sort of interest of time I wanted to kind of focus on the main pieces that I think this audience is going to be interested in, in terms of updating the lifecycle cost methodology that Charles just described.

In the presentation here and on the web you'll see probably 20 or 25 slides kind of walking through changes and methodology. I'm not going to cover all those today, but I want to focus on sort of what the key things are that you should be looking at, key changes.

Really I wanted to talk about three things. One was the methodology to compute these lifecycle cost multipliers that Charles just described and that are in table 1 and table 2. So how did we get to those.

The other thing I wanted to talk about was the updated data to the time-dependent valuation, and sort of what inputs went into that in developing new estimates for time-dependent valuation.

The third thing I want to talk about is the updates to the methodology that we're proposing between the 2005 time-dependent valuation and the 2008 time-dependent valuation.

In many ways what we're doing is going to look very familiar to you if you're used to the 2005 TDV. The methodology is the same with new inputs.

Also, for those that are interested or have been following the updates to the avoided cost methodology for energy efficiency measures at the CPUC, there's quite a few inputs and methodology that are part of that proceeding.

So, I've got a few slides. The first slide here describes in words the methodology to get this new table of lifecycle cost multipliers. And this is exactly parallel to the time-dependent methodology in 2005. It was to create from a forecast of time-dependent valuation dollars per kilowatt hour for electric or dollars per therm in each hour, a multiplier.

The way the methodology works is that every hour gets divided by a constant, which is based on the forecast of retail gas by sector. You do your simulation; in the simulation tools

compute TDV energy by energy component. And then after that analysis is complete, multiply back to get lifecycle dollars.

A little trick here. We knew that a lot of folks had in their simulation tools the 2005 curves. So we wanted to make an approach available so that you could get approximately the right, or the same answer without updating all of the curves in your simulation tool. So we created a set of multipliers to use if you've got the 2005 curves in your simulation tool.

The way that these were developed was to take the multipliers that were adopted for the 2005 update, and essentially multiply them by a ratio of the current forecasted energy value in 2008, to the forecasted energy costs that were forecasted for the 2005.

And because that ratio varies by different parts of the state, the table is a little bit more complicated. It's by fuel type and by climate zone. If this complexity is too much, you can always update and use the 2008 curves.

I wanted to say a couple things about the differences you're likely to see in your

results if you use the 2005 curves with these multipliers versus the 2008 curves with the 2008 multipliers.

For most measures you're going to get almost exactly the same answer, okay. And this goes to what changed in the methodology between 2005 and 2008 was really an update on the very hottest, highest cost hours of the year. So the top 100 hours.

If your measure saves energy during those very very critical hours predominately the 2008 curves will give you a higher lifecycle benefit. If your measure is really focused on a broad number of hours, 1000 hours or 2000 hours, you're likely to get exactly the same answer using this table with the 2005 curves and the 2008 curves.

So I mentioned that there's a methodology change. This graphically just shows a similar curve to what Charles showed, where we've got three components here. And these are sort of summarized, as a number of components, to the time-dependent valuation curve. And this is a picture of how those components sum up in the 2005 TDV methodology. And really what's changed is a

reconsideration of whether we actually have the appropriate value on those very critical hours.

So I'm going to roll this forward and show for 2008 methodology, if you look at that sort of peak day, it's basically going to go up a little bit like that. And all the other hours, although you can't see it go down, just a fraction, okay.

So, that's what it is. It's a focus on a revisiting of what the value is for saving energy during those top 100 hours.

In terms of the updated data, new inputs -- and I think this is going to be probably the most significant change for those that are not doing demand response measures, is that we've applied the same methodology as done in 2005, with that update to account for the demand response. But we've also updated all the input data, okay.

So these time-dependent valuation curves are based on current forecasts of retail electric and gas prices to customers in California. New propane prices expected for retail customers in California.

We've also revisited and looked at the costs of transmission and distribution capacity

costs. That's borrowed from the CPUC's energy efficiency proceeding.

We've revisited the cost of building new power plants and operating new power plants in California. And we've updated a look at the emissions costs of the value of saving emissions through energy efficiency.

With these new updates, the lifecycle benefits of energy efficiency, given current forecasts made, are going to be somewhat higher, I think, than people will find than in 2005.

MR. PENNINGTON: Snuller?

MR. PRICE: Yeah?

MR. PENNINGTON: I'm wondering if you could spend one more minute talking about the emissions, avoided costs being an adder in 2005 and being part of the price series this time.

MR. PRICE: Sure. In 2005 we had basically looked at the time-dependent valuation in two ways. One was to look at a emissions piece as an externality; in that way it was an option of whether to include it or not include it. And I believe the version that actually got adopted into the ACM was the version that did not include an additional benefit for environmental emissions.

Given some of the policy focus that Bill has described; given the CPUC's adoption of emissions reduction value into the energy efficiency, we've made that change and have included the environmental emissions component of benefits into the time-dependent valuation curve.

So not only do you see increased retail rates and other components in terms of the cost of energy, this version for the 2008 also includes environmental emissions. And I'm happy to answer more questions on that.

Yeah, Gary?

MR. FERNSTROM: Snuller, Gary Fernstrom, Pacific Gas and Electric. Are those --

MR. PENNINGTON: Don't think your mike's on.

MR. FERNSTROM: Thank you. Are those emissions values available and where can --

MR. PRICE: Yes.

MR. FERNSTROM: -- we find them?

MR. PRICE: Absolutely. The emissions values that we used for this are exactly the same assumptions that were used for the CPUC's energy efficiency proceeding. So those are available in a number of places. One place is currently, if

you were to go right now, would be on our website under the CPUC energy efficiency proceeding.

Another place that we hope to make available soon on our website in the URL that Charles had put is the same information, but under this proceeding, as well.

MR. FERNSTROM: Okay. Secondly, a question having to do with the extent to which the costs of electricity and gas compared to the retail prices. In the case of electricity, TDV and the Energy Commission tended to want to look at the cost structure because there were factors in the cost that aren't perhaps properly reflected now in the retail price. Volatility having to do with peak demand costs and so on.

It seems to me that just the reverse is true with the gas. There is a seasonality of gas cost. However, the gas price structure is tiered, and the more you use the more you pay per unit.

So is any thought being given to incorporating some of that tiered effect into the economic value?

MR. PRICE: Yeah, right now the input for electric and gas retail rates for both is set at the average rates for electricity and natural

gas in the state by sector.

So, that tiered effect of whether you're a low-consumption user or a higher-consumption user is washed out in the average.

MR. MAHONE: Doug Mahone from the Heschong Mahone --

MR. PENNINGTON: Excuse me, I'm sorry, I probably misled everyone. I intended to make a very minor interruption to Snuller's --

(Laughter.)

MR. PENNINGTON: -- and we've gotten into a question period.

MR. MAHONE: Oh, okay, I'll wait.

MR. PENNINGTON: So, let's let him finish.

MR. PRICE: No, I actually think -- I've covered --

(Laughter.)

MR. PRICE: Sorry, Bill. I've covered the major things that I think people need to be aware of. There are, as I said, about 20 slides here behind, but I think we wanted to get through our major questions by 11:00. And so I think it's fine --

MR. PENNINGTON: Sorry, Doug.

(Laughter.)

MR. PENNINGTON: You need that exercise.

MR. MAHONE: Doug Mahone, the Heschong Mahone Group.

Snuller, could you describe for the 2008 updates whether the electricity cost curve is peak year; whether the difference between the high cost and the average cost is greater this time around; and if so, by how much?

MR. PRICE: It is. Let's see, I don't have a slide that does a comparison before and after. But I can tell you it is peak year now. We can look at some -- well, let me just talk a little bit about the methodology and what creates that peak year shape.

And that is if you go back -- does this pointer work? Can anybody see, it's really small, I know. the blue area that I've sort of drawn on here is a look at how much it costs to add new capacity in terms of combustion turbine in the state.

So what we've done is we've gone back and looked at that hourly market price shape that was in the 2005 standards, and looked at, well, will that cover the cost of building new capacity.

When you make that calculation you find out that that falls short, okay.

And so what we've done is we've added a piece to the top hours that represents the cost of adding new capacity in the state through CT. And we've subsequently adjusted the other hours. And, of course, that's a very small amount, given that there are so many hours. So that the annual average is equal to the cost of building and operating a baseload plant, okay.

So there's a tilting. And it's not a dramatic tilt, but it is a tilt that significantly increases the benefits of measures that operate in this period here in the top 100 hours.

Are there other questions?

MR. HODGSON: Mike Hodgson representing CBIA. I think this is more just a clarification, but I think it also is kind of a question on who values what methodology.

It sounds like the time-dependent valuation, which we all have come to know and love in the 2005 standards, was supported by the utilities. And I'm just guessing from your website you had a lot to do with the E3 calculator, just a guess.

MR. PRICE: Yes, we did.

MR. HODGSON: Okay. And so as we're moving forward making choices on what's cost effective for the construction market, the presumption is then that we're making these choices on TDV, is that correct?

MR. PRICE: Yes, I think so.

MR. HODGSON: Or we should be making those choices on TDV.

MR. PRICE: That's right.

MR. ELEY: That's what we're doing, Mike.

MR. HODGSON: Right.

MR. ELEY: Basing LCC on that.

MR. HODGSON: Okay. And yet in the 2008 or 2006 to 2008 public goods funds, all the requirements were to be reporting on source. So we have funding from the utilities to TDV, but they don't use TDV to make up their mind as to what's good for the market we're trying to address. So is there a reason that the utilities don't use TDV and the Energy Commission does? And we should make those choices based on that?

MR. PENNINGTON: My understanding is that there is continued deliberation at the PUC on

how to properly value peak demand measures. And that that dialogue continues.

MR. HODGSON: Should we then hold off on using TDV until the people --

MR. PENNINGTON: Well, I think we think we have it right.

MR. HODGSON: Well, but, you know, --

(Laughter.)

UNIDENTIFIED SPEAKER: -- go back to the PUC?

MR. HODGSON: And, Bill, I believe you.

(Laughter.)

MR. HODGSON: But my concern is we're basically talking about public policy. And there are two fairly influential groups here, both the PUC and the CEC trying to lead public policy. And I know your opinion, meaning the opinion of the Energy Commission, and I'm not disagreeing with that at all.

It's just that it seems to be that if the public agencies can't make up their mind as to what to do and where to spend $2 billion cost effectively. And the Energy Commission, at the urging of the utilities, is going down one path, yet can't make up their mind whether it's the

correct path, that we should have some consensus before we plan more policy.

I mean it was very disconcerting to the new construction industry to plan for TDV and make choices based on that. But their incentives for the next three years are going to be based on source. And that really does not make a lot of sense.

So I'd just like to suggest that there is some meeting of the minds between the public agencies who are driving this boat, so that we know what direction you would like residential new construction to go in.

MR. PRICE: Are there other questions? Gary.

MR. FERNSTROM: Gary Fernstrom --

MR. PENNINGTON: This is not a PUC proceeding, you realize?

(Laughter.)

MR. FERNSTROM: -- PG&E. I don't know that this is a question so much as a statement. But I thought that the utilities, in evaluating their DSM programs, were using the CPUC TDV values which --

MR. PRICE: That's right.

MR. FERNSTROM: -- E3 developed. And these energy values incorporated, in a time-differentiated manner, an element of the capacity cost. So there may be more similarity here than there is dissimilarity.

MR. PRICE: I think Gary's right in that the avoided costs for the energy efficiency evaluation adopted by the CPUC looks very similar. In fact, we've tried to make a lot of things consistent across such as, you know, weather files. The components are going to look very similar between the energy efficiency avoided costs that are used in the E3 calculator to compute cost effectiveness for energy efficiency, and the TDV values that we're using here for building standards.

Are there other questions, comments?

MR. HUANG: Yeah, I'm Joe Huang from Lawrence Berkeley National Laboratory. To me it seems like with this big emphasis or new emphasis on demand I have some concerns that the weather data that you're correlating it to were developed 20 years ago, were developed for annual energy simulations. And for that purpose they only pick out the average monthly characteristics for the

probably 30 years from 20 years ago.

And I'm wondering have you checked to see if the weather data is actually appropriate, and do they actually pick up the peaks.

MR. PRICE: You're right, the weather data that this is based on is the same weather files that we've been using, the Y -- which is that typical meteorological year. To my knowledge no one's gone back and taken a look at whether those weather files really do reflect an extreme peak, or how the extreme peaks look compared to weather we're actually seeing. So, you know, I would agree with that.

Are there other responses folks want to make about that?

MR. HOROWITZ: Noah Horowitz with NRDC. I want to go back to one of the things Charles pulled up on the slide about there being a creation of a tier two. I'm wondering if you could briefly talk a little bit about how that's going to be applied, and what the basis for setting it. Is it going to be x percent tighter than the new title 24, so forth?

MR. ELEY: Bill's probably angry at me for even including this slide --

(Laughter.)

MR. ELEY: This will be on the agenda in a minute.

MR. HOROWITZ: Okay.

MR. ELEY: So if you'll kind of hold off on --

MR. HOROWITZ: Thanks.

MS. HEBERT: Any other questions, comments, discussion?

Seeing none, I think it's time for Charles to talk about the report template for evaluating measures.

MR. ELEY: Okay.

MS. HEBERT: Thank you, Snuller.

MR. RIEDEL: Does it follow here, Charles? Or is it another presentation?

MR. ELEY: No, it's a different presentation.

MR. RIEDEL: Is this it?

MR. ELEY: Yes. Okay, following the precedent we set with the development of the current standards, the 2005 standards, we're asking that each energy analyst that's recommending a measure, including members of their own team, provide certain information to the

Energy Commission and to the team so that we can effectively evaluate what's being recommended.

So, to try and provide this information in a consistent format and to provide complete information we've developed a template which is sort of a table of contents, an annotated table of contents, if you will, where we describe the information that should be provided.

Next slide. The first thing that should be is a brief, maybe just single paragraph or single sentence description of what's being recommended. This is probably the piece that will be carried around in all of the spreadsheets; it'll appear on the agenda. It's the description of the measure in a very concise way. Should identify whether it's res or nonres; and what type of measure it is.

Next slide. Another very important piece of information that you need to think about is what type of measure, or what type of change is being recommended. Is it a mandatory measure that has to be satisfied by every single building in California, or at least class of buildings. Or is it a prescriptive requirement that sets the basis of the performance standard.

Or is it a compliance option. A compliance option is something that's not required by the standard, but it can be used in the whole building performance method to achieve compliance, so you can make tradeoffs. For instance, you can incorporate a compliance option and then make tradeoffs against other measures, other prescriptive measures.

Some changes are modeling changes, different ways of estimating the performance. Later you'll hear about a modeling change being proposed for residential attics. So it changes the way we calculate energy savings.

And there's probably some other things, as well, that could be brought to bear.

Next slide. You should identify the benefits that you expect from the proposed measure. Especially, of course, energy savings and electricity peak demand reduction. But if there's other benefits, for instance comfort or reduced maintenance costs, lower environmental costs, improved air quality, health or safety issues, perhaps productivity improvements, or increased property valuation, any of these benefits should be identified as part of your

measure.

Next slide. And then on the other side of the equation should identify any environmental impacts, negative environmental impacts. Is water consumption increased, for instance. Or is air quality made worse. Or does the measure increase atmospheric emissions. I mean a measure, for instance, that's shifted energy consumption from one fuel type to another might have effects on emissions that would need to be evaluated.

And, finally, are there significant impacts associated with producing the product and bringing it to the marketplace and installing it into buildings, including resource extraction, manufacture, packaging, shipping, installation and so forth.

Next slide. Should also identify whether the measure expands or modifies the scope of the standards. One thing that may be considered this round is the possibility of working to apply the standards to some categories of type high occupancies, for instance, which would expand the scope of the standard but not necessarily change it for those things.

And then you should also identify the

sections of the standards or the ACM manual that would need to be modified to accommodate your recommended change to the standards. We'd like to see chapter and verse, you know, of the ACM manual, section 3.5.4, whatever it is, so that we can put that in our queue and we know it's something that has to be dealt with as we move into the next phase of the project.

If it's a mandatory measure or a prescriptive requirement then additional information should be provided on the measure's availability and cost. In particular, if it's going to be a mandatory measure or prescriptive requirement we'd like to know that the product is available from multiple manufacturers ideally. That there's some competition in the marketplace and that we're not requiring something that maybe is only available from one entity.

For the purposes of the lifecycle cost analysis it will be necessary to establish what the baseline condition is. For the most part, the baseline would be defined by the prescriptive requirements or the mandatory measures.

And you should identify how much the measure costs compared to the baseline condition.

And with this data then you'd be able to apply the lifecycle cost methodology that we just reviewed, and show that the measure that you're recommending is cost effective. If it is a mandatory measure or a prescriptive requirement you have to show that it's cost effective.

Next slide. Useful life, persistence and maintenance is also an issue. This has been an issue with a number of measures throughout the Energy Commission's history. The Commission is interested in measures that are going to save energy over the long haul and not produce short-term savings for a few years and then perhaps fail or not produce those savings because appropriate maintenance has not occurred.

So, if there are persistence issues or useful life issues or maintenance issues related to the measure those need to be identified and evaluated as part of the template.

Next slide. We also want to know if the measure that's being recommended as a compliance option or prescriptive measure or a mandatory measure requires some type of performance verification. Sometimes if there's a persistence issue maybe that can be addressed by some type of

performance verification.

In the lowrise residential standards it's called field verification and diagnostic testing. In the realm of nonresidential standards it's called acceptance testing. But in both cases someone goes to the field and verifies that the measure is actually there in the building and that it's working the way it's intended to work. So if the measure requires some type of performance verification, that should be identified in the measure template, as well.

And then once you've identified the cost of the measure in the basecase, then you can apply the lifecycle cost methodology that was presented in the last section. This would require that energy simulations be performed of the measure and compared to the basecase and with the TDV energy differences between the measure and the basecase be compared, and the lifecycle cost be shown.

Another thing to address in the measure template is -- and this is perhaps more related to compliance options than other types of changes, but can the reference methods that the Energy Commission now uses effectively evaluate the measure that's being proposed.

The reference method for nonresidential buildings is DOE2.1E. The reference method for residential buildings is CALRES and its derivatives. So can those methods effectively analyze the compliance option that's being recommended. And if not, how would they need to be modified, or what types of algorithms or procedures would need to be added to the reference method in order to accurately modify them.

Next slide. And then we should talk about, or you should talk about the relationship this measure has to other measures that are maybe already required by the Commission. An example here would be cool roofs, radiant barriers and insulation levels are all related. You know, if you do one, it maybe negates the benefit of another or vice versa.

So we'd like for you to identify those types of interactions, and to point those out in the measure template. There's many measures where there won't be many interactions, but if there are interactions you should identify those in your report.

Next slide. And then finally your report should include a bibliography that would

have research reports that you've used to draw the conclusions that you've made in your report. It would also help if you identify experts in the field or stakeholders in the field that would need to be consulted.

And if there's research underway that maybe will influence the outcome of the determination on the particular measure, that should be identified. Or if there's research that needs to be done that's not funded, you should identify that, too. So that's the final part of the template.

This document, I believe, is available on the website, right, at --

MS. HEBERT: Yes, and it's in Word, so you can download it and manipulate it pretty easily.

MR. ELEY: And this is -- we're not trying to create a huge burden here, but rather to make sure that we get the information we need to evaluate the measures.

Now, I guess there's one other thing I wanted to mention, I guess I failed to get it onto a slide, but when you review the information template there's one significant addition from the

one that was used for 2005. And that's this round we're asking that you provide information that should be included later in the compliance manuals.

So perhaps it would be an example or a question and answer that addresses some tricky things about the measure. Maybe it's data tables that need to be published in order to support the use of the measure. Or just generally explanatory material. If it's some new technology that the design and construction community is not familiar with in California, then we need a write-up on that to modify that and to include it in the compliance manual, so it would be produced post-adoption generally. Or that we start them prior to adoption, but they're not finalized until after adoption.

So that's it. Thank you, Elaine.

MS. HEBERT: Okay, is there any discussion, questions, et cetera? Please come forward.

MR. ELEY: Perfectly clear.

MS. HEBERT: Okay, I guess that's it.

(Laughter.)

MS. HEBERT: All right, then we'll just

keep on going with the agenda. And next we'll have Jon McHugh, and I think Snuller Price will be back, to talk about programmable communicating thermostats.

And before they start let me make a couple of small announcements. One is we had run out of lifecycle cost methodology reports on the table outside. We now have some more there if people in the room didn't have a chance to pick one up.

And for the presentation that's scheduled to start at 11:45, we have a person who will be -- Dave Watson from Lawrence Berkeley Lab has his presentation with him. I think we'll have to take a minute to load that into the computer. So, just a heads-up on that.

So, Jon McHugh and Snuller, take it away.

MR. McHUGH: Good morning. I'm going to talk today about a whole new area of the standards that we're looking at, and that's the programmable communicating thermostats. This presentation is not about our CASE report, as our CASE report is still in process. So this is essentially an update on our progress. So some of the

information that you see here is tentative, may change over time. So I'd just like to keep that in mind. This is being sponsored by the PIER buildings program, as well as Southern California Codes and Standards, and also Sempra and PG&E have both also contributed to this project.

So what are programmable communicating thermostats? As you can see from the slide here, programmable, so just like the existing standards we have programmable schedules in the thermostats for setups and setbacks. And related to the new features in programmable thermostats is a new feature that would allow you to set up based not just on time of day, but also an outside signal.

They're communicating, and there's two different kinds of formats that we're looking for communicating thermostats. One is a one-way thermostat; essentially receives a signal from the utility or the state asking to shed load. And then the thermostat would set up the thermostat and reduce the loads on the air conditioner.

The other communicating format that we were also looking at is a two-way communicating thermostat. And in that case the thermostat would be verifying that it received the signal, and

sending some information back, that maybe the air conditioner's on or off, and also potentially what the temperature is in the space.

Unlike other demand control technologies that have been used in the past, this PCT is based on temperature. And so the control is based on that we're setting up the thermostat level rather than duty cycling the air conditioner. So we're actually making sure that the -- we're not asking people to have excessive uncomfort, you know; if they had some duty cycling thermostat it might actually, just based on a given duty cycle and the size of the air conditioner, might be making the space ten degrees hotter instead of just three degrees hotter.

So we've been looking at some various minimum capabilities of the thermostat, so the primary concept is that when it receives a load-shed signal it increases the thermostat maybe three or four degrees. The idea is that this would reduce air conditioning consumption, the most in the first hour, and then less reduction in following hours.

The other thing that turns out to be important is that the thermostat have some sort of

geographical identification so that it can be controlled by location. And this is very useful if we have a local capacity shortage where we're short on capacity on a local circuit, not necessarily for a statewide problem.

And then also that there be two kinds of signals that are responded to differently. One is a emergency signal that we're in threat of losing the reliability of the electricity system. And in that case the override would be mandatory. It would not be able to be overridden by the occupant.

And then another level of response, which is related to a price response. The cost of electricity is higher, and so the consumer would be able to let their thermostat automatically increase its set point to save some money for the consumer.

There's a series of questions around what kinds of communications these thermostats should use, and this is the other side, so there's the actual programmable communicating thermostat. And then there's the rest of the system which includes someone to send the signal, a variety of different communication modes, and also a method

of providing the credit for the use of the thermostat.

So there's been two primary programmable communicating thermostat pilots in California, the San Diego Gas and Electric pilot. Here are these particular savings that we realized. Approximately half for the San Diego residential pilot, the savings were approximately half of what was predicted. And as the temperatures increased people tended to override the thermostat more.

Edison's program, which was small commercial systems, the realization rate was actually greater than the predicted amount. And we also still had some nonparticipation, either people deciding not to make use of the thermostat; or in some cases the signal was not received.

Related to the environmental impact of programmable communicating thermostats, this follows on the work that Snuller talked about for the TDV pricing of energy; that there's essentially higher emission rates for systems during peak and offpeak.

There are also nonenergy impacts. One is that, of course, people are less comfortable, and that this may have some impact on

productivity. People may also choose not to shop as frequently in stores that are not as cool in the middle of summer. And of course, the big nonenergy impact is the reliability of our electricity system.

The primary features that we're looking at for these programmable communicating thermostats, as I mentioned earlier, the voluntary program where someone can choose to set up their thermostat versus the emergency program where it is curtailed.

Right now I'm going to turn it over to Snuller to talk through the economics.

MR. PRICE: Thanks, Jon. I just wanted to walk the group through an example of an analysis. Just to follow on what Jon was saying, I want to show everybody an example of sort of how this looks in terms of the economics, really looking at two features of this PCT.

One is a voluntary feature where the thermostat will automatically increase, this example, four degrees; but you can go over to the wall and you can push the button and the thermostat will reset.

The example we're looking at here is

dispatched from 2:00 p.m. to 6:00 p.m. 20 days per year in that voluntary mode.

The second piece of this is an emergency program which is in the event that there would otherwise be rotating blackouts, that override feature no longer works. And would only be used during that period, and the dispatch, given our one day in ten year planning criteria for the system would be on average 2.4 hours per year. So those are the features that we're looking at in this example.

The way this looks, and again I'm going to try to use the pointer, what I've got here is just an example of one day, just to show you how this dispatch looks. I've got a 24-hour period, kind of across the horizontal axis.

On this axis we've got load reduction per ton. And this is for a residential example. So here's at 2:00 p.m. we've got some reduction. Because we've got the PCT in place, along the same set of hours we've got what the value is of reducing load. Okay.

And so just like you would evaluate any other measure and any other of the compliances, our CASE initiatives, the value in each hour times

the load reduction in that hour gives you the value. And this is just an example for one day.

I'd mention that the program that we're looking at is a 20-day program, so you would just repeat that dispatch 20 days.

We picked dispatch on the hottest, high-cost days, and you add up basically what the value is per ton. That reduction load shape and this load reduction load shape is for a particular climate zone. This example is climate zone 15, which is the southern desert. And is simulated. Again, I just picked one example. The simulations kind of cover the different types of building types, both residential and nonresidential.

Wanted to talk a little bit about how some of these other factors that Jon mentioned are getting factored into this evaluation. And walk through an example.

The numbers in here are ideally going to be aligned to the best we can with the results of the pilots that we've seen in the state. Although at this point it's sort of rough.

Clearly for climate zone 15 what do we need to look at. Well, what percentage of air conditioners are on; what percentage of air

conditioners receive the signal and respond; the percentage of folks that are participating in this voluntary program, and so on.

So you get, for example, load reduction of a thermostat that actually responds, we're getting about, in this example, 35 percent of that load reduction, okay, by the time we've net out people who are not participating or not home or what-have-you. Times the value that we just saw during the dispatch; the size of the air conditioners in that climate zone. And for this example, we're getting $288 per thermostat of value.

Right now, based on some of the feedback from the technical meetings that we had prior, we're using about a 50 percent factor for comfort loss, which might be a bit aggressive and -- conservative. So we're netting off something for the fact that people are now four degrees warmer. That's the first piece of this.

The second piece of this is the nonvoluntary emergency piece. And this is based on the cost of customers in a rotating blackout. What we've used is the class weighted average, because rotating blackouts don't affect just one

customer class, it's by block.

And a similar methodology to derate, in terms of the number of customer air conditioners that are on, the number of thermostats that receive the signal. Again, we're modeling this as a mandatory feature so that we've got everybody participating, and we've got rather than the 35 percent, we've also got 10 percent of the impact of this program that would benefit or reduce the rotating blackouts, again, linked back to the reliability target for the state, the system planning.

And in this example in this case that gives us $155. So we take the net nonemergency impact plus -- oh, one other thing I should point out is that we've also subtracted off something for comfort and productivity loss. And this is based on a recent study.

We take the net nonemergency impact plus the comfort and productivity, the net emergency impact, and we get a value. And so for this example, and again a lot of those inputs you can go back and look, and we're going to be aligning those best we can with the two pilots that we have in the state and other information from other

places. We're getting a value in this example of about $300 life cycle.

I'm going to turn it back over to -- oh, Gary wants to ask a question. Should we finish -- how much longer do you have?

MR. McHUGH: (inaudible) slide.

MR. PRICE: Well, let's -- Gary's got a burning question, so let's --

MR. FERNSTROM: It's quick. Did I understand that right, you used 5.6, 5.8 tons per house?

MR. PRICE: That's right.

MR. FERNSTROM: That must be a big house.

MR. PRICE: It's also climate zone 15, which is, you know, obviously in the south desert.

MR. McHUGH: So as part of this research, E-Source, who is one of the subcontractors on this project, surveyed a series of manufacturers of thermostats or potential manufacturers of programmable communicating thermostats, and asked them for their projected costs based on different annual sales volume.

And this table contains the result of that survey. And if you look at those results,

the incremental costs for one-way programmable communicating thermostats are approximately less than $150 relative to the cost of a standard programmable thermostat. And the incremental cost for the two-way communicating thermostat are greater than $250. So there's a good jump in price if you want to have the verification capability built into the thermostat.

In addition, there's additional infrastructure cost associated with two-way communications. And as I mentioned earlier, the primary motivation for a two-way thermostat is to have some verification the consumer actually received the signal and how they're responding.

So, in terms of the code proposal, as Charles had mentioned earlier, we're looking at a mandatory requirement for programmable communicating thermostats. And where this would likely occur is in section 122, which has definitions currently for thermostats, for nonresidential thermostats; and section 150(i) for residential thermostats. And we've put together some sample language that would sort of investigate that concept.

Either one could fall underneath this.

And so the primary function is that to be able to set up the cooling setpoint. In addition, in some cases we might end up with a peak demand issue in the middle of the winter. And so in that case, that the thermostat be capable of controlling the supplementary resistance heating on a heat pump to mitigate that issue during the winter.

And that it have two different types of control, either emergency control or a voluntary demand response control. And that that emergency response not be able to be overridden. And then certain exceptions.

So there's some additional considerations that is still ongoing, there really hasn't been resolution yet. But who creates the PTC specification? Is that something that is essentially defined by the local utility in terms of something that meshes with their demand response program. Or is it something that is driven by the state in terms of a statewide uniform capabilities and protocols used for those thermostats.

As we look at doing our cost effectiveness analysis, should the cost of the communications infrastructure be included. And

there's some question about that. Some thoughts are that, well, that's going to be rate based, and it's not necessarily a cost.

You know, some of the things we've been looking at is the issue of looking at a net cost, so that there might be -- some of the cost of the infrastructure is related to other activities. And so that those other activities be netted out of the total cost.

And also there's some interest in looking at energy control management systems that if we can do this for a single thermostat, surely the cost per kW is cheaper on large commercial buildings that use a distributed control.

So, this work is underway. We have this website here, www.title24dr.com. It contains the minutes and meetings of our prior stakeholder meetings. And soon to come will be a spreadsheet tool so people can play with the costs and the benefits of using programmable thermostats, and look at what assumptions are used, and what is the impact of those assumptions on the results. As well as the TDV files that would include the costs associated with those peak events. And our preliminary CASE report.

I thank you.

DR. AKBARI: My name is Hashem Akbari from Lawrence Berkeley National Lab. I listened to the presentation with much interest. And there are three burning questions in my mind.

Number one, I noted that the numbers are being shown with five significant digits. And the question that I immediately had was that how is the validity of those numbers with the input assumptions?

The question number two that I have is that has there been any measured data to support this, what I understand are the result of simulations. And if the answer to the second question is no, is that are we ready, with based on simulation numbers, to require mandatory programmable thermostat setting.

MR. McHUGH: Thank you very much. We have had two major pilot programs in the state, so we're using the simulation results and then we're normalizing them based on the pilots.

In terms of significant digits, yeah, we could have probably taken a few digits out.

(Laughter.)

DR. AKBARI: -- questions that you,

variation of the results which --

MR. PENNINGTON: You can't be heard from there.

DR. AKBARI: My second question was the variation of the results with the input assumptions. How sensitive they are. For instance, you assume that 50 percent of the savings can be a negative effect on the comfort or productivity-related issues. It may be 10 percent or it may be 300 percent. Do we have any data to support such 50 percent number. And if we do not, what is the range of the savings with the changes in the input assumptions?

MR. PRICE: Just to answer that, I think you're right in that the analysis is going to have to include some sensitivity to inputs. And I think it's our intention to do that.

Clearly there are inputs here that we don't know for sure. And we've taken data in our example from a number of surveys and so on, and research. So I think our intent is to, you know, cite that and the research that's already been done on comfort and productivity by investor-owned utilities and others, in terms of value service on that particular input.

But there's also a bunch of other inputs, obviously. And, you know, our sources are research from, you know, sponsored by the CEC or others. The pilots that have been done in the state. And, you know, make all that information used going into the analysis available for review and comment.

COMMISSIONER ROSENFELD: Bill, I think I can perhaps make Hashem feel a little more comfortable by giving a little of the background.

I take it that Hashem's concerns are maybe this is just all too early in the game. And so let me give just a little bit of background about why there's so much interest in PCTs.

All three of the state's IOUs have applied for programs permission from the PUC to introduce demand responsive programs. PG&E wants to start installing advanced meters as early as early next year.

And Sempra, San Diego, that is, will come behind by about a year. And Edison seems to be trailing by perhaps another year. But within about five years we will have spent quite a few billion dollars with advanced meters. And the utilities will offer tariffs called critical --

tariffs.

And, Snuller and Jon, I want to disagree with one thing. You talked about 20 days a year. All the tariff discussion I've seen has been up to 10 days a year. The idea being that people will do things happily during emergencies up to ten days, ten hot summer afternoons, that they wouldn't consider doing every day.

Somewhat to my surprise, the way this has worked out is that the utilities have undertaken the responsibility of putting in the meters which are necessary for demand responsive tariffs. But want to leave up to the market, or the Energy Commission, the communicating thermostats which enable you to preprogram your thermostat.

As to participation that's what we're driving at. The thought is that on a new house, costing hundreds of thousands of dollars, that the surcost for going from the presently required clock thermostat to a communicating thermostat -- incidentally, Snuller and Jon, with the lots of meetings we've been having on this now, it looks like the surcost is going to turn out to be around 50 bucks for a minimum case, and $100 for

something with more bells and whistles on it -- seems like an appropriate thing to try.

As to participation rates, then, if these are required in new homes, which is the way to get started, the participation rate will be damned close to 100 percent. I mean it will not be the 10 percent which concerns you.

There's still, of course, a lot of economics to work out because climate zone 15 is a good case, and climate zone 1 is a pretty poor case. And so we'll have to consider per climate zone.

But I want to make the general point that I don't think this is very premature. I think, given the amount of money which we're going to spend on the meters and offering the tariffs, that getting new buildings ready for this seems like a worthwhile thing to study.

And then, of course, the big market will be all the people who then decide to take advantage of the fact that there is a replacement thermostat around and will go to Home Depot or Ace Hardware, wherever, and buy them for existing homes.

Hashem, you have a comment?

DR. AKBARI: Thank you, Commissioner. I wanted to first of all you actually raised one of the issues that I was going to ask, that price indication that it may cost up to 250, in my humble view, is probably about a factor of two or three higher than what it eventually would be. And you made that point, thank you.

Now, the question that is begged at this time, why are you only focusing on the cooling, but not the entire house energy use.

COMMISSIONER ROSENFELD: Because we think that -- okay, Hashem's question is why only on the cooling.

The easiest thing to get at is the cooling. For a thermostat to automatically set itself up four degrees when it receives an emergency signal is pretty easy to do.

However, we visualize a pretty modular system. We've been using the words system integration a lot. And so if I can make another couple of sentences -- is that okay, Bill?

MR. PENNINGTON: Sure.

COMMISSIONER ROSENFELD: We visualize a pretty minimal system for most houses in which there probably aren't any particular

communications expenses because we discovered that there are AM and FM broadcasts which cover like 98 percent of the state right now.

And the estimate by Ron Hofman as to the expense of building that base receiver into the thermostat sounds like $5 or $10, so that you would get your 24-hour advance warning just by radio without any extra communications.

We visualize then that the device would be relatively modular; and visualize it, to over-simplify it, visualize that as sort of an extension under the cover of your thermostat there would be two or three USB bars which could have connectors, which could have what we call pods or media sticks built into them with programming.

One of the features of that certainly would be to set up a local area network within your house which could then turn off the pool pump, which I think you're thinking about, and maybe turn on a red light on your dryer, or forbid the thought, electric hot water.

So we visualize quite a lot of marshal-arity in which the minimum version we hope that the surcost would be less than 50 bucks. But if you want to get three pods, one for the local area

network, one to communicate with the utility, and one to keep track of your current usage so you can dispute it with the utility, those might each cost another 50 bucks.

So, I think we can do a lot of useful systems integration. And I hope I'm answering your questions.

MR. SHIRAKH: This is Mazi Shirakh. I'd like to ask Ron Hofman to come up to the podium and elaborate on some of the points that Art is bringing up related to system integration.

COMMISSIONER ROSENFELD: Ron, I'm sorry, I didn't see you. I'm stealing your thunder. Thank goodness you're here.

MR. HOFMAN: Ron Hofman; I'm a consultant for PIER. Some of the ideas that Art's talking about right now haven't been fully vetted yet, but they're very encouraging.

And I think the most important part of what Art is talking about is that we're looking at the possibility of having a very very minimal capability that meets all of the objectives that have already been put up on the screen.

But, again, be aware that we haven't figured it all out yet. But, we're trying to make

something that's very modular and will meet both the high and the low end, both pricewise and functionalitywise.

MR. PENNINGTON: So, Ron, you said something has very minimal capability. Did you mean minimal cost relative to the capabilities?

MR. HOFMAN: Yes.

MR. PENNINGTON: Okay. So you're saying something -- are you thinking about something in the range of $5 to $10, as Commissioner Rosenfeld said?

COMMISSIONER ROSENFELD: Wait a minute, $5 or $10 surcost on what you already -- you know, right now --

MR. PENNINGTON: I'm not arguing; I was just trying to understand --

COMMISSIONER ROSENFELD: Right.

MR. HOFMAN: Yes. The answer is yes. It's we're looking at basic thermostats as the starting point, basic programmable thermostats, whatever the range they are. And we're looking at low-cost additions to those basic platforms, I'm picking that term very carefully, to try to preserve what intellectual property and capability exists in the current realm of programmable

thermostats.

And try to add to that technology that's purely additive; does not require vendors to redesign their entire platforms. And be able to add one-way broadcast systems that piggyback on the commercial AM and FM -- AM and/or FM. We haven't quite decided whether to make them capable of both or not.

And piggyback digital signals. This is all current technology. None of this has to be invented. The question is how it might be used.

So, we're thinking about adding that. We're thinking about, as Art has pointed out, the ability to have expansion ports on the thermostat at very low cost if they can be integrated by manufacturers.

We're thinking about interface capabilities that wouldn't require expensive, programmable LCDs as the minimum case.

So, yes, the answer to your question, Bill, is we're looking for the lowest cost way of trying to come up with meeting your minimum functional spec.

MR. PENNINGTON: So, could you just stay there for a second. My understanding is that the

incremental cost that we're talking about here is, you know, there's a range in what people have said. Commissioner Rosenfeld, in his, you know, several years experience related to DR, is thinking that somewhere in the range of $50 to $100 incremental cost for PCTs is reasonable.

You're suggesting that there would be perhaps a $5 or $10 adder to that to enable such a device to talk to a variety of different communication methods. And then the work that -- the survey work that was done that Jon McHugh reported on was showing a cost ranging from 150 to over 250.

So it seems to me one of the important points here is to reconcile these cost variations. And to be careful about how we do the costing. Perhaps the survey costs are including something beyond the incremental costs that we're talking about, or the engineering-based estimate of costs that might be necessary to accomplish PCTs.

So I don't know if there's any reaction to that comment from me from Art or you or Jon.

MR. HOFMAN: My comment would be that we have to be very careful about this. I don't think that the numbers that the manufacturers have given

us are wrong. I just think the system integration paradigm that we're using is different. And it may lead to significant -- it may lead, may lead to significantly less cost.

I didn't bring my presentation here today that Mazi has seen. But the approach we're taking has four or five assumptions at the very beginning of this. And provided that those assumptions are valid then the paradigm shift can be made. And it isn't something that manufacturers are looking at right now.

We've talked to one manufacturer. Their comment was, you know, they hadn't thought about that before, but it was a clever idea. And so we have to vet it; we have to find out. We're talking to lots of consultants, lots of experts. And we're trying to figure out whether what appears to be a very low cost option is, in fact, really a low cost option.

So the answer to your question is we've got to do it carefully. We're planning to put together what we call a reference design and make it public. And then let people comment on it. And if they find a fatal flaw in it, I'll come back up here and recant and say it couldn't be

done that cheaply.

MR. SHIRAKH: So I guess what Ron is saying is that, you know, he's presenting this to the manufacturers. And if they don't find a fatal flaw in what he's proposing, and so far they have not, it could result in reduced costs for the thermostats. Could be on the order of less than $50 additional cost.

But what he's suggesting is that we have to present the full-blown proposal to the manufacturers first before we can firm up the price.

MR. PENNINGTON: I thought I might entice you to come up, Carlos.

MR. HAIAD: Carlos Haiad, Southern California Edison. We were involved on portions of the E-source work. A couple of comments.

I actually think the idea that Ron brought up is very worthwhile pursuing. And as he indicated, we are still fleshing that out.

But I think here is the key difference. That is the minimum requirement under that technology, all right. And you may cost an incremental cost of $50 to $100, that's a fair take right now.

However, once you want to add the additional capability, let's say the utilities, for whatever reason, decide that two-way communication is the way to go. And you send, well, internally we call the bob, a device, you mail, literally you mail a device to the customer and say plug into your thermostat.

Well, that device has a cost. It's not zero. And I don't know if it is just a $5 cost or a $50 cost or a $150 cost.

Now, when we did this analysis with the thermostat, that entire capability was in there. All right. So the $250 not only includes the minimum requirement of 50 to 100, but also the bob that we might send out. So that's how, apart from the actual numbers, but that's how you got to view the fact that the work being presented by Jon right now will be higher because that capability is already there, regardless if we need it or not.

And in the case what Ron has proposed, which I actually think is a great idea, it might. You just give them the basic infrastructure. And, if needed, you deliver more. And evidently that more will have a cost; we just don't know exactly what it is.

COMMISSIONER ROSENFELD: But the one nice thing, and I'm just agreeing with Haiad, is that my guess, and I think Ron Hofman's and yours, is that this device will look different in climate zone 15, or will come equipped with extra features quite differently in climate zone 15 than in climate zone 2. And that's a nice breakthrough, to have that degree of flexibility.

MS. HEBERT: Hey, Carlos, this is Elaine Hebert. Hi.

MR. HAIAD: Hi, Elaine.

MS. HEBERT: I had promised you a couple minutes on the agenda this morning. Did you still want to make some comments?

MR. HAIAD: I'm good, thank you.

MS. HEBERT: Okay. I'm sorry, I had it in my --

MR. HAIAD: That's okay.

MS. HEBERT: -- notes, and I didn't read my notes. Sorry about that.

MR. HAIAD: That's okay.

MS. HEBERT: Someone else to comment on this topic?

MR. PARKER: Hi, I'm Danny Parker from Florida Solar Energy Center. I'm curious, the

size of the pilot with Southern California Edison that you had. And the reason I'm mentioning this is at Florida Solar Energy Center we did an analysis of the load control program that Progress Energy Florida has, and I think they're the largest utility load control program in the U.S.

And we metered 15-minute, took 15-minute data on 175-odd houses for a two-year period where we evaluated their load control program. And within that we had nested a subsample of I think 25 homes that used Scientific Atlanta products, called SuperStat at that time.

And although this report has not been made public previously, I can describe to you some of the fundamental conclusions within -- some of the things that we saw from that.

Well, one was these were radio-controlled switches in the load control program. And the average effectiveness was between 84 and 89 percent in terms of the switches that were responding. Because we were able to look at the data and see exactly each site, we were able to see if it was responding or not.

And a few other things. One, we found that the hardware, itself, which arguably maybe

was not mature at that time, this was 1999/2000, there were hardware problems with it in terms of we had some difficulty with it. The vendor was responsive and they provided software fixes to it.

But we also found very interesting things in looking at that sample of homes. Because there were, as you would expect within the diversity of the air conditioning systems, there were certain number of homes that weren't being air conditioned at all. So the fact that the switches were responding didn't really matter.

Then there was another group, even though the thermostat was being set up by four degrees didn't matter because the occupant had come home at 5:00 p.m., the switch was being activated just after that. But, you know, the thermostat was still a long way away from its target. So the four degrees was not making any difference in terms of how it was responding.

We did also, within that study, evaluation of precooling, where we had the SuperStat actually precool the building a few degrees. And that was pretty -- an encouraging capability.

And then I guess I would suggest that

anyone that's interested I can put them in contact with John Masiello at Progress Energy Florida. And perhaps he'd be willing to make some more details of that available.

You may have done something in much greater detail with Southern California Edison, but I can just provide that little bit of information.

They also did some very interesting things. They evaluated this type of system being used for dispatching two-speed air conditioners where you turned off high-speed operation during the peak period. You allowed low-speed to continue, which the utility is in favor of because they had, for their summer load control programs, frankly they've had a lot of customer complaints associated with comfort.

And then also one thing that was mentioned, I was very encouraged to see Jon describe this, we found that a very effective thing to do was to disable supplemental strip heat on the heat pumps during winter operation. And the utility applied for that within their load control program, and it's now part of the load control program for that utility in Florida, and

it's very effective.

And also the consumers don't really note that it's going on, because the compressor is still operating providing heating, and you know, the system is still operating providing heating from the compressor.

So, anyway, thank you.

MR. PENNINGTON: Danny, do you have a winter peaking situation in Florida?

MR. PARKER: Believe it or not, actually that utility is winter peaking. You know, they have very consistent summer peak, and it's not too far from the winter peak. But the winter peak is the one that's causing a lot of CTUs to be brought online.

And the reason for doing that evaluation, which was a very expensive project, was they wanted to find out what was causing them to be a winter peaking utility. And the thought was it was strip heating customers, because we do have customers in Florida that use only strip heating for heating.

And they were about 20 percent of the sample. But it turned out that wasn't the driver. The driver was auxiliary strip heat on heat pumps.

Because even in Florida, although you think it would be an ideal climate for heat pumps, if you only turn them on in the morning, you set them back, then if you're far away from the target for the heat pump it automatically brings on both the compressor and strip heat.

And so a good solution for the load control program was don't allow the strip heat on for those customers.

MR. PENNINGTON: Do you know what your market share is for electric heating versus natural gas heating in Florida, approximately?

MR. PARKER: It's predominately electric heating there. I think the gas heating is 20 percent or less. I don't have the exact figures. I could find them if you needed them. But it's quite different from here.

MR. PENNINGTON: Okay, thanks.

MR. PARKER: Thank you.

MR. BLANC: Good morning; Steve Blanc from PG&E. I've been asked to address the program as a whole, this program as a whole, with a number of things our corporation was concerned about.

We support the policy initiative of demand side management through retail pricing

signals facilitated by automated metering. We've been doing it for years.

We're also supportive of automation through enabling technologies that support price-based rates. However, we want to emphasize that we want customer choice regarding operation.

PG&E believes in the operational demand response benefits of automated meter infrastructure and is moving ahead with plans to deploy an AMI infrastructure. Our chosen AMI technologies are proprietary PLC, power line carrier, for the electric side, and low frequency radio-based systems for the gas side where communications protocols could be licensed to controls device manufacturers.

PG&E's comments are therefore focused on a smart thermostat approach that is compatible with any AMI or load-control communications technology throughout the state. At the same time we recognize the need for the smart thermostat effort to be compatible with other system, include those deployed at other IOUs, municipal utilities or irrigation districts.

We have no doubt that such a device is technically feasible; however, we note, and Ron

Hofman just said, that none has yet been successfully demonstrated on a large-scale to the specification that we're discussing here, along with the lines under consideration as a complete system that is planned by any of the utilities.

We have no doubt devices will have to be readily available through retail distribution chain and would need to be cost effective for end users, and some of that discussion already went to that point.

Current energy efficiency MNV indicates there is little or negative EE benefits from programmable thermostats given customer usage patterns. Since programmable stats are currently code, incremental benefits must derive from demand response opportunities, i.e., enabling technologies and support of critical peak pricing. And I might add that there are certain dissensions about some of the economics at this point between the utilities.

Existing smart thermostat technology is expensive, as shown up here. And costs must be reduced significantly for the customer.

For mandatory code measurements, and this is what we're really talking about here and

the nut of our argument, this creates some significant risks that code could require the customers purchase assets, IET stats, assets not currently available to consumers, which could fail to either operate properly or become obsolete, stranded quickly. We are concerned about this.

PG&E wants to do the right thing. We want to do this right the first time. We are concerned about the timing of bringing this into code. And I think that's probably the nut of our argument at this point.

Cost effectiveness of DR should be carefully reviewed in the context of all other related proceedings and treated consistently.

On the issue, and one of the issues that has not been brought up here yet this morning, bringing up the demand response would be a condition of service. There are some subtle semantics. This issue, however, should be addressed in the CPUC forum.

Fundamentally it would not be difficult to make DR a mandatory condition of service while structuring that service such that the customer retains override control of the device, i.e., the T stat. In fact, if one assumes an AMI

infrastructure, it is probably easy to do this, we should be okay with the concept as long as the customer ultimately remains control through either override or opt out.

The whole point of economic dispatch is always been to let the customer choose whether or not to pay the high prices. If the issue becomes emergency system stability, we already have effective ways of dealing with that. It's called rotating outages. I know Art disagrees with us on this one, however it has happened, and it generally happens during the day. So whether you turn your cooling off, or turn your lights off, it may not matter too much to the customers, how much they complain to us.

Thank you.

MS. HEBERT: Thank you, Steve. Any other comments? Yes, Mike.

MR. HODGSON: Mike Hodgson, CBIA. I'd like to follow up on Gary Fernstrom's earlier question about what the 5.8 tons represented. Was that the average cooling load of that house? Or was that the installed equipment?

MR. McHUGH: Like I said, what was mentioned earlier was that this is some early work

that was done. As I remember, these are from the DOE2 files that were used to generate, so the model in climate zone 15, and it was used a DOE2 model, and that was what the system auto sized at.

MR. HODGSON: Okay, so that would imply then that there were two systems in these homes. And that's kind of the question that I have. Is how does this work with multiple thermostats. And if you're typical -- I presume it was your average system installed load of approximately six tons. What happens with two thermostats? Does one get turned off? Do they both get turned off? Does the consumer have the ability to turn one back on and leave the other off? And what was the experience of your study with that size of tonnage?

MR. McHUGH: I can actually have the modeler discuss this with you offline. But I believe the model actually had a single system. But I'll verify that.

Now, in this context, we'd be looking at both thermostats would be controlled, because if you just controlled one thermostat you might end up having the other system essentially just running harder.

MR. HODGSON: Right, so that was one of the concerns is that you probably send a signal out and then --

MR. McHUGH: To all thermostats.

MR. HODGSON: -- and both thermostats would set up. And then the consumer then only switches one back on. It's going to be working even harder since the other one is off, and you're not, you know, working the house as appropriately as it should be.

So that was my concern is that your average tonnage seemed to exceed a single system. So I was wondering if you had data on multiple thermostat interaction within the research study.

MR. McHUGH: I'll get back to you with that.

MR. HODGSON: Thanks.

MR. McHUGH: Thanks.

MS. HEBERT: Okay, any more? All right, we are officially about 18 minutes past our schedule, but that's not too bad. I'm going to have now --

COMMISSIONER ROSENFELD: You knew this was going to be a cool topic, right?

MS. HEBERT: Looks like we're going to

have a little further discussion on demand response. And Dave Watson from Lawrence Berkeley National Lab is approaching the podium.

MR. WATSON: Thank you very much. My name's Dave Watson; I'm with Lawrence Berkeley Lab.

We've made a proposal to be included in the 2008 title 24. This is for nonresidential commercial buildings. It's also about demand response.

And the specific area where this is applicable is in nonresidential commercial buildings with new energy management and control systems. And the title of this proposal is global temperature adjustment, GTA for short.

This proposal came out of findings from over three years of studies that were funded by PIER and conducted by the Demand Response Research Center out of the Lawrence Berkeley Lab.

And in those studies we touched over 10 million square feet of commercial office space. And this particular strategy came out to be one of the most effective and least objectionable strategies out of all the different strategies that were tried.

These are some of the results. You can see, well, it's kind of low, but the -- your typical profile of a normal baseline day with the notch taken out during the demand response event using the global temperature adjustment strategy.

The core of this proposal is technology that enables the facility operators to turn the cooling setpoint up during demand response events. And this allows the air conditioning system to kind of coast along and recognize a large savings during that time period.

You might be surprised that that's not available in most commercial buildings. Even buildings with energy management and control systems. They're not in most existing buildings, and what's frustrating is that even though this strategy works so well, this feature is not included in most new buildings' energy management control systems, either. And this is what we're hoping to change through title 24 code.

You might wonder with hundreds of thousands of dollars or millions of dollars being spent on these fancy EMCS systems, you might be curious why you can't adjust the setpoint of the building and just turn the setpoint up. Well, you

can, but you have to do it on a zone-by-zone basis. And in these large buildings there can be hundreds or thousands of zones. And it's just not practical, even from a central computer, to click onto every zone and adjust the setpoint in response to a demand response event.

I did a calc; even at 30 second per, it would take a full day shift just to change the setpoints once. Then the next day you could change it back.

These are actual screen shots from a typical ENCS user interface, you know, that you would see on a common large commercial building. To use this to change a setpoint a building operator would click on a building at the campus level. Then they would get a view of that building. Then they would click on the floor they want to go to, say let's go to floor two. Then they'd get a view of -- this is only part of floor two, mind you.

And you can see there's many many zones showing the current setpoints and where the sensor is that measures that zone temperature all throughout that section of that building.

The operator would then click on one of

these; then finally they would get to a screen where they could adjust the setpoint for that zone. Right here you would slide these little sliders to adjust the setpoints for that zone.

So it's a time-consuming process; just not practical for demand response.

Here is a conceptual implementation of this proposal, and this is the global temperature adjustment proposal. From one screen the operator could click on either, it would normally be on normal mode, this big switch right here. The building would just operate like normal most of the time. But if there were a demand response event, the operator would become aware of it through the existing methodologies which are used by utilities today. And that is pagers, emails, phone calls, et cetera.

The building operator would then click this big software switch on the screen, and then the building would then enter setpoints that are whatever the operator set here for the whole facility, just in one click. These setpoints then would be broadcast to all of the zones throughout the entire facility.

This is what we would call an absolute

setpoint adjustment, which is one way that would be acceptable. Another acceptable way would be called a relative setpoint adjustment. In the last example the whole facility had the same setpoints throughout. In the relative adjustment the operator would just put a value, say two degrees or three degrees, and click into DR mode, and every setpoint throughout the facility would then relax by two or three degrees.

For example, if the cooling setpoint was 74 and they were relaxing by two degrees, it would go up to 76. If another zone had an existing setpoint of 75, it would go up to 77.

So either of these two ways are effective and acceptable ways for this proposal to be implemented.

The costs of doing this are very minimal; and the effects are very great. It's a software-only change. There's no change to existing hardware that are used in these types of systems. And, in fact, several of the smaller vendors already offer this feature in their existing product lines. And they offer it at no extra cost. It's just a latent feature that are in these products, that if it's not being used it

just remains there and can be enabled at any time.

These products are sold nationwide, so there would be -- if this were to become code in California, there would be no reason to have a special California product. It could be sold nationwide. And if there were no demand response programs it could just be ignored and left unenabled.

So, the cost to create this feature would be just a one-time cost that these EMCS vendors would encourage to add this to their product line. And this is a fairly low one-time cost. They already have people on staff to do both fixes and implement minor features, which this is. And it could be easily rolled into their existing product line. It's a pretty small effort.

And it should be noted that they do things like this all the time. For example, night setback is a feature that just always sits in the products of most vendors. And you can either enable it or not enable it, but it's always there.

So this is, you know, it's a pretty simple proposal. This is where we're at in the process. Additional work needs to be done to

further define the exact code language, and you know, gather some more documentation in terms of the effectiveness, payback periods and so forth. Get public feedback from vendors and others.

But I think it's important to point out that this feature can be used using existing communication technology to implement it. It doesn't require any radio signals or anything like that. Although it makes that easier. If we were to have radio signals or internet signals in the future, it makes it a lot easier to enable commercial buildings for demand response if they have this GTA feature already installed.

It's also important to point out that this feature can be used manually both for demand response, which is initiated remotely from a utility, and for just everyday demand side management. A building operator may want to shave some peaks to reduce their bill every month. And this enables them to do that, as well.

So, overall we feel that this is a very effective and least intrusive strategy that we found in commercial buildings. And we want to make sure that additional microprocessor controllers that are installed in buildings after

2008 don't go out there that cannot listen to these global signals. So that's what we're trying to enable through this proposal.

So, open to some questions and comments about this.

DR. AKBARI: Hashem Akbari from Lawrence Berkeley Lab. It's about time. As a person that has talked about this thing as of say 20 years ago, there are several things that has made the market ready and ripe a few years ago, perhaps a decade ago.

First of all, the ASHRAE standard recommend for all the buildings at 100,000 square feet or higher, to have an EMCS in them. So that is already there.

Then the market, I know that some ten years ago the direct digital controls were beating the pneumatic controls by a factor of two for the most application systems. Nowadays probably they are beating it by a factor of 20.

So this is an excellent measure that has to be incorporated. And I actually think that the control of the buildings for larger buildings should be one of the topics in the title 24 standards. And we can definitely put mandatory

topics there because we know that they are cost effective. Thank you for bringing in this.

MR. WATSON: Thank you.

MS. HEBERT: Anyone else, comments? Questions? No. Perhaps the noise of stomachs growling is overriding everything.

(Laughter.)

MS. HEBERT: Okay, I guess that's it. Thanks, Dave.

MR. WATSON: All right, thank you.

MS. HEBERT: It is now 12:16. Doing well. So let's give 45 minutes for lunch, and be back here a couple minutes after 1:00.

And I'll note that if you're having a conversation in this room the microphones will be remaining on, and will be broadcasting over the internet, so you might not want to stand too close to the microphones.

(Whereupon, at 12:17 p.m., the workshop was adjourned, to reconvene at 1:02 p.m., this same day.)

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AFTERNOON SESSION

1:14 p.m.

MS. HEBERT: From looking at the agenda the next part of our meeting today we're going to give an overview of the residential measures that the Energy Commission is thinking of for 2008 standards. These are going to be approximately five minutes per topic. And I haven't revealed to the public yet what order this is going to happen because I'm still pulling it together. But this is how it's looking.

First, we'll do a couple of Energy Commission idea projects, the tier two standard, voluntary standard that we had reference to this morning. And a little bit on duct tape. Yeah, our favorite, duct tape.

Then we're going to go into PIER, Public Interest Energy Research, which is Energy Commission work from a different part of the Energy Commission than where Bill and Mazi and I work.

We'll start with lighting with Don Aumann. And then Martha Brook will take over the microphone and she has several topics to talk about including water heating and heating,

ventilation and air conditioning.

And then we have, I think we have the cool roof topic on residential, is that right, Hashem? Yes.

And that's all my list has on PIER, and I'm not sure that my list is complete. Is anybody here that is representing another PIER area for residential? There are some, but there are fuller presentations a little later.

After PIER we're going to go with CASE initiatives; that's our IOU utilities initiatives for 2008. Steve Blanc from PG&E will present several topics including pool pumps and DR. And he'll introduce Fred Salisbury doing windows.

We have some heating, ventilation and air conditioning items from Davis Energy Group. And am I leaving out any case studies for residential?

Then we'll wrap it up. Charles Eley will take the microphone and talk about some more Energy Commission projects.

So, we're going to have Smita Gupta from the Energy Commission come up first and talk about the tier two standard. Smita.

MS. GUPTA: Good afternoon, everybody.

I'm Smita Gupta from the California Energy Commission Building Standards Office. And I'm talk a little about the tier two standard which had been mentioned briefly this morning. I'll give you a brief overview of what it is. We'll reserve details on it for future workshops.

So the Commission plans to introduce a tier two level in the 2008 energy efficiency standards for the residential sector which will create a higher benchmark for compliance. The tier two will be a voluntary level of compliance which somebody can choose to comply with. And it will address photovoltaic installations along with energy efficiency measures for residential purposes.

Some main motivations behind going for a tier two is the Energy Commission basically sees the tier two as in line with efforts in the state that consider providing substantial public funded incentives for PVs with a goal of making California one of the world leaders in the use of solar. And in the process, also driving down the cost of PV, then making the market sustainable over time without incentives.

One such initiative is the California

Solar Initiative, also known as the CSI. And this is an administrative initiative being pursued in the CPUC proceeding in collaboration with the California Energy Commission.

And it aims to accomplish one of the goals of the SB-1, which was known as the million solar roofs initiative of creating a stable ten-year incentive program to facilitate installation of 3000 megawatts of peak solar capacity on up to one million residential and commercial size by the end of 2018.

And the Energy Commission recognizes that PVs will be most cost effective when they're applied in conjunction with cost effective energy efficiency measures. And this is also consistent with the U.S. Department of Energy's Zero Energy Program, which includes photovoltaics and energy efficiency measures, as also the Energy Commission's effort in launching the zero energy new homes research and demonstration projects.

And also that utilities typically attach higher incentives and rebates to energy efficiency measures along with photovoltaics. And as Bill mentioned this morning that the IEPR also encourages the addressing of photovoltaics in the

standards.

Therefore, the energy efficiency measures considered for tier two level will be selected based on them being cost effective with respect to PV, then achieving higher energy savings.

And the approach to carry out this analysis, as Charles mentioned this morning, is still under consideration. So, again, we'll be presenting that in one of the future workshops.

And it is expected that most of these effective energy efficiency measures will be field verified and with diagnostic testing.

The Commission also intends that the tier two will be specified in terms of its performance standards, rather than just being prescriptive. And that the compliance software will automatically create a higher benchmark for the tier two compliance.

Another thing the Energy Commission also intends to incorporate in the compliance software, the determination of the PV performance that will go along with this. And that will account for all factors that impact output such as module properties, system and other component variables,

along with environmental and operational factors. And research and discussions on those lines are still underway, and again will be presented in future workshops.

So, with that I'll leave it for now. And if you have any more comments and suggestions feel free to contact me or contact Elaine and Mazi at the contact information provided on the website.

That's all, thanks.

MS. HEBERT: Bob.

MR. RAYMER: Bob Raymer with the California Building Industry Association. CBIA supported and hopefully will support SB-1 if we can get it fixed. The last set of amendments there in the latter part of August caused us and several others, including the Governor, to pull their support for the measure.

So, we also embrace the tier two concept. But there's some administrative questions that I sort of need to prompt to the Commission. You may well not have answers for those today.

And that is as we were going through the first three pieces of legislation, and finally SB-

1, Environment California, which was the sponsor of the measure, released a white paper indicating that it's their hope, through the use of the rebates, that photovoltaics in the residential sector may well become cost effective within a decade.

And that being the case, I think we can all sort of agree that maybe the cost effectiveness today is somewhat in question unless there are the rebates.

Having said that, how do you foresee plugging in photovoltaics into the standards, albeit voluntary, if they don't necessarily meet a specific criteria of cost effectiveness as all the other energy efficiency provisions do? I realize this may be an apples-and-orange kind of a thing, but it'd be nice if you could sort of address how you envision seeing this in a set of standards that we'll be doing in 2008.

MR. PENNINGTON: You want me to answer?

MS. GUPTA: Let Bill answer that.

MR. PENNINGTON: Okay. You can stay up there, Bob, if there's any further reaction. What we're contemplating here is developing a second criterion in the standards, if you will, that

would be the combination of higher energy efficiency measures and photovoltaics.

And so that would be a benchmark level that people would choose to comply with if they wished to comply with, instead of complying with the standards, themselves.

MR. RAYMER: And compliance would bring about a higher level of rebate, perhaps, from a PUC program --

MR. PENNINGTON: Right. You know, SB-1 had indicated that the Energy Commission could identify energy efficiency measures beyond standards that might be in a second kind of category relative to incentives.

So it's that language that Commissioner Rosenfeld and Commissioner Pfannenstiel, in particular, were very interested in pursuing relative to establishing a tier two level.

So basically there would be a level of incentives hopefully linking up with the CSI, or if there's a new bill, a follow-on bill, you know, after SB-1, that would provide incentives. Hopefully this tier two level would be a level that would have higher incentives levels attached to them that builders could choose to comply with

and --

MR. RAYMER: Sure.

MR. PENNINGTON: -- and utilities and others, other funding sources would provide incentives for.

MR. RAYMER: That's what I envisioned. And that's kind of what SB-1 had led us to believe, that -- and by the way, SB-1 is still alive; it's just in Assembly Appropriations right now, kind of languishing.

MR. PENNINGTON: So in terms of your cost effectiveness question --

MR. RAYMER: It may be irrelevant.

MR. PENNINGTON: What we have imagined thus far, and, you know, we have not settled on any final proposal here. But, actually again, Commissioner Rosenfeld's concept here would be that we would identify those energy efficiency measures that are cost effective compared to the cost of generating electricity with a PV system.

And those should make up a set of measures that are beyond the standards that would be a package of measures that you would install. And that would be the definition of this tier two.

MR. RAYMER: My only concern at this

point is when something goes into the building code in the manner that you're talking about, there will be a number of jurisdictions that may be inclined to just simply say we think builders should build to tier two. And maybe try to adopt it as a local mandate.

And as you're going along in your deliberations please keep that in mind, that this will probably be promoting local jurisdictions to give that some consideration. So, for whatever it's worth. Anyway, thanks.

MR. PENNINGTON: By the way, Bob, we intend to be identifying measures that are good candidates for tier two. And we intend to be looking at the Building America programs and the Zero Energy New Home programs that I know some of the California builders have been active participants in.

MR. RAYMER: Right.

MR. PENNINGTON: And so we're trying to kind of learn from what has been the successful measures in those programs, and viewing those as candidate measures for the tier two package.

MR. FERNSTROM: Gary Fernstrom, PG&E. So, Bill, while you're looking at tier two, you

might want to trade off the solar measures against the built-in energy efficiency measures in the home that title 24 applies to. You might also want to think about the solar measures as they relate to the appliances that consumers might install. So certainly clothes washers, clothes dryers, dishwashers, all those kinds of things relate in terms of their efficiency to the cost of solar production.

MS. HEBERT: Thank you, Gary. Any other questions? Mike.

MR. HODGSON: Bill, for the tier --

MS. HEBERT: Why don't you identify yourself, again.

MR. HODGSON: Mike Hodgson, --

MS. HEBERT: Thank you.

MR. HODGSON: -- Building Industry Association. Thanks, Elaine.

Having a tier two standard does it imply then if you want to get a photovoltaic rebate in new construction then you must meet the tier two standard?

MR. PENNINGTON: I think the linkage up to incentives programs would be done, you know, as a separate matter. I mean we would be basically

setting up a criteria that the Energy Commission thinks is an appropriate target for new construction.

You know, as I said before, SB-1 referred to the Commission identifying a higher level that would be a qualifying level for a higher incentive. And so that was in the bill language.

MR. HODGSON: Right.

MR. PENNINGTON: So this is along that idea.

MR. HODGSON: Okay.

MR. PENNINGTON: We would need to link up with CSI probably. And undoubtedly there would be interaction between the Commissioners at the two Commissions about how to coordinate this stuff.

MR. HODGSON: And the concern from the building is as proposed in SB-1, which was a fairly active dialogue, is that there would be, for these additional costs, a greater incentive to encourage --

MR. PENNINGTON: Right.

MR. HODGSON: -- you know, increase the encouragement. If it goes where there's greater

costs with no greater incentive, then what we're putting up is another market barrier. And I think we all agree that we're trying to encourage PVs in the residential new construction market, and we don't want to do anything that discourages it.

MS. HEBERT: Thanks, Mike. Anyone else? Okay.

Bill, you're up next with duct tape update.

MR. PENNINGTON: Well, since I was batting for Smita, Smita, do you want --

(Laughter.)

MS. HEBERT: Nice try, Bill. All right, we've got your PowerPoint up now.

MR. PENNINGTON: Okay, this is just brief.

MS. HEBERT: And for the benefit of the listening audience on the internet, we will have all the presentations up on the web as soon as we can.

MR. PENNINGTON: Next slide, please. This is the current language related to duct tape in the standards. Joints and seams of duct systems and their components shall not be sealed with cloth-backed rubber adhesive duct tape unless

such tape is used in combination with mastic and draw bands.

And this language actually was originally a condition for compliance credit for the duct sealing credit starting in 1998, and has been a mandatory requirement since the AB-970 emergency standards adopted in 2001.

Basically there are a variety of different kinds of materials that can be used for sealing ducts, but cloth-backed rubber adhesive duct tape, by itself, is not one of those. And that was based on testing at LBNL that showed very rapid failures for cloth tape securing ducts.

And so this requirements has been in the standards for quite awhile. It is a prescriptive requirement. It basically says this particular material cannot be used. And that's not the kind of standard that we would prefer to have.

We would prefer to have a testing requirement that would say that materials that meet a particular test, sort of regardless of the characteristics of the materials, would be allowable.

And unfortunately there was no test procedure -- there has not been a test procedure

that adequately addresses the durability of sealing ducts with duct tape. And so the Commission adopted this prohibition against this one material type.

The manufacturers of the duct tape were not particularly happy about this --

(Laughter.)

MR. PENNINGTON: -- particular requirement. And in 2002 asked the Commission to conduct a rulemaking to consider revisions to those requirements, elimination of them, or some kind of modification of them.

And the Commission did conduct a rulemaking, but the rulemaking concluded that the standards requirements were appropriate. And, you know, we really need to have durable duct sealing materials, given that ducts can have such a big impact on energy use in California.

Next slide, please. Over the past several years LBNL has sponsored the consideration at ASTM of a new test procedure that is founded on the test procedure that they developed and that the Energy Commission relied on for making its decisions about the requirements for duct tape.

And this new test procedure, ASTM E2342-

03 was adopted by ASTM and went through that consensus process and approval process.

And PIER has been sponsoring research related to duct tape for quite some time. And the most recent stage of that research resulted in a report from LBNL, I think it was January of this year, which made a number of recommendations related to the ongoing treatment of duct tape and duct sealing products in the standards.

And these are the recommendations that that report made. Basically the first recommendation is to change the standards to allow tapes that pass ASTM E2342-03 with a criteria for this test that products must survive 60 days of testing in order to be considered passable.

And another finding in the most recent research that LBNL did was that the plastic straps that hold duct tape were a culprit in failures and actually failed at the temperatures that they were being tested at. So another recommendation for a standards change would be that straps be rated for continuous use at a temperature of at least 200 F.

And so those are the recommendations. The Energy Commission proposes to consider these requirements in the 2008 standards. And we expect

to have quite a bit of interaction with the manufacturers. In particular, Tyco and ShurTape have been actively interested in requirements related to duct tape for several years. And we would intend to continue to dialogue with them as we consider these changes.

MS. HEBERT: Comments? All right, seeing none, we're going to start now with other PIER projects, and I'm going to have Don Aumann from the California Lighting Technology Center step up first and talk about lighting research.

MR. AUMANN: Good afternoon. As Elaine said, I'm Don Aumann from the California Lighting Technology Center. I'm here to present one technology that came out of the PIER research program. This is a commercial -- uh oh, excuse me. This is tomorrow's presentation.

Oh, Monday, Aumann Monday, oh, Aumann Tuesday, Aumann Monday. Excuse me, you'll see that one tomorrow. It'll be a really good one, so you'd better come back.

So I have just one technology today. It's a hybrid lighting technology that has a high-low system; a 5 watt LED operates all night long, and it provides just a low level of lighting

around the doorway so that people can see where the door is and such like that. It's a benefit compared to a completely dark doorway. Right now the code requires either a high efficacy source or a low efficacy source with a occupant sensor on it.

And so that low efficacy source with control on it would give you a dark front. And this gives you a warm glow in front of the house, but it's only 5 watts which uses a little over a dollar's worth of electricity for the entire year.

Then when a person walks up there the main light flashes on and then you get full illumination. There's two versions available. One of them is a wall-mount for buildings, which is the top one, you can see. And then there's a bollard post-mount type style that is available for walkways.

The wall and post-mount version are commercially available right now. There's only one manufacturer that has it on the street. And it is pretty expensive at this point. A low-cost version we're expecting next year, and we're actually going to be doing some testing of some preproduction models at some University of

California campuses this fall, less than half the cost of the other version.

But there is a publicly available product specification on this so it's not proprietary to a manufacturer.

There's also a universal mounting plate that's in discussion that may be available next year. you can see that in the top photo there, that you could mount any kind of fixture on that would provide any manufacturer to provide this technology.

And there's also security type version; you can see the two-headed -- on the bottom; that one, again, provides a low level of ambient light. And then just like the current versions, when you walk up the lights flash on. But this one provides that continuous low-level light.

So this is an interesting technology that offers promise for providing a better quality of lighting to the space.

So, in summary, very low wattage that operates all night long; beats the compact fluorescents. And there's this kind of built-in security system that when the main light flashes on you know that somebody's walked up. Very long

life, again beating CFLs. And it's a completely integrated system with the occupancy sensor, so you don't have to try and figure out separate controls.

So, in summary, it beats CFL as an energy use; and I think there's a potential code opportunity for stimulating the use of high and low exterior lighting systems for homes.

One caveat. The LEDs have been progressing in their capabilities, and the current versions, the best ones are meeting the high efficacy source requirements for this size, which is 40 lumens per watt.

So, that's all I have. Oh, I guess, product's commercially available and additional products coming out soon. So in the process for the 2008 code, to get around the issue of only one product line available, we're expecting several products to be available for this.

And that's it, thanks.

MS. HEBERT: Comments, questions, discussion? Yes, come on up to the microphone, please.

MR. PATTON: David Patton. Isn't the only LED a poor color rendering amber?

MR. AUMANN: No, there are white LEDs available --

MR. PATTON: At this efficacy?

MR. AUMANN: Yes.

MR. PATTON: There are.

MR. AUMANN: Yes.

MR. PATTON: Okay.

MR. AUMANN: They're just -- it's kind of early in their development, but this was a question that came up a couple years ago as this product was being developed. And at that point they were just kind of approaching the 40 lumens per watt.

But, no, there are units available. They're cooler colors like around 4000K, 5000K; the 3000K level ones, I think, --

MR. PATTON: Are not?

MR. AUMANN: -- are tough to beat the 40 lumens per watt at this point.

MR. PATTON: Okay, thanks.

MR. FERNSTROM: Gary Fernstrom, PG&E. Don, my question is whether the LEDs at 40 lumens per watt include the drivers loss or the driver losses compared to the self-ballasted CFL that includes the driver or ballast loss.

MR. AUMANN: Good question. And I'm not remembering. I'm pretty sure that they do, because we asked this question. I mean I remember being fastidious about the driver losses, myself. But that's a good question, and I will ask our LED guy. And I can have a definitive answer for you tomorrow.

Okay, thanks.

MS. HEBERT: Thanks, Don.

MR. AUMANN: Anything else? Okay, thanks.

MS. HEBERT: I guess there's no more questions on that. All right, next up, Martha Brook has several topics she's going to cover, including water heating and some HVAC items.

MS. BROOK: I didn't prepare a presentation so you're going to have to just look vaguely around the room. Can you guys hear me?

MS. HEBERT: Talk into the mike and we'll hear you.

MS. BROOK: Okay. The first subject I want to talk about today is water heating and hot water distribution systems.

We have a current research project actually that's underway and we're hurrying

quickly to get results for the 2008 standards.

Our research in the area of hot water pipe heat losses hopefully will result in standard proposals to either require that under-slab piping is insulated; or it may actually propose that we eliminate it all together.

Another area of hot water piping that we are probably going to propose is to limit the length of hot water piping from the water heater to the fixture. and this is as a result of numerous laboratory tests that have been conducted over the last year and on into the near future.

Much of our hot water research will result in proposals to improve the modeling of hot water equipment and system performance in the standards.

Our anticipated research results include new heat loss coefficients for various pipe materials, flow rates and temperature conditions. And this, again, is based on numerous laboratory experiments. This kind of brings up the whole state of heat loss coefficients. I think that the ASHRAE standards have been relying on very old and dated information. So we hope that this really kind of contributes both to the state and the

national data in this area.

Also will be characterizing current construction practices. We're actually going out in the field to do that. We're going to provide information on hot water use patterns, pressure losses and small diameter piping. And we're also going to develop a load-dependent energy factor for instantaneous water heaters.

Finally, we'll be collecting the necessary information to compute the cost effectiveness for the standards proposals we bring forward in February and April.

One area that is perhaps new to the standards is in the area of water efficiency. We will be determining the water efficiency of hot water distribution systems, making an attempt to quantify the water that runs down the drain before hot water is delivered to the fixture.

Then we'll be collecting water and wastewater tariff data representative of all water regions in California, to determine the cost of the wasted water.

That's all I have on hot water and water heating systems. If there are any questions I'd be glad to answer them.

MR. PENNINGTON: I'm wondering if you could mention the multifamily.

MS. BROOK: I was going to do that tomorrow. Do you want me to do that now?

MR. PENNINGTON: Yeah, well, --

MS. BROOK: Never quite sure where that fits in the standards picture.

In multifamily we're going to be looking at -- what are we going to be looking at -- actually don't think I have it here. Boiler controls, is that what -- boiler controls and demand control, right, for the circulation loop of the multifamily. And I don't really have any other information.

Any questions? Okay.

The next subject that I'm going to talk about is furnace fan efficiency. And, Elaine, this is the only other one I have, so.

We have an ongoing research project now that's completed field surveys of 60 air handlers in new homes. And the findings from this work include the following:

Fan loss while heating is 20 percent less than the fan loss while cooling. That median cooling air flow is approximately 360 cfm per ton,

and that was measured with a dry coil. It was kind of a conservative estimate. And also the median fan watts over these 60 air handlers was 630 watts.

And the other finding from that field survey was that the external static pressure is significantly higher than the maximum static pressure that's specified by the manufacturer. So the maximum specified is usually a half-inch, and the median external pressure that we found was .8 inches of water.

We also did laboratory testing of six furnace units, air handler units. They represented a range of units currently available on the market. And these tests demonstrated that 400 watts per 1000 cfm is achievable for both heating and cooling. And with both a half inch and a .8 inch external static pressure.

So not all of those units achieve that, but definitely several of them did. And it gave us enough information so that in a future workshop hopefully we will be proposing a prescriptive standard. And it would go something like this. Furnace fans in new homes would simultaneously demonstrate a watt draw less than 400 watts per

1000 cfm, and a flow greater than 350 cfm per ton of nominal cooling capacity. And that would be tested under a wet coil condition.

And we would propose that compliance would be demonstrated through the post-construction acceptance requirements that were introduced in 2005. So we would sort of expand on that. And we would propose that this credit could be traded away just like the duct sealing is traded today.

We've done just a preliminary life cycle cost analysis that looks promising. The cost of a good furnace motor that could achieve the 400 watts per 1000 cfm is less than the projected energy savings. So we're going to polish that up and present that in detail at a future workshop.

Are there any questions about that? Good, great.

MS. HEBERT: Thanks, Martha.

Now we'll turn to cool roofs and if Hashem Akbari would approach?

MR. FERNSTROM: Maybe just one comment on the fans. Gary Fernstrom, PG&E.

This improvement not only results in cooling savings, but it results in better heating

efficiency. And since gas is getting more expensive that's important to all of us, too. So I encourage you to consider those benefits, as well.

MS. HEBERT: Thanks, Gary.

DR. AKBARI: My name is Hashem Akbari from Lawrence Berkeley National Lab. I have three slides to show, and two slides as a general background.

We are here to promote having residential prescriptive requirement for the residential roofing materials. And you all know this is boilerplate material, and a lot of people are familiar with the cool roofing technology, they know that they can stay cool in the sun, and then therefore reduce the energy consumption and avoid the peak power demand or reduce the peak power demand. And also reduce the ambient air temperature.

The additional benefits are comfort and penalties of potential -- typically potential heating penalties.

The scope that we would be having for residential buildings would include the most steepest slope roof, and the lowest slope roof.

And most probably the -- perceive a standard would address both the new buildings, as well as retrofit of the roofs.

The methodology that we would be following is to look at the availability of the measure and their costs. And different manufacturer, different products. And the useful life of the product.

We would be performing cost/benefit analyses based on the energy savings. We are planning to use the new improved and free attic model to be coming very soon available, available on the MICROPAS that would be our simulation tool. MICROPAS is one of the simulation tools that the Commission has approved.

And then the analysis of lifecycle cost analysis will be done based on the net impact that would be the cooling savings minus the potential penalties. And we would be looking at the statewide effect.

And that's all the comment that I have to make.

MS. HEBERT: I see a commenter approaching the microphone.

MR. HOROWITZ: Noah Horowitz with NRDC,

and the former Chair of the Cool Roof Rating Council. I'm delighted to see where you're going on this.

And you were silent on this, I just want to make sure it's being considered that we're not only looking at the initial reflectivity of the product, but how it performs over time. Because the reflectivity could degrade greatly over time with some products.

DR. AKBARI: Correct.

MR. RAYMER: Bob Raymer with CBIA. In an earlier slide you mentioned high pitch for the roof?

DR. AKBARI: Correct.

MR. RAYMER: What are the specs?

DR. AKBARI: Typically the slopes that are less than 2-per-12 they're called, lower slope. And anything more than that is called the steep slope. So we would --

MR. RAYMER: So the steep slope you wouldn't do; the low slopes you would.

DR. AKBARI: We would do both of them. We would cover all the residential single-family market.

MR. RAYMER: Okay, do you, as Noah was

mentioning, do you have any data on the long-term reliability of this, as a product, to date?

DR. AKBARI: We do have some products that have been in the field for quite a few years such as cool metal roofing. And they appear to be performing about three times better than the standard product. And, of course, the data are very limited, only about three years of data.

However, the shingles that have been brought to the market last March, they only have that history. The manufacturers of the granules that go on those shingles are very comfortable with the products that they have.

On top of all these things, once these products are going to be recommended for prescriptive requirement, they would be having the CRRC label on them that would require both new and three-year-old age solar reflectants and thermal --

MR. RAYMER: Okay, I'm going to have to learn more about this.

DR. AKBARI: We are here to teach.

MR. DESJARLAIS: Andre Desjarlais, Oak Ridge National Lab. Hashem, I presume that the methodology that you're going to use is going to

be similar to what was done for low-slope applications.

I guess my first question is when you start that analysis you have to define what a cool roof is. And do you have that definition of what a steep slope cool roof would be at this point in time?

DR. AKBARI: When we did that for the low slope roof market, clearly the level that we start to look at was a product that has an edge reflectivity of 55 percent or higher. And all of the analysis was on that basis.

In here we do have different products that go on the residential slope roof, which includes shingles, tiles, metal shingles, as well as potentially some shake.

And we are going to look at all the products availability there, and that would be the very first part of the analysis that we do to find out how great is the market standing and how it can be supported. And hopefully we would select the numbers on those bases.

MR. CECH: Hello, I'm rick Cech, and I'm President of the Roofing Contractors Association of Southern California.

I just wanted to mention that on the 2008 regulation that various building departments in certain areas have architectural committees and stuff. I know on the low slope we're talking white roofs here. And that's something that's going to have to be addressed by both the manufacturers to make the emissivity reflectivity component of the shingle comply in 2008. That's something that we're going to have to look at in the industry.

And then also on the low slope cool roof, that the cab has a CRC rating. What we're finding out is people are buying that, and it doesn't necessarily meet the criteria for title 24 just because it passed a test. I just wanted to bring that to your attention.

DR. AKBARI: On your first comment I should mention that with the generous funding from the California Energy Commission and the Collaboration of the Oak Ridge and the LBL and 16 leaders in the roofing industry we have come out with products that offer you the choice of color. And they also are highly reflective. And these products are available in the market now. And that's for steep slope roof.

And then as far as the performance of these products over time, clearly that's something that we have to understand and study more, frankly.

MR. DESJARLAIS: Very good, thank you.

DR. AKBARI: My pleasure.

MR. HITCHCOCK: Hi; I'm Reed Hitchcock with the Asphalt Roofing Manufacturers Association. And I just wanted to make you aware that much of the data that you're talking about generating reflectivity values for existing products, cost analysis and what-have-you, that's work that ARM is undertaking currently and would be more than happy to share with you in a collaborative manner, if that's something that you all would be interested in.

Additionally, we certainly want to engage in a dialogue with the key folks at the Energy Commission and with the Labs, both yours and Oak Ridge. Oak Ridge has also been doing some work with us on both steep and low slope that we'd like to share with you, as well.

DR. AKBARI: And the answer is three yes.

MR. HITCHCOCK: Okay, thank you.

MR. RAYMER: Sorry for getting back up here again. Bob Raymer with CBIA. Am I understanding the Energy Commission is considering this as a mandatory feature for --

MR. PENNINGTON: Prescriptive.

DR. AKBARI: No.

MR. RAYMER: It would be an option that you could plug into your --

MR. PENNINGTON: It would be a prescriptive requirement, not a mandatory requirement. So it would be the basis of the energy budget.

MR. RAYMER: Okay, so in essence you could trade off against it, but it would be plugged in, okay.

I would hope that very shortly the Energy Commission's able to provide us with their analysis on product availability, et cetera, et cetera. Doing 200,000-plus homes a year, is this going to be a major change in product usage?

I mean we just went through a set of regulatory changes for roofing materials with the urban wildlife interface regs with the fire marshal's office. Are we talking about doing this again within just probably a few months of each

other?

I'm not saying it's good, bad or indifferent --

MR. PENNINGTON: I'm not --

MR. RAYMER: -- it's just --

MR. PENNINGTON: I'm not aware of any conflicts with the urban wildlife interface requirements, but if there are that sort of thing we want to know about that and work through that.

MR. RAYMER: If we're having something, let's say, if this is going to take effect in November of 2008, which is probably a good estimate, I would say, right now, given what we know.

If this is going to have a significant impact on roofing materials we need to know about that now and we need to get that information out now. Because the roof is an important part of the house, to say the least. You get one with every house.

(Laughter.)

MR. RAYMER: And so just like windows. So, at the risk of being -- sounding just dumb here, it sounds like we've got to get an industry well up to speed overnight, otherwise this is

going to be something they're going to have to be making up for in the rest of the regulations. And I'd rather they not have to do that.

Thank you.

MS. HEBERT: Anyone else? Okay, thanks, Hashem.

DR. AKBARI: Thank you.

MS. HEBERT: I think that's it for PIER for the residential sector. And now we're going to go to the utilities' CASE initiatives. Bill, would you remind me what CASE stands for?

MR. PENNINGTON: Code and Standards Enhancement --

MS. HEBERT: Enhancement --

MR. PENNINGTON: -- Initiatives. I should ask the Commissioner.

MS. HEBERT: So many acronyms. Let's get Steve Blanc up first. Steve.

MR. BLANC: If you'll indulge me for a moment we're going to pretend like this is before lunch; we're going to go back to demand response for a second because we kind of got left off the agenda this morning because everybody wanted to go to lunch. So I'm going to be talking about a demand response case study.

And Bill stole my thunder. This was actually our definition of the case study. Technical and feasible information on energy proposals to inform a CEC decision. You can see technical information, how does it work; how much does it cost; how much does it save. And then feasibility, what are the market shares, those kinds of things.

And all the utilities are undertaking, either on their own or in partnership, various and sundry numbers of case studies covering any number of issues.

We're in particular doing a case study on demand response. Our contractor, HMG, came to us earlier this year with some suggestions on amending our program. And this was one of them. Basically we want to approach DR from an overall perspective looking at, first of all, the value; building on some of the work that's been done by PIER and SCE already. Looking at hours of load curtailment. Looking at trying to develop some scenarios of load curtailment for the nonresidential sector in the whole. Demand effects model. What are the technical models of demand response.

And then doing some extrapolations from some of the pilots on the nonresidential side. There's been a lot of work done with programmable thermostats, but what we're really talking about is looking at the nonres side here.

And then the likely protocols that would be used. And some of that has been developed by PIER; some of us are familiar with controls protocols. And we'll move on from there.

One of the interesting things is to try to look at load segmentation by its curtailability. There are loads that cannot be curtailed in the commercial sector and in the industrial sector simply because the economic or life safety issue that is affected is just too great. So we're going to try to deal with those.

Moderate high value would be curtailed during a power crisis. We'll also be looking at some of the aspects of that to try to establish its value. And then the economically curtailables.

And finally -- and you'll be seeing this slide again tomorrow, unfortunately -- we're looking at doing several case studies, we're amending several of our case studies to include a

demand response aspect of it, both from the automatic load controls receiving credits and from looking at the various lighting controls in particular. We want to look at a wider range of lighting controls as far as demand response goes.

And signs lit during the day. Although that's probably not the kind of load -- doesn't want to go on. Are there any questions? I think I just kicked it off --

(Pause.)

MS. HEBERT: Here's Randel.

MR. RIEDEL: Sorry about that.

MR. BLANC: No problem.

MR. RIEDEL: No, that's nonres, sorry.

MR. BLANC: That's nonres. That's tomorrow. I know I got one too many presentations.

MR. RIEDEL: How about here?

MR. BLANC: That's it, that's it.

MR. RIEDEL: All right. There you go. Sorry about that.

MR. BLANC: No problem. Now we'll fast forward back to this afternoon and talk on residential case studies. I'm up here for two reasons, one to provide an overview of the two

case studies that we're doing, and also to introduce our pool pump case study.

Most of the case studies that we are undertaking, with the exception of the two tomorrow, have not been completed. And we expect that we will be presenting them either in February or April depending on how our contractors work their issues through, and when we get contracts signed. And the Commission members know that there is one thing slower than a Commission contract, and that's a utility contract, so.

(Laughter.)

(Parties speaking simultaneously.)

MR. BLANC: I know, but, you know, it's also, and Bill and I have talked about this, we have a rather incestuous relationship with several contractors, some of whom seem to be working for everybody, but we won't go there.

Again, we've introduced our case, codes and standards enhancements. We talked a little bit about that before. But the two case studies that we're talking about for residential are pool pumps and residential windows. And Fred Salisbury will be up as soon as I'm done to talk on the residential windows.

Pool pumps. Well, there are an awful lot of pools in California. And over the years PG&E has been very involved on the energy efficiency side with pools. I don't know how many hundreds of thousands of pools out there, actually Gary Fernstrom, who is my confederate and our leading pool expert, knows all those numbers. But it's really a massive load. And Gary has done yeoman work over the years going out and educating pool contractors about the benefits of two-speed and multiple-speed pumping, and various and sundry other improvements.

But there are 23,000 new pools in California; 35 megawatts of load per year. Most or all of it is shiftable.

Basically what we're suggesting is that we want to look at control requirements, either two speed or variable speed, but with the idea of proposing maximum water velocities in the filtration system that would allow proper filtration, proper chlorination of the pool, but it would also minimize the amount of energy required to do that. And also provide enough flexibility that pool loads can be shifted during times of peak demand.

And that's where the demand response needs and applications come in. Part of this is the issue of -- and I'm pretty sure it's been done; I'm not real familiar with this end of it, but there has been work done with radio control switches on pools to turn them off and on. And it's actually a fairly simple control item to do. So this is essentially what we're proposing for pool pumps this year.

And I'm going to turn the podium over to Fred Salisbury and he can talk further. Any questions?

MR. SALISBURY: Okay, as Steve mentioned, I'm Fred Salisbury. I'm with Pacific Gas and Electric Company's customer energy efficiency department.

I'm going to provide a brief overview of the residential windows case study. The intent of this case study is to look at potential enhancements, prescriptive enhancements for U factors and solar heat gain coefficients for residential new construction and retrofit.

Please keep in mind also that, as Steve mentioned, some of these case studies, including this one, are -- the details have not yet been

fully determined. So what I'm presenting here today may be substantively different from future iterations of these projects.

The scope of this particular study, as I mentioned, is residential new construction and retrofit looking at the glazing requirements as far as U factors and solar heat gain coefficients are concerned.

Obviously this will be looked at from a cost/benefit standpoint. That's what I mean when I say determining the optimum U factors and solar heat gain coefficients.

One of the things we want to look at is any existing codes that may already be in place in different jurisdictions, for example, the International Energy Conservation Code. There are a couple of reasons why we might want to take a look at this. One is to establish a starting point for our own particular enhancement suggestions.

Another one is to analyze and determine any possible jurisdictional overlaps. And consider if and how these overlaps might be resolved.

Another thing that we want to accomplish

is to assess and also close, if they exist, possible loopholes in existing standards. For example, there may be a loophole that exists in the current code regarding the use of high performance low E glass in extremely hot climate zones, such that an increase in the window-to-wall ratios in a particular residential building will actually result in an increase in the compliance margin for that building. So if such loopholes exist, it's something that may need to be addressed.

As far as methodology is concerned, obviously we want to identify and make sure we involve any and all stakeholders that may be able to provide us with input into this particular issue. Such stakeholders could obviously include manufacturers, developers, other utilities, et cetera.

And by gathering as much input as possible this would allow us to more easily identify and resolve any unique issues such as the ones mentioned above of loopholes or existing codes.

Also we would need to make a technology assessment. We need to be very careful to make

sure that for whatever U factor and SHGC levels we propose sufficient technology exists that we could achieve those compliance levels without, I suppose, rocking the boat too much as far as manufacturers and other interested parties are concerned.

And finally, of course, we would want to involve future savings, projections for this particular -- for these residential windows in order to determine what particular levels of compliance we hope to achieve.

Any questions?

MS. HEBERT: We got distracted there by a strange sound in the room, but are there any questions for Fred?

You know, I have a question for Steve Blanc. Steve, you said 23,000 new pools. Was that per year?

MR. BLANC: Yes.

MS. HEBERT: That's a yes for those who are listening in. And is there any consideration of running any of that load with solar DC off the grid? Because I know there's --

MR. BLANC: Actually, the expert is standing here.

(Laughter.)

MR. BLANC: Mr. Pool.

MS. HEBERT: All right, Gary Fernstrom one more time.

MR. FERNSTROM: Sure. The utilities aren't pursuing rebate programs for solar offgrid, but the effect of running a 1.5 horsepower standard sized pool pump and motor at half speed drops the horsepower load down to less than a quarter of a horsepower. that would be ideally suited for a fractional horsepower DC motor and a DC collector.

We're not seeing much of that now. But there is one manufacturer in the market that makes such a product. And I expect to see it become more popular in the future.

MS. HEBERT: Okay, thanks. Yes, Danny, go ahead.

MR. PARKER: Danny Parker, Florida Solar Energy Center. I'm one of those people with a solar powered DC pool pump. And I understand that it's still there this afternoon --

(Laughter.)

MR. PARKER: -- after being struck by three hurricanes in two years. But anyway, a

couple of other things. Within that study that I described this morning for Progress Energy of Florida, let's see, 20 percent, one in five houses in Florida have pools. The average UVC is almost 4000 kilowatt hours a year. If your home has a pool it's the second largest end use, after air conditioning. So, it's really big.

And also load control, as Gary mentioned, works quite well, and people really don't notice it much in terms of what you're doing. Very different from controlling their air conditioner.

Another thing that we're considering in Florida that might be something you'd be interested in, as well, is when you build a pool you have a unique opportunity to put in larger piping; typically 1.5 inch PVC piping is installed. But if you work out the engineering in terms of the head pressure that the pump is working against, if you just substitute two-inch piping versus 1.5-inch piping, you cost another $50 to $100 to the building project, but you're able to downsize the pump by 40 percent or more. And still get the same flow.

You can work out the numbers yourself

and see there's a huge difference in pressure on two-inch versus 1.5-inch piping. So this is something we're considering in Florida. So might as well put the bug in your ear about this here, too, since I'm sure you're not using 4000 kilowatt hours a year for pool pumps, but it's probably, you know, it may be half that or something. I'm not sure. But anyway, there's my two cents on that.

MS. HEBERT: Thanks, Danny. Anyone else? Okay, let's move to Davis Energy Group. I believe Mark Hoeschele is going to talk about evaporative cooling. Do you have only one topic? Is there a topic on ventilator cooling, as well?

MR. HOESCHELE: No, just evaporative.

MS. HEBERT: Just evaporative, thank you.

MR. HOESCHELE: My name's Mark Hoeschele, Davis Energy Group. We're a consulting firm. This work is actually out of tier two, but it has two phases to it. We did case study initiative work for Southern California Gas Company and San Diego Gas and Electric. And then there is a component of PIER research work that's kind of taking that initial step farther in

different directions.

Evaporative cooling has huge potential in California. It does also have a stigma with swamp cooling. But as homes get more efficiency from a cooling perspective, the potential for evaporative cooling to meet that load becomes greater.

So this work basically looked at looking at what's currently in the standards for evaporative cooling and coming up with approaches to improve the modeling and the credits available for the technology.

RAS (phonetic) data suggests that about 5 percent of homes statewide in California are cooled with evaporative cooler. Sales, and this would include commercial also, amount to about 100,000 units a year, so they're pretty significant. But a lot of them are the low-cost swamp coolers.

But in today's market we're slowly starting to see new, more efficient, two-stage coolers come out which offer the potential of achieving lower supply air temperatures to the house and result in better comfort and lower indoor humidity.

And as the building envelope gets better, the last bullet there, I mean as we improve the cooling performance of the building, either through cool roof technologies or radiant barrier and the pretty universal advent of spectrally selective glazing we get to the point where intelligently designed buildings can have low enough loads where evaporative cooling can meet that entire load.

We've done significant work in both technology development through the Energy Commission, ETAP and PIER, as well as field monitoring of different advanced systems that are out there. In those field monitoring studies we find, quote, SEERs or cooling season efficiencies, roughly 20 to 50 on an annual basis. So it depends largely -- we're defining the cooling capacity as the difference between the temperature of the air supply to the house, and the house temperature.

So if people can run the house at 80 degrees you'll get a much better cooling capacity than if they require a 72 degree setpoint, which is where the evaporative cooler may have greater trouble maintaining comfort.

Currently in title 24 evaporative cooling isn't handled very well. And beginning in January of next year is the federal minimums on air conditioning goes up to 13; evaporative cooling will actually see a penalty with direct evaporative coolers assumed to have an 11 SEER, and indirect/direct or two stage to have a 13. So, you know, in a few months we'll see where there's no credit for the technology or actually a penalty.

And another problem is those efficiencies are actually degraded by the air conditioner model that's in the ACM right now. And evaporative coolers, the way hot weather spells occur in California, the hotter the weather is the drier the weather is. So, if anything, there should be a performance advantage for evaporative coolers with these conditions.

So what we have now isn't working. One change related to evaporative coolers that will take effect in January is appliance standards which will require all products to be tested and listed. It won't set a minimum efficiency standard but it will require manufacturers to test their product under realistic conditions.

There's specific standards which the title 20 requires; and they'll be required to report effectiveness, total power at full speed and full speed airflow. There's also what's on that table there, an ECER, which is evaporative cooler efficiency ratio, which is based on testing at a 91 degree outdoor dry bulb, 69 wet bulb condition at 80 degree indoor. So, from that and the unit power, we'll define the ECER for the unit.

So beginning title 20, or beginning in January we'll have a title 20 standard which will give accurate information tested at a .3 external static pressure.

So, for proposals that we're floating, you know, under the CASE initiative, and we're still finalizing that, we will require only title 20 listed equipment and strict eligibility criteria on how these units get installed, and what's required, and so forth. Because a concern historically from the Commission, which has been reasonable, is that there's an uncertainty about how the product will stay in the house. So we have to be careful with what we propose.

So there are two options that we're

looking. One is just boosting the fixed SEER ratings for the direct and indirect/direct to 13 and 15. But eliminating any degradation for outdoor temperature conditions, the AC model corrections. That's kind of a simplistic approach, but it's conservative given the fuel data that we've seen in numerous studies.

There's another compliance option that it's not clear whether, how this fits with tier two standards options, or if it should just be part of the regular compliance approach. But working with hourly performance modeling of evaporative cooling, using the title 20 inputs, the power airflow and effectiveness data, and actually modeling on an hourly basis to determine if the evaporative cooler can meet the capacity requirements for the house. And if the capacity's insufficient the program would default to 13 SEER air conditioning for that hour.

So, in running the hourly model the user would have to input a specific piece of equipment for that house, and the credit would be determined based on how that equipment meets the load.

And here's just a quick summary of some preliminary results that we have for the 16

climate zones. On the left-hand axis is the cooling budget, the standard cooling budget for, I think, a 1600 square foot compliant house. And that's the blue diamonds that are on the bottom.

So for all but climate zone 15 the cooling budgets are under 30 TDV per square foot per year. And then on the bottom axis we're going from climate zones 2 through 16 there.

On the right-hand axis for somewhat conventional or typical pieces of equipment, we have the green square showing what a direct evaporative cooler would do. And the red diamonds, or the red pyramids showing what a two-stage indirect/direct with effectiveness of 110 percent would do.

And as you can see, the two-stage gets a much higher cooling reduction benefit, probably averaging around 70 percent for all the zones. And the direct unit probably in the neighborhood of 25 or 30 percent, mainly because there are more hours where it cannot maintain comfort, and then defaults to the 13 SEER air conditioning.

So to talk a little bit -- so, all this work was basically the CASE initiative that will be reported to the Commission in the measure

information template.

The PIER funding that we received to take this work a little farther, working with Ken Nittler of Enercomp, we implemented the hourly evaporative cooler model into MICROPAS. And we're working on the eligibility criteria. And we expect that, you know, the sizing, detailed sizing calculation will be a requirement of this to make sure that the piece of equipment that's installed is appropriate for the house.

And there's some model validation work that we're also pursuing as part of the PIER work.

So, in conclusion, you know, the potential for evaporative cooling is significant in the coming years. Builders and designers who want to focus on low energy cooling and programs such as Building America and Zero Energy Homes can benefit from the technology with the right design.

MS. HEBERT: Questions, comments? All right, thank you, Mark. Now it's going to turn back to Charles Eley. Charles, did you have a presentation, a PowerPoint for this, or are you just going to --

MR. ELEY: I do.

MS. HEBERT: Okay, great.

(Pause.)

MS. HEBERT: Looks like we've got that presentation loaded in.

MR. ELEY: The reason I did it at the last minute is our job is going to pick up the crumbs, you know, the measures that no one else is dealing with. And I wasn't quite sure if they would all be covered or not. But there's a few here that are not yet been covered.

One is some work that PG&E funded in evaluating EnergyPlus. I don't think -- I think where this may lead in this round is possible changes to the ACM manual that would enable EnergyPlus-based tools to meet the requirements for the 2008. I don't think we're quite ready to make it the reference method yet, but it is a powerful tool. There are some significant gaps between ACM requirements and program requirements that have got to be closed.

One of those gaps is that we rely on NFRC data for window performance, which is U factor SHGC and light transmission. And EnergyPlus can't take this information. It requires that you define the window almost from first principles, you know, by defining the frame

and each layer of the window construction and so forth.

So there's kind of a -- in general there's a gap between commonly available engineering data and the inputs required for EnergyPlus. And windows are one example of that gap. Another example of the gap are air conditioners, almost any kind of equipment. With air conditioners we know the SEER and perhaps the EER, and if you dig deep maybe you know something about fans. But what EnergyPlus requires is a detailed compressor model, a fan model and all of these things.

So translating commonly available engineering data into what EnergyPlus requires is a problem that needs to be addressed. And I think it is being addressed, but it's going to take a little time.

Another item that was in our contract that we will be addressing are some possible updates to the broad topic we call residential construction quality. That covers a lot of things.

I think we're going to take a look at the existing protocols and application methods, or

calculation methods that are in the ACM, including duct sealing, envelope sealing, all these things, just to fix what needs to be fixed.

There will be a possible requirement; maybe you've heard a little bit from Martha about the fan, furnace fan requirement. There could be a possible requirement that would require some minimum air flow across the evaporator. Fan energy, as you heard.

And possibly some credit for advanced framing systems. We're talking about wall and roof framing systems that have special designs for the corners and the headers and so forth, so that the effect of thermal bridging due to the framing members is lessened.

Right now we have to use data from the joint appendix 4. And that data does not recognize anything other than just standard wood framing systems. So that will be considered.

And the last measure I'm going to talk about are some tweaks and updates to the residential lighting requirements. These are two ideas that are definitely on the table. There may be more. One is to remove the occupant sensor of the controls exemption for support areas in

residences, such as laundry rooms, utility rooms and garages. In this case a high occupancy, or excuse me, a high efficacy luminaire would be required in those applications. And you couldn't get an exception to the requirement by putting in controls.

And then another measure that's on the table for consideration relates to large bathrooms, more than 140 square feet. This would be probably, I mean a bedroom is barely 140 square feet, but I guess there are bathrooms that are that large.

The idea here is that there would be a requirement for at least one high efficacy source on a separate switch in these areas that would be not accepted by the controls requirement. So those are two things that are on the table.

And my consultant, Jim Benya, is here. Do you want to add anything, Jim? Okay, that's it.

MS. HEBERT: Questions, comments, discussion? Yes, please come to the microphone.

MR. PATTON: David Patton, again. As far as a high efficacy source goes in the bathrooms of 140 square feet, it kind of doesn't

make sense to me in that it seems as though the place that you would end up putting that would be in a shower or something. And then it would sort of circumvent the reason that you had it in the first place, which is to be a safety issue.

So, you know, you get a bathroom that's that big and clients, in essence, don't want fluorescent. That's part of the reason that you have the exemptions in the first place. It seems like that's going to be the way that they're going to go to get around it. And it's not going to solve the problem.

So, I think we have to look at it in a different way.

MS. HEBERT: Thank you. Yes, another comment.

MR. NULL: John Null from the WattStopper. So, regarding the controls exemption for laundry rooms, utility rooms, garages, so there's actually sort of a safety and convenience ways or reasons to have controls in those rooms. So I think that would be expedient to look at that a little bit closer, that exemption.

And regarding the large bathrooms --

MR. PENNINGTON: Could you explain what

you mean?

MR. NULL: Well, for instance, in a laundry room right now the code says manual on; motion sensors or occupancy sensors are allowed. For instance if you allow automatic on for people that are walking in with laundry baskets, for instance, that would be a comfort/safety type of control methodology.

Same way for garages for instance, where you pull your car in and the lights come on, for instance. So, I think that limiting the controls to only manual on for the entire house doesn't lend itself well for the market transforation to controls in homes.

Secondly, for large bathrooms, greater than 140 square feet, right now the sort of the state of technology is wall switch sensors. And I don't think that builders are actually thinking that there are other control options. For instance ceiling sensors, which can cover an area that large. And you can still have manual on options with ceiling sensors. So I think that's a consideration that should be taken maybe in the ACM.

That's it.

MS. HEBERT: Great, thank you.

MR. HUANG: Joe Huang, LBNL. Charles put up a slide about the EnergyPlus, use of EnergyPlus. And I just want to say a few things about that.

Many of you probably have known that at LBL we've been working for since January in going through the ACM certification runs, and basically translating the DOE2 files into EnergyPlus. And in doing that, what we're developing a translator that would do that automatically.

And in doing that we are looking into the problems, the input problems that Charles has mentioned. And I just want to mention a couple of things.

On the windows, we're refining a method where you give it an SHGC and a U factor. And then with a couple of other pieces of information you could generate a window that would be -- you could generate a window file that would be fairly accurate.

But the main thing for the title 24 office is that to do that you would have to define your title 24 requirements to be further than just U factor SHGC. You have to say a few other things

like is it low E, how many panes of glass, a few other things. Because otherwise there's just too much room for discrepancy. So that's one thing.

On the equipment, I'm finding out that there are problems in developing inputs for equipment for EnergyPlus, but they're really not much worse than for DOE2. So you have the same problem with DOE2. If you give it a SEER, what do you do. If you have the same levels inputted for DOE2, that could go into EnergyPlus very easily. Like if you have the part-load curves and you have what in DOE2 are called energy input ratios, or what in EnergyPlus are called efficiencies. That would go over pretty well. So, there are some input problems, but I think they're pretty tractable.

MS. HEBERT: Thanks, Joe. I see no other folks arising to the microphone. So, thanks, Charles.

We haven't heard much from Bruce Wilcox at the microphone today, and it's his turn. He's going to talk about the residential attic roof model he's been working on.

MR. WILCOX: Thank you, Elaine. This is reporting on a PIER project for a program called

Research for the 2008 Residential Building Standards.

And what we're developing is a residential ACM attic duct model, which we actually are, through a lot of clever work with a consultant on names, we've decided to call UZM, which stands for unconditioned zone model.

And this is a team effort; people who worked on this project included Phil Niles, who is here in the audience, who is famous as the original author of the CALPAS, CALRES, MICROPAS series of programs. And we've brought him back for an encore here to do even better.

Ken Nittler, Larry Palmiter is not here, and Danny Parker have all worked on this project with us.

There it is, okay. So, the background here. Why do we need an attic duct model? Attics with ducts are the typical thing in California homes. People in the other parts of the United States don't believe that, but you all know that that's true. So, it's an important thing.

And energy efficiency of the whole house depends in a lot of ways on the roof attic duct performance, particularly when we're talking about

peak demand.

We need an accurate model for dealing with attics that evaluates all the relevant factors for developing standards so we can decide what's cost effective, and develop a standard that's rational and works.

We also need a better calculation to treat measures for compliance so that you can actually make tradeoffs between cool roofs and radiant barriers and extra duct insulation, all those factors, in a way that's rational and works.

the approach to this project was to crib all we could get from existing attic duct models. And we looked at the ones that are out there and learned from them. We've developed a new model that's designed to work for the ACM context. We've tested that and done some comparisons with data, and I'm going to talk about that in a minute here.

And then the plan is to integrate that into a special version of MICROPAS. That's a process that's underway and will be finished very soon.

Following that we're going to support using that special MICROPAS version within the

standards process for the development of the 2008 standards. And eventually we're going to publish this model in the 2008 ACM where it will be available for all program vendors to use in their models. So, that's the process that we're planning here.

Of course, we designed this model to work within the compliance world where there are significant constraints on what you can know and what information you have available. And also the kind of things you have to do.

So, first of all, we have to be able to handle all the current measures and credits that are in the standard now. We can't have a new attic model and then all of a sudden you can't use a multizone air conditioner anymore. So, as far as we know, this model is designed to handle all the current measures and credits.

We all know, after all these years, that you really can't ask people to check very many things in the field. There's only a few very simple things that you're going to get people to pay attention to. So, this is designed to have a very limited set of inputs.

And we also need to handle some

significant, although not predominant, some significant variance in buildings. Some houses in California have crawl spaces. And if you've got one of those, and you want to comply with the standard, there has to be a way to do it. So crawl space ducts are built into this model, as well.

There are flat roofed houses; there are flat roofed multifamily buildings, so we can handle flat roofs with or without attics. A very significant number of houses these days have multiple air conditioning systems. So this is set up so that it will handle a house that has a multiple air conditioning system. Can even get up to six tons, so you can build it in Palm Springs.

And also it's designed to handle, you know, the sort of extreme case, the house with multiple systems, multiple zones, ducts in the attics and crawl spaces and indoors all at the same time. So it's really designed to be a flexible compliance tool that works for everything.

We're covering the whole range of efficiency measures. You can see in there it's all the standard culprits. Tile roofs, radiant

barriers, attic ventilation, attic insulation, sealed attics, and insulation construction quality.

So the inputs for this. This is a model that works in MICROPAS for compliance, for performance. And right now the input for an attic is the R value of the ceiling insulation, really. We don't really have an attic in the model. So what we're adding here is a variable, which is the roof type. And currently you have the choice of a gabled roof or a hip roof or a flat roof. And it's not even completely clear that this overwhelming important, but it's built in there now.

And then the roof pitch, because that affects what the height is of the attic and so forth. So, you put in the pitch in normal construction terms, 4-in-12 or so. That's it. That's -- all the other stuff that you need to know about the size and volume and all that comes out of defaults that are based on the description of the house. So it really is a pretty minimal extra effort to include this information.

If you want to do other than defaults, then there's ventilation details, where the vents

are and how big they are. And then, of course, the roof properties if you're going to claim some sort of performance credit, the solar absorbtivity and emissivity and roofing type.

And then as far as the ducts go, the model we're using here builds on the current standard 152 derived model. And it basically has exactly the same fundamental inputs that we're using right now, except rather than running on a seasonal basis, the calculations run hourly. So the inputs are not very different and shouldn't be too onerous.

There are some limitations from this approach, of course. You know, we're going to assume that all gable roofs are square, and so forth. I mean, because we're not asking for a lot of input, we're taking big shortcuts on geometry. So, we can't expect to be able to match the performance of any particular shape or so forth.

As I said, we're using the pretty simple duct calculations. We don't actually know what the air flow is to each register, so you can't expect to get efficiency answers that depend on that sort of level of detail.

We're using a regression-based attic

infiltration and ventilation model that was actually developed by Ian Walker at LBL in one of his former lives. And we've adapted it for this model. But, again, it's not doing flow pressure network or anything like that. It's pretty simplistic approach.

And you're only allowed to have one attic space and one crawl space in any particular building. And that means that if you're doing some complicated house that's got shed roofs and all kinds of things, that we're going to put them all together and assume they're all one space. You know, it's not exactly precisely what you've got there, but it probably gets us the right conservation efficiency answers, I think.

We also have some new capabilities in this model, whether we decide to use them or not in the compliance world. We have a way of improving the infiltration calculation for the house, because there's this significant relationship between the house infiltration and what the conditions are in the attic or the crawl space. And so there's a way to make that an improvement.

We can handle unbalanced duct system

leakage. Up to this point we've always assumed that duct leakage is balanced, supply and return are equal. But this model can handle unbalanced leakage, so we may want to look at that as a different option.

We can supposedly handle forced ventilation of the attic using air from the conditioned space, all of the sort of night breeze and whole-house fan kind of approaches.

In theory, if there was such a measure available we can handle special radiant properties of duct surfaces. An interesting question about whether there is any such thing as a low emissivity duct wrap.

We can look at that important issue of the radiant barrier on the gable roof ends. I know you guys are all ready to hear about that one. And the impact of temperature on the insulation R value in the ceiling and roof deck insulation.

So part of our plan here is to get this model to work and tested. And then compare it to various benchmarks to determine that it actually works reliably and is doing what we think it should do. One thing we have done is compare to

experimental data. And we're going to present some of that to you in a few minutes. We've also compared to some measured California data to show how well it works in California houses.

And then we've got two more steps that we haven't actually completed yet because the MICROPAS implementation is not quite finished, and that's to compare to the current seasonal duct efficiency calculation to see whether we were changing anything with this new model. And then to compare overall compliance results for the new model versus the 2005 standards approaches. And make sure that we understand what we're doing and things are in the right ballpark there.

So the status here, the model's complete; the documentation draft is complete. Anybody who wants one, I don't know that it got posted, but it's certainly available. And we've done a bunch of the testing against data and MICROPAS is almost ready.

So now I want to have Danny Parker take over for a minute here and tell us about the Florida flexible roof facility where they've generated some experimental data that we're using to compare to with the model.

MR. PARKER: Thank you, Bruce. This is going to go really quickly. I guess what I wanted to tell you is that why are we using a facility in Florida to validate a title 24 model. It's because with this flexible roof facility that we have in Cocoa, Florida, we have very detailed weather data, solar insulation on a horizontal axis, wind speeds measured at rooftop level as well as at 10 meters. As well as this highly instrumented facility where we have six different test cells where they're thermally isolated from each other, but we're able to see things like you see here. This is a day in June 1997 that Bruce is going to be comparing.

You're able to see how everything compares to the ambient air temperature on this day for these different roof constructions. So this is the white tile; this is the black shingle; radiant barrier with 1:300 ventilation radiant barrier, with 1:150; the red tile case, that's very important for California; and white metal and so on.

So, you know, obviously these are big differences. This is from the minimum is like 70 degrees all the way up to nearly 135. So that's a

pretty hostile environment for a duct system, and also for heat transfer associated with the attic insulation. But we wanted to use this data that we had, high quality data, to compare what we measured in terms of temperature and heat flux and so forth, against what the UZM model was predicting.

We have a lot of configurations are changed every year, so we look at different types of roofing material. This shows us looking at a lot of metal roofing where we're measuring all these things; measured heat flux, air temperature, weather conditions. And we look at all these things including details like what's the air velocity near the rooftop, which turns out to measure and be important in terms of creating a model and finding out exactly how that wind speed varies near the roof is very important relative to how successful the model can predict what's going on.

And we are also able to look at things that you might want to consider at some point in the future. For instance, in Texas unfinished metal is very popular. And so we looked at these two unfinished galvanized metals as well as metal

shingles that look -- these are IR reflective metal shingles. They're spectrally selective so they would look like what you would tend to see with a kind of a chocolate brown tile in California. But this is, in fact, this is about a 40 percent, 50 percent reflective roofing system.

And then, you know, I'm not going to tell you what you're looking at, except that this is the attic air temperature for all those six cells from June 1, 2003 through October 1st, the entire summer. And, you know, what's the one that's hottest, 135, was the one with the dark shingles. And then we have these others; these are some of the lighter colored construction.

And, then we, you know, you try to make sense of what does all that mean over the entire summer. This shows, again the ambient air temperature. The temperature in each of these average attic air temperature over the entire summer. And then Bruce is going to show you data, showing how well the model works against what we measured. This just shows us changing configuration on some of these. A lot of the data's been published in different places.

So, go ahead, Bruce.

MR. WILCOX: Okay, so what this FRF data does is gives us a real test bed for looking at how well the model can replicate these effects.

And so here are, from the 1997 data, we have -- I've made two plots here. It's actually kind of a challenge to figure out a way to get these things onto one plot, so I decided to separate them out.

On the left-hand side we have the predictions by the new attic model, the UZM predictions. And on the right we have for the same roof surfaces the measured values. These are averaged hourly for the month of July of 1997. And I think that in general you can say that the UZM model reproduces the pattern pretty well. It's not perfect, but it gets the general trends very well.

The black roof is up there with 128 degrees average. And we matched that very well. The white roof down here at the bottom we get that pretty well. The little black line here is the average air temperature.

The ones in the middle we don't do quite as well on, but we've got the general trends, I think, very well.

So I think the conclusion is that the attic model can match the stuff on an average basis in the summertime pretty well.

If you look at the peak, this is the day that had the highest attic temperature for the black roof case. And, again, I think the model represents the data in a very respectable way, getting the peaks about right on the black roofs, and getting the other roofs in more or less the right relationship.

The ventilated case is better in the data than what we give credit for and so forth. But they're, you know, -- some of this has to do with, I think, explainable differences in climate and humidity and the actual geometry of this flexible roof facility versus what the ACM model -- or the UZM model is assuming and so forth.

One of the other things to look at, Danny's done some work where he compared a couple of the other models that are available with this same dataset. And we compared our models to the other two widely used models. One is a DOE2 model that Florida actually sells -- it's called EnergyGauge USA.

And the second model is ASTM C1340.

It's actually, I think, an ASTM standard which was developed by Ken Wilkes at Oak Ridge National Laboratory. And it's kind of the full-on physics approach to things.

And so in these three plots here are three different cases. This is the black shingle roof; this is the red tile roof; and this is the white metal roof. And in each case the black solid line is the UZM model; the square little magenta boxes are the real data; and the two dashed lines are the other two models. And I think you can say that the UZM model is as good as or better than the other two models representing this kind of performance. So we're happy with that.

And then the other thing I wanted to talk about a little bit is, well, that's all data from Florida and it's all -- but it's a different climate and different, in some cases, some kinds of different issues and so forth.

So I wanted to show how this model would work on a sort of more or less typical house. Some of you might remember having seen this house before. It's one that was an experimental house that was sponsored by Cardinal Glass Company, in

which I did the data collection and managed the project.

In which we have a year of measured data, attic temperature and weather data and solar data, the whole package, for a pair of new houses in Roseville, California. And these houses have a lot of the California-specific features that I think are important to be able to handle in this model. Tile roofs; they've got high level of ventilation; they've got sealed ducts in the attic with measured duct leakage; they've got ceiling construction defects that are pretty significant in terms of the insulation quality measures that we've recently put in the 2005 standards.

And so what we've done is we've taken the UZM model with the MICROPAS model, and looked at how well can we predict the attic temperatures for this house.

And I think the answer is we do very well. This is a week of data, seven days in which the middle day here is actually the hottest day in that whole temperature record. And, you know, the model is, again, the little magenta boxes are the data, the heavy line is the UZM model. There's a light black line that you may not be able to see,

which is outdoor air temperature.

But basically the model is doing a very good job of representing the pattern of temperatures over the typical hot sunny summer days.

If you average the whole of July dataset, the model matches the data within about a couple of degrees maximum difference. It's not exactly coincident. I worked at this a long time trying to figure out what's going on there. I think part of it is because the model assumes that the gable roof is nice and square and symmetrical. But this house actually has a big west-facing exposure. And I think it actually does, gets more solar gain in the afternoon on the roof than the model is predicting, and that's explainable. But as far as a model for compliance, or a model for standards development, I think this is perfectly good.

It also works in the wintertime. I mean we also are depending on this model to give us the winter duct efficiencies and so forth. And I think it does very well in those conditions, as well.

And just to sort of say what kind of

things you could do with this, potentially if you take the tile roof that I was just showing you that matches the data pretty well, for this house, and we do a second run with the model; and the only thing we change is we take out the tile roof and we put in the black shingle roof that we had in the (inaudible) test cells. And this is sort of the range that we're talking about here in terms of what's possible as measures in the standard.

The average temperature, this is again July, the average temperature goes from 105 in the attic to 122 in the attic, just simply changing the construction of the roof.

So that's it. We intend to come back with this model and report on the comparisons with the current duct efficiency and the current compliance use. And, as I said, this model will be available very soon and will be supported for use by stakeholders in the standards process throughout the 2008 standards.

Any questions?

MS. HEBERT: It looks like we have one person jumping to the microphone.

MR. WILCOX: Andre said he came out here just to hear about this model, so --

MR. DESJARLAIS: Andre Desjarlais, Oak Ridge National Lab. I guess I have a question for Danny, and one for you, Bruce.

Bruce, I know in our own use of modeling in modeling attics, modeling temperature is one thing, but modeling the heat flux through the ceiling is a completely different thing.

Danny mentioned in his experimental data that he has such information. Do you intend to do that and validate your model in terms of the ability to predict heat flux, which is really what we're all interested about, and not temperature.

And I guess my second question -- or, let me let you answer that one.

MR. WILCOX: Well, that's certainly possible. But I don't think I'd agree with you that that's what we're most interested in. I think that for the California situation it's the temperature at the ducts and air handlers sitting out there that are as important as the heat flow through the ceiling.

So that's why I went after the attic temperature, because I think that's really the

fundamental issue here.

We could certainly crank out a comparison on attic heat flux for the Florida FRF. Unfortunately I don't have anything like that for the California house. So, I mean that's the other reason there.

MR. DESJARLAIS: Yeah, no, I understand. We find that modeling heat flux and being able to predict heat flux is more challenging, so I --

MR. WILCOX: Yeah, I completely agree --

MR. DESJARLAIS: -- share that challenge with you.

MR. WILCOX: -- with that.

MR. DESJARLAIS: And I guess my second question is for Danny. Danny, you made the comment about air flow going up the roof as being extremely important. But yet the model doesn't allow you to orient the roof. And isn't that kind of a contradictory statement? I mean if you can't orient the roof with respect to the wind, you can't capture the flow up the roof correctly.

I kind of wondered whether that comment and the comment of not being able to orient the roof is contradictory.

MR. PARKER: We used a different model

that we had put together, FSEC2.1 (phonetic) where we also had a detailed attic model. And we looked at altering the geometry to see how problematic it was to have this model so it was geometry-neutral.

And then part of the reason why we didn't -- this isn't specific, is it doesn't turn out that you end up in that much difficulty.

On the issue of the wind speeds by the roof surface, I think that it, you know, Bruce and the others in the group that were involved in the team would agree that more time was spent on that element, on looking at what was going on with the wind speeds near the roof surface and at the roof's, or at even attic height versus 10 meter height versus airport. A lot of effort was spent on this question.

And we also communicated with Ken Wilkes about this relative to ASTM C1340. The agreement that you saw with ASTM C1340 only existed if we adjusted the wind speeds so that they were approximate; they were similar to what we saw at attic height.

We also measured them near the roof surface, which you saw in that picture. But actually we had 10 meter height, attic height, and

then also roof surface. And those were all prepared. I can send you the emails we've been exchanging recently on this topic.

But it's really interesting, but it's also -- well, I know it's kind of a geeky extravaganza, but it turns out to be really important if you're trying to model this stuff.

The reason I say that is if you assume the 10 meter wind speed or the airport wind speed you'll get the wrong answer. And for this model or any other model we don't want to get the wrong answer.

MR. DESJARLAIS: I like geeky.

(Laughter.)

MR. DESJARLAIS: But let me ask you one question then. But the weather files obviously are pulling wind speed information. You're using weather files, I presume you're using (inaudible) files to do the simulation. Are you correcting the wind speed?

MR. PARKER: Yes.

MR. DESJARLAIS: You are.

MR. PARKER: We are -- well, with the FRF data that's why this was unique. We had the attic or the rooftop level wind speed from the

weather tower close by to drive the model with.

We compared that to the 10 meter wind speed there, as well. And then also have been comparing that to the airport wind speeds.

Max Sherman's in the audience. And so we spent a lot of time looking at the wind speed normalization procedure within the algorithm that he developed awhile back. And, you know, it actually works pretty well. We haven't been able to do a lot better than that.

Actually, what we're finding is that the site wind speed at any particular location varies so much from one localized site to the next that this, you know, it makes it difficult to predict things for a specific location very well.

However, for code requirements and for title 24, the good news is you don't need to have to be exactly well, you're trying to represent a large population of houses that are close by that (inaudible) site. But I guess to answer your question directly, yes, it's important to normalize that wind speed, and yes, we do.

MR. DESJARLAIS: Okay. I have one last question. I apologize if I've monopolized you.

MR. WILCOX: Nobody else is interested,

so go ahead.

MR. DESJARLAIS: Yeah, nobody else is going to ask a question. Your data suggests that your model agrees fairly well with ASTM C1340, which is a free model, short of the comment that Hashem made earlier.

MR. WILCOX: Hashem also said our model is a free model, so.

MR. DESJARLAIS: What does your model do that 1340 doesn't do?

MR. WILCOX: A whole bunch of things.

MR. DESJARLAIS: I know the crawl space part was one obviously.

MR. WILCOX: Well, 1340 is, you know, maybe in retrospect it has a very rigid geometry. And it's not flexible. And it has a duct system that is kind of the level of detail we're talking about with EnergyPlus on windows. I mean it doesn't fit into the compliance situation the way we're trying to go.

And a number of things. I mean I think that model is actually -- I think the fact that they've done it as an ASTM standard and it's out there has been a wonderful thing. And we've ripped off all kinds of stuff from it, so we like

it a lot.

MR. DESJARLAIS: I think that's -- thank you.

MS. HEBERT: All right, no one else commenting on that. I think, Bruce, you get to stay there, or are you handing it over to Max Sherman totally?

MR. WILCOX: I am, yes.

MS. HEBERT: Okay, it's Max Sherman's time. Max from Lawrence Berkeley Lab, to talk about residential ventilation.

MR. SHERMAN: Thank you. We're going to switch tone a little bit. We're going to talk about residential ventilation, which means we're going to be talking about health and safety issues primarily, rather than energy efficiency issues.

So we're going to be talking about things that we're proposing should be mandatory parts of the standard rather than things that can be traded off.

So why are we doing this? Well, there's a whole bunch of issues for why we're doing this. First of all, houses are getting tighter. That's a good thing in term of energy efficiency. But it can be a bad thing if you're expecting

infiltration to dilute indoor pollutants.

Also ducts are getting tighter. Title 24 has been a leader in getting the ducts tighter, but leaky ducts have been very expensive but an efficient way of ventilating houses over the past.

We've got changing contaminants. There's all sorts of things that are in houses that didn't used to be. And we also have changing expectations. People expect a certain degree of service in health and safety in their homes now. And that may be different.

All of this sort of sets the tone for why we need to look at specific ventilation requirements. This is a trend in U.S. houses. I don't have a similar thing for just California data, but you can see the houses have been getting tighter. This is over the course of the '90s.

You don't have to know too much about what the units are, but you can see that there's been definitely a downward trend. And I can tell you that at these rates the amount of infiltration that you get is not sufficient to dilute indoor contaminants.

And what are those contaminants? Well, there's a whole set of them, volatile organic

compounds are everywhere in the products that are in our houses. Formaldehyde is sort of the poster child for them, but there's a whole bunch of them.

Products of combustion are everywhere. And in fact, products of combustion are why there have been ventilation systems in houses for about 9000 years. People have recognized that you needed to ventilate the products of combustion.

Moisture and water are the contaminants of concern in the media today because that's mold and asthma, and those are the things that make the news.

And then there's all sorts of esoteric things that are being added to consumer products and things in the home. A lot of them we don't even know how bad, or if they're bad, or if they're not bad, but we know that there's all sorts of compounds around.

So what have we done in the LBL project? We've done a set of things. Previously we did some scoping studies and some literature reviews. and that's all work that's done. What I'm going to talk about today is the fact that we've developed some criteria that we think should go into title 24, and that's in the applicability

report. And that's principally what I'm going to talk about today.

We're also doing a technology evaluation. Assuming that we were following these criteria what would it mean for different residential ventilation technologies. And that's work that's underway, and I'm not going to talk about that today.

And then, of course, we'll help assist the Commission in whatever it decides to do.

So, one of the first things we did in reviewing this is to look at what else was out there. The model codes all have something about ventilation in them. There's a bunch of IIQ programs, HealthHomes, EnergyStar, that look at various things to do with indoor air quality.

Around the world almost all developed countries have national standards on ventilation. So we looked at all the standards in the various developed countries. And, of course, here in the U.S. since 2003 we have an ANSI standard, ASHRAE 6022, which represents the consensus standard for residential ventilation.

So, in looking at the literature there's a whole bunch of key issues that we came up with.

And we addressed each and every one of these in the report. I'm not going to talk about all of these issues one by one today. We're going to talk about a few of the important ones.

We're going to talk about duct leakage; we're going to talk about infiltration; we're going to talk about windows, and a variety of other things.

So the applicability report is the primary thing that has our conclusions and recommendations on what should be done in the state. That link that you see there will lead you to it, but it's also on the website right now for anybody who wants to download it.

So we're going to look at some alternatives; we're going to look at how to address some of the key issues and what criteria we think should be in title 24.

So, as I mentioned, there are a bunch of key issues. I won't list them again. Except for this one. Windows is perhaps the keystone issue to be dealt with here. Because if you believe that people will operate windows when they need to operate windows, and there's no need to have minimum ventilation requirements. Throwing your

windows open at anytime is going to assure that you get plenty of air to ventilate your home.

Now, there's two reasons why people open their windows. One is for cooling purposes, when they believe it's too hot indoors and it's cooler outside, they open their windows. The second is IAQ, controlling minimum IAQ to make it acceptable. Those are very different things because one's a comfort thing and one's a health and safety thing.

But what I'm focusing on is looking at the indoor air quality aspects of the minimum ventilation rates. Currently, title 24 assumes that you will open your windows in either case. When you need to, you will open your windows either for cooling or for indoor air quality purposes.

We wanted to investigate whether or not this was true, at least from the point of view of the indoor air quality. So the Energy Commission and the Air Resources Board together funded a study to look at occupant behavior.

And so i'm going to give you a little bit of a sneak preview on this, because the stuff is not out yet. We're still in the process of

analyzing it, so I'm going to spend a little time on giving you some preliminary results of what we think is going to be in the final report so you can get a sense of what happens.

This was a study of about 1500 randomly selected new homes in California. So these were built under the 2001 standards and occupied for at least a year before the survey was made.

One of the simplest things we asked is how acceptable do you find your indoor air quality. Because that's one of the key notions. And what we found out is that less than 5 percent of the people found it barely acceptable, or worse. Which means 95 percent of the people basically found their indoor air quality acceptable.

This isn't a particular surprise because we know that people are not very good IAQ sensors. They can't really tell when the indoor air quality is good or bad. So the fact that they found it acceptable isn't terribly surprising.

But nevertheless, although most people found it acceptable, they also reported a bunch of problems when we asked them separately about it. They complained about heat and humidity in the

summer, cold and dry in the winter. Those are probably thermal comfort issues. Drafty, dusty; those might be considered indoor air quality issues.

The people who had mechanical ventilation systems reported less problems than those who didn't.

So we asked people why they opened windows. Now, don't pay attention to the numbers in each cell; those are for me in case you ask a question. But if you look at the red-colored cells, those are the ones that answered quite high. And here we had a whole set of questions of why do you open your windows. And they told us each thing, whether it was very important down to not at all important, or never opened their windows for this reason.

And people opened their windows to cool the house and provide air movement. Those are probably overheating issues in the summer. To remove odors. To air out the house after cleaning type activities. To save energy; that's probably also a thermal comfort thing in the summer.

There were some reasons that they never opened their windows. They never opened their

windows to warm the house. They never opened the windows to remove moisture, to remove smoke, to provide draft for the combustion appliances, or to allow pet access. And, in general, those people who had mechanical ventilation were more or less the same as those who didn't, except in the case of removing odors. Fewer of them who had mechanical ventilation reported that they opened their windows to remove odors.

We also asked why do you close your windows. So the flip side of that. The biggest answer was the top and the bottom, which was either nobody was home, or for security and safety. People did not want their windows open if they were concerned about security or safety. They wanted their windows open to maintain a comfortable temperature, to keep out noise, save energy, keep out rain and snow, dust, allergens or insects.

The only things that weren't important reasons to close their windows were to keep pets from going in or out, or to keep wood smoke out of their house. But generally they had lots and lots of reasons why they wanted to close their windows.

Those were very qualitative reasons. We

wanted to get a quantitative estimate of how much people opened their windows. So there were a bunch of questions in the survey about how much they opened their windows, certain times, certain amounts. And we put together a way of turning that into an equivalent specific leakage area.

Now, some of you know what specific leakage area is in the standards already. For those that don't, it's essentially an amount of hole -- the equivalent amount of hole that you have in the house normalized by the floor area of the house.

I'm not going to go too much into the number. I'll tell you how much it matters. But what we did is we turned the variable amount of window opening into the equivalent amount of hole so we could compare that to infiltration rates.

I'll spend a little bit of time on this plot so that you can get some sense of what the results are. Because this pretty much encapsulates the results that we got in terms of how we did it.

Along -- the horizontal axis is ESLA, which goes from zero to ten. At ten it's pretty much people have their windows full open most of

the time, so there's plenty of ventilation, there's plenty of everything, gale force winds inside the house.

And if you look at these plots here, these are the fraction of people who have their windows open all the time. In this particular case in the summer you can see that something over 30 percent of the people have their windows open effectively all the time.

Whereas down in winter, which is the blue line, very few people, only a couple percent have their windows open all the time.

Down here, this shows how many people never open their windows. So if you look in, roughly 50 percent of the people never open their windows at all in wintertime. In spring, summer and fall, 30 percent never open their windows at all.

Now, this shaded region is the region that people have to fall into to get the equivalent amount of ventilation necessary from opening their windows. Now, it varies by particular climate and a bunch of details, so it's kind of fuzzy. But if it's sort of in that band we get the sense that maybe there is enough.

And what this shows is that perhaps 40 percent, between 40 and 50 percent of the people during summer would get enough, less in spring and fall, down in winter to where maybe only 10 percent of the people would be opening their windows enough time in order to get enough ventilation from operable windows.

Now, there was a subset of people who we knew had mechanical ventilation because we worked with the builders to ask the questions of who had mechanical ventilation systems in their homes. So we had the special builders subset of people, and we asked them special questions; or at least we analyzed the data separately.

In this case this is the question, how much did you use your mechanical ventilation system. Continuous; somewhat; infrequent; never; or what we thought was a dumb answer, I don't have one.

Well, it turns out that 45 percent of the people didn't know they had a mechanical ventilation system in their house. So needless to say they didn't operate it. So it was operating in whatever mode the builder left it in when he gave the house over to them. So that's somewhat

interesting.

But of the people who knew they had it, generally they operated it either continuously or somewhat. Ten to 25 percent of the people, depending on the season, tended to use it very little. The rest of them tended to use it quite a bit.

So, what are our conclusions from these studies. First of all, few people use their windows a lot for indoor air quality. There's lots of reasons to close them. They can't tell when they need them. They open them sometimes. There's a lot of barriers to using their windows, and there's few cues for them to know when to do it.

They do apparently do it for cooling purposes. As you saw in the summer there was a lot more operable windows. People were doing that, the data suggests, in order to control the temperature and avoid using their air conditioning when they didn't have to. But they're not doing it for managing indoor air quality.

The mechanical systems seem acceptable to users. I didn't go over the data, but we asked them what they liked, what they didn't like. And

generally it seemed that those who had it were happy. There was some difference on the different kind of mechanical ventilation systems. I don't have time to go into that today.

Okay, so that's the summary of that study. Now, the real thing is what does that mean for title 24; what are our recommendations for what should be in these mandatory requirements.

First of all, the core standard of care should be the ASHRAE 62.2, the current version is 2004. That is, a lot of these issues have all been addressed, and most of them are applicable to California. That should be the standard of care that we start with, and then we tweak from there.

ASHRAE 62.2 is the only ANSI-approved standard on residential ventilation, so it makes plenty of sense.

The next issue which is near and dear to Californians is duct leakage. Our recommendation is to require that total duct leakage be no more than 5 percent. Now, this is not an energy rationale, although it will have energy implications, it's because when you have duct leakage from contaminated buffer spaces, you pull in an awful lot of contaminants. At the low rates

we're talking about for ventilation, you can't afford to pull in very many contaminants.

So 5 percent leakage is practical. It's done in thousands of homes in California. So it shouldn't be any problem to require it as a mandatory feature. Of course, if you have the ducts in the conditioned space, it doesn't matter, because this is leakage when the ducts go through contaminated buffer zones.

Combustion requirements. Basically we're not making any additional requirements other than title 24 or 62.2, but currently title 24 has a requirement that you can't have the envelope be too tight. Because if it's below 1.5 sla there's certain things you have to do. If you follow 62.2 we don't believe that that requirement is needed anymore, so we recommend dropping those special requirements.

Intermittency is an interesting issue, especially for California. 62.2 has a small ability to do intermittency, but we've come up with something that's a bit more general. And the reason why this is important is because when you have large diurnal swings like we have in California, when you have large peak load problems

like we have in California, when you have outdoor air quality problems as we have in California, there's all sorts of reasons why you might want to shut the ventilation system off for a few hours, let's say typically on a summer afternoon.

In order to do this you have to compensate in order to get the same indoor air quality by providing more ventilation at other times. And at LBL we developed the mathematics of how you do this in an easy tradeoff way. And we think this is very powerful. You can even -- can probably even save energy and certainly peak power by doing this. And, of course, in areas with bad outdoor air quality you may want to do this to avoid bringing in ozone and other outdoor pollutants. So we're recommending that that be allowed.

And as I said before, we're recommending that windows not be allowed to meet minimum ventilation requirements. Again, we're talking about IAQ, we're not talking about ventilative cooling. But that you have to have mechanical ventilation, not operable windows, in order to meet the minimum ventilation requirements.

In terms of sizing we're recommending

that sizing be done as 62.2 requires, but that we add 25 cfm to that sizing. There's a couple of reasons why we want to add 25 cfm.

First of all, California envelopes tend to be somewhat tighter than the rest of the country. But also it enables us to use the intermittent ventilation if you have a control system that you can shut if off for several hours during the day and still meet the intent of 62.2.

So by mandating that the capacity of the equipment is larger, that allows more flexibility to use these intermittent requirements.

So let me end with just a quick prescriptive example of what it would take to meet what we're talking about. For a 2000 square foot, three bedroom house, it would be a 75 cfm fan, exhaust fan, that would require to meet these. It would have to be quiet exhaust fan. That would be a one zone fan.

It could be just replace a bathroom fan and run continuously, or two bathroom fans if you wanted to split it up. But for every other bathroom fan we did a 50 cfm bath fan. 150 cfm or higher vented range hood in the kitchen. And 5 percent total duct leakage. Those are the key

requirements. There are bunch of other little ones, but those are the core requirements that you have to do to meet what we're suggesting.

MR. FERNSTROM: All of those or just --

MR. SHERMAN: All of those.

MS. HEBERT: Is there a quiet kitchen hood exhaust fan?

MR. SHERMAN: Yes, there are. There are plenty of them on the market. The kitchen fans only have to be rated at 3, as do the bath fans. The continuous fan has to be operated at 1. But any of the intermittent ones at 3. And there are plenty of them on the market now.

Now, what happens is you have to get the sound rated at 150 cfm, so there may be a 400 cfm kitchen fan that's 8, but it's also rated at 150 cfm and it may be 2 or 3. So there's plenty of those.

MS. HEBERT: I'm sorry, was your study done across all 16 climate zones for California?

MR. SHERMAN: The survey was broken up into three regions, the Sacramento region, southern California region and the rest of the state, sort of reflecting where the new homes were being built.

But the results that I showed you are weighted statewide results. So they've been appropriately weighted with all the official statistical added.

MR. HODGSON: Max, could you just back up one slide? Thanks.

MR. SHERMAN: Maybe.

MR. FERNSTROM: So we need to do all of those things?

MR. SHERMAN: Yes, all of those things.

MR. PENNINGTON: Can you explain the difference between a continuous fan and an intermittent fan?

MR. SHERMAN: To meet the whole house minimum ventilation requirement you need a continuous fan, so it's running 24/7; or using the intermittent thing a little less. But it's basically running continuously.

The other fans, the bath and kitchen fans, that are not being used to meet that requirement can be user operated as you wish. They don't run all the time; they run when the user wants it to be. So that would be a 50 cfm bath fan and a 150 cfm or larger vented range hood. Is that what you --

MR. WILCOX: No, the continuous ventilation could be a central ventilation system. It could be --

(Parties speaking simultaneously.)

MR. SHERMAN: What Bruce said was that there are many ways in the standard to meet it. This is one example. It can be, there's many kinds of ventilation systems you can use. There's supply ventilation systems, there's balanced ventilation systems, there's a whole bunch.

This is a prescriptive example using an exhaust fan, which is probably the simplest way. But the exhaust fan can be completely separate; it can be a supply fan that's completely separate; it can be a balanced system; it can be heat recovery. Did I leave one out?

MR. SHIRAKH: So, Max, the range hood fan is going to be running 24 hours, too?

MR. SHERMAN: No, no. No, that's -- the bath fan and vented range hood fans are just, that's the capacity that has to do it. It's operating completely at the user needs.

MR. ELEY: This is Charles Eley. Would that fan with the 75 cfm, would that just be hardwired with no switch or anything, so you can't

turn it off?

MR. SHERMAN: Well, there has to be a switch on it for --

MR. ELEY: So how do you know that it's going to be running continuously?

MR. SHERMAN: Well, 62.2 says the switch that's on it has to be labeled, ventilation system on vacation, or something similar to that, so it's very clear that the intent is this to be on.

A lot of people have a switch on their furnace fan, too, that they could shut off if they want. But they don't very often.

And there's no requirement that the switch has to be easily accessible. If somebody wants to put it in the top of the closet they can do that, too. If they want to put it in the fuse box, it can be that, too.

MR. ELEY: So we should make it inaccessible?

(Laughter.)

MR. SHERMAN: That's completely up to you.

(Laughter.)

MR. PENNINGTON: Could you back up one more slide, please?

MR. SHERMAN: Maybe.

MR. PENNINGTON: The bullet that's in pink there, might be interpreted to mean that you're talking about the mechanical system, the size of the unit or whatever. You're actually talking about the mechanical ventilation capacity, right?

MR. SHERMAN: That's right, mechanical ventilation capacity. That's right. Not the air handler fan. So this is the ventilation system.

MR. ELEY: And that's the continuous ventilation --

MR. SHERMAN: If you elect to use that option. Whatever of the options that you size, you select, you have to upsize it by 25 cfm so that there's this extra capacity to use.

MR. ELEY: This is Charles Eley again. Will this save energy?

MR. SHERMAN: It depends what you compare it with.

(Laughter.)

MR. SHERMAN: As I started this off, this is a health and safety issue. These are the requirements needed to meet certain minimum health and safety objectives.

Now, there are many systems you can choose. Some are more energy efficient than others. As I mentioned early on, we're doing an analysis of different systems to see which ones are more energy efficient than others. So there'll be a cost effectiveness calculation to determine, for example, is a heat recovery device cost effective or not.

We're not mandating those; we're not forbidding them here. That's going to be an economic choice.

Same thing of whether the intermittent supply air system, which is a vent into the return plenum, is cheaper, more expensive, more energy efficient, less energy efficient than a continuously operating exhaust fan.

So if you compare this to having your windows open all the time, this is definitely more energy efficient. If you compare this to an air-tight house where the indoor air quality is terrible, this is definitely less energy efficient.

The purpose is to find what are the minimum criteria that we need in order to achieve a certain objective, and then go about finding

energy efficient ways to meet it.

MR. FERNSTROM: So, Max, -- Gary from PG&E -- where does the makeup air come from if you're sucking this amount out?

MR. SHERMAN: Well, houses are not so tight that the makeup air can't come from infiltration and air leakage, just as it has been doing for hundreds of thousands of years in our current houses. Most of us probably live in houses ventilated predominately by infiltration. The makeup air is coming through those same cracks that it would otherwise, but now it's the right rate.

MR. FERNSTROM: Okay, so the reason I'm asking the question is with respect to indoor combustion appliances, like say a wall furnace.

MR. SHERMAN: The 62.2 has certain requirements, which I didn't go into, but if you have a naturally aspirated combustion appliance inside the conditioned space, then the largest two exhaust devices can't be above a certain threshold. And this was felt by the committee to be the way to protect against back-drafting sorts of issues. And that size has to do with the size of the space and all that sort of thing.

So that's a requirement that's in there. So you'd have to meet that requirement since we're assuming that you're meeting the 62.2 requirements.

MR. FERNSTROM: Thank you.

MR. DAY: Max, Michael Day. One question here that obviously comes up is that if we're moving towards recognizing what appears to be reality and under-ventilation, and we're moving towards something that may require mechanical ventilation, is there going to be a recommendation that title 24 give credit for heat recovery and energy recovery ventilation systems that could reduce the impact on total energy consumption?

MR. SHERMAN: Certainly. We would expect that the MICROPAS or whatever compliance software you use give you the credit for doing it. It's a simple calculation to do if the basecase house has, let's say in this case, a 75 cfm exhaust fan in it, that's going to have energy impacts there.

If you have a proposed design that has heat recovery you're going to be saving energy from that 75 cfm, and you're going to get credit and you're going to get credit for doing so. And

the cost effectiveness, of course, is up to you.

MR. HOESCHELE: Mark Hoeschele, Davis Energy Group. Max, how far would a ventilation cooling product working at night for eight hours at .4 cfm per square foot go with the intermittency?

MR. SHERMAN: I don't have that plot with me, but we have done that calculation. And that's a separate issue of how much credit you should get. But, in fact, if you look at economizers or a high ventilation rate cooling equipment, you can see that you can, in fact, get a credit against future things. That's all part of the intermittency equation. And our intermittency proposal allows exactly for that credit if you wish to take it. You need a control system to be able to show that you can take it, but you do get a credit for it.

So, for example, if you were -- just to give a rough idea, if you were operating for 12 hours on a high ventilation rate system, you could shut the ventilation rate off, I think, for 12 hours. You could have no additional ventilation.

MR. HOESCHELE: And high ventilation would be, I mean on the order of?

MR. SHERMAN: I think I used five air changes in the calculation, but it's not terribly sensitive to that once you get over a couple of air changes.

MR. PENNINGTON: So, Max, could you explain that a little bit more? That would only be for the time that the ventilation cooling system was able to provide a benefit.

MR. SHERMAN: That's right.

MR. PENNINGTON: And so there would be portions of the year where that wouldn't satisfy the requirement and you'd still need to have the mechanical ventilation exhaust fan, correct?

MR. SHERMAN: That's right. In order to take this credit you could only take it on days in which you were, in fact, ventilating that high. Which means you would need a control system that, let's say, during the winter would run a standard ventilation system. But during the summer when you might be -- or the periods when you might be doing ventilative cooling you could shut off that ventilation system for a certain number of hours.

So you would get credit on those days in which you were running the ventilation system.

MS. HEBERT: Anyone else? You know what

comes next, don't you? The public comment section of our meeting. Thank you, Max.

So, I mentioned earlier this morning, and haven't reviewed it since, that we expect there will be quite a few of you that will want to speak. And we have a potential system in place where we can figure out who and make sure everybody gets included. And that is we have some blue cards out on the table that you can fill in some basic information, who you are and what topic you'd want to speak on.

I haven't seen any come my way. So I know, I think that Dick Gillenwater wanted to say something. And are there many? A show of hands for those of you that want to speak.

All right, we've got a couple. Maybe we don't need blue cards if there's only a few. So, -- four? Okay. With Dick, were you one of those?

MR. GILLENWATER: Yeah.

MS. HEBERT: And since I know about you, why don't you come forward. Dick is going to address some cool roof issues.

MR. GILLENWATER: Dick Gillenwater with Carlisle. And in this comment I was going to do

it just on low-slope residential applications, since that's what you've been focusing on as the residential. And I just wanted to -- I'm not going to go into any detail because it has been submitted, and it's on file. People can look that up and do it.

I just wanted to go on record that we have submitted --

MS. HEBERT: Yeah, we got it on the internet already, so it's there.

MR. GILLENWATER: Right. So they can go see that. Cool roofs would be applied to low-slope roofs on low-slope residential buildings when the building is conditioned.

Again, this kind of goes along with a lot of the data that was presented today. Past work has been done on the cool roof area. And then some additional work is referenced in the proposal of a large -- two case studies in Philadelphia that were done by the Energy Combination Agency.

Where they have done some additional work and show where they did large-scale neighborhood changes, and the effects of modeling one building against the -- one right beside the

other one. And the information on that.

Again, low-slope roofing, although it's a little hard to get a feel on it, in the residential is approximately 15 percent of the market. Although in the commercial -- or in the nonresidential side we've been defining low-sloped roofs as 2-in-12. This market data is based on 3-in-12 and less. So it's a little skewed on that.

And I think that's another area that needs to be defined, is what is low slope in residential. Because if you'll note, one slide up here it was 4-in-12 and above was what the data work was being done with on the attic study. And typically when you get below 4-in-12 a number of the RainScreen systems begin to say they don't recommend their product for those applications, because you're beginning to roll over to where the water tightness. So I think there needs to be a definition of where we want to define that dimension.

And there's also a fair number of products that are already being used in these applications, so we're not going out and reinventing the wheel. We're just make it more official. You have everything from coatings to

polyurethane foam roofing for single plies, and some cool metals that's being used in those areas. And there are some new products coming out like in the modified bitumens that will address the ability to do the cool roof type of application.

MS. HEBERT: Questions, comments? Yes, Hashem.

DR. AKBARI: Dick, did I hear you correctly -- this is Hashem Akbari from LBL -- that you said 50 percent of the residential have low-slope roofs?

MR. GILLENWATER: 15 percent.

DR. AKBARI: 15?

MR. GILLENWATER: Yeah, approximately 15 percent.

DR. AKBARI: Thank you.

MR. GILLENWATER: And that's out of the Master Home Builders Association's market study that they did in 2002.

MS. HEBERT: And that's for California.

MR. GILLENWATER: Yes, for California.

DR. AKBARI: I would appreciate, you know, if you provide it, because that's part of hopefully --

MR. GILLENWATER: Yeah.

DR. AKBARI: -- the study that we would like to do.

MR. GILLENWATER: Yes, we can supply the --

DR. AKBARI: And I definitely would --

MR. GILLENWATER: -- specific parts out of that.

DR. AKBARI: Thank you.

MR. GILLENWATER: Okay.

MS. HEBERT: Anyone else on that? All right, thanks, Dick. There were more hands up. Yes, Gary. And then Ken.

MR. FERNSTROM: Gary Fernstrom, PG&E. Well, in contrast to the pretty sophisticated discussion we've had all day, this is going to be pretty simple.

PG&E would like to develop and propose a standard for illuminated house number signs. And perhaps other low-power but high-standby consuming products that we find in our homes.

MR. PENNINGTON: Such as?

MR. FERNSTROM: What comes to my mind is doorbell transformers. But there may be others.

MR. SHIRAKH: Can this be handled with title 20 rather than title 24?

MR. FERNSTROM: I would think either would do. Title 24 has a thermostat requirement. Thermostats could equally well be regulated with title 20 or title 24. Doorbell transformers similarly.

MR. PENNINGTON: Is that the only one you have in mind?

MR. FERNSTROM: That's the only one that comes to mind now, but there may be others, as I investigate my attic crawl space and inside the walls.

(Laughter.)

MR. PENNINGTON: Do you want to suggest anything, Commissioner Rosenfeld, for them to study?

COMMISSIONER ROSENFELD: I think he's asking me to say something about stuff like smoke detectors, is that what you have --

MR. PENNINGTON: Yeah, and garage door openers.

COMMISSIONER ROSENFELD: Yeah, there are a lot of vampires out there.

MR. FERNSTROM: So I don't want to promise too extensive an investigation, but certainly there are a few that may be pretty

simple and easy to look at. Thank you.

MS. HEBERT: Thanks, Gary. Ken Nittler, I saw your hand up.

MR. NITTLER: Hello; I'm Ken Nittler with Enercomp. A few items for you that haven't been discussed, that some fit real nicely with things that have been, and some don't.

The first one that I don't see in any of the materials here has to do with the portion of our marketplace related to existing plus addition plus alteration. You could characterize this as the beginnings of experience with the 2005 standards in terms of them being implemented.

We changed those calculations quite a bit. It was stuff done near the tailend of the process in 2005, or for the 2005 standards. And I would like to see us get -- some significant effort needs to go into refining those rules. And it needs to be done earlier in the process so that we can actually have the right amount of time and resources to do some of these things a little better than we did this time.

There's some statements in kind of the notice that went out, the staff notice, specifically regarding tier two, about notions

about perhaps providing say call it incentives for builders to participate by linking it to not having building officials do their plan checking duties. And I just want to speak out against that concept.

I think, you know, the HERS features are, you know, shouldn't be positioned as a way to avoid the building department enforcement. They're like the only party at the table that has the public good and public interest in mind at that point. And I would just urge that we don't head that way.

A --

MR. PENNINGTON: Just a reaction to that, for one second. I think that there is a possibility of providing incentive or motivation to comply with title 24 tier two through entitlements, quote-unquote. And if the building industry has any suggestions about that, we'd be really interested in pursuing that.

MR. NITTLER: Okay. I view it as a very slippery slope. Once you ask the building official to step outside of doing his plan check or field check functions, over time you're going to reinforce that they don't need to do it at all.

It will lose the enforcement we already have.

Here's one I'm sure will be very popular. As I look at the lifecycle costing methodology, I think we should consider looking at including source energy or therms or kilowatt hour lifecycle cost effectiveness criteria as part of the methodology.

I can't exactly stand here and propose how that would be done, but there are some issues that aren't going to fit well inside using TDV as a lifecycle cost methodology.

The one that comes to mind is in milder climates where perhaps air conditioning is optional, we have cases where the standards, in order for people to comply they might actually have to put an air conditioner in so they can put a higher efficient system so they can beat the cooling TDV budget.

You know, cases like that where, I think, if we had criteria that made sure, or some sort of balance that it met TDV lifecycle cost effectiveness, but also on an individual basis met some sort of kWh or therm type of cost effectiveness, that that might mitigate that problem a little bit.

There are other alternatives on this one.

COMMISSIONER ROSENFELD: Hold it, Ken, I just don't understand. Why on earth would somebody put in, or plan to put in an air conditioner and thus use expensive kilowatt hours on a mild afternoon? I just don't get it.

MR. NITTLER: Well, let's say you're building a home with lots of west-facing glass in the hills overlooking San Francisco Bay. And when you plug it into the new TDV methodology you get a big cooling load, because you have all that west-facing glass.

And when you have a cooling load, even though you and I would know that you'd open the window in real life, the calculations, because of those high valuations at times of peak, you might have a significant cooling budget that you need to mitigate. And maybe you can't find a heating measure that gets you there.

And so the most cost effective compliance option is to think about putting air conditioning in. Those situations happen. I get called frequently.

COMMISSIONER ROSENFELD: I'm sorry, we

shouldn't do this online. Let me just go on record and say I don't understand this argument whatsoever.

MR. NITTLER: Okay. I'd be happy to talk with you further offline and explain.

Alternatively there are ways that we could look at revising ACM rules that maybe could mitigate some of these problems in milder climates where we get some false signals out of the compliance methodology and framework that we have set up.

You know, another thing that's happening with this switch to TDV, and this is based on a few months of experience watching people implement these standards, is that for lack of a better term, of course, the TDV valuations are much more peaking. And so what we're seeing is that homes in climates that have larger cooling loads, that would be climate zones 11, 13, 14, 15, of course, the orientation is more critical than ever.

And we have these rules for cardinal orientations that are a convenience to the production builder, that allow them to build the same design on any orientation. And I'm kind of wondering if, given that I heard this morning that

the new TDV stuff is even peakier, so that case where the back of the house with half the glass faces due west, is going to be even further out of compliance. That maybe we couldn't think of a way to provide a credit under the standard, or at least mitigate a penalty for builders willing to not build those homes with the west-facing glass at back.

Years ago, the standards, when Bill was talking about when he first got started, we had passive solar features in the standards, you know. You're supposed to have south orientation and all that kind of stuff. And we've kind of lost that over the years.

But with this increasing peakiness there's going to be a lot of climate zones, the real severe cooling climates where maybe we should revisit that and we could maybe find an acceptable set of rules that would still encourage efficiency, but not -- well, while reducing the amount of west-facing glass, basically.

A corollary to that one is we added a new criteria, the prescriptive packages, in 2005 for west-facing glass, restricts it to 5 percent in the packages. And from looking at that, again

on a perspective of watching, helping people do compliance work, I think we may have been optimistic about the amount of glass we should allow to be facing west, particularly in these severe cooling climates.

And I'd like to see us revisit what that threshold out to be and see if it should either be higher in the severe cooling climates; maybe it could be lower in the milder climates. But it doesn't match very well.

Another way of looking at that is there'd be cases where the prescriptive packages, if you have lots of west-facing glass, would be the preferred compliance -- would yield compliance that would be easier than if you do a house with the performance method.

So, anyway, thank you.

MS. HEBERT: Thanks, Ken. Any reactions to Ken's suggestions? Okay, who else would like to approach?

Okay, Matt, I think I saw your hand up first, so why don't you come forward. And then Mike Hodgson.

MR. WHEELER: Thank you, and good afternoon. My name's Matt Wheeler, today

representing the Roofing Contractors Association of California. And essentially I'll make it quick because I know happy hour is near and it's been a long day.

But, I wanted to come up and actually make some acknowledgements. I wanted to thank the Commission, and particularly Ms. Hebert, and the staff who have really taken seriously our concerns with the 2005 standards.

And we reacted to those, and unfortunately we were a little late in the game. But there was a very quick reaction time and a willingness to sit down with us and really talk out how we can make this work.

So as we were sitting down at the table and looking at the 2000 standards, I essentially wanted to say that the roofing community is very well represented here today. We've had several voicemails coming through from those listening on the internet. You have the national roofing contractors in attendance today.

And we all know basically that there's a nationwide implication with any energy standards that we have in California. And so what the roofing industry is trying to do at this time is

come together with a very strong work group. And that would include individuals from the contractor community, from nationwide as well as statewide. To come together and really look at the 2008 standards as they're being proposed, and to come up with some concerns that we might have with some suggested amendments and how we think that we could actually strengthen those standards.

You have a commitment from us to really come up with a package that is going to work. And we agree with nearly everything we've heard today in theory, but I think there's something to be said for the fact that we represent the applicable side, and really need to give you some feedback of what it's like to be up with a harness on top of a roof.

And so I would just urge you, as we're talking about the 2008 standards to keep in mind what is available in the market in terms of products. And also give us a chance to educate our own industry. I want to thank PG&E for your willingness to talk to us with the building officials. I'm Matt Wheeler with the California Building Officials, as well; that's the other hat. And I want to thank you for that. And

we're looking forward to a strong three-year cycle.

Thank you.

MS. HEBERT: Thanks, Matt. Okay, I saw Mike Hodgkins' hand up next.

MR. HODGSON: Mike Hodgson, CBIA. I'd like to kind of propose possibly an adder to our lifecycle costing. And the reason I would like to do that is as we progress in these regulations, they're becoming more complicated. They seem to be coming more frequent. And we're concerned that the regulations, the building industry is concerned that the regulations are losing touch with what's going on in the field.

So what we're proposing, maybe we could take some example from what the CPUC is doing and add possibly a net-to-gross adder. And that would be that how many actually who say they do something are actually doing it in the field. And that would somehow have an impact back to lifecycle costing.

For example, we currently have been specifying tight ducts as a compliance option since 2001. It would be interesting to know in the current regulatory cycle how many actually

have tested who have specified tight ducts, have tested 100 percent of their homes at final by their subcontractors, have CF6Rs on file, actually have third-party HERS inspectors who submit CF4Rs to HERS providers who have them on file. And have given the appropriate paperwork to the homebuyer.

And those are the rules that we're supposed to be living to today. And when we do that, or if we do that, there probably is an impact on the potential energy savings, which should be somehow interpreted into the cost effectiveness of that standard.

And so we used to have, and this is a long time ago for some of us who were here a long time ago, which I see a few of us, we actually used to have kind of checks in the field on how the standards were going. And that would report back to the building standards process.

And I currently cannot recall when we've had that in the recent past. But we are adding fairly complicated procedures to a fairly complicated industry that is moving at a very fast pace. And what I'd like to know, and I think the building industry would like to know, and pledge their support in being assisting the California

Energy Commission, is how effective are some of these complicated procedures actually being utilized in the field.

Thank you.

MS. HEBERT: Thanks, Mike. Gary.

MR. FERNSTROM: Gary Fernstrom, PG&E. Just a comment on Mike's comment. It's an interesting idea to entertain the idea of some sort of net-to-gross or some sort of valuation of compliance.

But I would suggest to you that if the measure isn't being done or isn't being done right, it's not costing what it should, either. So to the extent that the savings may be less than the potential or what we would hope for, where it isn't being done I don't believe those costs are being incurred.

COMMISSIONER ROSENFELD: Yeah, Elaine, I think I'd like to make the same point, Mike. You have an excellent point, there's no sense deluding ourselves that we have tight ducts if we don't have tight ducts.

But, like Gary, it seems to me that's an additional and very important issue. But I don't quite see what it has to do with the title 24, as

opposed to just being a good idea. Can you explain?

MR. HODGSON: Commissioner Rosenfeld, I think the issue to us is one of the largest issues in the building industry is risk mitigation. And as the industry moves along and maybe says they're doing things that they're not exactly following through with, the exposure to risk is greater.

And as regulations are being made that are more complicated, which in turn usually means a little bit more difficult to comply with, I think there has to be some type of adjustment to say is this practical, that it can be done in the field.

The reporting requirements currently with third-party inspections, which you know personally we're very strong proponents of, really seem to be getting beyond the grasp of the building industry to be able to do.

One of the reasons for that is the Energy Commission makes these regulations, but they're not very effectively enforced. So, the point would be from the building industry is that if you're going to make regulations you should enforce them.

MS. HEBERT: Thank you. Anyone else? I would say speak now or forever hold your peace, but that's not the case. We will have many other opportunities for your input, including tomorrow afternoon where we'll be concentrating on the nonresidential side.

So, is there anyone else who'd like to say anything at all to us at this point? We're early, guys. Perhaps we've worn them down.

Okay, Jon McHugh.

MR. McHUGH: Since we've got so much time. I'll be quick --

(Laughter.)

(Audience participation.)

MR. McHUGH: Booed off the stage.

MR. PENNINGTON: So, Jon, you only have one hour.

(Laughter.)

MR. McHUGH: Okay. I've got a 50-page book here. Anyway, I'd like to say that I think what Mike's talking about is really important. And I think that there are a number of vehicles for following up on what's occurring in terms of codes and standards.

I know that PG&E has sponsored some

research to look at some of the compliance issues of the 2005 standards. It's my hope that PIER also does this, as well, since I think it is really important in terms of maintaining enforceable standards.

Since this is the residential section, also something that I've noticed is that there's a lot of reroofing going on where you have wood roofs with skip sheathing that are being -- plywood sheathing is being applied. And I think it would be sort of a cleanup issue for the Commission to take a look at the issue of radiant barriers on the plywood sheathing. I think it's a fairly low-cost measure. I don't know exactly what the statewide impact is. But I think it's worth doing.

MS. HEBERT: Thanks. I also know that a number of CEC Staff have a lot of suggestions for what we could do to improve the standards in the future. And we didn't think we'd have time for that today, so staff that would have something to say are not necessarily here. But at some point I'd like to certainly vet those ideas in a public workshop, and get staff prepared to do such a presentation.

Anyone else? We have a bunch of tired, restless -- okay, then, it's five after four here. I'm going to call this meeting closed.

Thank you.

(Whereupon, at 4:05 p.m., the workshop was adjourned.)

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CERTIFICATE OF REPORTER

I, PETER PETTY, an Electronic Reporter, do hereby certify that I am a disinterested person herein; that I recorded the foregoing California Energy Commission Staff Workshop; that it was thereafter transcribed into typewriting.

I further certify that I am not of counsel or attorney for any of the parties to said workshop, nor in any way interested in outcome of said workshop.

IN WITNESS WHEREOF, I have hereunto set my hand this 28th day of October, 2005.