STAFF WORKSHOP

BEFORE THE

CALIFORNIA ENERGY RESOURCES CONSERVATION

AND DEVELOPMENT COMMISSION

In the Matter of:)) Docket No.
2008 CALIFORNIA BUILDING ENERGY)
EFFICIENCY STANDARDS)
________________________________)

CALIFORNIA ENERGY COMMISSION

HEARING ROOM A

1516 NINTH STREET

SACRAMENTO, CALIFORNIA

WEDNESDAY, JULY 12, 2006

10:02 A.M.

Reported by:
Peter Petty
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COMMITTEE MEMBERS

Arthur Rosenfeld, Commissioner

ADVISORS, STAFF and CONSULTANTS PRESENT

Mazi Shirakh

William Pennington

Gary Flamm

Bruce Maeda

John Wilson

Ram Verma

CONTRACTORS PRESENT

Bruce Wilcox

Charles Eley
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David Patton
David Wilds Patton Lighting Design

John Proctor
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Iain S. Walker
Lawrence Berkeley National Laboratory

Kenneth Nittler
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Max Sherman

Nehemiah Stone
Heschong Mahone Group, Inc.

Ron Hoffman
The Berkeley Group

ALSO PRESENT

Steve Blanc
Pacific Gas and Electric Company

Antonia Tsobanoudis
Davis Energy Group

My K. Ton
Carmen Baskette
Ecos Consulting

John Hogan
City of Seattle

Noah Horowitz
Natural Resources Defense Council

Cheryl English
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Petra M. Smeltzer
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Robert Mowris
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Gas Appliance Manufacturers Association

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ALSO PRESENT

Michael Day
Rockwood Consulting
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James Mullen
Lennox International

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Steve Mohasci
California Building Performance Contractors Association

J. Carlos Haiad
Southern California Edison Company

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Bud Thomas
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Beutler Heating and Air Conditioning Corporation

Terry Pfaff
EDC Technologies, Inc.

I N D E X

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P R O C E E D I N G S

10:02 a.m.

MR. SHIRAKH: It's 10:00 and we're going to start. Welcome to the July staff workshop for the 2008 standards. This is the last staff workshop for the 2008 standards.

Before I start I'd like to ask anyone who has not done so, please do sign the sheet at the front desk or leave your business card so we know how to get hold of you.

And Commissioner Rosenfeld just joining us, too.

COMMISSIONER ROSENFELD: Good morning.

MR. SHIRAKH: Good morning, Art. As I said, this is going to be the last of the staff workshops. And after this we're going to move to the draft standards beginning this fall. We're going to have a series of workshops on draft standards.

It's going to be a full agenda today, and each presenter is going to present their portion. At the end of each presentation there will be about ten minutes left for questions.

And as you already know, you need to come up to the podium; and each time you need to introduce yourself, name and affiliation, for the benefit of the court reporter. It would be nice if you could hand him one of your business cards so he can get the correct spelling of your name.

I have a brief presentation here that I'm going to go through. Can we dim the lights, please.

Yeah, my name is Mazi Shirakh; I'm the Technical Lead for the 2008 standards. And I'll be moderating the workshop today.

The building standards operates under the Efficiency Committee. And the two Commissioners are Chairman Pfannenstiel and Commissioner Rosenfeld, who is present.

The public workshops got underway in October of 2005, and we've had workshops in October, February, March, May and July. And these are the staff workshops. And as I mentioned, this is the last of the staff workshops.

Our major collaborators in this effort have been the PIER program here at the Commission, who have funded and supported a number of our initiatives. We've also had a lot of help from our utility partners, PG&E, SCE, Sempra Utilities, through the case initiatives, who have supported a good deal of our projects. And there's also been a lot of input from the public-at-large.

This graph basically shows why we do standards. And I borrowed these from Commissioner Rosenfeld's presentation from ACEEE. Basically the two graphs here, the blue line down here, that's per capita electricity consumption for California; and the red is the entire country as a whole.

And if you notice, up until about mid '70s the two lines kind of tracked together. In the mid '70s where this line is, that was the introduction of the first appliance standards.

And shortly after that we had the introduction of first building standards. And you can tell where California's consumption has remained flat, the U.S. has steadily grown.

Now, the U.S. number includes California's number and other states where they enforce standards vigorously. A more meaningful number would be to compare our state against those who do not enforce standards.

Next. And that's what this number represents. This is California at around 7000 and these are the states who do not enforce standards at about 14. So we are half of what we would have been without the standards.

And the difference between these two would be about 13 nuclear power plants, or something similar to that up and down the state.

Next. As I mentioned this will be the last staff workshop. And what that means is this will be the last opportunity to introduce a major topic area into the standards.

So, you know, if something has not been presented by today or tomorrow, there will not be an opportunity to introduce a new concept into the standards. And this applies to the Commission, our consultants, our utility partners or member of the public-at-large.

The remainder of the 2008 standards will be devoted to refining the proposal that have already been introduced into the standards. The topic areas that have been since October and all the other workshops, and today and tomorrow. And we will be working to refine those ideas, rather than introducing new ones.

We know there are a lot of topic areas that still need discussions like cool roofs, PCTs, indoor and outdoor lighting, residential lighting, tier 2 standards and there are other topic areas that require ongoing discussions and will continue to do so.

In the fall of this year the Commission will hold some workshops to present the draft standards. Basically the 2005 standards markup with the 2008 changes.

And we encourage all parties to participate in what we call stakeholder discussions. And that will be a series of meetings that would involve all interested parties, Commission Staff, consultants, members of the public. Be a series of conference calls, email exchanges to make sure that, you know, your concerns are addressed and incorporated before we release the draft standards.

In 2005 the Commission -- 2007, I'm sorry -- will move to what's called rulemaking and adoption hearings. And the effective date of the standards anticipated to be in the fall of 2008.

Next. And this is a tentative schedule for the remainder of this effort. And, again, from September through November when it will have workshops for the marked-up standards. And in 2007 we'll move to rulemaking. And anticipated adoption date is 2008. And meanwhile we'll be working on finalizing our support documents such as the compliance manuals.

Any questions on the process? So, with that I'm going to move to the first topic area, which is a case initiative sponsored by Pacific Gas and Electric Company. And it's residential pool pumps. Mr. Steve Blanc.

MR. BLANC: Good morning, everyone. I'm Steve Blanc with PG&E. I'm here to introduce actually two case initiatives so you don't have to see me too much.

The first one will be put forward by Antonia Tsobanoudis on residential pool pumps. This is an outgrowth of work that we have done entitled 20 in the previous cycle, and it applies to title 24. The other one will be presented by My Ton from Ecos. And they're going to talk about standby energy losses.

These are actually -- it's a bit more nonresidential, but given the crowdedness of tomorrow's agenda I can understand why it's being done today. Thank you.

MS. TSOBANOUDIS: As Steve has said, my name's Antonia Tsobanoudis. I work for Davis

Energy Group. And I've been working with PG&E on swimming pool projects for about over -- for awhile now, actually.

And today's presentation regarding the case report that we've submitted is on residential swimming pools. Initially it's been called swimming pool pumps, but as we see it, there are other places within the swimming pool system that we can save energy to also help decrease the size of the pump.

These proposed measures are -- do I change the slide, or how do we do that? Okay.

So the proposed measures are -- we've narrowed it down to the six most important, as we see them. First, motor efficiency reference, which is basically building off of Title 20. Making sure that the motors that are used in new pump pool designs are listed with the CEC.

The second is a minimum turnover time, which also kind of builds on Title 20 in that we break it down by parts so that if you have a pool pump over 1 horsepower it has to be multispeed. Under 1 horsepower it can be single speed as long as it is energy efficient.

The minimum turnover time we found that

anything less than six hours could result in a higher pump, larger pump than necessary.

The third measure that we're proposing is efficient pipe and fitting design. There are three parts to that. Filter sizing and selection, basically we encourage the right sizing of the filter because we found that some builders out there have put in smaller filters than necessary on capital costs.

And then five, we've looked at demand response. We're not necessarily presenting demand response capability to pool pumps, but I'll present the findings that we found in case pool pump controls had a demand response capability and were able to respond.

And then six, pool covers been kind of a point of contention within these measures. Initially we sought out to find savings where pool covers were used. We decided then to take out any standards that are in the Title 24 report regarding pool covers.

So, measure 1, as I said, is regarding motor efficiency. It's just a reference to Title 20. Already been accepted in the Title 20 measures. We require that the pool pump be listed and submitted with the designs; that it be an energy efficient type motor. And we list the equivalent savings per pool as Title 20 has.

So what that kind of means is basically a cap-start cap-run motor be used. And since Title 20 -- let's see, yeah, basically that kind of motor and making sure it's energy efficient as listed with the CEC.

So, measure 2 is the minimum turnover time. Using -- we were kind of hoping to set a minimum of like about an eight-hour turnover for these pools. What that means, for those of you who don't -- who have never heard this terminology before, is basically a pool has a volume in gallons. And you can set the flowrate if you shoot to hypothetically turn over its volume, or pass through all of its volume through the pump within a set amount of time.

So in our case we're setting it at six hours. We'd hoped for like an eight-hour or a little bit higher so that we could keep the flowrates down, and thereby keeping the pool pumps as small as possible.

But, if you apply all these measures that we're proposing, the system curve of the pool gets so shallow that a six-hour turnover is essentially needed to have a small enough pump to fit it.

The selected pump shall have a curve A flowrate less than the filtration flowrate. Curve A is basically something that has been described in the Title 20 measures standards already. And if we go to the next slide we can see how that's defined.

In the blue there you see the curve A flowrate which goes to the point 60 gpm in 60 feet. This is actually a very conservative system curve. The system curve represents all the head losses that the system from the swimming pool, through the pipes, through the pump filer, all the way back to the pool might see.

And as you see here, a .75 pump on that curve would give you about 45 gpm. The average system curve we put on there as reference to show you that it's not -- it's a very easy curve to get within today's building standards.

Three, moving on to pipe design and efficient fittings. The picture on the top left there you see a pump that has two elbows leading right into the suction side of the pump. We're proposing to mandate at least four diameters of that pipe with some manufacturers requiring up to five diameters of pipe before the entrance.

And at the bottom there you see one coming out of the ground; this is a top view. So it's coming out of the ground and into the pump. Consequently that pump right there had actually failed about a month after taking that picture.

The idea is to prevent the pump from failures like that due to capitation, giving the pump ample opportunity, or leading pipe into the pump would give the pump ample opportunity to prime faster and last longer.

Moving on to the other measures that we propose. We're also proposing for a pipe design that they meet these minimum specifications for the pipe. You see the table on the left there shows 8 feet per second velocity and the suction pipe -- or I mean and the return pipe in a 6 feet in the suction lines. And we have already calculated the appropriate flow rates for that.

And then also the third measure that we're proposing regarding -- the third part, I should say, regarding pipe design are energy efficient pipefittings. Most people nowadays are not putting in any kind of sweep elbows, but we feel that going towards a sweep elbow instead of a sharp 90 elbow would save a lot of -- would help to save, to decrease the total system dynamic head, a total dynamic head of the system. And thereby aiding in finding a smaller pump for the system.

Go ahead. So here are the energy savings for the three parts of pipe design that I've mentioned. These are done on a per-pool basis for the individual measures. And then at the end we actually do a aggregate pool system where we show all the savings. And then apply them.

So, these savings here, while they look kind of small, like 1 percent, 4 percent, when coupled with a filter designs and decreasing the full pump, they actually -- they don't add up straight, they don't have a straight add-up, but they actually do help in contributing to a smaller pump.

Go ahead. So, here I'm showing the different filter types that we have, starting with cartridge on the left, sand is in the middle, and the diatomaceous earth is on the right.

Cartridge filters, the cartridge just comes out. Sand filters, the sand kind of goes on the bottom; they're measured by their square foot area that the water passes through. And the diatomaceous earth filters have these plates where the DE has to be plated onto those plates.

The filter shall be sized according to the flow rate. For each of the filters the manufacturer gives a range of appropriate flow rates for that filter. These that are listed here are common practices for commercial-size pools. And we think they're also appropriate and can be applied to the residential pool.

The energy savings of a correctly sized filter is about 13 kilowatt hours per pool annually. And also another part of a filter, MPV valve, which I didn't go into, but the cartridge filters don't require MPV valves. There are multiport valves that are needed for backwashing sand and diatomaceous earth filters.

And then -- go ahead. So here's the demand response findings that we found using pool pump demand profile found by ADM study in 2001. With no demand response you see basecase meaning the way that -- without any proposed measures.

TDV costs could be up to 6200 bucks; with demand response could be about 5900, savings in that case 300.

Once you do apply the proposed measures and you get savings from those, the savings with no demand response to demand response is about 144.

PK Data was instrumental in supplying us with market research. For swimming pools, they're actually the same company that the Association of Pool and Spa Professionals, the National Swimming Pool Association uses for market research. And they estimate about 35,000 pools will be built, new pools will be built annually.

So if you apply these measures, these dollar amounts to those swimming pools you get about what, $10 million, and half a million if you also, from demand response savings for proposed design measures.

Go ahead to pool and spa. This slide just kind of goes over what I said earlier about the current Title 24 measures, outdoor pool and spa, or mandates that outdoor pool and spa covers be used if so much solar heating is not used.

So, basically what we find in the

industry today is that people are -- the pool builders, let's say, some pool builders might actually buy these pool covers; leave them at the site. They're there for inspection; the inspector checks it off. And then the pool builder picks up the brand new box unopened and moves on.

We had initially thought maybe opening that box, requiring to see it on the pool and cut to that pool might help. But after talking with the industry we've decided that at this point the savings are hard to come by, or hard to prove because there's not been enough studies regarding pool covers for filtration savings. There's plenty of savings found for pool covers regarding heating savings.

Now, because of this discrepancy in the inspection process for pool covers, we've proposed to take out all pool covers in the Title 24 measures. We're keeping pool covers for spas as the industry says those are used. And those are definitely beneficial. But for swimming pools we're proposing to remove them.

Go ahead. So, as I said before, when we looked at all these measures all together and applied them to a whole system, we find energy savings of up to 1600 kilowatt hours per pool. Extrapolate that to the 35,000 new pools that are estimated to be constructed. This could mean 57 gigawatt hours of energy savings.

Similarly for demand, we found that we could increase demand for a pool by 970 watts. And extrapolated to the statewide savings, this is 34 megawatts.

And that concludes my presentation. If you guys have any questions I guess I can try and answer them now.

MR. SHIRAKH: Bill Pennington has a question.

MR. PENNINGTON: Hi.

MS. TSOBANOUDIS: Hi.

MR. PENNINGTON: I'm wondering if you're seeing water savings associated with these requirements also?

MS. TSOBANOUDIS: That was a lot of the nonenergy benefits associated with pool covers, is that they would prevent water savings. But as far as the other parts of the system contributing to water savings, I suppose, yeah, the idea being you have to put in less chemicals if you're, you know, filtering at a lower flow rate. But we haven't calculated that or haven't really mentioned that in the nonenergy benefits because it's hard to say where each of the particular measures.

MR. PENNINGTON: So the last Integrated Energy Policy Report of the Commission placed substantial emphasis on joint energy efficiency and water-saving measures. And, in fact, the Energy Efficiency Committee's duties were changed as a result of the IEPR to include water savings.

So it seems like this is a measure that potentially has water savings and --

MS. TSOBANOUDIS: Yes.

MR. PENNINGTON: -- it would be good to have that well quantified. Any aspects of this proposal I'm asking you about, --

MS. TSOBANOUDIS: Okay.

MR. PENNINGTON: -- I guess what I would suggest is that PG&E and Davis Energy Group look hard at that and try to quantify those results.

MS. TSOBANOUDIS: Sure. We'll try. I do know that filter selection does contribute to water savings. If you have a standard DE filter, that requires backwashing, and hence, more water.

Also, through these proposed measures the idea is that you probably have to change your filter, if it's appropriately sized, you have to change the filter cartridge or the backwash less, so.

MR. PENNINGTON: Okay, thank you.

COMMISSIONER ROSENFELD: Art Rosenfeld has a question. I'm pretty surprised at your proposing to drop the pool cover. Pool covers are now required, up till now.

MS. TSOBANOUDIS: Well, I think the way that they've been interpreted is that every pool requires them whether they have solar heating or not.

COMMISSIONER ROSENFELD: Whether what or not?

MS. TSOBANOUDIS: Whether they have solar --

COMMISSIONER ROSENFELD: Yeah.

MS. TSOBANOUDIS: -- panel heating. You know, usually on the roofs or something. And the water passing through those. It has been stated in the standards that if 60 percent of your heating of your pool comes from solar panels you do not need a pool cover. That's the way that it is in the measures right now, in the Title 24 right now.

After speaking with some of the pool industry experts and stakeholders who were around when that was put into the measures, they have said that one, that was just thrown in there kind of maybe as a second thought, or as a way to save, you know, heating efficiencies.

But it's not easily enforceable. And when it comes to in the field, when the inspector comes, when the pool builder has to deal with the pool cover, they're not actually installing it. People aren't using them. Bubble pool covers, which are the cheapest of the lot and probably the hardest to store, are seen as a nuisance.

So it's mostly on persistence and lack of enforceability that we are taking them out. We're proposing to take them out.

COMMISSIONER ROSENFELD: I don't know, I guess what you're saying is they're just generally too much of a nuisance and -- they're very effective, right? They save water.

MS. TSOBANOUDIS: Of course.

COMMISSIONER ROSENFELD: They're probably 50 times --

MS. TSOBANOUDIS: Yes, our case report shows --

COMMISSIONER ROSENFELD: -- cheaper than solar collectors for heating the pool.

MS. TSOBANOUDIS: Yes.

COMMISSIONER ROSENFELD: We're heading into global warming and a hundred more Katrinas and we're taking out pool covers. It sort of bothers me.

MS. TSOBANOUDIS: Yes, I understand that. But without going to some drastic measures -- well, not maybe drastic, but something a little bit more outlined for pool covers than the way that they are right now, they're not easily enforced.

So, in our case report we suggest future research to show the savings from filtration coupled with the savings from heating. And we also recommend that they be checked with inspections and things like that.

COMMISSIONER ROSENFELD: It's just that if what you're saying is we need another three years to get the numbers straight, I'm a little concerned with, you know, we have a regulation, we drop it for three years, and we put it back in again, it --

MS. TSOBANOUDIS: I understand.

COMMISSIONER ROSENFELD: -- gives me a little bit of a headache.

MS. TSOBANOUDIS: I understand.

MR. SHIRAKH: I think we need to continue this discussion to address Commissioner Rosenfeld's --

MS. TSOBANOUDIS: In the afternoon, maybe?

MR. SHIRAKH: Yes.

MS. TSOBANOUDIS: Okay. Are there any other questions?

MR. SHIRAKH: John.

MR. HOGAN: John Hogan, City of Seattle. I'd like to offer a couple of thoughts. Pool covers are required in the Washington State code. I think their primary benefit is evaporation. So, it's really, a lot of it's a water issue.

In terms of the comment of enforceability, I would say that's not a reason to drop the requirement. Certainly in commercial buildings, nonresidential buildings, with a lot of HVAC controls requirements, if it's a simple seven-day timeclock, sure, the inspector can look for that. But in all these large buildings with central energy management control systems, no building or mechanical inspector is going to the control room and saying, okay, run me through this; show me that you have every single mechanical control that's required in the code.

So there are a number of places where things are not being verified, but they're in the code and they're good requirements. And just because we have samples of where it's not being enforced, I don't think that's a good reason to drop it. That's a reason to work on enforcement.

Secondly, I wanted to offer some thoughts on spas. I know the focus here has been on pools. When I look at section 114(b) it seems to indicate that you just need to have a pool cover unless you meet this solar exemption.

There's quite a bit of difference between pools and spas. I think you could argue that swimming pools would be used more during warmer weather, and so there's not so much a winter issue.

Spas, conversely, are used more in the winter, I would think, certainly during colder times. We have a requirement for that in the Washington State code; ASHRAE 90.1 has a requirement for R-12 pool covers for spas for places that are heated to over 90 degrees.

And if you just think about the situation, the average annual temperature in Seattle is about 50. We're trying to heat spaces to 70, you know, heated spaces indoors, so that's about a 20-degree delta T.

Spas are heated to 100, so you got a 50-degree delta T, you know, average annual year-round if people are doing that. And so obviously if you can require insulation for walls and roofs and spaces you should be requiring things not only for the cover of the pool, actually for the sides of the spas and things like that. But that's a separate issue.

So, I could reference in ASHRAE standard 90.1, section 7452, pools heated to more than 90 degrees shall have a pool cover with a minimum insulation value of R-12.

Thanks.

COMMISSIONER ROSENFELD: Thank you, John Hogan.

MR. SHIRAKH: Any other questions or comments on pools, spas? Bruce.

MR. MAEDA: Bruce Maeda, California Energy Commission Staff. In terms of all these measures do you have any idea of how we actually go about enforcing these things? Because it's kind of difficult, our code's getting quite complicated as it is. And building officials are the ones that might have to look at it. Do you have any proposals on that?

MS. TSOBANOUDIS: Yeah. We've definitely looked at this, especially when you look at the checklist going from maybe four or five lines in concordance with a bunch of other building standards to a whole two pages to adopt all our proposed standards.

We have thought of maybe an outside agency, kind of like a HERS rating type of approach to it. Also in the works is maybe a stamp for pool builders to say that, yes, we passed a certain type of training. And then the pool inspectors, the plans inspectors kind of just take the word on that.

We also had in this checklist many tables that make it almost foolproof and kind of easy to go through. We hope, at least, it's easy. Maybe from an engineer's viewpoint it is, maybe not, I don't know.

So we have looked at that and we

definitely look forward to developing a way to make it easy and be adoptable into the city's plans.

MR. SHIRAKH: Any other questions? I think we need to have some further discussion on the pool covers. I think there's some interest in maintaining that.

COMMISSIONER ROSENFELD: Pools and spas.

MR. SHIRAKH: And spas, definitely. Thank you so much, Antonia.

MS. TSOBANOUDIS: Thank you.

MR. SHIRAKH: There's a couple items I forgot to mention in my introductory. There's a slight change in the agenda; at 2:30 it indicates public comments. Right before we start the public comments there's going to be an update on the PCTs. That's -- what does that stand for? Programmable communicating thermostats.

That's a thermostat that will be used by the utilities for DR events. And a lot has been happening lately and I think it warrants an update. So it will be right before the public comment period.

I also have a laser pointer here; if any of the presenters want to use it, I'll be happy to make it available to you.

So, you have a comment on the pools and spas?

MR. TON: Oh, no, sorry. I'm just getting ready for the next.

MR. SHIRAKH: Okay. So the next item is standby energy, and My Ton is the presenter. And this is also a project that has been sponsored by the Pacific Gas and Electric.

We're getting some background noise from some of the folks on the phone. If you could kindly mute the phone we'd appreciate it.

MR. TON: Good morning. My name is My Ton; I'm with Ecos Consulting. And along with my colleague, Carmen Baskette, and Kate Conway of Conway and Silver Energy Associates, we conducted a investigation into a number of standby loads. And, you know, I'd really appreciate you put up the chart earlier from Commissioner Rosenfeld California progress on energy efficiency, because, you know, we really see that this, in the pursuit of energy efficiency we're practically leaving no stone unturned, so to speak.

What project has looked at is we're looking at a number of nonresidential control devices. And basically standby loads, we're only limiting two -- we ended up with just two areas in our investigation.

One is lighting control devices; and then the other are ground-fault interrupter circuits. And these are what I believe Commissioner Rosenfeld had termed vampire alerts. These are small loads that are constantly on. And they take up a number, a little bit of energy, but there's a lot of them. And so together they constitute quite a bit of energy consumption in both California and the rest of the states.

So we evaluated a number of products and ended up looking at two potential -- two products with potentially important implications, class 2 transformers, which are typically used for doorbells and other residential applications and ground-fault circuit interrupters on the residential side.

We basically set out on this as more of an investigation to look at what these products actually draw rather than have some code changes that we intended to recommend. We evaluated a number of the products and looked at, do actual measurements on the products that are available in the market.

We also talked to manufacturers, contractors, and looked at industry publications. And also existing standards to see if there's any existing work or previous work have been done on these products.

We also looked at code language review, code language before we conducted the proposal developments.

Next slide, please. So, the next slide, I apologize if it's hard to read, but this is what we're finding that we can present is we measured a number of sensors that are used for lighting controls here. The motion sensors, occupancy sensors, and photosensors to see their standby power consumption. And we also have the pricing on the other side.

And as you can see, under standard use they have quite a variety of load, and quite a variety of difference in their load, ranging from a third of a watt to about 1.5 watts for, you know. As a class, the photosensors tend to take up a lot more energy while they're standing by than the rest of the sensors.

Next slide. Here's just a chart,

summary chart of the products that we've tested up to this point. And, again, you can see the one in front, sensor type, there's a range between the motion sensors, occupancy sensors and photosensors.

And also in the back you can see that there's also a segregation between indoor and outdoor in terms of their energy consumption. Outdoor sensors, as a group, tend to have much higher energy consumption on standby.

Based on the findings that were test result, we also used that to interview a number of manufacturers and other folks in the industry. And, as I said, since we've left no stone unturned, that the most common answer that we've gotten when we asked manufacturers whether or not they'd measured the power consumption, especially standby load of their controls, and the answer's been they've never been asked that question before.

So, obviously we're on to something here that, you know, there's an area that we haven't looked at before. And manufacturers have not been asked to pay attention to this area.

Of the 15 manufacturers that we

evaluated and interviewed, only one manufacturer reported their power consumption on their product specification sheet.

The other things that we found in a conversation with manufacturers is that specifically for sensors there's definitely potential for efficiency improvement through not the sensor design themselves, but how the sensors are powered.

You know, as with a lot of the other power supplies that the Commission has dealt with, how the power pack design, how the power packs are designed has a big effect on their power consumption.

And because, you know, the Commission has not sent a signal to manufacturers that this is an area of importance, manufacturers have not paid attention to that, to standby energy consumption as a design criteria.

We also talked about -- interviewed manufacturers about the cost impact of a redesign and while there are manufacturers with products out there, one of the reason why these products have not made deeper market penetration is because the cost, there's a cost differential between the power pack design, between a less efficient power pack and a more efficient power pack used for these controls.

So, because there's not enough information out there the approach that we were recommending the Commission to look at is that we need to find out more information about the energy consumption of all of these devices.

So we're asking that there's a test and list requirement for lighting control devices in the Title 24 standard. That'll give us more time to look at more products, establish the correct range of energy consumption and the level of efficiency improvements that can be achieved. And then move on to setting the standard by device type and technology.

Because this is a future change, this code change can be accomplished either under Title 24, or a Title 20 proceeding.

We did a gross statewide impact analysis on just based on data, census data, for California. And new construction data. And these are, you know, as you can see there's some gross assumptions here for the impact analysis, because, again, you know, this data was -- you know, this is preliminary data. And so this is the numbers that we came up with on estimated number of units that would be impact.

And we also carried out a gross cost effectiveness analysis here just to see, you know, and based again on fairly gross assumptions on how slowly things might move if this standard were to be enacted.

So this is the proposed Title 24 language change. And the reason that we chose Title 24 for photocontrols is that there's already language in there dealing with sensors. And so rather than making manufacturers go into different areas to look at the changes, we thought that this will be a suitable area to recommend the language change.

And all we're asking is that manufacturers test their products for standby power requirements and provide a listing on both the device and the packaging.

And also, because, you know, as you can see, that there were some distinctions between power consumption of interior and exterior products, we're asking to get a clarification on that, as well.

So, to summarize for the recommendations, we think we're assuming that this work process will take two phases. The first one is to gather additional data for analysis, and then based on that analysis, the state can then make better, more informed decisions as to which levels to set. And, you know, what other impacts it can have on the change in Title 24.

The last bullet up there is he conversations with the CEC and also manufacturers, an area that we haven't covered because we focus on just the sensors, themselves, is that we can also look at the efficiency in conjunction with overall light and system efficiency and design, rather than just a device-only basis.

MR. SHIRAKH: Thank you. Bill has some questions.

MR. PENNINGTON: Good morning. The original impetus for starting to do work related to standby here was Commissioner Rosenfeld's concern that there are many devices in homes that are proliferating that have standby; garage door openers, ground-fault interrupters, door bells, maybe more.

MR. TON: Right. And I believe it was

he that coined the phrase vampire loads, or I'm not sure who --

COMMISSIONER ROSENFELD: No, actually that was -- I don't take credit for that; that was Dan Reicher, the Assistant Secretary.

MR. TON: Okay. Right.

MR. PENNINGTON: So we were expecting in this proposal to see recommendations related to those devices for residential. And is there some reason why that didn't happen?

MR. TON: Well, actually the proposal that we're making here applies to both ground-fault interrupters and lighting controls. We're recommending that both -- because, again, the lack of data and information that's available, we're proposing that both product categories --

MR. PENNINGTON: So you have door bells and garage door openers and other devices --

MR. TON: Oh, actually only ground-fault interrupters. Door bells are, I think, yes, Steve can clarify it on the door bell, and garage door openers are plug-in devices, so that's why we didn't look at them.

MR. BLANC: Steve Blanc, PG&E. I think that a lot of the reason why we're at this point right now was that in discussions with staff, some of whom are sitting here at this table, it was decided that a lot of this stuff was going to go under Title 20, because a lot of it is technically plug-in.

One of the problems, Bill, has been is that we're dealing in a really gray area between Title 24 and Title 20 here. And when we put these forward at stakeholder meetings -- when was that last stakeholder meeting -- May, June, somewhere in there, we had a discussion that basically said okay, where it's really hardwired and where we can make a solid case for it being hardwired, we're going to put it in Title 24. Everything else is going to go in Title 20.

So that's basically where we're at with this. This wasn't an issue of us overlooking these vampires, if you will. It was a question of where in the regulations we would put them.

MR. PENNINGTON: Okay, so I don't see the inapplicability of Title 24 to these devices that commonly get installed in new construction, new residential construction.

So, I don't know, maybe we need more discussion on this.

MR. BLANC: You might want to have a little meeting with you staff on that one then.

MR. PENNINGTON: Um-hum.

MR. SHIRAKH: Any other questions? Bruce.

MR. MAEDA: Bruce Maeda, Energy Commission Staff. I didn't have much time to look at your slide on the cost effectiveness, but at first blush it sort of looked like there were negative present values on most of the slide. I was trying to figure out what that is. Could you go back and go over that briefly?

MR. TON: Sure. Slide 10.

MS. BASKETTE: This is Carmen Baskette from Ecos Consulting. What we did here, because we only had information really from manufacturers, and sort of a guesstimate of what it might cost to make some of the changes that we were talking about, what we did was a scenario analysis, if you will, where we looked at, all right, if it was a minimum cost to manufacture impact cost and a minimum impact in terms of energy savings, the negative values actually per the TDV analysis were actually the cost effectiveness values.

So, anywhere where there was a maximum

cost to manufacturers as we estimated, and we have a lot of detail in the report on this on what we've assumed, that, you know, especially in the minimum efficiency proposal, that would not be a cost effective approach, if the cost to manufacturers was that high. Because the energy savings on a per-device basis are relatively low.

So the negative values represent the cost effectiveness scenarios.

MR. TON: Unlike the pool pumps where we're getting, you know, 1600 kwh per year; we're looking at pretty small numbers with these individual devices. So it does require wholesale changes to -- cost effective.

COMMISSIONER ROSENFELD: Comment. I don't know what to do about this on the fly, but I find this general conclusion pretty surprising. John Wilson, who's standing at the back of the room, talked to manufacturers in Taiwan and China on -- vampires, not on this particular issue of sensors. And in general, came back saying that the payback times were going to be, in some cases two months, in some cases one month, in many cases zero. That it wasn't going to cost anything more at all to improve the efficiencies.

MR. TON: This is on sensors, or power packs?

COMMISSIONER ROSENFELD: No, those were power packs, I said. But I don't see why -- I'm wondering why it's so different for sensors.

MR. TON: Well, one of the studies that we looked at actually was when the Lighting Research Center conducted a study. They set out to design the most energy efficient lighting control. And I think it was about two, three years ago.

And so they found the sensors, themselves, the cost and efficiency weren't as big as how the power packs were designed and used. And at the time when they ended up looking at the cost of the power packs, the change to a more efficient power pack, the cost was quite high.

And so they, you know, that's the conclusion that they looked at.

And so we took up that investigation and went further in looking at just the cost of the power pack change. And how that has changed over time, and also the current economics versus what they were looking at several years ago.

And I guess that's, you know, we'll have a followup conversation with John about that, to see what other information we can add to this discussion.

MR. PENNINGTON: When you say power packs, those are internal power supplies is what you're talking about?

MR. TON: Yeah, basically they're internal power -- they're power supplies -- well, depending on, we're looking at lighting controls. They can be external to the sensors, themselves. There's power packs that can power up to two, three sensors at a time, they're together.

But, you know, if you only have one sensor, it still requires a power pack to power it. And basically it is, you know, it's a little power supply that are designed for use with these smaller circuits.

MR. PENNINGTON: So, John, I wonder if you have any comments on this. Or you might want to elaborate on what Art said? You could sit there, if you wish. So, either way.

MR. WILSON: Well, I don't have a lot to say. I wish I had seen this before. I am surprised at the result, as you are, that, you know, just looking at the power supply as a technical fix, it seems like that's clearly feasible and cost effective.

And, of course, Ecos has done all the work for us on power supplies. And so I'm sure that My Ton has consulted with Susanne Foster. And so, but I think I would like to follow up on that.

I guess --

MR. PENNINGTON: Is there any particular reason why internal power supplies would be less cost effective than external power supplies, which we've already regulated?

MR. WILSON: I can't think of one. So I think it's worth a bit more digging. Another question I had was the Australians have voluntary labels, as I understand it, for smoke detectors. And I wondered if you all had considered that.

MR. TON: We did. We actually evaluated quite a range of hardwire, residential hardwire products. And in terms of, again, you know, the smoke detectors is actually an interesting area because for Title 24 to address it, it actually also touches the safety codes and standards, as well.

And in terms, you know, looking at areas where things can quickly be done, that's why we settled with the product that we addressed today.

MR. PENNINGTON: What were the other hardwired residential products that you thought about?

MR. TON: We looked at smoke detectors, other transformers. What other things that we looked at, Carmen?

MS. BASKETTE: Well, in terms of what we concluded on for the residential it was the class 2 transformers and the GFCIs. And those are the two devices that we moved forward with and intend to include in Title 20 as part of this project.

Additionally, we screened, I think, probably 20 in total. Did a prescreen of standby measurements for ceiling fans, smoke detectors on residential and commercial applications. Security lighting. We've got an appendix with that information in the report.

But one of the interesting things was sort of how -- what we made our decision on was the level of standby load, the population and the potential feasibility of getting a new standard or an updated standard.

So, that's how we narrowed down the

devices to the lighting controls, GFCIs, and class 2 transformers.

MR. PENNINGTON: Okay. I think it would be very good to have a thorough discussion of all of that, what your thought process was with the Commissioner's Office to really review that and see if we concur.

MR. ELEY: I have a question. I'm Charles Eley with AEC, contractor to the Commission.

Have you looked at how many of these devices are sold in new homes versus the total market? Because if we put the test and list in Title 24, it's only going to apply to new construction. And I was just wondering how much of the market for these devices is going to be covered by that. As opposed to putting it in Title 20, which would address all sales in California.

MR. TON: We haven't looked at that simply because we weren't sure how this was going to be approached, and whether or not it was going to be covered by Title 24 or Title 20. So we basically focused on just the new homes market and the impact on how this change in code would affect that. We calculated the efficiency, the cost effectiveness based on that assumption.

MR. MAEDA: Bruce Maeda, Energy Commission Staff. I was concerned about two things. One, in your lighting control analysis it looked like you had controls on all the lights for new construction; and I'm not sure whether that's the case, at least for sensors.

I'm not sure how many -- it's only a fraction of the lighting that's installed in new construction that gets controlled.

But the second thing I wanted to address is what's your opinion on the indoor/outdoor difference? I have my opinions, but I'd like to hear what you think of why the difference occurs. In terms of the power --

MS. BASKETTE: Let me address the first question. We did not assume sensors on all new lighting. And in the report we've got tables with our assumptions about how we determined a lighting density and a control density. So, it wasn't for every watt out there.

MR. TON: My -- the second question, my guess on the sensors, I think it would be -- I think outdoor sensors probably require a lot more power simply because they either have to cover more distance or, you know, they tend to be placed higher for whatever reasons. I think they just, you know, manufacturers tend to try and put a little bit more range on those products. That could be why it requires more power.

COMMISSIONER ROSENFELD: I'm going to ask a question of Bill Pennington. If I seem confused it's because, in fact, I can't quite figure out why we didn't put this whole thing under Title 20, this is the question that's been coming up, as opposed to 24. Can you remind me?

MR. PENNINGTON: Well, I think your initial thought was that you're seeing these devices substantially in residential homes --

COMMISSIONER ROSENFELD: And we have more responsibility there.

MR. PENNINGTON: -- and this is the proceeding we're working on. So, if those opportunities are there, why shouldn't we address those.

COMMISSIONER ROSENFELD: And then go on to Title 20 later?

MR. PENNINGTON: Potentially; that would be dealing with the existing market more.

COMMISSIONER ROSENFELD: Yeah, okay.

MR. HOROWITZ: This is Noah Horowitz for the Natural Resources -- did I turn it --

MR. SHIRAKH: Yeah, I think you managed to push that --

MR. HOROWITZ: Okay, sorry about that. With NRDC. I'm a little confused about this discussion, as well. It's clear that there are a lot of devices that are installed during the construction of the home before the person moves in that use standby power, and that's what we're trying to get our arms around.

And those range from things like smoke detectors, the door bell, the GFI, the garage door, the photocells. Some of these are hardwired; some are not hardwired. So it wouldn't be part of Title 24.

So I'd recommend a friendly proposal here that we have a one-hour meeting, either on the phone or in person to talk about this further. And then from that, figure out which are the big savings opportunities; is there a wide range in what's out there; and which, if any, of these devices should we fast-track for Title 24; or if several of them appropriately Title 20. And, if so, how do we get those addressed.

COMMISSIONER ROSENFELD: Makes sense to me. Gary.

MR. FLAMM: Gary Flamm, Staff of Energy Commission. I've got to take some of the blame for where this is right now, because there were several conference calls where I was part of, and we really wrestled with plug loads and hardwire loads and where would these devices reside in Title 24.

I thought section 119 would be a very clean place to put lighting control requirements because it's existing. And it was my advice to PG&E and their consultants that maybe some of these things would be better addressed with Title 20.

So, there were discussions; and I suppose I should have pulled more of Commission Staff into those discussions.

MR. BLANC: We don't blame Gary.

(Laughter.)

MR. SHIRAKH: We do.

(Laughter.)

MR. BLANC: You can always come work for us.

(Laughter.)

MR. BLANC: Steve Blanc. I think one of the issues here, and it's just sort of, as I was listening to this conversation, as we were going through this project, it kind of struck me. There are a lot of components that this standby energy thing touches. And a lot of these components are already in Title 20, if not as that component, but as a class of components.

And I think one of the things that we need to get to is trying to look at you've got these classes of components, transformers, door bells, all this other stuff that exists already in Title 20 as appliances. And should we continue, for consistency's sake, continue to put those components into Title 20, or for what reason do we need to put them into Title 24.

Because as I understand it, Title 20 is a more broad-gauged type of regulation since it covers all retail and wholesale transactions in the state, as opposed to just new construction.

So, I would second Noah's suggestion of a conference. But let's think in terms of, maybe we need to think in terms of a little bit broader agreement about what goes into Title 20 and Title

24.

Because this is a borderline case. And clearly when we put this up here we knew it. And I forgive Gary totally because I think Gary -- and I think this is the problem. We're trying to interpret where the borderline is. And we called it, you know, I like to think that a lot at the end of the day is pretty arbitrary. So wherever you call the line is wherever the line is.

MR. SHIRAKH: I think it's obvious that we need to regroup in the near future and take Noah on his suggestion.

Any other questions or comments?

Looking at the clock -- thank you so much -- and what's on the agenda, I can almost guarantee that we will not break at 12:10 for lunch. So hopefully everyone here has had a hearty breakfast and you can hang on until we go through the next items. And some of them are pretty exciting.

The next item is the residential lighting. And this is one of those topic that has generated some excitement. And Gary and I have been tasked to bring some clarity into this. And Gary's tried to -- Gary will present the results.

MR. FLAMM: Thank you. Gary Flamm, Energy Commission Staff, lighting program lead. I'm going to go over proposed changes to section 150(k), which is the residential lighting.

I have been working with the advisory group, an ad hoc advisory group, and other individuals. Let's go to the next slide.

What I'm proposing is a clarification in response to inquiries I've been receiving since the 2005 standards were adopted. And include information that was put into blueprints and in the res manual into the standards.

There were some requests, changes made by custom home builders that altered it for the kitchen. And I'd like to go over that.

Next slide, please. I'd like to rearrange some of the text for clarity. I did float a strawman document. I'm not going to go over that document during this workshop, but a lot of the folks who are involved in this do have that copy.

I am proposing that we separate the requirement for electronic ballast from the definition of high efficacy luminaires that has caused some confusion. Add requirements for lighting that is integral night lights. This is in response to the PIER work that's been done in response to the hotel night light and the outdoor lighting night light done by the California Lighting Technology Center.

Clarify that HID can be considered for indoor applications. I think we inappropriately excluded that in the '05 standards. Create a definition for low efficacy luminaires, because the current language is kind of clumsy in that we keep saying luminaires that are not high efficacy. And I keep getting inquires, well, what are luminaires that are not high efficacy. So I'm proposing a new definition in section 150(k).

Clarify some control device requirements for exhaust fans, for three-way switching, how to address lights that are attached to a building. And to include a few more controls into section 119 that need to be certified.

Next slide, please. One of the requests that came to us has to do with custom homes, where the allegation is that additional lighting is being installed, additional wattage is being installed. Because with some of the custom homes, they start with the incandescent design, and then they add fluorescent to the 50/50 rule. The 50 percent high efficacy versus 50 percent low efficacy. And therefore we are causing these custom homes to install excessive wattage.

Now, it's my assumption from working with this advisory group that what is being proposed will not impact production homes. Because the 50/50 rule is working for production homes. But it's the custom homes where the excessive wattage is being installed in kitchens.

So one of the proposals from this advisory group was to exclude internally illuminated cabinets from the 50/50 rule. Because it's usually custom homes that have the internally illuminated cabinets. They're typically incandescent, and that's another source of excessive loads. So, proposing to break out internally illuminated cabinets.

Next slide, please. The advisory group ended up with two alternate options for kitchens. And there has been no conclusions. And I'm going to present both of those.

Alternate one is to allow an additional 100 watts of low efficacy lighting in the kitchen if all of the lighting is put on -- the low efficacy lighting is put on a dimmer, manual on occupant sensor energy managed system or multiscene controllable programmable control. And if all permanently installed luminaires in garages, laundry rooms, closets greater than 70 square feet, utility rooms are high efficacy, and controlled by manual on occupant sensors. So this would be a tradeoff to allow for this alternate option.

Next slide, please. The second option was to first install a minimum of 1.25 watts per square foot of high efficacy. And then install no more than 3 watts per square foot in the kitchen, which means you may install up to 1.75 watts per square foot of low efficacy lighting. And the same tradeoffs as in the other alternate would need to be made.

Next slide, please. So looking at these two options, looking at this table. I looked at kitchens from 50 square feet to 300 square feet. The 2005 analysis, the kitchens were in the range of 50 to 200 square feet.

So, if 1.25 watts per square foot of high efficacy was installed, how much low efficacy would have to be installed under the two proposed options.

If you look at the third column, if you add 100 watts the load is higher, the connected load will be higher than in option two for kitchens that are smaller than 200 square feet. At 200 square feet the connected load's the same. And above 200 square feet the 1.75 watts per square feet is excessive.

Now, this is only for those kitchens that install 1.25 watts per square foot of high efficacy.

Next slide, please. So, for these additional requirements, just a tradeoff, how much will they save. So the assumption I made is for the kitchen low efficacy will be on a dimmer. But the kitchen, garage and laundry room, the connected load will be the same as it is in 2005; however, let's add an occupancy sensor to that.

And then for utility rooms and closest greater than 70 square feet, I went from an incandescent to a compact fluorescent luminaire. So the reduced connected load would be 60 watts.

Next slide, please. And so then I used the same hours of operation on those connected loads. And what I found is that there'll be an additional 160 annual kilowatt hours saved.

Next slide, please. I worked with David Patton; I'm not sure if he's here. But, thank you, David, for working with me and providing some of these kitchens. These are actual kitchen designs that he has done. And we've looked at where those excessive loads in these custom homes are being installed.

So, if you look at the blue line, which is the second row from the bottom, that's the extra row -- those are the extra high efficacy lighting that had to be added to meet our 50 percent rule. So this is a real design. He had to add an extra 168 watts so that he could meet the 50/50 rule.

Next one. Here's another kitchen design, a little larger square footage. And, again, the blue line, the blue row shows the extra wattage that had to be added. Next one, please. And here's the third kitchen.

So each one of these kitchens additional load had to be put in high efficacy in order to meet our 50/50 rule.

Next, please. So, here's a comparison. In kitchen 1, under 2005 there's 1156 watts that was installed to comply with 2005, 3.28 watts per square foot. Now, if we look at the option 1, which is the 500 watts low efficacy, match it with 500 watts high efficacy, plus another 100 watts, you would end up with 1100 watts, which is less than the original design.

And then if you look at option 2, you take the square footage, which is 352 square feet times 3 watts per square foot, that's your maximum load, it's 1056 watts, which is 100 watts lower than the 2005 design.

So I don't want to go over all the details, but each one of these examples shows that -- well, except for the third, that these alternate options will result in lower connected loads for the custom homes.

I did find for the third kitchen the extra 100 watts actually increased the load by 50 watts. So, there's not a conclusion of what we do with this, because there's different, you know, a custom home is what it is, it's custom. So the designs are custom, and these were just examples.

Next slide, please. So those were the two, the alternate proposals. And we do need help on where we go from there. I do think that it's a legitimate issue that the custom homes appear to be putting in higher loads. I do think that we want to have a proposal that does not affect production homes, because we don't want to increase the load in California.

Any questions, please.

MR. MAEDA: Bruce Maeda, CEC Staff. On the alternates for the custom homes that you looked at, did the designer agree that his design concepts were not impaired too much by using the alternatives?

MR. FLAMM: Are you asking if the designers agree with the alternates?

MR. MAEDA: Yeah, in particular the one that supplied the kitchens --

MR. FLAMM: Designers were part of that advisory group. And these were the two options. There was no consensus on which one to go with.

MR. MAEDA: But I mean all the custom kitchens that you showed at the end, did that designer, in particular, believe his goals were met for the design when the alternates were applied?

MR. FLAMM: David, would you like to speak to that?

MR. PATTON: Yes, I did.

MR. SHIRAKH: David, you need to come to the --

MR. FLAMM: Why don't you come to the microphone, please.

MR. PATTON: Yes, I did. This is David Patton from David Wilds Patton Lighting Design. I was looking at other alternatives to the 50/50 in order to give flexibility in lighting design, itself.

In other words, I feel as though where we went in 2005 restricted us so much in allowing good designs, sparkle, good color rendering, things like that, that some of these alternatives that we're looking at seemed to be better.

And so I was pretty pleased with either one of the options pretty much. Does that answer your question?

MR. MAEDA: Yes.

MR. SHIRAKH: Sir. David, you may want to sit up here just in case there are more questions.

MR. BACHAND: My name's Mike Bachand; I'm from CalCERTS. One sort of question or comment, this is all real good in watts per square foot and so forth, but one of the issues has been in the past defining the kitchen. And I wondered if any work has been done on that, whether custom or production homes is really irrelevant. Where is the kitchen? And if we use a watt-per-square-foot terminology then we need to have some good things to hang our hats on for that.

MR. FLAMM: This is Gary Flamm. We thought we solved that in 2005. We offered an expanded definition of what a kitchen is. And if that's not solved we need to dialogue over that. But we thought that that was already solved.

MR. SHIRAKH: If I may add, I don't know if you've seen the definition that Gary is referring to. If you don't think it's adequate we'll be happy to entertain new definitions.

Cheryl and Petra, would you like to address the --

MS. ENGLISH: Thank you. Good morning. This has been an interesting issue. Cheryl English, Acuity Brands Lighting. We are the largest lighting equipment manufacturer in North America represented in residential lighting primarily through brandable -- lighting.

We have demonstrated a strong commitment to the development of energy efficient lighting, especially for residential lighting. I agree that there are distinct differences in the design of production homes and custom built homes. And certainly want to try to find a solution that works for both without damaging the work that manufacturers have done to promote energy efficient lighting.

During the 2005 standards process CEC made a case that residential energy use for lighting was critical to California in terms of energy efficiency and demand management. And I will remind that these standards have only been in effect for a few months, and we really don't know what the impact is and what kind of gaming is being done.

My comment is that California cannot afford to progress backwards with regard to energy standards by allowing additional exemptions that may not move energy efficiency development forward.

Industry has responded with quality products and product solutions that have excellent performance and reliability. I did present this information at a May workshop. I thought that

that was part of public comment, so a lot of what I'm discussing here I will resubmit my May comments as part of the public record for this workshop.

These energy efficient products are stocked in California, readily available; and they are identified as meeting Title 24 requirements. And so I think we've demonstrated a strong commitment to help push this forward very quickly in the California marketplace. And it's just now being recognized by the consumers.

We have invested significant cost and time in developing compliant products, as well as the marketing communications at point of purchase displays as well as training for builders.

The manufacturers and retailers cannot afford the stranded cost and the lost time required to support new energy standards when there's a question about whether they'll be supported by the Energy Commission.

Our concern is that by relaxing these requirements it's going to shift the market dynamics from energy efficient luminaires to control systems that may be low cost, present more gaming, and introduce increased vampire loads that have been discussed this morning.

I do believe that there is a possibility, we don't know from these proposed standards what will happen in terms of that market shift. I think there is a very high likelihood that it could present more gaming in production homes by shifting to low efficiency luminaires with low cost occupancy sensors.

So, my proposal is that the CEC maintain the current code proposal of the 50 percent lighting power without the addition of an exemption to, the 2005 requirements are reasonable. They're supported by the products in the marketplace. They're easy to implement and easy to inspect.

I have a couple of other comments with regard to residential lighting that are not related to the kitchen. I support the requirements to insure thermally enhanced recessed lighting that insures reliability of these products and therefore market acceptance of energy efficient residential lighting. And so I'm anxious to work with the Commission to craft the language for recessed residential lighting so that we can insure the proper thermal characteristics.

There have been a number of questions with regard to the GU-24 base. And I do believe that that's an effective solution only for surface and pendant-mounted lighting. There are additional thermal characteristics that are introduced with the GU-24 base when it's used in recessed applications. And I think that would be contrary to the direction that we've been trying to work to insure reliability of energy efficient products.

With regard to the standby power and test and list proposal, which is brand new to me today. This is the first that I've seen of this proposal. To me, it's very clear. It is not a Title 24 issue. I do encourage the Commission to create a more definitive definition of Title 24 versus Title 20.

I believe for lighting in the last several years, the barrier or the boundary between the two is getting more and more blended. It's making it very difficult for designers and manufacturers to determine what the requirements are.

In my mind Title 24 is a performance standard for buildings. And it's defined regardless of the product used, you meet a certain performance.

Title 20 are those requirements that apply specifically to products. And so a test and list requirement for lighting controls, to me, is very clearly within the purview of a Title 20 approach.

Thank you very much.

MR. SHIRAKH: There were some questions about the availability of high efficacy fixture early on when Title 24 went into effect in 2005. And it was brought up, and I think that has largely been addressed by the manufacturers.

A question I have from you, Cheryl, are you -- are manufacturers planning to introduce more decorative fixture? Because what we've seen in the retail stores are basically down-lights, with the four-pin compact fluorescents. What about more decorative fixtures that would meet the high efficacy requirements?

MS. ENGLISH: Okay, thanks, Mazi. Again, Cheryl English, Acuity Brands Lighting. In the May workshop we presented a number of samples of high efficacy decorative types of products. My company recently was recognized by the EnergyStar product of the year in terms of innovation in residential lighting.

There has been a proliferation of new products that have been introduced. The May workshop I mentioned a particular website for our products that is www.lightahome.com, which allowed a number of people to look at the new types of styles. Residential manufacturers are clearly, beyond just my company, putting a lot of effort into the development of these.

David Patton mentions a requirement by the custom-built howeowners. What I do think is important is dimmability and sparkle. And I think that those are areas that are challenging for some of these fluorescent types of systems. Because as a homeowner, I don't think that they have yet good dimming capability and sparkle capabilities, although I would contend that with the 50/50 approach for kitchens you can add that sparkle without sacrificing the energy efficiency by using low voltage or other low wattage types of products.

So, again, I will submit those slides that I presented in May that show examples of some of these energy efficient products.

MR. SHIRAKH: So some of the other areas that's been mentioned is for sloped ceilings, are manufacturers producing products that are high efficacy and can go into sloped ceilings?

MS. ENGLISH: Yes, there are recessed down-lights available for sloped ceiling type of applications. I will say that today likely you may not find as many trim options for those sloped ceiling applications as you do for flat ceilings. But it's certainly an area that's developing in between now and 2008, there's going to be more of those types of products.

MR. SHIRAKH: Another area that was brought up is low profile, high efficacy fixtures. We saw a few at the light fair, but I'm just wondering if there is going to be more products available for ceilings that are --

MS. ENGLISH: Surface mount? I'm not sure what you're referring to.

UNIDENTIFIED SPEAKER: Recessed for short --

MS. ENGLISH: Oh. I'm sure there will be development in that area. The challenge with lower profile, and I'm assuming you're talking about smaller plenum depth?

MR. SHIRAKH: Correct.

MS. ENGLISH: Is the tradeoff between thermal performance and shallow depth. And the more shallow the depth, the more challenges we have in terms of thermal dissipation.

You know, we've certainly worked with CEC PIER funding to work on thermally enhanced types of systems. And we intend to continue that work.

MR. SHIRAKH: Thank you, Cheryl. Any other questions? I saw a hand earlier. John.

MR. HOGAN: John Hogan, City of Seattle. Maybe I misunderstood Gary's earlier comments. Seemed a lot of this was precipitated by people putting lighting in cabinets. And it seems if that's the case then I wasn't sure whether the proposal for occupancy sensors was to control the lights in the cabinets, or whether it was to control -- and I realize this is conceptual, maybe, at this point, to control the lights in the cabinets or to control all the lights in the kitchen.

And if the issue is cabinets, and maybe this is a small part of the issue, maybe it could be occupancy sensors or they could have some sort of controls like refrigerator doors where you open the door, the light comes on; you close the door, the light goes off.

MR. FLAMM: If I may clarify. The proposal is to require dimmability at least in the low efficacy lighting in the kitchen as part of the tradeoff. And that was expanded from dimmers to occupant sensors, or multiscene programmable or energy management systems.

So basically put the low efficacy on some kind of a control in order to earn that exception.

And then the other portion was to all the utility rooms in the house basically have to be both occupant sensor and high efficacy. So that was the nature of the tradeoff.

So therefore the kitchen cabinets, being low efficacy in the kitchen, would have to be on a dimmer. Or some kind of a control, other than a toggle.

MR. SHIRAKH: Petra first, then Melissa.

MS. SMELTZER: Good morning; my name is Petra Smeltzer and I am a representative of NEMA, the National Electrical Manufacturers Association. And I'm sure you're all very familiar with us.

I essentially only wanted to make a few iterative points to Cheryl's comments earlier, indicating that NEMA also does not support the addition to exception 2 to the kitchen lighting requirements for all the reasons that she stated. Essentially the standard hasn't been in place for a sufficient period of time to fully evaluate.

Alternatives that encourage the use of low efficacy lighting don't support the investments made by manufacturers, and shifts market demand for decorative energy efficient products. And additional exemptions confuse the marketplace.

NEMA has put together formal comments which will be put on the website for folks to review.

In addition I wanted to say that NEMA doesn't support the use of GU-24 based integrally ballasted lamps in recessed down-lighting. And that really refers to almost any lamps for recessed down-lighting.

And finally, NEMA members want to work on new language that will promote product reliability through improved ballast thermal management.

So, thank you very much.

MR. SHIRAKH: Thank you. I think Gary has a couple of comments on that. And then, Melissa, why don't you --

MR. FLAMM: Just for the record I want to clarify why all this talk of the GU-24. In the strawman document that I floated, in my definition of low efficacy, I basically am proposing that low efficacy is any luminaire with a line voltage lamp holder or line voltage socket as part of the definition, with an exception for the GU-24.

The GU-24 is a new base that EPA had worked on developing. And it has, it's being promoted as an energy efficiency only base lampholder for compact fluorescent or LEDs.

And there's nothing currently to keep the market from shifting to low efficacy products. So that's where the concern is right now, is that the GU-24, there's no standards that say that you can't use that for low efficacy.

So I just wanted to clarify for the record and everybody online that that's why we've been discussing GU-24.

MR. SHIRAKH: Thank you. Just one more comment from Melissa and we'll move on.

MS. BLEVINS: Thank you. My name's Melissa Blevins; I'm from the California Lighting Technology Center. I'd like to echo some of the comments that were made here today.

We have conducted numerous training events with builders, inspectors, contractors. And what we've seen so far is that the 50 percent ruling is working. It was a little bit of a learning curve associated with it, but it is working and clearly enforceable.

The second alternative power density may inquire much more learning objective for these inspectors. And that although production home builders may not use this, we aren't clear. And if they do take this route, we don't know what the guaranteed power energy savings here.

Inspectors would have to make the call on the ruling on where the kitchen is; what the power density is. And also they would have to enforce that. So we do not support the alternative methods, power density.

MR. SHIRAKH: Thank you, Melissa. With that I'm going to move to the next topic, which is also related to residential lighting. And, Noah Horowitz from NRDC is going to present that.

MR. HOROWITZ: Good morning, again. For the record this is Noah Horowitz with NRDC. And we've been very active over the last several proceedings, particularly on the lighting side.

Today I want to comment on three things; talk a little more about the dimming option that's currently in the code; and provide some technical alternatives to gain more savings there.

Talk a little bit about a universal key-based approach in a hotel room, so there's a master switch. I'll talk more about that. So when you leave the room the lights actually go off. And also there's a current exemption in part of the lighting for hotel rooms that we think should be removed.

Next slide, please. One more. Okay, most of you are familiar, first of all my comments today are not going to be addressing kitchens and bathrooms. We feel that's already covered and you already had some discussion on that. So all my comments are on the other internal room types in the home.

The code currently allows two paths basically. You put in a high efficiency or an efficient luminaire; or you have a choice, you put in a simple dimmer or a manual on/automatic sensor. The way most of these things work the much lower cost option is selected. In this case you can get a very low cost dimmer and away you go. You've met code. We think there needs to be a better way for many of the rooms.

Next slide. Our concerns about dimming is in most cases the dimmer isn't used in homes. In commercial settings dimmers are used more and that's what a lot of the existing data is on. But I think if we did an informal survey the only time dimmers are used in many of the rooms is your annual romantic dinner or when you're singing happy birthday or things like that. But in general we think you just turn the light on. And if there isn't more data there we may need to get that through one means or another.

Also, if you have a screw-based socket and you have a dimmer switch you can't put a conventional plain vanilla CFL in there. Some people are going to put that in there and have a bad experience with CFLs. And that could potentially prevent them from using other CFLs in the future. And that would be tragic.

So, next slide. If we look at this, and

again I stress the word qualitative, the basecase would be the inefficient fixture. And this is an attempt to show the decreasing energy use of various options. If you put in a dimmer you could save a little bit of energy. How much is debatable.

If you put the occupancy sensor on you do get some dramatic savings, because when your child leaves the bathroom light on, it will go off rather than stay on all day. You know, you save a quarter, a third or a half, to be determined.

Then we do know if you put in the high efficacy fixture when it's on it's going to use roughly one-quarter of the power compared to an incandescent version. So that's definitive savings that are achieved. And then you could get even more if you apply controls.

Next slide. So some of the fixes then, the section 10 in the draft that Mazi sent out, dimmers are still an allowed pathway for compliance for many of these different room types.

So we took a look at the bedrooms and hallways and said, there's a wide range of efficient luminaires here. The lighting needs aren't that complex. Let's remove the dimming option there. That would be a simple proposal.

And what would that be worth. So let's focus on the bedrooms. Let's say right now there's a incandescent fixture with two sockets, each with two 75-watt bulbs. You could replace that with a high efficacy luminaire, assume two bulbs at 18 watts.

Next page, you crank out the numbers. You could be looking at 170 kilowatt hours per year savings if that fixture was on four hours per day. And that's well over $200 in savings over ten years in the electricity costs.

Another way to look at this is if you have a three-bedroom home, and to the extent the lights are on four hours a day, that's a refrigerator's worth of power, or energy rather, a year that we could be looking at in terms of trading off. So the numbers are quite substantial here.

Another option, if you don't like the first one -- and I'm throwing these out just to start the dialogue. I don't necessarily have an opinion where we land -- is if you're going to continue to allow dimmers, let's, at a minimum, require that socket to come with a screw-base dimmable CFL. So we know we'll at least get one bulb's worth of savings and hopefully the consumer will come back to more in the future.

Two slides. Another option should be, there's a term I like to use called cannification where we're seeing recessed cans, five, ten in a room, in rooms beyond just the kitchen. Living rooms, for example, you go to different remodels and you're seeing six, ten cans in there. And all you need to do is dim and you can comply with the code.

So, one way to do this is just say, again, forgetting about kitchens and bathrooms, if you're going to put inefficient fixtures in a room, let's limit those to one. And that would discourage all the cans from going in, the inefficient ones. If you want cans, they have to be an efficient one.

So those are the different options and suggestions we'd like to see some dialogue on in terms of improving the residential lighting part of the code.

Quickly I'd like to move on to another topic. Next slide. I've had the good fortune of traveling around the world a lot in the last 18 months --

MR. PENNINGTON: Noah, you're changing topics here dramatically, so I thought maybe I might ask my question about the residential lighting.

MR. HOROWITZ: Sure.

MR. PENNINGTON: The basis of the dimming requirement was based on a cost effectiveness analysis that HMG did in the last proceeding. And for the rooms that have the dimming allowed, those were rooms that were determined to have fairly low use per day, hours per use per day based on the HMG field research on use patterns.

And I'm wondering if your challenge here is you're challenging those hours per day of use. It seems like you're challenging that analysis and so I'm wondering if there's some basis for -- do you have new information or something?

MR. HOROWITZ: No. I guess we should collectively take a look at those numbers. I didn't look at those when I developed this.

MR. PENNINGTON: Okay.

MR. HOROWITZ: Mazi?

MR. SHIRAKH: Go ahead.

MR. HOROWITZ: Should I move on to the other topic now?

MR. SHIRAKH: Well, might as well, since Bill opened it let's ask one of the questions related to --

MR. FLAMM: I just want to -- Lutron couldn't be here and they sent a letter responding to your proposal. And just for the record I wanted to bring in that they sent a letter and they're saying that their studies show that most residents dim their lights by 30 percent, generating 20 percent of energy savings.

So, there are some studies showing that the dimmers are being used by residential. And I've also had some informal conversations, submittals by WattStopper where they're also saying there are savings with dimmers.

So I think there are some. The studies we looked at for the 2005 standards, most of them were based on commercial studies saying that when in commercial applications it has been proven that when dimmers exist they're used.

There were scant studies that specifically addressed dimmers in residential. And so the control manufacturers are stepping forward with their own data saying that dimmers do save energy. And I just wanted to bring that on behalf of the manufacturers.

MR. SHIRAKH: Any other comments on dimmers?

MR. HOROWITZ: If I can respond to that real quick.

MR. SHIRAKH: Okay, go ahead.

MR. HOROWITZ: We'd be glad to take a look at that data. I think we need to be careful. I believe in a kitchen, yes, people do dim it down and use some of the kitchen lighting as a nightlight so you can get your milk in the middle of the night without falling.

But I think some of these other rooms, this data may or may not be relevant. So we need to check that.

MR. SHIRAKH: David.

MR. PATTON: I think that -- David Patton, again. I think the proliferation of preset dimmers actually is part of the reason that people do use dimmers in the bedrooms. So it makes it easy. It still is on and off, but it's on and off to a dim level. So that is my comment to that.

On top of that I think realistically if you were to take a recessed down-light that is fluorescent and compare it to an incandescent, that I don't think you can get a payback for as much as you have to pay for the lower efficacy dimmer -- or fixture. So I think that that really needs to be looked at.

Plus, I agree with Bill that I think when I looked at that study it was only 1.4 hours of operation in a bedroom. So the four is really kind of a misnomer.

So those are my comments.

MR. SHIRAKH: I have a dimmer in my bedroom; I use it. But I could be the odd one, I don't know.

Any other comments?

MR. PENNINGTON: More than once a year.

MR. SHIRAKH: Yeah, more than once a year.

(Laughter.)

MR. HOROWITZ: A lot of this goes to -- I will change topics here.

(Laughter.)

MR. HOROWITZ: Getting back to dimmers, though, briefly. What is a dimmer that's compliant with California's code. There are dimmers where it's simple, a dial that you turn. And I think one could argue those are less likely to be dimmed than the preset ones. So maybe a constructive move would be to require the type that have a preset like the prior speaker just mentioned.

And I think then a lot of these issues go away from the table and would satisfy most of us.

Okay.

MR. SHIRAKH: So we do need to show cost effectiveness for any of --

MR. HOROWITZ: Sure. Okay, so in hotels in many parts of the world, with the exception of America, you go in the room; you open the door; there's a little slot you put your plastic key in there and the light by the door goes up.

When you leave the room to take your key with you, you take it out, then all the lights go off after a certain delay. And depending how it's set up, a lot of the plugs in the room are also powered off.

And this is a great way to have a lot of energy savings. And for better or worse, when people stay in a hotel, they're not paying the electric bill, they're in a hurry, they don't know where the switches are. A lot of the lights get left on, and some of the appliances, as well.

So this could provide dramatic energy savings with little to no hassle to the occupants. And this is happening both -- or this has happened for years in both developing and developed countries. So it's not just something that couldn't be applied here.

So, we'd like to see that fast-tracked. We've suggested this over a year ago. There seems to be interest, but there hasn't been a utility study on this. The CEC consultants, I don't think, have looked at it in depth. And I don't think it would be that hard to find out how this is being applied in other countries. Maybe this coding can we take a look at that as a starting point. And we'd be glad to work with others on that.

COMMISSIONER ROSENFELD: Two comments. First of all, my impression was that this proposal was going to be both for lighting and air conditioning.

MR. HOROWITZ: It could be for -- it

could be a minimum of lighting, it could be certain sockets in the room and then the air conditioning could be required to go to some higher set point.

COMMISSIONER ROSENFELD: Right. And then, Bill or somebody, there is an experiment going on right here, right, on -- in -- Gary.

MR. FLAMM: This is Gary with the Energy Commission. We haven't been able to secure funding for that. The California Lighting Technology Center is sitting on the edge of their seat waiting to do such a study in collaboration with the California Hotel and Motel Association. And we haven't been able to secure funding for such a study.

COMMISSIONER ROSENFELD: I hear you.

(Laughter.)

MR. SHIRAKH: Sir. You need to come up to the podium, please, Robert.

MR. MOWRIS: My name is Robert Mowris and I'm here to talk about something else, but since you raised the subject about hotels, I think the refrigerator should also be on the shut-off switch.

And we should also think about how

refrigerators are installed in hotel rooms, because oftentimes the small little refrigerators are installed in cabinets that don't have vents; and they have doors on them, so they shut the cabinet. And the cabinet can get up to about 100 degrees.

What happens is the refrigerator can consume anywhere from 50 to 75 percent more energy than it would otherwise, especially if it's on all the time.

I just measured some in London and found out that they were using considerably more energy than were expected. And so I think that would be another one to maybe put on the master switch since the refrigerator isn't really going to be used immediately when the occupant opens the door of the room.

Thank you.

MR. SHIRAKH: Thank you, Robert. Any other questions or comments?

MR. HOROWITZ: I just have one more slide.

MR. SHIRAKH: Okay.

MR. HOROWITZ: The last slide, if you would. Can you go back to my presentation?

(Laughter.)

MR. HOROWITZ: Yeah, I can wing it for time's sake here. Right now section 130(b) it says for high rise residential living and hotel/ motel rooms up to 10 percent of the guestrooms in a hotel/motel need not comply.

And I'm not sure where that came from, but I'd like to see that removed or there be some further justification as to why that's needed.

MR. SHIRAKH: Basically I think that came from California Hotel/Motel Association for their presidential suites. I mean they have a certain number of rooms that are honeymoon suites and they wanted an exemption for it, so that's where it came from.

MR. HOROWITZ: The best way to start a marriage is to be in a room with efficient lighting, so --

(Laughter.)

MR. HOROWITZ: -- I'll close with that.

MR. SHIRAKH: I'm not saying it's a good idea; I'm just telling you where it came from.

(Parties speaking simultaneously.)

MR. SHIRAKH: Okay, we're now going to switch tracks completely and go from lighting to

HVAC. The next presenter is Mr. Bruce Wilcox, who is a CEC contractor; and the topic is furnace fan watt draw and air flow in cooling mode. And next to him is Mr. John Proctor who worked and coauthored this study.

MR. WILCOX: Right. Thank you. I'm going to present work that we produced as part of project that was funded by the PIER program. And in addition to John Proctor and myself, Ken Nittler, who's helping Ram with the -- hopefully helping Ram with the files over there, was a significant contributor, as was Rick Chitwood. Rick, stand up. Who did a large part of our work on air handlers; carried out all the field research. And Iain Walker and Max Sherman are sitting in the back row, identify yourselves, also contributed to work on air handlers. And you'll see Max later on talking about ventilation.

So we have a two-part presentation here. The first one has to do with furnace fan watt draw and air flow requirements. And then the second one has to do with air conditioner refrigerant charge and TXVs, and also air flow to a lesser degree.

Next slide, please. Okay, so this is

the first topic here, which is furnace fan watt draw and air flow in cooling mode. And we've also expanded this to include watt draw and what we're calling air distribution mode, which is a new item in the standards. So this all has to do with air handler or furnace fan more commonly, performance and the efficiency in the electrical use and the ability to move air efficiently.

I'm going to talk about our investigation and supporting data; the cost effectiveness for what we're proposing to do; the new prescriptive standard that we're proposing; and something about the alternative compliance method changes that are required to implement this.

Next slide. As part of this PIER project we carried out a field survey to attempt to get data and get a picture of what the context and the situation and the performance was with new air handler furnace systems in new California houses.

So, Rick Chitwood went out and surveyed and measured 60 furnace systems in new homes up and down the Central Valley in California. Fifty-five of those were in production homes, and five were in custom homes.

And he measured the air flow and fan watts by operating mode, heating and cooling. He measured the air flow and fan watts when zonal control was in operation. And he also measured the system pressures in the ducts and figured out where the pressure drops in the duct system were and so forth. We used that data significantly in developing the standards that we're proposing here.

Next slide. Just to give you an idea about what the data looks like, this is the fan watts for the air handler fan in all 60 houses. It's a distribution plot, so that on the left-hand side we have -- or the left axis, we have the fan watts. This is the total watts. And across the bottom we have the number of systems with that wattage or less.

The median fan watts is 632. And the maximum is above 1200 watts in cooling mode. The pink squares are showing the heating mode consumption, which is slightly less than the cooling mode. So these are significant energy-using devices, and that's why they're worth dealing with here.

Next slide. The other side of this is what are they actually achieving. This is the cooling air flow in cfm/nominal ton of the air conditioning capacity. And you can see that the median is about 358 cfm per ton. And the range is from 300 all the way up to some systems that are above between 500 and 600 cfm per ton.

Next slide. Here's one of the important thing that we have documented in this survey, and that's the external static pressure that the fan system has to operate on. And so this is basically the resistance to flow in the ducts and the cooling coil and the filters and all of the stuff that's on the outside of the furnace box in these typical systems.

And again, it's a distribution plot. And on the left axis is inches of water column, which is the standard measure. You'll notice that the median is .8 inches of water column. There's some systems, one or two, that are down below .5 inches of water column. And the maximum is all the way up at 1.2 inches of pressure water column.

Next slide. So, one of the other things that we looked at in this survey is using a term watts per cfm, which is the amount of fan power it takes to move the cubic feet per minute of air flow.

And one of the interesting conclusions that we came up with was that the watts per cfm, as found in those systems we surveyed, is related to the size of the air conditioning system. Those three box plots there are for systems that are less than 3 tons on the left bar, systems that are 3 to 4.5 tons in the middle bar, and 5 ton systems on the right. And each one of the box plots, the horizontal line in the middle of the box is the median. And the box contains 50 percent of cases. And the whiskers on the top and the bottom are the 95 percent case, I believe.

So, you can see that there's a significant difference that larger systems use more fan power per cfm of air moved. We think this is due to two reasons. One is that the duct systems are probably not proportionally larger for the 5 ton systems. And also the 5 ton air handlers actually have a harder time being designed in an efficient manner because they have to put more air through a box that's more or less the same size as the smaller units.

One of the controlling factors in

furnaces we're told is that they have to be able to fit through a standard attic cache into the attic of a California house, so they can't be any wider than 22 inches or so, no matter what the capacity is. So the larger capacity units get crammed into a relatively smaller box and restricting the air flow.

Next slide. One of the arguments that we've discussed many times in workshops and with people in the industry and so forth is the issue of, well, isn't this just an issue of external static pressure.

So this is a plot of the external static pressure that we measured, which is on the -- so small I can't see it either here -- but it's external static pressure is on the horizontal axis at the bottom. And on the left-hand side we have watts per cfm. Thank you.

And if there was a definitive relationship that external static pressure alone was causing the problems then you would expect to see, you know, a nice line where the data would all cluster along the line where the external static pressure was closely related to the watts per cfm.

But, in fact, it's -- there might be a slight relationship, but no better than slight. It's really a cloud. And so we think there's a lot of things going on here, not just the static pressure.

Next slide. Then we went on and we also did some laboratory tests of six furnaces that we selected to represent the furnaces we found in the field. These were 3 and 4 ton units. And we tested both, permanent split capacitor and electrically commutated motors. That's PSC and ECM motors. And we measured the flow and watt draw over a range of external static pressures for those systems.

Next. So, here's the laboratory experimental setup. It's a standard setup for measuring this sort of thing. The furnace being tested is here. There's a duct system, and then there's a resistance element and a fan at the other side so you can actually adjust the air flow and static pressure in a very systematic way.

These were all done in a laboratory that Proctor Engineering had set up for this purpose.

Next slide. So this shows the results of the tests we did on the six furnaces. And the group on the left here are at .5 inch of external static pressure water column; the group on the right is at .8 inches of water column.

And one thing you notice right away is that the .8 inch, the higher static pressure group, the data is showing generally higher watts per cfm, which is what you'd expect. But it's not consistently and overwhelmingly that way.

The blue unit here is giving about the same watts per cfm at both of those static pressures. Of course, these are running at high speed. They're not actually delivering the same amount of air flow in both cases because they're running at their maximum speed at those static pressures.

The other thing that we're looking at here is the difference between the ECM motors and the PSC motors. And you'll notice that at the lower static pressures the ECM motors have a significantly less, lower watts per cfm.

Next slide. We can talk further about details about those tests if people are interested.

We then looked at a manufacturer's data set, or a set of manufacturer's data that was compiled by Lawrence Berkeley National Lab using data directly from manufacturers' websites, or directly from the manufacturers.

They had 841 different furnace models and blower speed combinations that had actually blower power information in the manufacturer's literature.

Next slide. And if you look at the self-reported data from the manufacturers we get trends that are interesting in terms of what we're trying to do here.

This, again, is a distribution plot and on the left axis is the watts per cfm at high speed with .8 inches of water column static pressure. And you can see that the data ranges from .36 watts per cfm up to about .6 watts per cfm. And the median there is at just about .5 watts per cfm. So this is at the high pressure, the median of the pressures that we find in the field. And in that condition, the median efficiency unit here produces about -- or has about .5 watts per cfm of fan energy consumption.

Next slide. If you take that same set of data and look for the watts per cfm at .5 inch of external water column, you get a nice line now.

And the median in this case is .45 watts per cfm. And about three-quarters of these units would be able to deliver at .5 watts per cfm or less. So, there's a significant difference in the electricity consumption to move the air at the higher external statics.

Next slide. Again, using this manufacturers' data -- the previous slide like this was the data from the field survey -- using manufacturers' data you can see that there's a significant difference between units that are rated for 5 tons of air conditioning and all the other units.

In this case the boxes don't even overlap which is the classic conclusion from a box plot like this, is that they are significantly different data samples if they don't overlap in the middle. And the 5 ton units median is about, well, I don't know what the median is, but most of the 5 ton units are less than .55 watts per cfm. Most of the smaller units are less than .5, or 10 percent less energy.

Next slide. Okay, so one of the things we looked at is what are the measures that are available to improve these systems and make them use less energy. And there are several ways that you can go about doing that, but one of the straightforward approaches that's available in the building standards is for the builders to improve the duct system and reduce the external static.

And so we looked at an analysis of what it would take to do that and what it would cost. So here are the components of external static. The supply duct, which in our survey is .18 inches of external static out of the total of .75. Cooling coil, which is .27, or about a third of the total external static. The return duct, the filter and again the total is .75.

So we looked at, okay, so how would we reduce that. And Rick Chitwood went through and analyzed a standard design approach. And, you know, his shot at how to do this was to reduce -- was to leave the supply ducts alone because he thought they were okay. Reduce the cooling coil static to .2, the return duct to .05, the filter to .07 and the total static would then be .50, or meeting the target we're looking for here, which is also coincidentally what most of the furnace manufacturers recommend.

Next slide. The cost to achieve this,

Rick figured out the materials cost and labor cost to take this nominal 3.5 ton system and make these changes to the duct system. Made no change to the supply duct. We increased the cooling coil size, at a cost of $40, to get a larger coil and reduce the pressure drop through the coil. Increased the size of the return duct, which cost a total of $32. Increased the size of the filter by 25 percent to reduce the pressure drop through the filter; that cost $15. Overhead and profit, we have to make sure that the mechanical contractors get their due here, so the total for that is $123 to change this prototype system from .8 inches of external static to .5 inches of external static.

Next slide. So we have a -- we've gone through and done calculations on the TDV lifecycle cost savings for this savings, and dropping the external static pressure, and reducing the air handler watts from .6 down to .5 watts per cfm.

And for example, in climate zone 12, we're calculating that it saves $172, and the cost is $123.

Next slide. In the report that's been posted on the website is a more recent version of this lifecycle cost analysis, which shows the lifecycle cost calculations for all 16 climate zones. And our conclusion, based on that analysis, is that this prescriptive standard is lifecycle cost effective in climate zones 10, 11, 12, 13, 14 and 15, which are all the Central Valley cooling climates, basically.

And so for those zones we're proposing a new prescriptive standard that says that central forced air systems shall simultaneously demonstrate in every zonal control mode a flow greater than 350 cfm per ton of nominal cooling capacity and a watt draw less than .5 watt per cfm if it's less than 5 tons, or .55 watts per cfm if it's 5 tons or more.

Next slide. A related new standard, prescriptive standard, is for these same systems, but used in a different context. And that's -- there's an increasing trend toward people using central air handler systems like this to distribute ventilation air in their houses. And as you'll see later on this afternoon, we're going to talk about a requirement for ventilation in the standards. And many people think that air distribution is a component of good ventilation system design, and they often use the central air handlers to do that.

When the air handler is used as an air distribution system, it typically runs some fraction of every hour of the year to make sure the air stays mixed up in the house. A consequence of this is that the air handling system runs a very large number of hours, two to maybe four or five times as many hours as it would have it if was just running to meet the heating and cooling loads.

And so consequently it's more cost effective for systems like this than for normal heating and cooling systems to put in a good fan.

So, what we're proposing here is a second prescriptive requirement that if you do an air distribution system, in other words, if the builder says I'm going to operate this central air handler fan in air distribution mode to mix air in the house, and I'm going to have a control that turns it on for 20 minutes out of every hour to mix the air around, then in that case you have to meet this watts-per-cfm number in all the climate zones. It's the same standard as we're proposing for the cooling mode prescriptive standard, but it applies to all the climate zones in the state.

Next slide. There's also associated some ACM modeling changes, particularly for air distribution systems. We're going to propose that the air distribution schedule is basically 30 percent on time every hour. This is the common specification that's used for these kinds of systems. If you look at the literature from manufacturers and people using these systems in California, this is the normal specification.

And second part of this is that if ventilation air inlets are a part of this air handler system, if they are not controlled with a damper and a control system so the air inlets are closed when they're not needed for ventilation air, then we're going to add the effective leakage area of that ventilation vent, which remains open all the time and essentially increases the leakage area of the house, we're going to add that ELA to the proposed house specific leakage area for modeling for loads.

And, in addition, we're going to add the ventilation inlet as a return leak in the ventilation system -- sorry, return leak in the heating and cooling system. So that whenever that system runs you're going to be drawing in outside air as a return leak. And this is because it's not controlled. And so whenever the system is running under peak conditions it's over-ventilating and causing extra loads.

For systems where there is a more smart control that has a damper and closes off the external air inlet, then we don't propose to have any sort of penalty on the ventilation air beyond what we will be accounting for as ventilation.

Next slide. Okay, so I think we should maybe -- this is the end of the topic on air handler fan watt draw and air flow. And I don't know if you want to take questions here or whether we should go all the way to the end and --

MR. SHIRAKH: This is the next topic, I think, on the agenda, so --

MR. WILCOX: Yeah, this is the beginning of the next topic. We put them together in the same PowerPoint.

MR. SHIRAKH: So, why don't we stop here and see if there are any questions or comments related to the furnace watt draw. The gentleman in the back.

MR. DELAQUILA: Good morning; my name is Dave Delaquila with the Gas Appliance

Manufacturers Association. Thanks for the opportunity to comment.

I guess my first question is I didn't see the presentation online this morning. Was it posted on the website? I only say that because I had some general comments prepared and it would have been nice to see the presentation to --

MR. WILCOX: I think the -- it was posted this morning, but --

MR. DELAQUILA: Yeah, I --

MR. WILCOX: -- but --

MR. DELAQUILA: -- I looked this morning but I didn't -- what was it called?

MR. WILCOX: I'm not sure. It will be posted, and I believe there's a period of time when you can make written comments. So we'd encourage you to study it in detail and let us know what you think.

MR. DELAQUILA: Okay, and we will. And I had a few general comments to make. I think maybe one or two of them might not be relevant anymore.

We do support the concept of reducing the static pressure in the external duct system. We think that would be a very appropriate thing to do. And we would support that.

One of the things that I didn't see up here with the cost/benefit effectiveness is what -- is there going to be a cost/benefit analysis conducted with replacing or requiring regulating ECM motors as opposed to PSC. These are premium motors and can range between $200 to $300 increased cost to the consumer. So I think it would be pertinent to do a cost/benefit analysis on that.

MR. WILCOX: Should I answer?

MR. SHIRAKH: Yes.

MR. WILCOX: Our current plan is that we think the primary method for meeting this requirement will be putting in a better duct system. And getting the system designed and installed correctly and so forth.

So, I don't think we're going to focus on an ECM motor requirement, although, you know, it might turn out that some builders decide that that's a part of their solution. It's certainly not the only way to do it, and we don't expect it to be the primary way.

MR. PROCTOR: This is John Proctor. I'd also like to point out that in the tests, the field tests and the lab tests, it was clear that PSC motored furnaces could meet it when you used a decent duct system on it.

MR. DELAQUILA: Right. And, again, we would support better external duct systems to the equipment.

The last comment I'd like to make is whether or not the requirements are going to be for new construction or existing construction, as well. Just looking for clarification on that.

MR. WILCOX: Well, I think at this point my thinking has been new construction. But I don't know that we've debated that to any great length, and if you would like to make a recommendation I think it would be good to hear that.

MR. DELAQUILA: Okay, thank you.

MR. SHIRAKH: Thank you so much. The gentleman there.

MR. REEDY: Good morning; I'm Wayne Reedy from Carrier Corporation. I appreciate the opportunity to comment.

First, Carrier agrees with the effort to reduce residential duct work and filter static pressure levels which were use sound levels and energy use in the homes. So we appreciate that.

Second, Carrier also agrees with the effort to establish minimum air flow levels. Carrier does, however, recommend that the minimum air flow level be set at 330 cfm per ton, or provide a minus-20 tolerance. As it turns out, 350 is a design point for our variable speed systems and manufacturing and measurement tolerances, you know, could cause a problem. And we'd hate to have something fail at 349 cfm per ton.

MR. SHIRAKH: What was the number you recommended, the cfm?

MR. REEDY: 330.

MR. SHIRAKH: 330.

MR. REEDY: Third, Carrier recommends that voltage be taken into account in the watts per cfm value, as above nominal voltage increases blower watts and cfm. And so at this point Carrier is unable to comment on the proposed .5 and .55 watt-per-cfm value as it does not include a specified voltage.

I guess the last question, how will this be implemented. Will it be prescriptive or as a tradeoff option?

Thank you very much.

MR. WILCOX: Yeah, Wayne, I have a question for you, actually. To answer your question, what we're really doing here is taking what's a compliance credit in the 2005 standards where you can measure post-construction measure fan watts and air flow and verify that you've achieved the specified value. And then you get a credit for that. We're going to use that same approach for this prescriptive standard.

And I'd caution you that in the California words mean somewhat different things sometimes. And a prescriptive standard in the context of our performance code means that it sets the level of performance that is expected at the house. And if you were to comply prescriptively you would have to do it.

But a vast majority of builders in California use the performance method for complying. And then prescriptive standards can be traded away against some other efficiency measure. So, that's the intention here, that this would not be a mandatory requirement and could be traded off.

People with a much more efficient system could also get credit for having fan watts and air flow that are better than what's specified as the standard here, as well. So we expect that people doing above-code programs may want to go to much more, go beyond this requirement, I guess.

My question for you is whether you could help us with understanding the relationship between voltage and power and air flow on your systems. We've sort of been assuming that it more or less worked out with the same watts per cfm. And maybe that's not true and we need to figure that out.

But I think we'd like to benefit from your knowledge and expertise, if possible.

MR. REEDY: Absolutely. We'll be glad to. I don't have the data or an answer for you today, but be glad to work with you.

MR. WILCOX: Great, thank you.

MR. REEDY: Okay, thank you.

MR. SHIRAKH: Any other questions on this topic? Mike.

MR. HODGSON: I have a question for Bruce and John --

COMMISSIONER ROSENFELD: Who are you?

(Laughter.)

MR. HODGSON: Good morning, Commissioner. Mike Hodgson, ConSol. I apologize.

MR. WILCOX: Yes, we like to work with you.

MR. HODGSON: We would love to work with you.

Some of our builders in above-code programs are going to higher MERV filters.

MR. WILCOX: Yeah.

MR. HODGSON: And looking at your slides you were looking at potentially a filter resistance of .07. And I believe some of the MERV filters that, for example, EnergyStar's recommending a 6. There's some builder programs that were doing, I think, a MERV 9. And the resistance on those, I believe, and, John, you are probably more familiar with this that I, are like .2 to .4 by themselves.

I'm wondering, you know, to encourage better design, but at the same time better filtering of air, how is that going to work?

MR. PROCTOR: This is John Proctor. I think that at this point the only that I know to make it work is to increase the overall area of the filter. So you can't just take a one-inch filter of the same size and slip it in for the old gravel-catcher and get it to work.

So they have to design more filter area in order to accomplish it with the higher MERV ratings.

MR. HODGSON: Right, and I think they're already doing multiple returns, so they're using two returns, so they're doubling the surface area, and they're still at .2.

MR. PROCTOR: Yeah, and they may have to go away from a one-inch filter. They may have to go to a four-inch pleated.

MR. HODGSON: Okay.

MR. WILCOX: And just as a preview, this afternoon we're going to talk about ventilation, indoor air quality; and one of the requirements of the proposal we're going to make is that a MERV 6 filter would be required. Just so your life is interesting.

MR. HODGSON: No comment.

(Laughter.)

MR. SHIRAKH: I saw a hand from way back there, and then this gentleman.

DR. AMRANE: Good morning; Karim Amrane with the Air Conditioning and Refrigeration

Institute.

We haven't had a chance to review this presentation. I believe it was posted this morning but I guess, you know, we haven't had a chance to look at it, and we will probably be filing comments later on.

I would like to commend Bruce for reaching out to some of the manufacturers on this topic. I guess I'd suggest for the future that it be useful also to get ARI involved because we have a thorough base of manufacturers to help discussion among themselves. I think it will be really better in the future next time if you can reach out to us, as well.

Regarding your cost/benefit analysis, I believe, and correct me if I'm wrong, you focused your cost/benefit analysis on new construction only, is this correct? So if the Commission -- a debate whether to use that, as well, for retrofit as well as new construction, I think you'll need to revise; probably you'll have to revise the cost figures, especially for the ducts, since you are thinking of focusing on ducts, as well.

So that's my comment. I think ARI, as an industry, I think we support -- I think it's about time that the Commission focuses on ducts and try to reduce the static pressure in the ducts. I think that's where most of the losses are. And I think it's very important that the Commission look at this issue and try to resolve it.

Thank you.

MR. WILCOX: Thank you.

MR. SHIRAKH: Please.

MR. CHAPMAN: Good morning; Jeff Chapman with California Living Energy. And John and Bruce and Rick, first question. As you're weaving through this in terms of prescriptive performance I'm hearing it being more of a prescriptive issue.

Rick, as you cost this out, did you think about pricing and the cost of a duct design? You know I'd ask the question. That is a cost. If it's not here as a prescriptive issue, then it doesn't really matter. If it's a new home performance issue, then that's something we need to deal with.

And, Bruce and John and Ken, where fan wattage draw now is, in terms of the amount of Title 24 credit gets, if it's a prescriptive issue, if this were to become prescriptive procedure would the credit change in Title 24 so there's more credit for the builder so they get more impact on Title 24 for the cost of the inspection?

MR. WILCOX: Well, this prescriptive standard is being structured slightly differently in terms of the reference house. So there will be a larger credit in meeting this than there was under the current standard.

And we've also reduced the adequate air flow number from 400 down to 350 to make the system more cost effective and we think more reasonable.

So I think this will be more, we'll have a bigger credit for the builders than the current situation does.

MR. CHAPMAN: And I would apply the 350, as a colleague of mine here from another company, we've been wrestling with adequate air flow at 400 cfm per ton, dealing with all these issues of static pressure and so forth.

So, thank you very much.

MR. PENNINGTON: So, Jeff, one comment I would have related to the cost of the duct design comment you made.

MR. CHAPMAN: Um-hum.

MR. PENNINGTON: The California mechanical code has required duct design as a mandatory requirement since 2001, I think it was.

MR. CHAPMAN: Well said.

MR. PENNINGTON: So that should be, you know, there may be important issues related to that, but --

MR. CHAPMAN: Thank you.

(Laughter.)

MR. PENNINGTON: -- but that's what the law says.

MR. CHAPMAN: No, no, I appreciate --

MR. PENNINGTON: And it's not our law.

MR. CHAPMAN: And I think, I'll say we both, not to be presumptuous, but all of us, I think, have seen those things submitted that were accepted that were on paper with pencil, that were drawn in as duct designs. And that is changing and needs to continue to change.

What qualifies as what's submitted, that needs to be affirmed by building departments if they're going to take something that is, indeed, stamped and/or ACCA approved.

MR. SHIRAKH: Okay, thanks.

MR. CHAPMAN: Thank you.

MR. SHIRAKH: Any more comments on furnace fans? Charles and then Mr. Day.

MR. ELEY: I have just a question of clarification. There were a number of graphs where you showed watts per cfm. Was that measured cfm or rated cfm?

MR. WILCOX: Measured.

MR. PROCTOR: Measured.

MR. ELEY: It was measured in all cases, okay.

MR. WILCOX: Basically using the procedure in the appendix of the ACM manual.

MR. SHIRAKH: Michael.

MR. DAY: Michael Day with Rockwood Consulting this time. One thing that --

(Laughter.)

MR. DAY: I need to keep track of myself sometimes. One of the things --

MR. WILCOX: Well, it says on your chest there.

(Laughter.)

MR. DAY: One of the things that I think we need to pay attention to is that the Commission has done a very good job in producing houses that are in the range of what you might call super-compliance. Houses that have six-inch walls with one coat stucco; have extremely efficient envelopes.

There's some builders and some customs that go to extremely efficient envelopes. And the unintended consequence of that is to keep .6 cfm as an air distribution number, .6 cfm per square foot. The result of that ends up being that you have a cfm per ton where you may need, you know, 1600 to 2000 cfm to keep your cfm-per-square-foot number in distribution good. But you may only need a refrigeration of say, 2.5 or 3 tons on extremely efficient houses.

So using a metric of cfm per ton, you've already started to run into that. And I know that a certain large mechanical contractor that I used to be intimately familiar with would occasionally run into houses where they'd have an actual cooling load of less than 3 tons, but would require 2000 or 2200 cfm to provide the ventilation there.

So, again, just keep an eye on the cfm per ton as necessarily the standard that you're working towards. Because when you get really efficient houses you want that to drift.

MR. PROCTOR: Yeah. Mike, can I ask you a question? This is John Proctor. Where's the specification of .6 come from?

MR. DAY: I don't know. I don't know, but I know that it's a -- that for comfort and odor and a lot of other things, it's one that's been used for a long time. But I can't specifically tell you where the .6 cfm per square foot was derived from.

MR. WILCOX: Yeah, I think the prescriptive standard we proposed here is not based on a number like that. And so I think our assumption is that meeting the load is what determines the cfm.

MR. SHIRAKH: Okay, we're going to move on to the next topic, which is air conditioning air flow, refrigerant charge and TXVs. Bruce Wilcox and John Proctor.

MR. WILCOX: John's going to present this.

MR. SHIRAKH: We'll break for lunch after this. And we're about 15 minutes behind, so.

MR. PROCTOR: Okay, John Proctor. We're

going to talk about air conditioner flow and refrigerant charge and TXVs. Go through a field experience and data, changes to prescriptive standards and some housekeeping changes inside this arena.

Next slide, please. Basically this starts from reports from HERS raters and evaluators, about poor installation quality of TXVs that are preventing proper operation of the TXV in new construction and actually in replacements, as well.

Next slide. Based on that, we took a look at our database and we had, in our database we had over 4000 field tests of TXV metered units, split units, that at some point in the process had the correct amount of subcooling, indicating that they had the correct refrigerant charge.

And I probably can't go through a training session here on what a TXV does, but let me try this. The purpose of a TXV is to provide a constant amount of superheat. So a TXV is designed, and on the bottom of our graph here, this is the superheat that the TXV is providing. And basically they're designed to give you some fixed value pretty much regardless of what is happening with the indoor conditions and the outdoor conditions.

And they're going to vary over some, you know, some range. And so basically we created a range here from 4 degrees of superheat up to 25 degrees of superheat. And basically we said, okay, everything in here could very well be working properly. But units with less than 4 degrees of superheat are not, and units with more than 25 degrees of superheat are not.

This was to get some idea of whether or not the information from the field was supported by the data inside the database. And it is to that degree.

Next slide. So what we are proposing is changes to the prescriptive standard that exists right now for a/c charge. And this only applies to the high climate zones, same climate zones we're speaking of that we have in today's standard.

And the change would be, it would eliminate the TXV credit as a credit just for having a TXV and verifying that it's present. And it would change it to that you have to verify charge whether it's a TXV or not a TXV.

The second part is that you would verify that the TXV is performing properly. And by that we mean that it's holding the superheat to some range either specified by the manufacturer or between 4 degrees Fahrenheit and 25 degrees Fahrenheit.

This other change actually Bruce talked about which is setting the adequate air flow credit at 350 instead of 400 cfm per ton.

Next slide. So, probably the easiest place to find this and to try to understand it is inside appendix RD. Again, we remove the TXV exemption; we add a subcooling test for TXVs and EXVs. EXVs are electronic expansion valves which perform a similar job to a TXV.

Also add metering device operation to check for TXVs and EXVs, which is that they produce a superheat within a reasonable range, preferably as specified by the manufacturer.

Next slide. That's the substance. Now, there's housekeeping items here. Clarify that the minimum air flow for refrigerant testing can be established by the temperature-split method, but you can't use the temperature-split method to prove you have, quote, "adequate" airflow.

Minimum air flow for refrigerant testing is different from adequate airflow.

Am I doing something wrong here? Some clarifications on the temperature-split table. To be quite honest with you, there are conditions on that table that don't exist in the physical world as we know it. Those will be eliminated.

And the third housekeeping change is that the inspectors, that is the HERS raters tolerance on temperature split subcooling and superheat will be 1 degree Fahrenheit wider than the installers, just to acknowledge the fact that even when the equipment is calibrated on a regular basis, there still are differences between different pieces of equipment.

Next slide. That's it.

MR. SHIRAKH: Any questions or comments on this one? When I said this was the last presentation before lunch I lied. I do that from time to time. Mr. Mowris, he has a presentation which is directly related to this proposal, and I think it's going to take about ten minutes.

Iain, you have some comments? Sure.

DR. WALKER: Iain Walker here from LBL. The question I have is about the fuel verification of the charge. How are you going to do that in the winter or in cold climate zones where there's many months of the year where you probably can't do that testing simply because it's not warm enough to run the air conditioner?

MR. PROCTOR: Okay, currently in the standard we will maintain what we have in the standard today, which is the weighing method is allowed in the winter. It's not a great method, but it's allowed.

DR. WALKER: I just wanted to find out if that was going to stay in there. Okay, thanks.

MR. PROCTOR: Yes.

Meanwhile, while Robert's getting ready does anybody else have any questions or comments on this?

MR. HODGSON: Mike Hodgson, ConSol. John, what certification do you need to do the testing for the TXV?

MR. PROCTOR: You have to have the EPA certification to handle refrigerants.

MR. HODGSON: Okay. And are there raters out there that have that?

MR. PROCTOR: Yes.

MR. HODGSON: Are there more than five?

MR. PROCTOR: Are there more than five? Yes.

(Laughter.)

MR. HODGSON: Okay, give me a number, because --

MR. PROCTOR: If you keep guessing the numbers --

MR. HODGSON: -- it's not more than five.

MR. PROCTOR: -- I'll be --

(Laughter.)

MR. PROCTOR: You're going to go beyond my knowledge. I know there's more than five.

MR. HODGSON: Do you know, Mike?

MR. BACHAND: It's very few.

MR. PROCTOR: Very few and --

MR. BACHAND: Whatever the number is, it's not a lot right now.

MR. PROCTOR: Right. Okay.

MR. BACHAND: Mike Bachand with CalCERTS.

MR. PENNINGTON: So, I wonder if anybody who's knowledgeable about the EPA certification process can comment on how difficult it is to get certified?

MR. PROCTOR: If you are smart enough to become a HERS rater you better pass the test. Otherwise you ought to get kicked out as a HERS rater. It's not hard.

MR. MOWRIS: It's a 100-question test, and the manual to study for the EPA certification test is roughly eight pages.

MR. PENNINGTON: Do you have a green light on your mike? It didn't --

MR. BACHAND: Mike Bachand, again. I had a question for John. Is there also some kind of a requirement if you're carrying a tank of refrigerant around, like for the weigh-in method? Are there additional state regulations or things that apply to being able to carry refrigerant in volume like that?

MR. PROCTOR: Well, the HERS raters don't do the weigh-in method. They actually have to wait until it's warm enough to do the real method.

MR. BACHAND: Right, which is a bit of what I have as a problem during the winter. If we can only use the weigh-in method at that time, and a rater needs to do that, I mean how long can we postpone --

MR. PROCTOR: No, no, what I'm saying, Mike, is that the rater can only do the non-weigh-in method. The installer can do the weigh-in method. But there is no --

MR. PROCTOR: Which means in the wintertime a rater doesn't do a lot.

MR. PROCTOR: Pardon me?

MR. BACHAND: Which means in the wintertime a rater doesn't do one.

MR. PROCTOR: That's right.

MR. BACHAND: That's my point.

MR. SHIRAKH: Okay, Robert has presented this PowerPoint in their March workshop. So, I guess --

MR. MOWRIS: There's some new slides in here and some --

MR. SHIRAKH: -- I would ask you to emphasize the new slides.

MR. MOWRIS: Okay, I'll do that. Thank you very much. My name is Robert Mowris and I did make this presentation in March, but I've added some additional slides to it and I'll try to go through the ones that I gave previously more quickly so that we don't spend any time on it.

The purpose of my presentation is really to, if you go to the first slide, is to focus on HVAC, which this slide was in the first presentation so I'll go over it quickly.

Air conditioning is the largest contributor to peak demand in California. Go to the next slide, please. This slide basically is the same slide I gave last time indicating that there's a considerable number of new air conditioners installed each year in California; roughly a half a million. Fifty to 70 percent are installed improperly. And the savings potentials are 10 to 40 percent.

The savings in California, the potentials are quite high, 3 terawatt hours plus or minus .5. And 2.5 gigawatts plus or minus .5.

The biggest problem, as John pointed out, in the proposed standards that the technicians don't have the proper training equipment or verification methods to make sure that they get proper installation on refrigerant charge and air flow. And so that's really the problem, that's what the proposed standard revision is for.

I'm also going to talk a little bit about cool attics in this presentation, which would be a minor modification that I'll touch on briefly.

Go ahead to the next slide, please. The suggestions are consistent with what the staff is presenting on proper refrigerant charge and air flow. I'd also add another recommendation to verify proper installation of the TXV sensing bulb, since most of them are installed incorrectly from the factory.

To maintain proper refrigerant charge by use of locking caps and labels to identify units that aren't installed properly. And then a mandatory cool attic requirement if the air conditioning equipment is installed in the attic, that essentially what we'd require would be what's already in the standards, which would be a cool roof or a radiant barrier system, plus one to 150 upper/lower ventilation. Or if that's not possible in the home, a solar powered attic fan.

And then there's a couple other recommendations that I may not touch on since I presented that information previously.

Go ahead to the next slide, please. The primary reason for this is that new equipment does under-performs. This slide gives you an indication. There was a study that was funded by Edison that this slide is taken from. It indicates that only 6 to 50 percent of new equipment really performs as advertised.

Next slide, please. Go ahead, next one. This is really a repeat of what John has already mentioned. We have field data on 16,500 units showing that 48 percent of new split systems had improper refrigerant charge. And on the new package units, 30 to 67 percent of new package units had improper refrigerant charge. So I'd also recommend that this standard be required for commercial package units, as well.

Next slide, please. You see here the data on new residential units. While 50 percent of the units are installed correctly as found in the field from thousands of measurements, 50 percent are not, including TXVs and non-TXVs. Roughly the proportions are the same.

Go ahead to the next slide, please. Next slide, please. Commercial units we see a significant number installed improperly. The two middle bars are those that are installed properly. We see the TXVs are generally the package units are the ones that seem to be the most problematic in terms of getting them correctly charged in the field.

Next slide please. Go ahead to the next one, please. This is a slide of a TXV unit. The first thing that we actually recommend in the field under the verified refrigerant charge program has been to check the TXV sensing vault and make sure that it has proper orientation, proper contact, and insulation on it so that it can sense the suction line temperature as it leaves the evaporator and establish the right balance with the spring and the TXV.

And then the sticker's placed on the unit to indicate that. And then from that point on then the refrigerant charge is checked, and the air flow and so on. In this particular case, this unit saved about a kW when it was installed and properly charged. And the efficiency went up by about 30 percent.

Next slide, please. And the sticker goes on the label to indicate. Go ahead to the next one, please. This is a package unit. We have a tremendous problem with package units insofar as the filters are immediately adjacent to the evaporator coil. I mentioned this last time, and anybody that wasn't in that presentation can see that this unit is completely iced up. We've seen brand new units two months old with this phenomenon occurring. And what I'd like to see in the future is potentially a standard that would require that filter assemblies not be immediately adjacent to the evaporator coil on both package units and ground-source heat pumps where this is an endemic problem.

Next slide, please. This is a package unit measured up at the unit you saw in the previous slide. A different picture, but the same basic trend. When the evaporator freezes if you get freezing back to the compressor you have very high power usage and low efficiency. Once you thaw it out, get the charge corrected, get the efficiency that it's rated at, you get the tremendous drop in power usage.

Next slide, please. Next slide. Okay, so for maintaining proper RCA the recommendation that we're making is really to require a registration of the information with a third party that would be available on the HERS website, through a verification service provider.

Labels to indicate as such, that there's something on the unit that could indicate that it not only has proper TXV installation, but also proper refrigerant charge and air flow. And then locking caps. To maintain that efficiency similar to ducts where we have a requirement not just that the ducts be tight, but that they be sealed with proper materials, namely UL-181 tapes or mastics. In this case the cost per locking caps is roughly $5 to $6 for a, you know, multi-thousand-dollar piece of equipment. It seems like a very tiny amount of money.

In addition, the caps prevent leakage of refrigerant which ties in the efficiency with protection stratospheric ozone depletion consistent with section 608 of the federal Clean Air Act. And without these measures, we find degradation of charge.

Go ahead to the next slide, please. The labels and the caps are shown in this picture. Next slide. Okay, we did some analysis of some EM&B work that we performed, programs that had proper charge and air flow as a measure.

We found when we looked at the hazard rate survival functions that the effective useful life was essentially 7.4 years plus or minus 2.6

for jobs that did not have labels or locking caps. Programs that used these labels and locking caps we found significantly lower failure rates. In fact, the hazard rates were so low that the effective useful life is equivalent to over 100 years, which is obviously indicating significant maintenance and sustainability of the proper charge and air flow.

Next slide, please. This is the hazard rate function and the liable distribution for the case where we didn't have the locking caps and labels. We see it falling off fairly quickly.

Next slide. And the liable distribution for the case where you had the locking caps and stickers. You see that essentially with the locking caps and the labels you end up with the issue of maladjustment sort of falling off the radar map. And the life of the refrigerant charge and airflow, at last, or the refrigerant charge in this case, maintaining itself longer than the life of the equipment.

Next slide. The TXV, again the importance of performance and you verify that it's installed correctly. Go ahead to the next one. This is a TXV, you're supposed to optimize refrigerant flow as cooling loads vary.

Next slide. You see here the one on the right, on the upper right, is factory-installed unit without insulation, with very poor contact. The one on the left is a field-installed component where it actually came with the evaporative coil, but was installed incorrectly.

In this case you see the little tubes coming out the bottom. That should be reversed. But most of the time you find it this way in attics. When the tube is coming down you get liquid into the line, and that can affect the signal that comes from the sensing bulb. These are both sensing bulbs. The lower horizontal in the right slide is the suction line.

Next slide, please. This is an important topic that I think should really be -- could easily be added to the standards in this go-around. Essentially what we'd be talking about is a requirement for a cool attic, which can either be accomplished by the presence of a cool roof material, or radiant barrier system with one to 150 upper and lower venting. Or is the venting wasn't feasible in the design of the home, a solar-powered attic fan.

If this were mandatory, which it already is in the standards, if it was just mandatory whenever an air conditioning piece of equipment, evaporator, forced air unit and ducts get installed in attics, we reduce the temperature in that space by roughly 20 degrees, as evidenced by two studies that the Florida solar Energy Center did. Got the acronym wrong there, but they showed in their test facility a 20 degree drop in the attic temperature when they had the RBS, the radiant barrier system. Plus the one over 150 vents. And a 22-degree drop with the RBS, plus a solar attic fan.

So essentially what we're looking at, if we can accomplish this, is a significant savings. My feeling is that if you've ever been in an attic in the summer in the Central Valley where temperatures get up above 140 degrees during the peak period, what happens is you get a tremendous reduction in capacity.

And my feeling is if we could intelligently design systems with cool attics we could probably reduce the average size of an air conditioner in a home by roughly a half a ton at least. And a half a ton corresponds to about .75

kw. Multiply that times 100,000 homes, you've got a significant savings per year potential in California for new construction.

Next slide, please. This slide is from the Parker study. The next slide will be another one. You can see in this slide the tremendous difference in temperature between a conventional attic with a black-shingle roof and no RBS and very poor venting, one in 300 venting, versus the ambient condition which is the blue line at the bottom.

The brown line sort of midway -- the aqua blue line midway down is sort of the case I'm suggesting which would be the RBS system with the one in 150 ducting.

We go to the next slide. This one is from the other study that Parker did where they showed a 22-degree depression in the attic temperature with the RBS, plus the solar attic fan. In this particular case they only had the soffit fan so the attic fan provided that flow of air. The combination of the RBS reducing the radiant heat load with the convection improvement by the solar attic fan in homes where there's just soffit venting really has a dramatic effect.

Basically the same as an RBS system with one in 150 upper and lower venting.

Next slide, please. In the multizone systems, talked about this previously, essentially tried to improve the efficiency of these systems. And I won't go into much detail, talked about it last time.

Next slide. More information on that. You have it in the handout. Go ahead, the next one. Proper sizing. Again, if we could do the -- if we get the proper charge and the airflow, the other information on the duct design, the staff already presented, and then the cool attic, we can drastically reduce the size of air conditioners. And that really has a huge impact on peak demand.

Next slide, please. Matching coils is another one I talked about last time. I won't go into it this time. Next slide. Economizers I talked about last time.

Next one. And then the conclusions. Essentially an echo of the intro. Really supporting Bruce Wilcox and John Proctor's recommendation. Adding to it the requirement for nonresidential. Checking nonresidential charge on package units. And the verification of the TXV installation for proper installation of the sensing bulb; insulation of that. As well as the cool roof adding. I think those are really the key things.

I appreciate the opportunity to give my talk. Thank you. Do you have any questions? I'd be happy to --

MR. SHIRAKH: Any reactions to Robert's or John's presentations on TXV, refrigerant charge?

MR. PROCTOR: John Proctor. Can I ask you a question. You mentioned that you have folks look at the sensor before they do the charge check. So, on your graphs that show the distribution of charge airs, on the TXV units, were those TXV sensors relocated and insulated prior to that? Or after that? Or not at all?

MR. MOWRIS: They were generally corrected before the did the charges, yes.

MR. WILCOX: So I'd just like to say that we reviewed these proposed suggestions of Robert's, and as you can tell from his supporting what we previously presented, I think we've agreed with him on several things.

There are several others that we don't

think there's evidence to support the fact that they would be cost effective, like labels and locking caps. Although maybe there's data that -- we've asked for some data and haven't seen data yet on some of these issues. So we haven't included them.

We have a prescriptive requirement for a cool roof or radiant barrier, and proposals in that area to increase those requirements in 2008. And I'm not sure that we can achieve consensus on a mandatory requirement for cool roof at this point. I think that's -- I agree completely with Robert that it would definitely save peak demand and so forth. But there's also a question about what's acceptable in the building industry.

MR. MOWRIS: May I respond to that? My recommendation on that is if the builder is going to put the air conditioning equipment and the ducts and the evaporator in the attic then that's when the mandatory cool attic would kick in.

I think Danny's point to me yesterday when I talked to him on the phone, Danny Parker said it's of paramount importance. If you can make that point to the Commission it would be huge.

I think that's really when it would kick in. If a builder puts all that equipment in the garage or crawl space or somewhere else, you know, obviously they could get away with not putting the cool attic in.

I still think the cool attic is a great idea, and I think it supports the cool roofing, you know, initiative that you already have in the standards. But I think if the equipment goes up there it just seems like it makes sense to me, very common sense.

MR. PENNINGTON: I have a question for you related to the locking cap. You said that that, I'm not sure if you said eliminated or reduces refrigerant leaks. And so I'm wondering if there's any information about the frequency of refrigerant leaks at that point relative to the frequency of leaks at other points in the system, you know. Doesn't seem like you're isolating the only leak there.

MR. MOWRIS: I looked into this when I made this presentation at the HVAC out at PG&E in mid-June; and I also made it in England about two weeks ago. And people ask that question, several people in the audience. And so I looked into it.

And the other, I mean the main thing to understand is that an air conditioning system generally is like a, it's a welded, it's a brazed copper system. The only other noncopper material that's in the system would be the aluminum fins on the condensing unit, and possibly aluminum on the evaporator unit.

And so there were some questions about the dissimilar metals and potential for galvanic corrosion and champagne leaks. So I looked into that issue and determined that there was some information on the internet about that several years ago. It was investigated and found to be very infrequent; in fact, almost zero probability of occurrence.

Generally the moisture that condenses out of the air onto a condensing unit or onto an evaporative unit is essentially distilled water. And so if you look at the galvanic reaction with distilled water present between aluminum and copper there's very little galvanic corrosion that can occur.

So, I've got an email I actually put together and sent to the HVAC -- that I could forward to you that would be -- that would respond to that issue.

As far as other locations of leakage go, the Schrader valves are really the weakest link because essentially, I don't have slides in this presentation of it, what a Schrader core looks like, but a Schrader core is essentially two or three threads with slices in the threads, themselves. And there's no locking device that would double-lock that core valve down into the Schrader threading.

And so what happens over time is you see with older units that this, that you get a loosening; you also have a very small pliable elastomer that, O-ring that is on that core. And that can leak over time. And so you get the leakage from those points.

The thing about the caps that's so interesting from our point of view is that you get this elimination of maladjustments, elimination of unauthorized tampering, which is fairly frequent in new construction, at least from what we found in the new construction program that we ran where building supervisors and unauthorized non-EPA-certified technicians were tampering with air conditioners. And this was prevented by the presence of the locking caps.

Where people tried to remove the locking caps, they used all kinds of devices and they could not get them off. So we'd actually get calls from people based on the sticker and the website. They'd go to the website; they get a phone number. They call someone from the company; get information; determine how to get the caps off. And so on and so forth.

And so because we have such a widespread problem with technicians not having the right equipment and the right methods and the right training to do proper refrigerant charge and air flow, if we install it correctly the likelihood probability of a technician coming back to the site and not knowing what they're doing, not having the right methods, maladjusting it, it's evidenced by the slides.

I didn't go into this, but the first few slides I showed, and if you look in your handout you'll see them, the difference between new units and older existing units, there's much greater probability of maladjustments in the existing units.

The only way that can occur is either

through maladjustments or through leakage. Okay, so if you look at -- the leakage would be on the side where you're adding refrigerant. If you look at removing refrigerant you find that there's a difference.

And so that difference, again, is evidence of maladjustments. So it's the maladjustments really that you're preventing with the locking caps and the labels. You're indicating to a technician, hey, the charge is okay.

Now, most technicians are, there's not a motivation for them to maladjust, I mean when they come to a site. In fact, it's hard to get them to do a charge even when you're giving them incentives, as evidence by recent data that we have where Sears is participating and other large companies are participating in incentive programs. And you go out and interview the technicians; they'd rather not make a refrigerant charge adjustment if they don't have to, if they're getting paid the same amount of money, because it's work.

So if they see a sticker and label on the unit, the likelihood of them making a maladjustment is reduced. So really it's like a preventative measure.

And in that regard, since it's so cheap, it's like $5 to $6. If it were required under the standards, the price would drop precipitously because in California now there's probably sales of maybe 30,000 to 50,000 of these Schrader and locking caps statewide. If the state kicked in and required it, you'd have sales anywhere from 250,000 to 600,000 per year. So the price would drop.

In fact, that's what we need to have happen so that we get protection on the Schrader caps. Now Schrader caps are also labeled -- with the proper refrigerant. As we move into newer refrigerants we're going to need to identify the refrigerant that's on the unit at the point of entry so that people don't mix refrigerants.

So, yeah, it's a refrigerant maintenance, refrigerant handling issue. We have EPA with EnergyStar, but we don't have a connection between EPA EnergyStar and EPA refrigerant section 608, you know, the folks at EPA that take care of that.

So the Commission could do a tremendous

amount by following the advice of a study that was produced by, that I provided the quote of in the last presentation, was actually funded by Carrier, to encourage, you know, better maintenance and better handling of refrigerant labeling. The caps do that. They actually label the type of refrigerant that's in the unit.

MR. SHIRAKH: Thank you. Any other questions? Well, thank you, Robert.

MR. MOWRIS: Thank you.

MR. SHIRAKH: I guess -- there's one more comment.

MR. MULLEN: Jim Mullen with Lennox. Just a couple quick things. There were two studies mentioned in here. One was on refrigerant charge and the other was on RCA useful life, by Mr. Mowris. I wondered if we could get the full citation of those so we could read them and understand them.

MR. MOWRIS: Yeah, those will be in the --

MR. SHIRAKH: Robert, you need to come back up.

MR. MOWRIS: Thank you for the question. Yeah, those studies will be posted when we submit the required documentation for the recommendation for the measures. I'm putting that together right now, so it should be posted in a couple days.

MR. MULLEN: Second one. You may want to stay up here for a minute.

(Laughter.)

MR. MULLEN: On proper installation of TXVs, I was wondering what criteria you were using to decide whether or not it was proper. The manufacturer's instructions or --

MR. MOWRIS: Yeah, it would be the manufacturer's instructions. Some of them are required to be installed below the section line with respect to up and down. Some are required to be at a different, you know, orientation with respect to 9:00 or, I mean, what is it, 4:00 and 7:00 or 2:00 and 10:00 or something like that. And then contact. If the little strap that's around the unit is too small, they slide around and they're not even actually in good contact.

The slide I showed had a small quarter-inch strap that you find, you know, oftentimes on products that are strapped together on pallets that are sold, like at Home Depot or something. Some of the manufacturers actually put a fairly wide sort of like plumber's tape around it. It's like a flexible copper tape, if you will. Has little holes in it and they tighten it down. It's got very good contact.

I've got pictures of those. I didn't show them in this slide, but that would be excellent if we get the manufacturers to provide more of a secure attachment.

And then if they could come from the factory with insulation around them, so that they're all ready to go, that would be the optimal. I don't know if Lennox does that now or not.

MR. MULLEN: Well, it depends on the unit and the application, I think. The way that Lennox, and I would guess most manufacturers install the valves in their equipment or specify in the instructions is based on the expansion valve manufacturer's instructions for application.

And that was the basis for my question. And the point is really whatever the valve manufacturer recommends, whether it be Sporlan or Parker or whatever, should be the criteria for whether or not it's installed properly. And I just wanted to check.

Just a comment on locking caps for refrigeration systems. We've had some experience with those in past years, and looked at them and evaluated them. And the discussion kind of falls into two brackets.

One, the locking caps that we looked at, most of the technicians could figure out how to take them off in about 60 seconds without the key. They are defeatable. Where I guess if you got to the other point where there was one that you couldn't defeat, then you have to equip every technician with a key, which is another interesting proposition.

MR. MOWRIS: Well, I brought the caps with me. So let me get -- I mean I challenge you to -- there's two manufacturers' locked caps. I'll give you --

MR. WILCOX: Sounds like a good lunch time exercise for those who are not --

(Laughter.)

MR. WILCOX: -- hungry at this point.

(Parties speaking simultaneously.)

MR. MOWRIS: I'm not sure if those are the ones we looked at or not. They're hard to get off. I mean, literally, I've personally tried to get them off, myself, before we started using them, and they're very difficult to get off.

MR. SHIRAKH: Can I encourage you guys to continue that conversation. Too many growling stomachs here.

Why don't we come back at, by that clock, an hour from ten after two.

(Whereupon, at 1:08 p.m., the workshop was adjourned, to reconvene at 2:10 p.m., this same day.)

--o0o--

AFTERNOON SESSION

2:14 p.m.

MR. SHIRAKH: We're going to start. Just heard there's a gentleman from Lennox who wants to address the issue of TXVs that was brought up this morning. And after that we'll go to Bruce Wilcox's presentation.

Good afternoon; could you introduce yourself and --

MR. HANNIS: My name is John Hannis, Territory Manager for York; we're an air conditioning equipment manufacturer. And wanted to make a comment in regards to information concerning suggestions for HVAC efficiency improvements in regards to refrigerant charge on the commercial package equipment.

York factory was concerned with the comments in there concerning the charge. And I was asked to read a statement from a gentleman at our factory. The gentleman is Chris Forth; he is the Director of Commercial Product Management for York, a Johnson Controls Company, headquartered out of Norman, Oklahoma.

Chris' statement is: As a member of ARI, the American Refrigeration Institute, our packaged air conditioning and heat pump units, 20 tons and under, are audited to the applicable ARI test certification standard. As such, units must be certified as to efficiency and capacity at the rating standard given the small tolerance for manufacturing process."

"A major factor in meeting this certified efficiency and capacity output is the proper refrigerant charge. The equipment leaving the factory must have the proper charge in order to maintain our certification. And it's mandated and audated (sic) by ARI, as well as all manufacturers that fall under ARI certification standard."

That's all I had.

MR. SHIRAKH: Thank you so much.

MR. HOGAN: Thank you.

MR. SHIRAKH: Any response to that? Any comments?

Okay, so with that we're going to move to the first afternoon presentation by Bruce Wilcox, and Ken Nittler, I'm sorry. And it's the ACM rules for duct location and area.

MR. NITTLER: Well, I'll be Bruce Wilcox.

(Laughter.)

MR. NITTLER: I'm here to describe a proposal for two new types of credits. The title on the agenda doesn't quite exactly fit, but it's related to the efficiency of the distribution system in a couple different ways here.

Why don't we go to the next slide. The first one I want to talk about is some new terminology here; we're calling them low leakage air handlers.

As many of you know, air handlers are a significant source of distribution system air leakage. Raters and others involved in the field regularly recognize that how leaky the air handler is, is a pretty significant factor in whether or not the duct sealing criteria that we have can be met.

There are a number of sort of persistent problems with field sealing of air handlers, especially things like access panels where the very first time that another technician shows up at the air handler to do some servicing they're going to be tearing off the tape, or whatever else. And I understand that putting mastic on the openings is not a really great idea.

(Laughter.)

MR. NITTLER: So there's some persistent problems with field solutions to at least sealing some types of leaks on the air handlers.

Next slide. Now, it turns out that if you study what's out there, the State of Florida in their Florida energy code, it's chapter 13 of their code, has, for some time, I think it's since 2001, had a credit for, they called them factory-sealed air handlers.

And this credit, what we're going to propose here is that we use the exact same language that they're using for Florida. We want to improve it in one very significant way, that these factory-sealed air handlers are going to have to be certified. The manufacturer will test, but they have to certify to the Commission that their product, in fact, meets the criteria.

This is a credit that requires HERS verification. And it's also combined with the existing duct leakage credit. You can't take credit for a sealed air handler unless you're also doing a verified duct leakage test.

Next slide. So here's what the proposed definition looks like. We tried a variety of terminology. The one we settled on most recently is this low leakage air handler. So, it's a factory-sealed air handler unit, tested by the manufacturer and certified to the Commission to have achieved -- I'll let you guys all read this, it's big enough -- to achieve a 2 percent or less leakage rate at 1 inch water gauge. Some other details there.

So this is basically exactly the same language that's in the Florida, if you find where it says, to have achieved, all the way to the end it's exactly the same technical criteria that's being used in Florida.

I talked with a few people in the process of putting this together in Florida. Some people at the Florida Solar Energy Center, including Phillip Fairey, Danny Parker and that HERS rater down there.

The general feeling is that this is not in wide use for code compliance, but that it's definitely in increasing use on above-code programs like EnergyStar. So it is seeing some interest.

There is no apparent listing or certification. There's no one place you can go to find a list of equipment that meets this criteria. So I think one of the improvements that we're proposing here is if a factory-sealed air handler has to be certified to the Commission, we'll then have a place to list equipment that meets the specification.

I would anticipate that some day there will be some sort of national test methodology maybe from ASHRAE, for example. I understand there's some action on that amongst ASHRAE people to create such a test that we could then reference at some later date.

So what does the credit look like? Next slide, please. We're proposing, in essence, two methods that can be applied here with this credit. The first is that if you install a factory-sealed or low-leakage air handler, and then you do the verified duct leakage test, which requires testing to 6 percent of fan flow air leakage, total air leakage, there's actually a little bit of wiggle room, if you will, on the current ACM calculations.

For that configuration we currently, well, we test to 6 percent, the calculations are based on an 8 percent leakage rate. For a variety of factors, uncertainties in the testing and uncertainties about the longevity of the sealing and so forth, is part of the reason for that conservative 8 percent.

So what we're proposing here is if you just want to do it in conjunction with the existing verified duct leakage test, we reduce, in the ACM calculation, from 8 percent to 6 percent total leakage. And it's balanced, and it's split equally between supply and return.

Second, this is a pretty big step. The second way of doing this is if the HERS rater or whoever's running the software, with the agreement of the builder or mechanical contractor presumably, wants to specify explicitly the duct leakage that they'd like to test to, that this would provide an avenue that would allow that to happen.

So the software would allow the user to put in that I'm going to test to 4 percent total leakage, 2 percent supply, 2 percent return. We use the testing methods that are already in appendix RC. And the verification phase by the HERS provider, in addition to verifying that a low leakage air handler is installed, also you have to verify that the target or specified leakage is, in fact, met when you do the test.

So, it provides a way to do better than these fixed values that we've been using in the ACM calculations for some time.

So that's the first half of this proposal. Next slide. Now, there's a second low-leakage factor to consider here. We're calling them low-leakage ducts in conditioned spaces. We wrestled for some time to find a short title, but this was about as short as we could figure out how to make it.

So, certainly everybody would recognize that if you could move all your ducts and distribution system into conditioned space, that there's a significant energy savings there.

The current ACM rules separate the issue of conduction losses and air leakage losses when the calculations are done. So, if in software somebody says, yes, my ducts are in conditioned space, what the software does is it zeroes out the conduction losses. But the air leakage of the duct work is assumed to be at the same level as the duct in the attic. So what this will do is provide a way to cover the leakage portion of ducts in conditioned space.

Next slide. Well, how do we do that? Again, we're going to rely on test methods we already have in appendix RC.4.3.3. There's a methodology for testing the duct leakage to outside. So this is not the most commonly used approach to doing the duct leakage right now. Most would probably measure the total leakage in the duct, itself. But this is actually measuring the total leakage to outside from the duct work.

We've designated a threshold of 25 cfm to meet this criteria. And that's because apparently when you do these measurements you have to basically both be simultaneously doing a duct blaster and a blower door. And it's difficult, or at least possible that you could have cases where you have a very low leakage duct, but it's not going to be identically zero. So we give a little bit of wiggle room on that.

Again, this HERS verifications required for this credit. And the last bullet point here is pretty important. Again, it's also combined with, we already have an existing credit for verified ducts in conditioned space. So, you have to meet the criteria for what we recognize as ducts in conditioned space. And then, in addition, you're going to have to do that test that you see at the top to determine that the leakage to outside is at or less than 25 cfm.

Next slide. In terms of -- it's the definition we basically just talked about, so why don't we go to the next slide.

So how does it work out in terms of the ACM credit. Well, when you again look at the current calculations there's the duct leakage factor in the current ACM calculations when you have verified ducts is at 8 percent. And what we're proposing here is that we reduce that 8 percent down to 0 percent when a system with a low leakage duct is verified and installed.

Now, there's one case, as I was preparing this PowerPoint that I realized maybe we haven't fully thought through. The standards also recognize a case where ducts up to 12 feet are outside of conditioned space. And they get treated with a different duct surface area. And we might need to figure out how that plays into this proposed credit.

See, that should be it. Any questions? Everybody loves it.

MR. SHIRAKH: Any questions or comments? Bill has a question. Anybody else?

MR. PENNINGTON: So, the intent here is to award some pretty significant credits. The one credit to encourage manufacturers to actually provide air handlers that are essentially leak free. And hopefully this will get the manufacturers' attention.

And we understand that in Florida this is not happening very much. But it seems like if we give a really substantial credit to builders to do this that we could get the manufacturers' attention, and that this might have wheels.

The other thing is that the credit that we're talking about for installing ducts in conditioned space is a considerable increase over what we have now. And if there's a verification, that you're really not getting any leakage to outside, or essentially none, there would be a considerable credit.

So, both of these would be providing compliance flexibility under the 2008 standards.

MR. HOGAN: John Hogan, City of Seattle. It seems we're not really talking about no leakage, right? You're talking about low leakage.

And it seems there should be some distinction made between people who have baseboard, who have something completely inside the house where there really is no leakage, versus people who have systems that are outside. That we shouldn't treat both of those the same.

MR. NITTLER: I don't think this does treat them the same, John. The language that you have to look at here is in order to take the credit for low leakage ducts in conditioned space, you also have to meet the existing criteria to get credit for ducts in conditioned space. That requires a layout and you have to describe the supply ducts. I don't think that it would allow a baseboard system without ducts to qualify for this credit.

But -- well, that's my opinion. It's not intended to, certainly.

MR. WILCOX: You don't simply have to show that you have close to zero leakage to outdoors. The ducts also have to be in conditioned space. So it's not the normal attic duct system sealed real tight, doesn't meet this criteria.

I mean these two criterias overlap in

kind of an interesting way if you get down close to zero. But I think what we're doing makes sense, and is relatively clean for that purpose.

From my point of view, this is a way to give people who are interested in making superior efficiency buildings a path to get more credits than we give them now. And there's applications for this in zero energy new homes programs. And we've talked about above-code programs for the new solar homes partnership and so forth.

And one of the things we're trying to do here is make more positive credits available and give people bigger credits for the things like putting ducts in conditioned space that we all know is a good thing. But most people, or 99 percent of the builders are not doing now because it's too expensive. Implicitly meaning they're not getting enough credit for it.

MR. SHIRAKH: Michael.

MR. DAY: Michael Day. Two questions. One, maybe I'm just a little bit dense, but I'm wondering if the ducts are in conditioned space, what's the mechanism where they can leak to the outside? That would be question number one.

Question number two, how would that work with apartments where a lot of times you have the entire duct system in just a very few number of square feet in the center of the unit, and it distributes outward?

MR. WILCOX: Yeah. Well, the traditional thinking has been that with ducts, even if the ducts are nominally in conditioned space, a lot of times they end up in, you know, in an interstitial space between the first and second floor, or in spaces like that, which are actually connected to the attic, or connected to outdoors from a pressure point of view.

So, when they leak they don't necessarily leak into the house. And so what we're doing here is we're providing a test that you can actually show whatever leakage you have is not to outdoors, as the criteria.

And then once you've done it, it seems to me no reason why you shouldn't get credit for it.

The multifamily case is kind of interesting. This may be hard to do in a multifamily building because it's probably, we'll have to look into that. It may not be possible to pressurize the building, the whole building at the same time. Otherwise I'm not sure you can make this work.

But you could certainly make it work on a one-unit basis, and maybe that works all right. Maybe that's what the criteria has to be is on a per-dwelling-unit basis. So if your ducts are leaking into the other person's apartment, you won't meet the criteria. And maybe that's all --

MR. DAY: That would work for multifamily.

MR. WILCOX: Yeah. And, well, if anyone has any comments on multifamily issues on this, let us know, please. Because we obviously hadn't thought about that.

(Laughter.)

MR. SHIRAKH: Other comments? I heard a "no comment."

MR. WILCOX: Yeah.

MR. SHIRAKH: Jim, I mean --

MR. HODGSON: You can call me Mike.

MR. SHIRAKH: -- Mike, yeah.

(Laughter.)

MR. HODGSON: Or you can call me Jim, I really don't care.

Mike Hodgson, ConSol. A quick question

on the factory-sealed air handlers.

MR. NITTLER: Yes.

MR. HODGSON: Is there now a test method for that?

MR. WILCOX: There is a test method, a test specification defined in the Florida code. And --

MR. HODGSON: So California's going to reference a Florida code?

MR. WILCOX: No. We're writing it in, we're going to write that same specification into the standards.

MR. NITTLER: Could you back up one slide, please.

(Parties speaking simultaneously.)

MR. NITTLER: Keep going, back, back. What we're proposing is to have the definition -- one more -- there we go. Is we're proposing to add this definition into the California language. And from about the third line where it says, "to have achieved", from that point down it's exactly the same language that's in the Florida building code.

MR. HODGSON: So the manufacturer certifies to the CEC with some type of seal that their air handler duct meets this definition?

MR. NITTLER: Right.

MR. HODGSON: And that's satisfactory?

MR. NITTLER: Well, right now there's no national standard to reference.

MR. HODGSON: Okay.

MR. NITTLER: I mean we would anticipate there might be at some point.

MR. HODGSON: Okay. And are there any factory low leakage air handlers on the market today?

MR. NITTLER: We're told that there are.

MR. WILCOX: Wayne told me at lunch that they made one once at Carrier.

(Laughter.)

MR. HODGSON: Okay, that's --

(Laughter.)

UNIDENTIFIED SPEAKER: The guy that made that one also does the RCA tests in the field.

(Laughter.)

MR. REEDY: Wayne Reedy, Carrier.

(Laughter.)

MR. WILCOX: I'm sorry for putting you on the spot.

MR. REEDY: My comment on this would be

that you need to look through and make the test representative of the way the air handler actually works, in that typically below the fan deck it'll be under a negative pressure, above the fan deck it'll be under positive pressure.

And so if you just arbitrarily put it in a laboratory and test the whole thing at say a positive pressure, you'll get the wrong answer. Because you'll blow out panels that would normally be sucked in.

MR. WILCOX: So, you're proposing that we not use the Florida criteria. That we make a different criteria?

MR. REEDY: I'd certainly look it over carefully. I'd be glad to work with you on it.

MR. WILCOX: That would be -- we'd be interested in that. Any of the other manufacturers or GAMA or anybody who wants to weigh in on this, whether or not the Florida criteria, whether we should maintain national consistency or whether we should have a standard that works.

(Laughter.)

(Parties speaking simultaneously.)

MR. MOHASCI: Steve Mohasci. I think

this concept of the certification of a low-leakage air handler is quite appropriate. What I'd like to suggest is to make the whole thing far separate for HERS verification is we currently have a standard of 6 percent. If they're going to install a 2 percent less leakage air handler, then they will have a test level of 4 percent.

Why go through all the hassle of trying to come up with definitive ways, because is the HERS rater going to be required to verify that the air handler meets the 2 percent standard --

MR. WILCOX: No.

MR. MOHASCI: -- because it's certified? So let's just make the standard 4 percent if they're claiming the air handler credit and just move on.

MR. WILCOX: Well, it's not at all clear that if you take a system that's currently sealed to 6 percent and replace the air handler with one of these that you'll reduce the leakage by 2 percent. I don't, you know, --

MR. MOHASCI: I don't think -- the problem with the whole testing approach is you can't really distinguish where the leak -- I've seen systems measure in at 2.5 percent without a low-seal air handler.

So, right, you may install this low-leakage air handler, and then test the system at 4 percent. And the air handler, itself, may not be what, in fact, is getting it to 4 percent.

MR. WILCOX: Yeah.

MR. MOHASCI: So it's going to be a real hassle as far as tests. Now, if we're going to do it, we ought to make the test concept as simple as possible.

MR. NITTLER: I'm not sure you are getting exactly what we're proposing here. The manufacturer of the air handler is going to do this test, the 2 percent that you see on this slide. Did you understand that, Steve?

MR. MOHASCI: Yes, yeah. I --

MR. NITTLER: So the HERS rater is going to do two things. It's going to look and verify that there is one of these listed or certified --

MR. MOHASCI: Certified, installed, that's correct.

MR. NITTLER: -- low leakage air handler. And then they're going to do this pressure test to the outside air --

MR. MOHASCI: Right.

MR. NITTLER: -- to prove that it's 25 cfm or less.

MR. WILCOX: Or they're going to do the normal duct leakage test and then they get to claim 6 percent because they've got the certified air handler.

MR. MOHASCI: Well, if we're going to add this 2 percent gain, why don't we just lower the standard for this credit to 4 percent and make it far simpler?

MR. WILCOX: Well, we lowered it from 8 percent to 6 percent.

MR. MOHASCI: Well, but the current new standard is 6 percent.

MR. WILCOX: Yeah, well, okay. There's the issue of what you get actual credit for in the calculation, which is --

MR. MOHASCI: That language, yeah.

MR. WILCOX: Yeah.

MR. MOHASCI: That's your problem on the ACM number.

(Laughter.)

MR. MOHASCI: I want to just make it simple to test.

MR. WILCOX: Yeah, okay. Okay.

MR. SHIRAKH: I see people are very anxious. Please. And then --

MR. BACHAND: I'm sorry, if you didn't point at me.

MR. SHIRAKH: No, you're --

MR. BACHAND: Mike Bachand, CalCERTS. In the event that we have 6.4 percent leakage and we're using a 2 percent air handler, we still have to identify where this leakage is coming from, don't we? I mean, the ducts may be very well under. We don't know that the 2 percent certified furnace is actually performing at 2 percent. So I'm not sure I'm clear on how all that would work in the event of a failure.

MR. WILCOX: I think the rationale for this different credit here is you basically do the test exactly the same way you do it now. You meet the 6 percent criteria. That's the simple case, right?

And then when you're doing your compliance calculations you specify you're going to use one of these low-leakage air handlers. And that gets you a 6 percent leakage calculation in the ACM rather than an 9 percent leakage calculation in the ACM. So there's where the credit is. It's 2 percent better leakage.

And the rationale for doing that is that if the -- you know, over the 20 years that that air handler is going to be sitting there, that it probably will maintain its sealed condition better because it's designed to be sealed and it has factory-installed seals, rather than something that would get undone the first time somebody looks in there to, you know, change something in the control board or something.

So it's really you're getting more credit for the thing you're measuring, exactly the same way you're measuring it now. That's the issue. Shouldn't change the field verification at all, other than identifying the air handler.

MR. SHIRAKH: Karim.

MR. STONE: One quick question. Is this a recommendation for the appliance standards?

MR. WILCOX: No.

MR. STONE: The second part?

MR. WILCOX: No.

MR. STONE: Or is it for the building standards?

MR. WILCOX: Building standards.

MR. STONE: Enforcement, I mean what was

rolling over in my mind is the last discussion was how the enforcement would work for manufacturers that certify this. And there's a mechanism within the appliance standards to do that. And going back to --

MR. PENNINGTON: So, Nehemiah, all the mandatory requirements, or many of them, have certification to the Commission requirements, right?

MR. STONE: Okay.

MR. PENNINGTON: A whole bunch of stuff in the 113 to 119 sections have --

MR. STONE: Okay, so the question that came up a moment ago was it's certified to be at no more than 2 percent. And then you test the duct system, and the duct system you can't quite get it down to 6 percent, but you know it can't be the air handler because it's certified at 2 percent.

Well, is it at 2 percent? I mean did you actually get it down to that from the manufacturer? If it was in the appliance standards there's an enforcement mechanism. How are you going to deal with that? I'm not saying it's impossible, Bill, I just don't see --

MR. PENNINGTON: The certification process would be identical if it was in the appliance standards or if it's in the building standards. It would be a test procedure specification. The manufacturer would sell certified to that. We'd have a list of manufacturers that certify. So, that process is identical, whether it's there or here.

A lot of times we have building stuff, building component related stuff that is required to be certified to the Commission in the building standards. And not in the appliance standards.

MR. STONE: Yeah, I'm sorry, I wasn't very clear. This physical, how you do it with this piece of equipment, in other words, if it doesn't work, you know, in the appliance standards you have a contractor goes out and buys some equipment. Takes it to a lab; tests it under the test procedure it was supposed to.

Now, if this is just in the building standards it's not covered by the appliance standards. It's in the building; it doesn't quite work like it's supposed to. How do you know whether the manufacturer did the test right? I mean how do you know that it's working?

MR. PENNINGTON: We can hire a contractor; have them go out and buy some off the shelf and test them.

DR. AMRANE: Karim Amrane, ARI. I guess I'd like to follow up on that specific issue here. Are we asking manufacturers to certify, you know, does it take more than 2 percent, but there's no test procedure.

So, I guess we are jumping here, we are trying to implement something. And I think the first thing would be first to have a test procedure. Without a test procedure I don't see how this 2 percent can be even checked or certified.

So, I guess I would like to urge you to first try to come up with a test procedure before trying to implement this requirement.

MR. SHIRAKH: Any other comments? Okay, thank you. Oh, John, okay.

MR. PROCTOR: John Proctor. I'm a little confused about the concern about the HERS rater and the installer. Today if you test and you're at 6.2 percent, you figure out some place to get some more leaks out of it and get it below 6 percent. And that's what you'd have to do tomorrow, or 2008. To me it's exactly the same.

MR. CHAPMAN: Jeff Chapman, California Living and Energy. Quick question. Mike's question kind of triggered this in my mind. Ken, help me understand why -- and I'm going to state it in a little bit of a juvenile way, why is it that Florida's the only state that has access to 2 percent leakage furnaces? Are they being prepped at the factory or at the wholesale level? Is the wholesaler doing work in that furnace once he gets the equipment to seal them?

MR. WILCOX: We have some experts here who can answer that question, I think --

MR. CHAPMAN: Yeah, yeah, --

(Laughter.)

MR. CHAPMAN: Like I said, just a quick question.

MR. SHIRAKH: Anybody would like to answer that question? Don't all speak at the same time.

MR. WILCOX: Yeah, they do it at the manufacturer is what Wayne Reedy says. And, Jim, I understand you guys are advertising these units. What do you guys do?

MR. MULLEN: I'm sorry, I missed the

question.

(Laughter.)

MR. WILCOX: The question came up from Mr. Chapman about where the sealing of the air handlers was taking place. Was it happening at the distributor in Florida, or was it happening at the factory?

MR. MULLEN: As far as I know, it's the factory.

MR. SHIRAKH: The response was it's at the factory.

Other questions? Okay. Moving right along, next topic area is mechanical ventilation, and the presenters are Mr. Max Sherman from Lawrence Berkeley National Labs and Bruce Wilcox.

MR. WILCOX: This is another part of the PIER research projects for the 2008 standards, and also part of a PIER project at Lawrence Berkeley Lab. They were separately run to look at the issue of ventilation in the California standards.

And I'm going to talk briefly about the context here and the specific requirements for energy efficiency in ventilation. And then Max Sherman is going to go over the details of what the proposal implies.

Next slide, please. So why are we talking about a mandatory requirement for ventilation. This is my short brief summary; this is the arguments that work with me.

Recent research indicates that ventilation rates in new California homes are lower than we had been assuming. And I think there's two components of that. One is that houses are much tighter. And in the template in the evaluation report I referenced a couple of significant studies. One that was done for the Southern California Gas Company which looked at houses built I think three or four years ago in which the air leakage rates were much lower and the ventilation rates natural infiltration -- occupied air change rates in those houses were much lower than what we have been assuming in the standards.

So, the houses have grown tighter in spite of all of our assumptions that that wouldn't happen.

And the second issue is that Lawrence Berkeley Lab and the University of California did a survey that was part of the project sponsored by the CEC and ARB. And the conclusions from that survey were that -- and this study was just finished. It's based on occupants of houses built in 2003, I believe.

And the conclusion is that there are a lot of occupants of these houses that actually don't open their windows enough to provide the level of ventilation that we think is necessary.

And we've been assuming in the building standards for a long time that people would open their windows and that would provide whatever increment of ventilation was needed beyond natural infiltration.

So we got two things going on. The houses don't infiltrate as much, and there's a lot of evidence now that people don't really use their windows enough.

And the result of this, the last point there is that I think this can contribute to -- I'm personally convinced this can contribute to unhealthy pollutant concentrations inside the houses. People don't necessarily sense levels of pollutants that are deemed to be unhealthy, especially over long-term exposures.

And there's, I think, a pretty good argument can be made that we're in danger territory already here.

Next slide. So, what the proposal here is that we reference the requirements in ANSI/ASHRAE standard 62.2, 2004, which is titled ventilation and acceptable indoor air quality in lowrise residential buildings. And I have a copy of the standard here.

Since it's kind of hard to figure out what the requirements of a standard are unless you can read them, and you probably all don't have one of these lying around on your desk. I've actually copied the technical parts of the standard, and they're attached to the measure evaluation report as an appendix.

So basically all the stuff you need to understand about what's required is in there. And we got permission from ASHRAE to do that. And so you can use that for the purposes of evaluating this proposal.

So what's proposed here is a mandatory requirement for all new houses, can't be traded away, that meet the requirements of standard 62.2.

And the second piece of that is that standard 62.2 says that open windows can be used as a means of whole-house ventilation if approved by the authority having jurisdiction. So as part of adopting the proposal is we say that window operation is not permitted in California as a means of meeting the required whole-house ventilation. So, we're really talking mechanical ventilation here, as the requirement.

Next slide. In addition standard 62.2 is strictly an indoor air quality standard and doesn't say anything about energy. But we're operating within the context of the energy standards here. And so we're going to overlay this with a requirement for energy efficiency of the ventilation. But we're not proposing a very tight standard here. We're not trying to keep people from doing a good ventilation job.

The requirement is that the -- the proposed requirement is that the ventilation fan power shall not exceed 1.2 watts per cfm of required ventilation air.

And if a performance approach is used, then the total fan power in the standard design is equal to the proposed house, but not greater than 1.2 watts per cfm are required for ventilation air.

And we think that watt draw is pretty

generous. The kind of efficient exhaust fans that are really the fundamental basis of the requirements in the standard 62.2 mechanical whole-house ventilation operate at about .25 watts per cfm.

So the intention here is to allow latitudes so that people can put in balanced ventilation systems, air-to-air heat exchangers if they need to, and so forth. And do a superior level of ventilation as long as it's within this modest level of energy use.

Next slide. Okay, so I'm now going to turn this over to Max Sherman who is going to explain the -- give an overview of the requirements of 62.2 that we're basically referencing here.

MR. SHERMAN: Okay, I'll do it from here so I don't have to tell people to push the button. He wants to push the button.

(Laughter.)

UNIDENTIFIED SPEAKER: That's a union violation.

(Laughter.)

MR. SHERMAN: All right, so now we're talking about 62.2, what it says right now, and it says, as Bruce mentioned, a whole-house mechanical ventilation or equivalent. You need fans in kitchens and bathrooms. You need windows in most rooms, although that's not really an issue because other codes take care of that.

Then there's some source control issues and you need good equipment. Good is the worst kind of equipment you can have because it goes good, better, best, right. So you need good equipment. And I'll talk about all those things.

So, first of all, what is the mechanical ventilation that you need. The rule is 1 cfm per hundred square foot of floor area plus 7.5 cfm per person. And we get the number of people by the number of bedrooms plus one.

So this little fan flow rate curve shows you the range of flow rates you would need, mechanical flow rates. For a typical 2000 square foot home we're talking about 40 or 50 cfm of ventilation; small home may be down 20 or 30; a very large home might be as high as 80 to 100 cfm. But that's the kind of range that we're talking about.

It's also required that it have a control system so that it can be shut off if it needs to be, or if it's some sort of a interactive system, a control system to assure that you know the minimum amount of time it's going to run so that you can deliver the air. So those are the basic mechanical ventilation rates.

We allowed intermittent ventilation; and what intermittent ventilation does, and I'll come back to this later, but it allows you to not run continuously but on a cycle time. For example, if you want to run one hour out of every four, you need a larger fan, but you can do it and we give a formula for doing that.

The current formula in 62.2 is not as flexible as I think California needs. There's a proposal to make it more flexible that's going in Committee, and I'm going to recommend that we actually use that in California, as well.

Okay, in terms of kitchens and bathrooms. For one thing, windows aren't allowed to meet this requirement. You must have an exhaust fan; it must exhaust to outdoors, not a recycling fan. So in kitchens you need at least 100 cfm in a range hood; or if you don't have a range hood, you can use five kitchen air changes.

Now, we talked a little bit about what

the size of the kitchen is earlier this morning. 62.2 uses a slightly different interpretation of the size of the kitchen. Because it's the room that contains the kitchen, a room is a thing with walls. So, if you have a kitchen/dining room combination it's that whole big room that counts. But from the 62.2 point of view, turns out that's not a problem for the way it's used in 62.2, even though that can be quite a large area.

For bathrooms, 50 cfm exhaust fan, so you have capacity; or 20 cfm of continuous operation. And, again, it has to be exhaust. There are no requirements for toilet rooms or anything else. It's just kitchens and bathrooms.

Okay, there are a bunch of source requirements, and these are things to keep the known sources from becoming a problem. So, first of all, clothes dryers are exhausted to outside. There's an exception for these condensing kinds of clothes dryers. But for a standard clothes dryer they have to be exhausted to outdoors.

There's a restriction on combustion appliances. They're not allowed in the conditioned space if you have too much exhaust capability, or if you're GAMA you would say you can't have too much exhaust capability if you have combustion appliances in the conditioned space.

In any case, there's a restriction there between the amount of exhaust capacity you have and whether you have combustion appliances. And now we're talking about naturally aspirated combustion appliances. Direct vent and condensing aren't included in this.

You can also compensate for exhaust fans. If you have air handlers in the garage you must meet a 6 percent tightness spec. So, again, that would now be a mandatory 6 percent tightness spec if you have air handlers in the garage.

And you also have to have particle filtration. I'll show you that in a second, but we talked about that earlier.

Okay, for particle filtration, anytime you have a duct length of more than 10 feet, you have to have a particle filter. And the reason here is not so much, not directly to keep the air clean for people, but to keep the HVAC components from becoming sources, themselves; from getting dirty, being built up and becoming sources.

The requirement is a MERV-6, which is a good filter. It's the lowest rated pleated filter there is. And, as I think somebody said before, you don't have too much trouble meeting the pressure spec if you have a four-inch MERV-6 filter, but you will have trouble if you have a one-inch deep pleated filter. So you have to keep track of those pressure concerns. But that is a requirement.

In terms of air moving equipment, it has to be rated for continuous use. It has to deliver the air flow. And the ways of showing the delivery of the air flow are either to meet duct length, size and bend requirements; or you can field-demonstrate that it does the delivered air flow, too.

If it's a multifamily environment there has to be dampers to keep cross-flow down. Again, you have to have a control system. And the fans must be quiet. The fans that are used to meet the standard have to be quiet. So if you have a continuously operating fan, it has to meet a 1 sone requirement; and if you have an intermittent one, like the bath fan, it has to meet a 3 sone requirement.

The HVI catalogue has many many fans meeting these requirements. Coincidentally, most fans that meet the sound requirement also tend to be energy efficient.

Downdraft kitchen exhaust has a few special cases. That's what that five air change rate was for, in case you have downdraft. They are not currently rated for sound, so we couldn't put a sound spec on them. Perhaps down the road they will be, but they're exempted from the sound requirements, so they're a bit special.

Okay, as Bruce mentioned, there are a couple of modifications for Title 24. One of them is that windows are not allowed to meet the mechanical ventilation requirement; you've got to use a mechanical system.

The study that Bruce mentioned about window operation, which was funded by ARB, is pretty convincing that only a small fraction of people use their windows very much.

As I mentioned before, we want to use the more flexible intermittent ventilation strategies. And this part's important because it allows us to do things like how the ventilation system on for 20 hours and off for four.

That's pretty important in California for two reasons. First of all, it allows some peak load control. If you had a PCT that you could shut off the ventilations system during the four hours of peak, it's also important when you have bad outdoor air quality in the air basins of the state to be able to shut off the ventilation rate during bad outdoor air conditions, and still the rest of the day have enough ventilation.

Now, I have a couple of suggestions that are not actually in the proposal that I think should be in, and one of them is that we should have a mandatory 5 percent duct leakage limit. And the reason for that is -- if you have ducts outside the conditioned space. And the reason for that is if you have ducts outside the conditioned space and they leak, you're going to cause pressure imbalances in the house. And you could easily suck in air from an attached garage or a contaminated crawl space, even if the ducts, themselves, even if the leakage, themselves, is supply.

So from an indoor air quality standpoint it makes sense to have a duct leakage limit for ducts that are outside the conditioned space.

The second thing I would suggest is adding 25 cfm to the 62.2 limits. There's two reasons for this. First of all, as Bruce said, California houses are tighter. The infiltration rate that they have is much lower than the default infiltration rate that's assumed in 62.2. So for that reason alone you might want to bump up the mechanical rate.

But also if you want to do some of these intermittent things you're going to have to have extra capacity. So if the state, down the road, wants to put in a thermostat that can shut off your ventilation system for four hours, you have to have the extra capacity in the ventilation system to make up for it during the other 20. And the best way to do that is to put the capacity in in the beginning.

So, those are my suggestions. Those are not in what Bruce was talking about.

And with that I can stop and take some questions on --

MR. SHIRAKH: Thank you, Max. Any questions on ventilation for residences? Michael.

MR. DAY: Max -- Michael Day. Max, two questions. Why not a credit for fans that had a lower wattage per cfm to incentivize people to put in the more efficient fans?

And the second question is what about adding in the energy efficiency benefits for either heat recovery or energy recovery benefits to encourage people who are going to have some form of continuous mechanical ventilation to install things that are inherently more energy efficient?

MR. SHERMAN: Bruce, do you want to answer that one?

MR. WILCOX: Yeah. We actually intend to add the heat recovery ventilator algorithm to the ACM manual. I'm not even actually sure that made it into -- it didn't make it into the PowerPoint, and I'm not sure it's actually in the write-up. But that's intended to be there for that reason.

I think we decided to not put in the credit for the energy efficient ventilation fans because it's not very much, if you stay below 1.2 cfm or watts per cfm, and we're talking, you know, a typical house, 50 cfm, we're only talking 60 watts. And it's not -- it's an order of magnitude smaller energy use than for example the air handler fans. So we didn't feel like we wanted to spend a lot of effort on that.

We're not proposing that this be HERS verified. And so without that, then you're kind of, you know, you don't have a lot of basis for making credits. So, that's the basic argument.

MR. SHERMAN: And I'll also add that even in climate zone 16 you don't actually save a lot of energy with an HRV because of the increased fan cost. You certainly save thermal power, but the increased fan cost compared to the equivalent fans, makes it a pretty close wash. What you do get with an HRV in a cold climate is much better comfort.

So it's definitely going to be something that a builder might want to consider, but it's not going to be a huge energy difference one way or another.

MR. SHIRAKH: Carlos, did you -- Carlos and then John.

MR. HAIAD: Thank you. Carlos Haiad, Southern California Edison. Picking up on the point that you just made, is this proposal increases the energy usage in the home? Is about the same? Or reduces? And if it increases, what happens with the cost effectiveness?

MR. SHERMAN: Well, okay. Those are two

separate questions. The first half is does it increase or decrease. And that's a very interesting question. It all depends on what you believe. This is a belief-oriented answer.

Because the current standards believe that people open their windows in a certain way to get sufficient ventilation. If that is, in fact, true, then this proposal actually winds up saving a little bit of energy.

But, in fact, we don't believe it's true. We believe most people don't open their windows that way. And so by requiring mechanical ventilation it's actually going to cost a little bit of energy. We're not putting this in to save energy; we're putting this in for health and safety purposes, because we don't believe that people are actually operating their homes with windows in such a way that meets it.

Previous versions of the standard did not have an ASHRAE standard to refer to; 62.2 is new. And so in previous versions of Title 24, we didn't have a reference case. We didn't know how to design for acceptable indoor air quality. Now we have a standard which tells us how to do it.

So we're improving health and safety,

which, of course, is a state function. And it may cost energy compared to the house that is not ventilated.

MR. SHIRAKH: John.

MR. HOGAN: John Hogan, City of Seattle. Maybe this is more an observation rather than a question, but the Washing State Legislature passed a bill in 1990 requiring mechanical ventilation for all new construction and remodels in Washington State. That took effect in 1991. We've had this requirement for 15 years; it's a good idea.

MR. SHIRAKH: Thank you, John. Any other questions related to this topic? Okay, thank you, Max and Bruce.

I'd like to make an announcement. Tomorrow's workshop is not going to be in this room. It's going to be across the street. And is that the Bunderson Building? The hearing room is on the north side of the building, but you enter through the P Street entrance. You got to go through the friendly guard and then you can go.

UNIDENTIFIED SPEAKER: Friendly guard?

MR. SHIRAKH: He's very friendly actually. Too friendly, some --

UNIDENTIFIED SPEAKER: Which one is that?

UNIDENTIFIED SPEAKER: If we see you splayed on the floor with a gun to your --

(Laughter.)

MR. SHIRAKH: Okay, the last -- or it's not actually the last, the next topic is water heating. Are you Jim Lutz or --

MR. STONE: I'm Jim Lutz, yeah.

MR. SHIRAKH: Okay.

(Laughter.)

MR. STONE: Actually I'm Nehemiah Stone with the Heschong Mahone Group. The name on the agenda was wrong, not on my name tag.

As way of background, the 2005 code began a process of making multifamily water heating analysis more representative of what we actually see, but it didn't accomplish everything. And unfortunately we can't accomplish everything even at this round, but we are proposing to make some changes that would fix a lot of the issues.

What I'm about to present is based on a research project, a PIER research project, being managed by LBNL. And there are a number of contractors on it. We have one piece of it. And at the end of this there's one slide talking about some other items that are coming out of that overall project that are not ready at this point, but hopefully will be before it's too late for the 2008 standards.

The current standards don't accommodate the kinds of controls that can be used for multifamily central water heating systems and provide a lot of energy savings. The current standards are based on very scarce data about multifamily draw patterns. And virtually no data on failure modes for recirculation systems.

So those were the three main things that we started looking at in the research. And I won't go through and read all of these bullets, but essentially what we're trying to do in the research is figure out how these systems actually work; what kind of controls save what kind of energy. What we can do about failure modes so that we stop the energy waste and leakage at that point. And provide some changes to the algorithms in the ACM for hot water systems, for the central systems.

What I'm going to do here is go through what our recommendations are, and then go through the background on how we ended up with these. So I'm going to get all the recommendations first, and we'll come back to the justification in a moment.

The first recommendation we're making is a measure to stop backflow. With a central water heating system there's cold water and hot water going back and forth between the two supply lines. And there's a couple causes for that.

So, to prevent one of those causes, we are proposing that the cold water makeup pipe have a backflow prevent or a check valve before it connects with the return line or goes into the tank, whichever is the way that it's plumbed.

The other measure to prevent backflow is that the valves that allow cross-over, shower valves, faucets, et cetera, should not be allowed. And you can't just close off an industry without another option. So in lieu of that when those valves are installed, then we propose that check valves be installed on the hot and cold water supply at the valves that allow cross-over.

Another failure mode is the pumps cavitating; just running with air in them and not moving the water. And you end up getting complaints from tenants and the water heater gets turned up, which doesn't really solve the problem, but it wastes a lot more energy.

A simple way to solve this is to put a riser just before the recirc pump, then put an automatic air release valve at the top of that. That will get -- when air gets to that then it's allowed out of the system. This is fairly typical for radiant floor systems; it's not that typical for hot water recirc systems.

Moving from the mandatory measures to prescriptive requirement, we also recommend that there be a prescriptive requirement for any multifamily, any new construction with multifamily central water heating systems to have either a recirc demand control or to have a temperature modulation control.

The two kinds of controls have, they operate in very different ways, and they both are effective in different kinds of cases.

We also recommend acceptance testing. It doesn't do much good to put the controls in if they're not wired correctly and signals are not going where they need to get. We're not talking about establishing here's what the right temperatures are, here's what the right schedules are, you got to, you know, do it this way. But making sure if a system is relying on sensors, whether it's flow sensors or temperature sensors, that the signal is getting from the sensor to the controller.

We also are recommending that a operations manual be provided with the building to go to the building management staff.

We are also -- this is going to come along at the end of the summer, once we have analyzed the rest of the data. We're recommending changes to the hourly adjusted recovery load calculations for central hot water systems. We proposed the calculations, or the algorithms that are in the code now last time based on a theoretical model that we had done. And now we have some real-world data, and we're proposing some changes to that. They won't be dramatic, though.

We're also going to refine the draw schedule for multifamily buildings in the ACM manual. Currently it's essentially the single family draw schedule, you know, stacked on top of each other, however many units you have. And then with a diversity factor in to recognize that people don't all do everything at exactly the same time.

So, here's the description of what we've found and why we're making the recommendations we are. Here's the kind of thing we're talking about on air release. So the recirc pump is typically at the end of the line, shortly before the water goes back to the tank.

This sort of situation where the pipe, the riser and the air release valve at the top will let the air that gets in the line bleed out, so that the pump doesn't cavitate.

Cross-over prevention. This is a kind of valve that when it fails allows the hot water and the cold water lines to be directly connected, which means if there's any pressure differential between the two sides, and it probably will be different at different floors, and so you're pushing different directions, you'll have hot water going into the cold and cold water going into the hot.

Just to give you an example of why, or a way to believe that this is actually a significant problem, if you think about your showerheads that have the valve that you can just shut the shower off and you don't have to turn the valves off, but the showerhead you just push the button over, those used to be made so that it shut off the water 100 percent. And you can't find those anymore.

You find now where it shuts off about 75 or 80 percent of the water, lets some through. The reason that happens is because what happened with the first ones is when you turn it back on people got scalded. And if you think about it, there's no way of getting scalded unless the hot water is pushing the cold water past instead of getting, you're getting a little of both through it.

We found a significant amount of cross-over when we looked at these buildings that we looked at. That's under -- cross-over can happen under a normal condition with some valves where even when the valve was in a closed position, the hot water and the cold water lines similar to this valve are actually connected. So when the valves close and you don't have water coming through the lav or the shower, you do have the hot water and the cold water connected.

So the way to prevent it, if you don't have a valve that can prevent it, is to put a check valve on both the hot water and the cold water supply and not let it go back the other direction.

The three buildings we monitored were in St. Helena, Oakland and Emeryville. I'm not going to read all through the details on his, but we looked at buildings from eight units to 121 units. We looked at different kinds of systems. And one of the things that's important to note from this is that if you look at the existing control, what you find out, what you see is that in all three cases, in three out of three cases the system was in failure mode when we arrived.

What we also found is a highly variable amount of pipe insulation. We found one system that was insulated a lot more than you get credit for in the current code, as the better case. And we found another system that was not insulated at all. And the other system, part of it was insulated and part of it was not. And these were fairly recently built buildings. These were not old ones. And one heater, one water heater kept failing during the research project.

This is the way the system in the Oakland, the 121-unit building; it's three water heaters so that there's no boiler and tank. The tank is integral. The recirc pump is a long ways, relatively a long ways away from the water heaters where the pipe starts splitting to go to feed the separate areas of the building.

This is a layout of where we had all of our sensing equipment, the temperature sensors, the flow switches, flow sensors, et cetera.

Go ahead. The St. Helena building was a one -- excuse me, 100-gallon water heater. And the cold water supply in this system went directly into the water heater rather than joining with the recirc, or the return line first, as usually happens.

The Emeryville is a boiler and storage tank. And I don't need to go through the whole system there, but it basically shows you where all the sensors were.

So, we've not finished taking the data off of Emeryville, so presenting for Oakland and St. Helena, these are the different regimes we looked at in each of them. We had hoped to have a temperature modulation control on the Oakland project also, but the Oakland water heaters have a digital control signal that is not compatible with the kind of control we were wanting to put on. So we were not able to do that one.

But we looked at continuous flow, just essentially taking all the controls off, having the system run all the time. We looked at time clock. And with the Oakland we did the continuous flow first so we could get an idea of the usage pattern. And found out that for Oakland we could really only shut the system off for three hours with a time clock. Whereas we could get six hours off with the St. Helena.

The demand control essentially switches the system off, switches the pump off until the water temperature rises a small amount in the line after the last apartment. And in one case it's a 6-degree rise; in another case it only takes a 1-degree rise before you're insured that all of the tenants will have hot water where they are.

The temperature modulation control in the St. Helena, the pump runs 24 hours. What it does is it changes the temperature that's being circulated so you don't need to be sending 125-degree water around. It kicks it down to 110 degree. And so your losses are significantly less during those hours.

This is one of the pieces of evidence for cross-over. What you're seeing here is that you've got the supply water, the return water and the cold water makeup. And if you think about it, when nobody's using anything the supply and the return ought to be equal to -- excuse me, the return and the cold water ought to be equal to the supply. When somebody's using something, the only difference is how much they're using.

What you actually see here is that you have negative cold water supply. In other words there are significant portions of time where the sensor shows that the water is flowing backwards at the cold water supply because of cross-over.

That's not the slide I expected to see, but this is an illustration of how the cross-over actually works. If you remove that check valve from the picture, that's where -- first off, that's where we believe the check valve needs to go. If you remove the check valve from the picture what you have is when you have two separate apartments with single lever valves that allow cross-over, you can have cross-over on that one loop between those two apartments and that portion of the hot water supply loop.

When you -- with or without the check valve. When you have the check valve that's the only cross-over there is. When there is no check valve, then the green arrow at the bottom of the loop there shows that you have cold water flowing back, coming out of the tank, or coming from the cold water side, into the hot water loop.

Now, one of the -- go to the next slide. I think it's -- yeah, this is the most telling evidence for the fact that we do have that sort of a cross-over. The blue line is the cold water supply. And the cold water supply should be, during this time of year, should be remaining about 65 degrees all the time.

Whenever it rises up to 100 or 103 degrees, the only way that that could be happening is if you were pulling the hot water out of the tank, back through the line. This is not just conduction through the copper pipe. We have those temperatures also.

Mazi, did you have a question at that point?

MR. SHIRAKH: If I went home right now

and I turned on my cold water tap, I get 100-degree water out of it just going through the attic.

MR. STONE: This is not in an attic.

MR. SHIRAKH: It's not.

MR. STONE: No. This is in a boiler room that's sitting on a slab in an unconditioned area. So this is not picking up heat from the outside. We've done a lot of proofing on this to figure out what's going on. We didn't believe -- first off, when we saw that we had negative flows to the cold water we said, okay, something's wrong with our sensors.

And we went back to the sensor manufacturer and, you know, they told us a couple things to do. We did that. It corrected about 5 percent of the problem. We went back to them again and he told us something else to do. We did that. It corrected about 2 or 3 percent of the problem.

This is, from my point of view this is the proof that, regardless of what you see in the flow, this is the proof that we have cross-over coming back through the cold water line.

The magnitude of the cross-over, and we

can only estimate it and it leaves a piece out, so these are conservative estimates, the magnitude is about 1.5 gallons a minute in St. Helena, and over 2.5 gallons a minute in Oakland.

The reason it's conservative is because this cannot -- we cannot pick up this way the cross-over that's happening between apartments. If you think about no cross-over happening at the cold water makeup, but you have two apartments that have valves that are allowing cross-over, you can have flow between those two apartments regardless of what else is happening.

The magnitude of the impact is pretty significant, $1230 net present value over the 30 years for per apartment.

The evidence we have, if pump cavitation is not direct evidence we have, it's from data that was made available to us by EDC, who's in the audience and can take questions on their data if necessary. But what's significant is that they have -- they take data on all of the systems that they've installed. It's thousands of multifamily buildings in California.

They get this data all the time. And the 12 percent of the systems are in a failure mode. And most of -- so, about 5 percent of those are a pump failure, which could be solved by simply having the riser and the air release valve at the top of it.

Common response when a pump starts cavitating is that the property manager will just go turn up the boiler or the water heater because somebody's complaining that they're not getting enough hot water. And they'll just keep turning it up until the complaints stop. It can mean a tremendous amount of gas waste and dollars wasted.

So here's our estimate of the energy impact of requiring one of these two type of controls, rather than no control at all. First off, we estimate that there's -- because there's currently about 60,000 multifamily units being built per year. Our data from the surveys we've been doing shows that about 40 percent of them statewide are getting central systems rather than individual water heaters.

And if you take a look at the savings, the individual savings per unit from the two different kinds of controls, we're looking at a California upper bound of about a million Btus savings per year from one control, and 870,000 from the other. And these assume that half the buildings use one kind of control and half the buildings use the other control.

One way of taking a look at the impact is how much does the burner for the water heater or the boiler, how much is it on. And if you take a look at the different cases, it's on 14 percent of the time with continuous pumping; it's on 13 percent of the time with demand pumping. And the savings compared to continuous pumping for the demand pumping is 5 percent; 490 kBtu per unit per year.

That's a graphic that just shows the same thing I just talked about. Go ahead.

So, for St. Helena, we're looking at a savings for temperature modulation of about 9000 kBtu per unit, and for demand control of about 7000 kBtu per unit.

Go ahead. The other thing that we were doing in this study is trying to refine the draw schedule that's used for multifamily buildings within the ACM. So one of the things we've done is plot out the draw schedule for the various sites we're doing, and take a look at an average across those sites to see if there's something that can fairly represent multifamily.

The current assumption is the redline in this. And what we're finding is that, you know, there's a significant difference between the current assumption and the actual weekday schedule and the actual weekend schedule. And we will be refining this as we get the information from the third site and pull it all together.

We'd also like to recommend consideration for some code changes that can't possibly be ready for 2008. One is a inspection of the vent dampers on the, you know, for power vent, or a vent damper at the top of the boiler or water heater are actually working instead of stuck in one position or the other. And that the air release valve is actually working.

We recommend commissioning of recirc systems. These are just three of the things that would be included in it.

Go ahead. We also recommend that the Energy Commission consider a credit for continuous commissioning. Out of the building that EDC looks at, that they get data on all the time, again 12 percent of them are in failure mode at any moment.

The buildings we looked at, three out of three, or 100 percent, were in failure mode. And I believe that the difference between those is that EDC is providing information to the building owners when the failures happen. And they're being corrected. Whereas the buildings we looked at there was nobody that knew these buildings were in failure mode. Nobody had any idea that something was not working with them.

There are control failures common to other kinds of building elements. This is very similar to that situation.

Continuously monitored data can tell you anytime that there's a failure. It's going to reduce the major failures because if something minor goes wrong and it's fixed, you can prevent the major failure.

And relying on some of the EDC and others that have data from years, we can help to put together the diagnostics of what needs to happen in the continuous commissioning.

Sorry, that one's out of place. That should have shown up earlier. That's just a graphic of how much savings can be had. The point of this slide is that there are, between these two main kinds of controls, they are appropriate for different kinds of buildings.

So the temperature modulation control, in terms of the number of units, -- actually I think these two are mis-labeled from the data that we had. I apologize for that. The demand control gives you a higher amount of savings on the smaller buildings. And the temperature modulation control typically gives you a higher amount of savings on the larger buildings.

Duplicate slide, sorry. This -- is Rob still here?

MR. PENNINGTON: Go ahead, Nehemiah.

MR. STONE: Okay, I don't know these items, so Rob was going to talk about it. As I said, the rest of the LBLN water heating research is being done by other firms. And these items are under research right now. If they are -- if the research is done in time and the recommendations can be made to be included in the 2008 standards, then these other items will be coming forward.

I can't speak to what's going on with them, or the status of them, though, Bill.

Questions?

MR. SHIRAKH: Robert.

MR. MOWRIS: On the air release valves

we found numerous areas where they fail because of the way they're constructed. And typically it's hard to find air release valves that are, in California anyway, that are totally brass. We found this problem where a lot of the air release valves had some components inside them that were nonbrass. And so they would rust and freeze up.

And so if you have a standard for air release valves my recommendation would be require that they be made out of, you know, a non-rustable, like a stainless or a brass material inside, all the inside components.

And then on the controls, we did some studies of controllers and found failures due to the way they were installed. Primarily they would be plugged in instead of hardwired. And so if they were plugged in and they were disconnected in some fashion, or they were attached to the heating device, like the boiler or the water heater. And those devices were removed and replaced, we lost the control.

And so one of the recommendations would be to have some type of failure signal that would be sent. You know, because if you lost your continuous control obviously that's a failure signal. So you put EDC systems I think you'd always have that signal getting back to the controller. But if you didn't have that requirement, you could lose the controller, then you'd lose your savings or you lose your, you know, the savings that you're looking for.

MR. STONE: Yeah, I don't think good is strong enough. As I said, the three buildings that we took a look at, every one of them was in failure mode when we got there.

MR. SHIRAKH: Any other questions for Nehemiah? Charles.

MR. ELEY: The schedules that you showed where there was a different pattern of use for weekends and weekdays, are you proposing that just for multifamily or for all residences?

MR. STONE: I'm making no recommendations for single family at all.

MR. ELEY: Okay. Because I would imagine the patterns of use would be different for all residences --

MR. STONE: Davis Energy Group --

MR. ELEY: -- weekdays.

MR. STONE: Davis Energy Group is looking at that. I don't know the status, Charles.

MR. ELEY: Okay. And then there was a, I saw another slide where it appeared that the credit seemed to be a function of the number of units. Is that what you're proposing, so there'd be a -- so you'd get one credit for one to five units, and --

MR. STONE: No. What I was trying to get at there, not the credit is, that the savings are related to at least that factor, at least how many units there are.

And so rather than the Commission saying you'll have a demand control as a prescriptive requirement, or you will have a temperature modulation control as a prescriptive requirement, simply make the requirement, you will have one of these two. And let the design community figure out what's the best control for that building.

MR. ELEY: Okay.

MR. SHIRAKH: Other questions or comments for Nehemiah?

Ken.

MR. NITTLER: Ken Nittler with EnerComp. I'm intrigued by this continuous commissioning. Can you -- have you through any more exactly how that credit might be taken at new construction time? How does --

MR. STONE: No. Essentially that's why I'm saying for 2011, rather than 2008. We only, in the last two months, have seen the system that would allow you to -- that brings it down from 100 percent failure mode down to 12 percent of the buildings in the failure mode.

So we have not thought through how that credit would be --

MR. NITTLER: If that concept could be invented, there's lots of things that could benefit from it.

MR. STONE: Well, that's what that last bullet meant. There's a lot of things, you know, the controls give you this great idea up front. But as soon as the controls stop working, you might be in a worse situation than if you had not used controls in the first place.

MR. NITTLER: And then something that I realize isn't your bailiwick, but I want to make sure it gets on the agenda here, has to do with this last slide. There are a couple cases in the current water heating methodology where there's a big discontinuity between the calculations on storage water heaters and larger storage water heaters, that's very difficult to describe to people why they're putting in a large storage water heater and it yields lower energy use in cases where that doesn't seem likely.

There's also an awkward calculation when you have pilot lights and tank insulation on indirect or large storage water heaters where the tank losses can go negative. You can end up with a negative R value in the calculation in essence.

So hopefully --

MR. STONE: So they sucked energy out of the --

MR. NITTLER: They're perpetual, you know, energy machines or something. So it would be nice if those two things were on this plate somewhere. Thank you.

MR. SHIRAKH: Any other questions for Nehemiah? Thank you.

So our last formal presentation is the PCTs. Do we have that?

And then after that we'll move to the public comment. I have a few cards here, blue cards, for those who wish to address the audience here, or you can just simply come up to the podium.

The Commission and the utilities and thermostat manufacturers, you know, we've been working on this concept of PCTs or programmable communicating thermostats over the past year. And we've had a number of workshops and meetings. And there's been some developments, so we thought it warranted a quick update today.

Next, please. And the PIER has been supporting part of this effort and they held three workshops on demand response, AMI and PCTs over the past year. We also had a number of discussions in the Title 24 workshops over the past year.

And the stakeholders who were participating included IOUs, munis, thermostat manufacturers, Commission Staff and other interested parties.

There's a lot actually that all the parties agreed to. And we started out with, you know, divergent positions, but over the past few months I think the opinions are kind of converging.

And these are some of the items that all parties pretty much agreed to. We all agree that the PCTs -- by the way, these are thermostats that are going to replace the existing setback thermostats.

And so anything that's currently controlled by a setback thermostat would be controlled by these. This could be split systems in residences, or it could be small commercial units, package units; anything that's controlled by a thermostat, setback thermostat.

So we all agree that the PCT should respond to emergency signals. And it will typically be a 4-degrees offset. So, in other words if your thermostat is set at 78 degrees when the emergency signal comes, the thermostat will set up to 82 degrees. And that cannot be overridden by the occupant or the user.

We also agree that the PCT should respond to the price signals from the utilities. And again the offset is 4 degrees. But in this case the user or the occupant can bypass that; they can go up to the thermostat and reset it back down to whatever temperature it was.

Presumably they'll pay a price for that because during these events the price is going to be a little bit more than the times when there is no emergency event.

We also agree that the PCT must have at least one external port. And this would be a port that can receive in an external chip or a --, this could be a USB port or it could be a SD card similar to what you use in your digital cameras. And through this port you can actually activate several features on the PCT which would include either one-way communications, or a two-way communication including Zigbee. And you can also override some of the features in the thermostat.

We also agree that there should be a common user interface, an LCD type or an LED, which indicates the status of the device and the type of event that's taking place at the time.

And we've also agreed that there should be a standardized equipment connector which connects the PCT to the mechanical equipment, to the compressor and the rest of the air handler.

And this would simplify installation and will minimize any type of error that you might make during installations.

What we're still continuing to discuss has to do with these two options that are listed up here. And we have two options; one would be to have the one-way communication onboard, on PCT. And when the PCT comes out of the box and it's plugged into the wall jack, the one-way is ready to go. And a utility or muni who wishes to communicate with that thermostat, they can do so.

The other option that has been presented, which is option two -- this is called option one generally, and this one is called option two.

Option two would be that the thermostat does not have either one-way or two-way communication onboard. And the one-way or two-way communication will be enabled through the external port.

So when you install the thermostat a chip will be either shipped with the thermostat or the utility can provide that, and you put that into that external port. And it could either activate the one-way or the two-way communications.

And up to this point the Commission has been favoring option number one, which with the one-way onboard and with the two-way provided through the external port. The IOUs have been in favor of option two.

Today actually we came up with a third option, which for lack of a better term we're calling Mazi option.

(Laughter.)

MR. SHIRAKH: And that is to have a hybrid thermostat which basically it's neutral. It will allow either option one or option two. And then we let the market decide which way we should go.

Anyway, you know, when we're arguing about option one or two, we're trying to look into the crystal ball and try to foresee what the future looks like, what the market looks like, and how the players are going to react to option one or two.

So the suggestion was to actually leave it to the market to decide. And we'll accept either option as a Title 24 compliant.

And once we agree on the proof of concept, Ron Hoffman and his Berkeley Group will actually build a prototype thermostat that will demonstrate how this works. And they'll try to work out all the -- there's a lot of detail to be worked out. How do you match the thermostat to a utility and so forth. So the Berkeley Group will help us to work through some of those issues. And Ron is here if you have any questions you can ask him.

This is basically a graphical representation of what the PCT looks like; you know, the logic is here; and the four interfaces that I talked about. The interface with the HVAC equipment. This is the expansion port. This is communication with the users, the LCD or LED. No, I'm sorry, that's the one-way or the two-way communication, and this was the -- interface.

Next, please. And the Berkeley Group and Ron Hoffman have actually made one prototype of this thermostat which pretty much looks like this. And they use PCs to simulate different DR events and responses. And they brought their equipment here to the Commission and demonstrated. And as this concept evolves, you know, they will change their equipment and hardware, and they'll demonstrate it again.

So that's basically was a very quick update. Is there any questions? I would like to actually hear from the other utilities. Because the discussion we had this morning involved Edison, but we'd like to know other utilities, if they're okay with this hybrid concept that we've proposed.

MR. ELEY: I have a question of clarification. This is Charles Eley. Do you -- what are we going to do, if anything, with the 2008 standards?

MR. SHIRAKH: This is going to -- we actually have draft language which is fairly, you know, detailed. And it will replace the section, what is that, -- well, anyway, the setback language that we have in the res and nonres will be replaced with this. So this would become a mandatory requirement in the standards for 2008.

MR. ELEY: Even though the equipment doesn't exist right now?

MR. SHIRAKH: The equipment, from what we hear from thermostat manufacturers, they can make it very quickly. Is that correct, Ron? Ron says yes.

Michael.

MR. DAY: Michael Day representing ICE Energy.

UNIDENTIFIED SPEAKER: A different Michael Day.

MR. DAY: Different Michael Day, yeah.

The question I'd have is there any thought for an exemption for energy storage a/c systems? Obviously energy storage a/c systems which shift the vast majority of the power consumption from peak to offpeak are already accomplishing the goals that are called for in this.

And if the call for -- if there's a demand response call if there's an emergency, and that's during the time when the energy storage a/c is already preprogrammed or goes into an emergency mode to provide that, then they should not necessarily be, for lack of a better term, punished in the same way that an instantaneous would. Because they're doing what the goal of the PCT is.

And one possible option there would be that we could be a separate program that would be pulled in through the expansion slot.

I don't know if you guys have thought about that, but we'd be happy to work with you on that at ICE Energy.

MR. SHIRAKH: So, you know, when you're talking about ice storage, what this thermostat would do will disable the compressor temporarily during DR events.

And I don't see how that would impact your ice storage.

MR. DAY: It wouldn't impact any form of energy storage air conditioner that we're looking at.

MR. SHIRAKH: It's not disabling the air handler, and if you have stored the ice the night before or during the threshold hours, your system should cruise right through.

MR. PENNINGTON: So if your system is undersized and it doesn't get through the --

MR. SHIRAKH: Then it might impact --

MR. DAY: Then it would impact. But, otherwise then --

MR. SHIRAKH: But I mean you're talking about a few hours a year. I mean I don't really see that to be a problem.

MR. DAY: Great. Thank you.

MR. MAEDA: Excuse me, Mazi. The way the slides read is it's setting the thermostat up.

MR. DAY: Exactly.

MR. MAEDA: If you're setting the thermostat up that means they could provide the comfort without increasing load because they're drawing it off the ice. And so why do they have to set their thermostat up when --

MR. SHIRAKH: Well, that's an interesting challenge, because --

MR. DAY: Yeah, that's exactly what my question was. Thank you very much, Bruce. Is that we'd be happy to work with you on that.

MR. SHIRAKH: Well, again, if it's a price signal the user can go up there and they can turn down the thermostat. And the compressor is not working. So there won't be any penalty.

If it's an emergency signal then, yes, what you're saying is going to happen. But the emergency signals, hopefully, happen only maybe once maybe every other year or so.

So, --

MR. DAY: What we're saying, though, is as a "for example", we would have, it's possible with our system to engage this so that if there's an emergency signal, say we're designated in Redding to come on from 2:30 to 6:30, and that's what the model number represents, we could have an emergency override so that we drop it, as well. But at the same time maintain the cooling.

MR. SHIRAKH: Well, in fact there is language in there that says if there's any other component within the system that performs the same function as the PCT that's deemed to be equivalent. So if you can come up with something like that, then that's fine.

MR. DAY: Okay, thank you. We'll be in touch to work on that with you. Thank you.

MR. SHIRAKH: Sure. Mr. Blanc.

MR. BLANC: Yes. I think we need a little time to look at your evolving design here, to get back to you on it.

MR. SHIRAKH: Okay.

MR. BLANC: All right. I would speak for both PG&E and Sempra on that issue. And you knew I was going to be on vacation next week, didn't you?

(Laughter.)

MR. SHIRAKH: Well, why did you think we picked today to talk about --

(Laughter.)

MR. SHIRAKH: Any other comments on the PCT? The lady, Vikki.

MS. WOOD: Vikki Wood, Sacramento Municipal Utility District. I have just a few questions. Has any consideration been given to an option for shutting the PCTs off completely for some period of time, as opposed to just raising the temperature setpoint?

Because that would accommodate, you know, some load management.

MR. SHIRAKH: You can send your signal as long as you want. But, so, you know, if your signal is good for half hour, 45 minutes and then at the end of that period you think you still need more DR action, you can send the signal again, and perpetuate it.

MS. WOOD: So the signal -- so I'm not understanding how it functions obviously. So you send a signal and it just shuts off until it reaches a certain temperature setpoint?

MR. SHIRAKH: There should be -- Ron could probably answer this, but I think the signal will have a duration in it so that specifies like the offset would be there increase for half hour or 45 minutes. is that correct, Ron?

MR. HOFFMAN: I think the signal is still to be determined. I think options for what Vikki's asking for are easy to add.

MR. SHIRAKH: The default is 4 degrees. We can talk about this probably. The way it's written right now for emergencies it's 4 degrees and you cannot override it.

For price signals it is 4 degrees, but it can be overridden. So if there's a different default that you think would serve you better, we can talk about that.

MS. WOOD: Okay. And another question is the addition, it's been agreed to, I think, in principle that there will just be one additional port. But my experience with electronics is that, you know, additional functionalities that we can't foresee appear pretty, you know, regularly, and within short periods of time.

And so what is the incremental cost of adding additional ports and --

MR. SHIRAKH: Well, I think the way we've written it right there, it says at least one port.

MS. WOOD: At least one port. But that port would accommodate --

MR. SHIRAKH: Either a one way or two ways.

MS. WOOD: -- option one or two, yeah. What I'm saying is how costly would it be to add an additional port for, say, data collection or some other functionality.

MR. SHIRAKH: It doesn't really cost much. Again, I'm looking at Ron, and his estimate is that the hardware cost for the ports, for the one-way communications is pennies, or maybe a few dollar.

MR. HOFFMAN: We posted a bill of materials on the website. I don't know it off the top of my head, but I'll get it to you, Vikki. But for the SDIO port that we're thinking about, and again the manufacturers may choose a different one, to standardize, right now it's running about a dollar or two per port for the hardware.

MS. WOOD: So I'm thinking it may behoove us to specify at least two ports. That way if additional functionalities come along that we can take advantage of, the port will be there to accommodate it.

MR. SHIRAKH: Yeah, the opposition to more than one port has come from some IOUs. And we need to have a discussion with them and really understand why they're opposed to it. I personally don't have any prejudice against it, and the cost is not an issue.

Bruce.

MR. MAEDA: Bruce Maeda, CEC Staff. USB

technology, in particular, that you can chain together at least 16 ports out of one, so there are technologies where you can make one port into 16 ports without any trouble whatsoever.

MR. SHIRAKH: Well, again, what Ron and the Berkeley Group are telling us, that we can make it any way we want. It's just a matter of policies and utility programs and what works for individual utilities.

MS. WOOD: And have we actually articulated the pros and cons of the two, or three options now that we've got up there? Is that something that -- because I was looking at those options, and I'm trying to devise in my mind what the, you know, the benefits and the detriments of each option would be.

MR. SHIRAKH: Well, the benefit, you represent SMUD, so if you have the one-way on the PCT, essentially you can use that without taking any additional actions. You do not have to mail the expansion cards; you do not have to install them; you can use them right out of the box.

MS. WOOD: But you'd have to have some way of communicating to the thermostat that this is a SMUD --

MR. SHIRAKH: Thermostat. You have to, you still have this question of mapping the thermostat to the specific utilities.

MS. WOOD: Right.

MR. SHIRAKH: And that is true, but that can be handled in a variety of ways. It can be remotely or it can be through a bunch of dip switches. And those are all the options that Ron and his team will be working.

Now, if you don't have either one, one- or two-way communications, then you have to provide this insert. And when you do that then you can take care of all the mapping and all these other issues at the same time.

So, you know, they have pluses and minuses, each one.

MS. WOOD: I guess I was asking had those pluses and minuses been formally articulated anywhere.

MR. BLANC: (inaudible).

MS. WOOD: Thank you.

MR. SHIRAKH: Steve Blanc just volunteered to send Vikki reams of information.

(Laughter.)

MR. NITTLER: Ken Nittler with EnerComp.

Let's imagine you had a house in a cooling climate, Fresno or something like that, or Palm Springs. And when the occupant leaves they already set the thermostat at the maximum high temperature that they're willing to live with, like they'll let their house get to, say, pick a number, 85 when they're not in the household.

Then you have one of these devices. The signal goes out and sets that 85, which is already the hottest temperature they're willing to let their house get to without melting stuff, or whatever it is they're worried about.

And the signal now sets it up to 89. You could accidentally with this simple strategy of only changing the thermostat setting, you could accidentally force that type of occupant to instead leave the house and set it down to 81, because they know it's going to be a bad day and they don't want their house to ever get above 85.

And you could have the same sort of scheme the other --

MR. SHIRAKH: It can happen.

MR. NITTLER: -- side on your house freezing. And so you have a place up at Tahoe where you're worried about pipes freezing or something.

There needs to be -- maybe there needs -- I haven't quite thought it through but it's like there needs to be some sort of signal that says this thing's already set at the maximum efficiency level, and therefore it gets to ignore the signal, or something.

MR. SHIRAKH: We actually talked about all of the scenarios. The first one in the cooling climate you mentioned. And the recommendation of IOUs and everyone else was to keep it simple.

And, true, somebody can learn to manipulate it and, you know, they know tomorrow's going to be a hot day, they will lower their thermostat. But some of our utilities have actually experimented with this device. And they've had fairly good results despite all those individual, you know, manipulations. The response they got when they send the signal they thought it was very good.

So, we thought about having --

MR. NITTLER: I agree on --

MR. SHIRAKH: -- you know, an either/or 4 degrees or a maximum of certain setpoint. But all of that would add to the complexity of the PCT and manufacturing cost. And what we heard was 4 degree works.

And even though some people may be astute enough to manipulate it. And if that happens they actually pay a price for it, which is okay.

MR. NITTLER: I'm not sure you're getting my point, but I'll take it offline.

MR. SHIRAKH: Okay. Any other questions on PCTs?

Okay, with that we're going to move to the public comment. And I have a Bud Thomas.

MR. THOMAS: Bud Thomas. Yeah, I am Bud Thomas; I'm a representation of the Association of Pool and Spa Professionals.

Basically with comments from one of our people out there; his name is Jerry Wallace; he has a company called ChemQuip. They service 5200 pools a week in this area. Their job is to keep those pools sparkling clean and healthy for the people who pay them.

Jerry's biggest concern is regarding the requirement for bubble-type covers that rest on the water. Those aren't used in a lot of cases despite being mandated for some time, I believe. But if they are used improperly and allowed to stay on the water, they can cause some issues with pool clarity and pool chemistry that can be expensive to maintain, and plus, make the water unhealthy.

Jerry had written some comments out. He wishes he could be here, but he's in Irvine on business. Everybody who's in the pool industry is working like crazy right now because we had a real rainy spring. So they got behind.

Anyway, Jerry's comments were this. And I'm not a pool chemist, myself, so these are anecdotal, they're from him.

But indiscriminate use of pool covers causes problems. Swimming pool water needs access to the atmosphere so that an oxygen/carbon dioxide exchange can take place. In short, the water needs to breathe.

Pools that are constantly covered undergo a chemical change that often results in cloudy water even with proper filtration. The lack of oxygen/carbon dioxide exchange results in solids dissolved in the water coming out of solution and clouding the water. Extra filtration and/or chemical adjustments are required to clear up the cloudy water. And if not corrected, this can lead to scale buildup on the pool surface. And with today's trend toward colored plasters, you can get a really unsightly pool very quickly because of calcium, which is the predominate precipitate, is grey-white.

Additionally, indiscriminate use of solar pool covers results in over-heated water resulting in higher chemical use and more difficult to keep clear water. The warmer the water the less dissolved solids it can hold in solution; and the faster that bacteria will multiply in hot water, because it goes through sanitizer faster.

And those are Jerry's comments. As I say, basically just to eliminate any sort of code requirements for bubble type covers that rest on the water in nonheated pools. We feel that heated pools should be in some way the energy kept in them.

There's one more issue that was mentioned awhile ago. Some feeling that these type covers reduce some of the load of the automatic pool cleaner. In fact, because the covers rest down in the pool on the water, any debris that falls on the cover, when you attempt to pull the cover off, unless you've got a crew of people out there, the debris will typically tend to fall back in the pool again. So it still is a problem in the pool.

And those are my comments on behalf of Jerry Wallace with SwimChem.

MR. SHIRAKH: It's too bad John Hogan's gone, but you know, he just told us that this has been in the Washington code for a number of years. I'm wondering if they've experienced any problems with this.

MR. MAEDA: Yeah, I thought our requirements were only for heated pools. In fact, why would we worry too much, except for water conservation, about unheated pools. So.

MR. THOMAS: Washington has a comparatively small number of pools compared to California.

(Laughter.)

MR. THOMAS: They may not have the experience that Californians have with water quality. Anyway, those are my comments, gentlemen. Thank you very much for your time.

MR. SHIRAKH: Next is Jeff Chapman -- okay, no Jeff Chapman. How about Wayne Reedy?

MR. REEDY: I made my comment earlier --

MR. SHIRAKH: Okay, thank you. David Delaquila.

MR. DELAQUILA: Delaquila; I made my comments earlier.

MR. SHIRAKH: Thank you. Gloria Pumponi.

MS. PUMPONI: No comment at this point.

MR. SHIRAKH: Thank you. Okay, Melissa Blevins. I think she made her comments. Cheryl English, she was earlier today.

Sir, did you wish to make some comments? Please.

MR. BRENNAN: My comments are related to Bud Thomas' comments. I'm Steve Brennan from Davis Energy Group. And I was involved with Antonia in the evaluation of the proposed measures. And this relates to pool covers.

As Bruce just stated, the exception for solar-heated pools to the requirement of a pool cover in the code is confusing because it indicates that pool covers are only needed for heated pools. In the enforcement document it requires that all pools require covers. And that is, in fact, how code officials are enforcing it in the field. Every pool is required to have a cover.

As Bud spoke about, when you're required, I guess when the pool professional is required to provide a cover, they're going to -- and they don't want to, or the owner doesn't want it, they're going to supply the least expensive cover, which is a floating bubble cover or something equivalent.

And as Bud spoke to that, they actually can be a lot more detrimental than helpful for what we're trying to accomplish.

After our study, after our discussion with -- we had a meeting with the industry experts, industry representatives, utility personnel and code enforcement officials. We discussed the pros and cons of pool cover use and most everything indicated that the usage of safety covers, high quality rather expensive safety covers, is what we really want to be encouraging.

But the requirement of just a cover is going to result in the use of floating bubble covers, which have all the problems that Bud just spoke to.

So our conclusion, after discussing our findings with them, was that educating the homeowners and leaving it up to them to buy the covers would be beneficial, because the choice to buy the cover indicates that they're actually going to use it when they get it.

And that utility incentives like the PG&E rebate program could be used to encourage this sort of behavior.

When Antonia talked about, you know, waiting three years to get some study results to change the codes what she was speaking to is the hope that we can have a performance model for pools in three years where you get credits for using an automatic cover, or a sophisticated safety cover.

And so we would like to see a performance model for pools some day, but it's quite a job to put one of those together.

So, is there any questions about pool covers and our recommendations? Okay.

MR. PENNINGTON: It would have been really convenient to have this dialogue at the same time we were having the previous item, so that the other commenters could have responded. Unfortunately we didn't do that.

MR. BRENNAN: Other? I'm sorry, --

MR. PENNINGTON: John Hogan was here and made comments about it, for example. Didn't hear this gentleman's comments.

MR. BRENNAN: Right, okay.

MR. SHIRAKH: Next. No? Any other? David. And then that gentleman.

MR. PATTON: I guess I'm going to do just what you said not to do, and go back to lighting again.

I just had three things that I wanted to touch on that I didn't think I'd touched on. And they're all pretty general issues.

One is that no matter how much we'd like it to be different, fluorescents really aren't point source lighting. And so there's always going to be a place, it seems to me, in the residential lighting design field to use point source lighting.

And so, you know, I see some movement or some desire to be energy efficient by the use of CFLs. And I agree, I'm totally there. But at the same time I think it's not appropriate for everything. So, it's just something I felt like I needed to be the conscience again of good lighting.

Second is John, I mean Noah, when he was talking this morning, spoke about that there were no environmental impacts he thought. And I wonder if we were to go to this great proliferation of CFLs, I wonder if we wouldn't be increasing the mercury load on our landfills to a degree that would also be detrimental.

And so I kind of feel as though we need to have the conscience or the overview to pull those kinds of regulations in at the same time that we start putting those kinds of loads on the landfills.

So, I want to kind of agree that that's a direction to go; but, at the same time I want to make sure that we don't have unintended consequences.

And then --

COMMISSIONER ROSENFELD: Of course, there are serious consequences (inaudible) mercury --

MR. PATTON: That's exactly right. And so the first mandate here really is that we are trying to not create any new power generation plants, right?

COMMISSIONER ROSENFELD: Which means -- that's the plus from the CFLs.

MR. PATTON: Correct.

MR. SHIRAKH: There's always a tradeoff between the mercury that you generate from power plants to generate electricity versus the fluorescent lamps. But I think time after time it's been shown that the mercury in fluorescent lamps are actually less than the power generation.

MR. ELEY: Actually the advanced lighting guidelines document that the reduction in mercury from reduced energy consumption exceeds the additional mercury from the use of fluorescent lamps.

MR. SHIRAKH: And actually I think in California as of January 1 it's the state law that all fluorescent lamps must be recycled. Now, whether people do it or not, you know, I don't want to get into that. But, by law, you have to recycle now.

MR. PATTON: And in reality that's not, that part is really not under the auspices of the CEC anyway, right.

MR. SHIRAKH: It's not, but I mean it's a state law.

MR. PATTON: Right. Last thing is some of the contentions that I think have come up in the way that we've talked about different things have to do with how much and whether people are really gaming. And whether the things that we're proposing or creating work or don't work.

And so I would propose that we actually have some research into whether that gaming actually occurs and to what degree.

I remember reading a CEC document somewhere along the line that actually showed what that level was. But I think it was more than ten years old. So, I'm just wondering -- and so it's not really pertinent to the documents that we're talking about now.

And so I have a feeling, I mean I see this on a day-to-day basis. And so I really feel that the problem is probably bigger than we think it is. And I'd just like to have some way of quantifying that. And I think the only way to really do it responsibly is through some kind of research. So.

MR. SHIRAKH: I think what Cheryl

English was saying this morning was that the 2005 code's only been in effect since October. So anything studied must be related to the new code.

MR. PATTON: I agree.

MR. SHIRAKH: And, you know, you --

MR. PATTON: Is there some kind of exit poll that we could do or something?

(Laughter.)

MR. PATTON: Anonymous exit poll.

MR. SHIRAKH: There's, I know we've had PIER project that looked at this kind of -- but these are all, they take years.

MR. PATTON: Right.

MR. SHIRAKH: And I don't know if we have that luxury --

MR. PATTON: And by then we're into the next iteration.

MR. SHIRAKH: -- for. And what Cheryl was saying is we need to, and you've documented some of the gaming that's been going on, --

MR. PATTON: Sure.

MR. SHIRAKH: -- but we need to demonstrate that this is actually a widespread enough problem to warrant --

MR. PATTON: That's right.

MR. SHIRAKH: -- you know, major change in the code. But, yeah, I understand your point there.

MR. PATTON: Okay, that's it. Thank you, guys.

MR. SHIRAKH: Thank you. Sir.

MR. JOHNSON: I've got ten copies. Good afternoon; I'm Mel Johnson with Honeywell International. And I just had some end-user perspective comments to the recommendations submitted by EnergySoft. This is obviously relating to commercial not residential, so I'm a little early on this.

After reading the recommendations submitted by EnergySoft regarding the addition of fault detection diagnostics to the 2008 building energy efficiency standards, I felt that I wanted to bring some knowledge to the table, a perspective from the end user for the Commission to consider.

Basically I'm in agreement with the general premise of what they have submitted, and the recommendations to include the embedded fault detection diagnostics into Title 24 for 2008. And also just like to expand on some of those requirements that are stated. I'll be very brief with it.

MR. PENNINGTON: Are you going to be here tomorrow?

MR. JOHNSON: Unfortunately not. It was engineered circumstances that got me here today.

There's just a few modifications to it, and you'll see it in the details of the handout. But these are the keys that I'll cover. One of them is that the environmental impact is actually positive of doing this. As we all well know that anytime that you can change and provide savings and efficiency and burn less kW you will emit less greenhouse gases.

So, if we can keep everything running optimally when it comes to package units, which is, I think, 54 percent of what's going on here in California, we are having an impact on greenhouse gas emissions. And I think it should be duly noted.

The other is that the transparency that goes on with the end users in the field. We have found that, as you've heard today, even in the residential side of it, a lot of things aren't known to the end user of what's going on with this equipment.

And when you're able to put this type of technology at play to help the customer and actually help the vendor who's doing the work, everything is revealed. There's nothing hidden. You get to see exactly what's going on underneath the hood I guess is the best way to state it.

So I thought it should be duly noted that when you use something that's current state of the art, that's also going to help the customer and it's going to help the technician and get the proper analysis, so that these systems will run efficiently.

And then also like to note that on the cost, it talks about implementation. As it becomes more widely accepted, manufacturing and installation costs will decline rapidly. By the time 2008 comes around the initial installation cost should be approximately 450 to 550.

And the annual energy savings from these systems can be expected to be in the range of 400 to 1000, depending on a number of factors. Most notably the size of the equipment.

So we just wanted to bring that to bear, as well as the fact that confirmation has been done through PIER on the FDD energy saving algorithms that were developed by Professor Brown in 2003.

And basically they've been sponsored and the report details the accuracy and the dependability improve, they're acceptable and available.

Lastly, just wanted to give you some more of a concrete evidence of what we're doing out there in the field. We currently have facts-based examples where there are currently five units under Honeywell's global service response center with the embedded diagnostics. And it's showing the savings.

Twenty-two units at the three California University campuses that were done through PIER. Ten units at Walgreen's stores; and seven units at the Staples stores. And then in 2007 six more units to be done.

We've also taken this to local and state government. And we currently have like an agreement with a customer 25 miles from here that are utilizing this technology and benefitting in savings. They've taken it to their council, to their mayor, and seen the difference that it makes when you use this technology with services.

So really what you're saying is you enhance, as a service provider, the O&Ms. You change this to like a reliability centered maintenance. And then you save in energy from 10 to 30 percent in using this technology.

With that, that's all the comments I had.

MR. SHIRAKH: Thank you so much. Bud Thomas. He already --

UNIDENTIFIED SPEAKER: He's already left; he made his comments earlier.

MR. SHIRAKH: Okay. How about Bob Radcliff.

MR. RADCLIFF: My name's bob Radcliff. I'm with Beutler Heating and Air Conditioning. Just have some comments I'd like to go over.

Number one, our zoning systems that we install can get confused with the zone industry. We are not using and supporting bypass dampers. And we are driving an awful lot of air through our systems to make sure that we can get the cfm that we need per ton.

A lot of our system packages that we put together, to give you an example, we're doing over

15,000 units a year right now with our zone systems out there. They're providing a lot of service to customers with being able to handle zone need requirements without cooling or heating the entire home.

I just kind of wanted to go through that; wanted to talk about the benefits that we see from the zoning and the cost savings that we see in the zoning system. And wanted to make sure that that type of system is looked at. If you would like any help or if you have any concerns on that zone system, I want to make sure that it's not confused with a bypass-type zone system that may limit air flow and cause extra impact on the compressor.

So if you need -- if you'd like to look into that with us at all, just please let me know and we'll provide all the assistance we can.

I'd also like to just quickly go through, if I can, some of the charge issues that we brought up. What I heard today I know I'm going backwards here a little bit, but very concerned about winter startups and how winter startup verification is going to be done.

That is a tough situation for us, as an

installer. We install an awful lot of the units in the winter, fire up a lot of units in the winter. Very difficult to set charge, other than by weight capacity.

We would be very interested also in supporting any tests or work that we could do towards service lights or service light indicators for a charge verification on thermostats. Any of the work you're doing in that direction; we have sat in on groups to discuss this over the years. And we think that's a real positive way to go.

We think that'll provide long-term customer support. To make sure that those systems stay functioning at full capacity and full energy efficiency. And that seems to be a real valuable option for new homeowners. And if we can provide any assistance in that at all, we'd like to help out.

MR. PENNINGTON: I'm wondering if I could have Bruce talk about that.

MR. WILCOX: Two things --

MR. PENNINGTON: Why don't you wait there if you can.

MR. RADCLIFF: Sure.

MR. WILCOX: Bruce Wilcox. One of the

things that we realized at the end of our presentation today was we left out the charge indicator out of the presentation. And that was actually intended to be in there. And so we're very interested in options in that -- that work in that way because we think that does give you much better, a much more flexible situation, so.

It was intended to say that that could be an alternative to doing the refrigerant charge procedure. So, we'd be happy to work with you on how we could specify that to make it work.

MR. PENNINGTON: One thing I'm interested about, I think we were thinking about that being an indicator that would come from the manufacturer. And it sounds like you would conceive of a way to do it as an engineering firm, you know, as an add-on to equipment, is that correct?

MR. RADCLIFF: I think we would take the position to try to help manufacturers provide this product.

MR. PENNINGTON: Okay.

MR. RADCLIFF: That's what we can do best, is work with the manufacturers, partnerships with the people that can get it done. And work that way, rather than we would probably not be into production of something like that.

MR. PENNINGTON: Okay.

MR. RADCLIFF: An add-on control that might provide --

MR. PENNINGTON: I was just curious --

MR. RADCLIFF: -- that, might do --

MR. PENNINGTON: I wasn't understanding how Beutler would view this as a business opportunity. And I was imagining that you would be adding it on as an after-market kind of device. And maybe I was misunderstanding you.

MR. RADCLIFF: Yeah, we love the concept of having new customers in our homes with a method to have feedback on the charge on a day-to-day basis. A one-time visit is great, but there's nothing like a continuing monitoring system.

MR. PENNINGTON: Okay, thanks.

MR. RADCLIFF: Okay.

MR. WILCOX: And I think we would like to talk to you more about the zoning issues. So, we'll be in touch.

MR. RADCLIFF: Okay.

MR. SHIRAKH: Bruce.

MR. MAEDA: Bruce Maeda with CEC Staff.

Mr. Radcliff, I had a question. How does your zoning systems work? Do they cut down the cfm when a zone is -- when some zones are not calling for heating or cooling?

MR. RADCLIFF: The dominant zone system for us is a two-zone system, two-story home. We over-size our zones, each zone, so that they can carry three-quarters of the airflow of the system when they are closed down. That helps. We'll try to make sure that we have a furnace large enough and capable enough to move the air flow at three-quarters when the static's been increased that we'll still be able to keep enough airflow, 350 cfm per ton for the a/c unit.

MR. SHIRAKH: Sir.

MR. PFAFF: I'm Terry Pfaff with EDC Technologies. We got into this a little bit late with Nehemiah, and provided a lot of information about controls and hot water systems. We currently monitor and control remotely approximately 60,000 apartments in California and their hot water systems.

So the amount of data and information that's available to the Commission, we'd like to provide, if there's anything that could help in any way. Most of the problems that Nehemiah brought up as far as cross-over and the various problems that are out there are very obvious when you're actually looking at the data.

So if there's anything that we can provide as far as data or information that would help out, we'd like to do that.

MR. SHIRAKH: Thank you for that. And I encourage you to work with Nehemiah and Jim Lutz.

MR. PFAFF: Yes.

MR. MAEDA: Bruce Maeda, CEC Staff. How's your communication work, and what kind of -- are you using microprocessor-based things at the site, or DDC controls, or what's going on there?

MR. PFAFF: We use a control at the site, itself; it's basically a data logger and a control. And it's pretty much a time-based temperature control.

We then use the internet, either IT based, information technology that comes via radio wireless on the property, and it's sent through the internet to us. We communicate on an hourly basis to the controls and gather the data. And then parse that information for problems for the properties.

So we're continuously looking for the kinds of problems that affect energy savings. Energy savings are a byproduct of having the system run right. So we're trying to find those types of problems.

Thank you.

MR. SHIRAKH: Any other questions or comments on anything you heard today?

Okay, with that, I'm going to close today's workshop. Again, tomorrow's workshop is going to be at 10:00, if you're interested, across the street. The schedule for that workshop is even more compressed than today's, so be prepared. Thank you.

(Whereupon, at 4:31 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 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 26th day of July, 2006.