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CALIFORNIA ENERGY COMMISSION

STAFF WORKSHOP

In the Matter of:)	Docket No.
)	17-BSTD-01
))
)	WORKSHOP RE:
2019 Building Energy Efficiency)	High Performance
Standards PreRulemaking)	Envelope and Domestic
<hr/>)	Hot Water Measures for
		the 2019 Residential
		Standards

STAFF WORKSHOP ON
HIGH PERFORMANCE ENVELOPE AND DOMESTIC HOT WATER
MEASURES FOR THE 2019 RESIDENTIAL STANDARDS

CALIFORNIA ENERGY COMMISSION

THE WARREN-ALQUIST STATE ENERGY BUILDING

FIRST FLOOR, ART ROSENFELD HEARING ROOM

1516 NINTH STREET

SACRAMENTO, CALIFORNIA

THURSDAY, JUNE 1, 2017

9:03 A.M.

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P R O C E E D I N G S

June 1, 2017

9:03 a.m.

MR. BOZORGCHAMI: So usually Mazi does this part and recently he's stepped down so I guess I got to do this. My name is Payam with the California Energy Commission.

First thing, the housekeeping, some housekeeping items we have to go through. Restrooms outside the double doors to your left. Snack bar, if you guys get hungry, is upstairs on the second floor. In case of an emergency and we have to evacuate the building, we'll reconvene at the Roosevelt Park across the street, kitty-corner from us.

Today is going to be a full schedule. So I'm -- we're going to start off with a quick background of why we're doing what we're doing. How the Title 24, Part 6 is developed. We'll go into the high-performance walls, attics. And we'll have a discussion on QII for 2019, and then Ken Nittler is going to provide us information on high-performance windows and doors. And then Danny Tam will provide us with compliance options for compact hot water distribution and drain water heat recovery.

It's going to be a full day and my part I'm trying to go as fast as possible because you guys have already seen these if you participated in the utility workshops that were held both in late 2016, early 2017. For every measure you'll see today you've probably seen it

1 twice already.

2 UNIDENTIFIED SPEAKER: Payam.

3 MR. BOZORGCHAMI: Yes, sir.

4 UNIDENTIFIED SPEAKER: Call-in number
5 [indiscernible] forward if you can find out.

6 MR. BOZORGCHAMI: Give me one second.

7 MR. WICHERT: For anyone who would like to call
8 in, the call-in number is 1-866-469-2 -- 3239. That's 1-
9 866-469-3239.

10 MR. BOZORGCHAMI: The passcode.

11 MR. WICHERT: And the meeting number is
12 920097418.

13 MR. BOZORGCHAMI: So how the Energy Commission
14 started. It started through two legislators, Warren-
15 Alquist developed in 1970s under Governor Ronald Reagan in
16 1974. When Jerry Brown came into office, he funded the
17 program to get better energy efficient buildings in
18 California.

19 Some of the policy drivers for our building
20 standards are set by the Governor's Clean Job -- Energy Job
21 Plans. We have this goal, quote, unquote, to meet or try
22 to meet this thing called ZNE by 2020 for residential and
23 2030 for commercial buildings.

24 Some of the other areas that the Energy
25 Commission is responsible for is for fuels and

1 transportation, permitting power plants greater than 50
2 Megawatts, looking at the forecast and looking at the
3 future energy consumption of the buildings, and other
4 areas.

5 Our policy and goals here at the Energy
6 Commission are to do energy efficiency and demand response
7 is key, then we go into renewable generation, our PV
8 systems and storage.

9 Energy Commission with the help of its utility
10 partners, and I would like to thank Pacific Gas and
11 Electric, Southern California Edison, San Diego Gas and
12 Electric, Sacramento Municipal Utility District, Los
13 Angeles Department of Water and Power, who with their
14 consultants help support our efforts in moving the measures
15 for 2019 forward.

16 Also I would like to thank Heidi Hauenstein and
17 Kelly Cunningham, too, making sure that the communications
18 happening between the two offices, the Energy Commission
19 and the Utility and the case partners.

20 As you know when we look into our measures for
21 2019 we look at sixteen climatic zones for California.
22 They're a little bit different than ASHRAE's one climate
23 zone being Climate Zone 3, ASHRAE. And we'd have to look
24 at cost savings for every climate zone separately. So if
25 you notice our prescriptive packages are develop --

1 separated into sixteen climatic zones that have different
2 requirements for fenestration, insulation, radiant barrier,
3 and so forth.

4 Our life cycle cost analysis was developed for
5 2019 based on the 2019 time dependent value, which takes
6 the energy consumption for every hour of the year into
7 consideration. And we have to go through a rigorous
8 benefit cost analysis when we're proposing a measure.

9 The -- this is one of I could say one of Mazi's
10 favorite slides and other in the office is showing the
11 benefits of what the standards have done for California
12 with respect to energy savings. We've got a good looking
13 downward trend going so far and we're trying to keep that
14 going.

15 Our 2019 standard process is currently we're
16 doing our second pre-rulemaking workshop. We have quite a
17 few left. And these are the timelines we have to meet
18 pretty much to be able to get the -- to meet the effective
19 date of January 1st, 2020. We're hoping that we go into our
20 45-day language hearings in late 2017 and go into adoption
21 in March of 2018.

22 These are tentative schedules for topics that
23 we're going to be discussing throughout June, July, and
24 August. So today, June 1st, we're going to be talking about
25 envelope measures, high-performance walls, attics. Again

1 quality -- QII, high-performance windows and doors. And
2 we're going to talk about -- discuss hot water distribution
3 systems and drain heat recovery later this afternoon.

4 And then on June 6th it would be the indoor air
5 quality for residential and nonresidential and some new
6 topics on the laboratory measures and warehouse topics.

7 Down here at the bottom where you see June 19th,
8 13th, 18th and we have one August 30th to be determined.
9 Those dates are not set in stone yet. There might be some
10 fluctuations happening later in June. Hopefully by next
11 week I get a clear understanding and I will get you
12 something on our website soon. August 30th is set for
13 CALGreen discussions, but most likely that will fall back
14 farther into September.

15 The case reports, the draft case reports will be
16 available on the Title 24 Utility Sponsors Stakeholder's
17 website. Our building efficiency program website will give
18 you all the notices, information on the current standards,
19 the proposed standards. And then if you have any comments
20 that you want to submit to us for today's meeting, please
21 have them submitted to the comments to be submitted in
22 website, and that should be done by June 16th. Okay.

23 Some contact information for the folks here, is
24 again Mazi Shirakh, ZNE Technical Lead Advisor for the 2019
25 standards. Myself. Larry Froess who does all -- is the

1 senior engineer responsible for our computer monitoring
2 program. Peter Strait who is the supervisor for our
3 Building Standards Development Team. And Todd Ferris who
4 is our supervisor for our soft -- excuse me, Software Tools
5 Development Team. And then we have our office manager
6 Christopher Meyer. All complaints send it to Christopher.
7 He's good at responding.

8 Any questions so far? Okay.

9 So with that I'm going to go right into the
10 residential wall proposal. Some of you know it as high-
11 performance wall systems. Pretty much the high-performance
12 wall system is introduced in two thousand -- actually, it
13 was introduced in 2013. High-performance walls can be met
14 by one-coat stucco with a rigid board on the exterior. So
15 it's not anything in reality new other than the thickness
16 of that rigid insulation is advancing.

17 I'd like to give acknowledgement to Alea German
18 from Davis Energy Group who actually worked on this
19 proposal on behalf of the California Utilities Statewide
20 Codes and Standards Team.

21 The residential wall proposal that we're looking
22 at is to raise the U-factor from a .051 to a .043 for all
23 exterior walls. This is not meaning the wall between the
24 garage and the living space. This is -- this would be
25 something that we would be looking to Climate Zones 1, 11

1 through 16 for low-rise residential buildings and 11, 15,
2 and 16 for multifamily buildings. The .043 right now the
3 basis is an R-21 with an R-7.5 rigid insulation. And
4 that's based on GPS, graphite polystyrene.

5 This is currently what is required under our 2016
6 standards. Under 2016 standards, during the development we
7 heard a lot of concerns from the builders, installers in
8 the industry that we're really not ready. We don't have
9 the knowledge, education to do what we call high-
10 performance walls at the time. So to reduce the stress a
11 little bit here and to give builders the ample time to come
12 up with the methodology to do high-performance attic -- or
13 excuse me, walls, we proposed -- we provided actually, a
14 PV, a photovoltaic trade-off option. So you could trade-
15 off PV systems for high-performance walls and attics, or
16 attics actually, within the 2016 standards.

17 And at the same time, the Energy Commission
18 provided funding to develop the Work Force Instruction and
19 Standards and Efficiency Program. This program is a
20 program statewide, provides training, information to
21 builders, installers of new technologies, new methodologies
22 to meet the high-performance wall systems. That's still
23 ongoing and it will keep on going. So by doing all this,
24 we're hoping that builders are understanding how to meet
25 this high-performance wall.

1 And for 2019, the PV trade-off is going to be
2 gone. We've -- Bob Raymer from CBIA has presented that
3 multiple times at the WISE meetings, conferences. I have
4 done that. So the information is out there. The notice is
5 out there that it's not going to be available come 2019.
6 And it is -- and the builders have about three years and
7 manufacturers have about three years to come up with
8 technologies and how to build these type of walls.

9 Another thing that we did was through the WISE
10 program and the California Advanced Home partnership
11 developed this catalog of different high-performance
12 attics, high-performance walls, criteria that you can meet
13 the prescriptive requirements. We got information here
14 from Owens Corning's products, Knauf's products for attics.
15 We got, who else, RMAX's product, Atlas's products that can
16 be used to meet the high-performance walls.

17 And we also have the advance wall systems
18 described in this package. Unfortunately, you can't see it
19 and I apologize. The website is there. It's on the
20 wisewarehouse.org website that this catalog will be
21 available. I just edited it last week, so hopefully
22 they'll get it done in the next 2 to 3 weeks and it will be
23 available on our website for you guys to look at. And it
24 has contact information of who to communicate to get that
25 education.

1 So for 2019 for prescriptive single family for
2 the climate zones that we're looking into again is 1, 11
3 through 16. We're requiring to go to an R-21 plus a R-7.5.
4 The area -- the climate zones that did not show effective
5 or benefit we left as is as of what it is in 2016. And
6 those are Climate Zones 2 through 5, excuse me, and 8
7 thorough 10 will stay at .051. Climate Zones 6 and 7 will
8 stay at .065.

9 I'm basing everything on a U-factor because that
10 allows all types of assemblies, construction. I'm not
11 basing it on -- I'm allowing technology to come forward and
12 meet that U-factor versus me telling you throw an R-value
13 in the cavity and slap some rigid insulation to the
14 outside. But for our basis for our analysis, we based it
15 on a 2x6, 16-inch on center R-21 cavity with a R-7.5 rigid
16 insulation. Which is the 7.5 rigid insulation is about 1½
17 inches of GPS. For multifamily as showing cost effective
18 in Climate Zones 11, 15, and 16.

19 The prototype building that was used to do that
20 analysis are standard prototype buildings that we have
21 built into our programs here in the Energy Commission.
22 It's the single story 2100-square-foot and the two-story
23 2700-square-foot. And we have the multifamily, which is a
24 8-unit at 6960-square-foot buildings. And those are the
25 areas assumed for walls, windows, window perimeter,

1 [indiscernible], and so forth.

2 What we did, we blended the 2100 and the 2700
3 buildings. The 2100 buildings and the norm in California
4 is about 45 percent of the market, where 55 percent of the
5 market is 2700 two-story buildings. Some graphics of how
6 the buildings are looking like in our analysis.

7 And then the summary of the cost applied to this
8 analysis. I apologize it's a little small. These new
9 screens that they put up is not doing justice for this. So
10 they're -- these are the assemblies and the construction
11 practice and the materials used for the analysis and the
12 units used. So for example, for the fasteners we've
13 provided \$12.18 for a 3-inch nail that's good for 1½- inch
14 of continuous insulation. And that's based on 100 square
15 feet exterior wall system.

16 There is a labor cost associated to this based on
17 RS Means and California is multiplied by 1.5. So it came
18 out to \$44 an hour. And the cost effective analysis for a
19 single family incremental first cost you'll see rigid
20 insulation, windows, fasteners, weep screed. So for the
21 blend, it came out to \$935. And then for the multifamily,
22 it's about \$23.84. It's a little high, yeah. And the
23 reason is is the nailing. There's a -- this is all hand
24 nailed. There's -- at this time, there's not a staple or
25 nail gun that could handle this type of fastening.

1 MR. SHIRAKH: Payam, are you in discussions with
2 the gun manufactures to --

3 MR. BOZORGCHAMI: We are -- we have -- there has
4 been discussion with the gun manufacturers to provide a
5 cartridge that could handle a longer nail. And I'm hoping
6 that that communication is still going and moving forward.
7 So. And they're working on it. So there's three gun
8 manufacturers that are aware of what we're doing and
9 they're looking into seeing what they can do. So if that
10 does happen soon in the next year or two, I'm assuming the
11 price of fastening is going to come down because now it's
12 going from a hand nail to a mechanical nailing will save a
13 lot of time and cost.

14 So the life cycle cost benefit cost, anything
15 above the blue line is showing cost effective for the blend
16 2340, which is the again which is the 2100 at 45 percent
17 and the 2700 at 55 percent.

18 Again the benefit cost is showing cost effective
19 in Climates 1, 11 through 16. The electric savings for the
20 climates -- you'll see that on all these that Climate
21 Zones 6 and 7 is N/A, because it didn't show cost effective
22 in 2016. And the case team is like we're not going to
23 bother with this again, and we're not going to look at
24 those two climate zones, because it's not going to show
25 cost effective.

1 So the electric savings there are there per
2 climate zones, peak demand. This is the first year's
3 energy impact, natural gas and the TDV savings and kilo BTU
4 per year.

5 And then TDV cost savings over a 30-year period
6 of the analysis shows that there is some TDV electric
7 savings, gas, and the total energy costs for at 2020
8 present value.

9 For multifamily, again anything above that 2500 I
10 show what is it twenty -- 2700. So it's showing to be cost
11 effective. And it's only showing it in three climate
12 zones. But for the multifamily, most likely there will be
13 an exception to the prescriptive table that will indicate
14 that for multifamily you would have to only meet the
15 requirements for Climate Zones 11, 15, and 16.

16 And again the benefit cost analysis for the
17 multifamily. The first-year savings in Climate Zones 3, 5,
18 and 8 you'll notice that there's negative savings on the
19 electric savings kilowatt per year. And then the TDV
20 energy cost saving over a 30-year period again for
21 multifamily.

22 And again I just wanted to bring up that there
23 are ways to meet the high-performance wall systems. We
24 have the advanced framing system where you could go to a
25 2x6 with a 24-inch on center, do a single top plate, and do

1 other things aligning the studs and so forth and reduce the
2 framing factor from 25 percent down to 17 percent. You
3 could even do insulated single headers will help with that,
4 because it's all weighted average into that wall system.
5 Again advanced wall systems where you could put XPS, not
6 GPS but XPS has a higher R-value per inch. These are all
7 options that you can be used to meet this criteria.

8 SIP panels, panels are manufactured, built per
9 your design out in the factory and shipped to the site and
10 the installation of this is much faster. You don't have to
11 worry about the framing. The first cost might be a little
12 bit higher at first, but the time savings of installing
13 this is much faster.

14 And then we have the ICFs. I know of two ICF
15 buildings in California so far. One of them is my boss',
16 so he lives in an ICF house.

17 Again I wanted to bring up that there's other
18 alternatives within this catalog or this document that can
19 help meet the high-performance wall measures that we're
20 proposing.

21 Again the links where this presentation will be
22 provided, it will be on our website. The stakeholders will
23 have the draft case reports. When the final case report is
24 submitted to the Energy Commission, we will have it posted
25 on our website to you.

1 If you have any comments and if we can't get to
2 them today, please submit it to us in writing. You have
3 till June 16th. And you could always pick up the phone and
4 give me a call. I'd be more than happy to talk to you.

5 I have one mistake in here. As soon as I fix it
6 and Adrian's in the office, we'll have it posted.

7 Any questions?

8 Please come up to the podium and pronounce --
9 give us your name and the affiliation you're with.

10 MR. DUBIN: Steve Dubin with RMAX. The numbers
11 that were listed under the rigid insulation, where do those
12 come from? Is that a per foot price, is that a per inch
13 price, or is that a per R-value price on the slide that
14 showed those?

15 MR. BOZORGCHAMI: I believe those are per inch
16 price. And I believe those were captured -- Alea, join us.
17 And they were captured by communicating with distributors
18 and manufacturers of the products.

19 MR. DUBIN: Per inch?

20 MR. BOZORGCHAMI: Per inch.

21 MR. DUBIN: Okay, thanks.

22 MR. BOZORGCHAMI: It shows one inch, but yeah
23 it's incremental so you 1½-inch is multiplied by 1.5.

24 MR. DUBIN: Okay.

25 MS. GERMAN: And they're based on -- hi, this is

1 Alea German with Davis Energy Group. I'm here today on
2 behalf of the Statewide Utility Codes and Standards Team.

3 I believe that -- so all the costs are based on
4 the square foot, but per inch as Payam said. So each of
5 those values were multiplied accordingly to achieve cost
6 per 1½-inch for example.

7 MR. DUBIN: Okay. Thank you.

8 MR. BOZORGCHAMI: Bob?

9 MR. RAYMER: Thank you. Bob Raymer with
10 California Building Industry Association.

11 First, I'd like to get clarification. When will
12 the case studies be loaded up? Because we can't really
13 respond to it until they're available. So.

14 UNIDENTIFIED SPEAKER: They're being
15 [indiscernible] now.

16 MR. RAYMER: Oh great.

17 MR. BOZORGCHAMI: So they are being loaded up
18 now?

19 MR. RAYMER: Oh, okay, perfect. That's great.

20 Just in general, we're going to be very
21 interested, and this is the same speech we've given, you
22 know, for the last three updates. We're going to be very
23 interested in getting our hands on the beta version of the
24 CBECC, particularly with the new solar and the battery and
25 the other plug load options so that we can start looking at

1 what the 2019 update looks like in its totality. And
2 that's how we usually do our cost impact analysis.

3 We're going to be very interested as you can
4 understand in the impact of all this on Central Valley,
5 particularly Climate Zones 11 through 15. In particular,
6 Climate Zone 13, 14, and 15, and the eastern portion of
7 Climate Zone 10. California still hasn't come back from
8 the economic downturn.

9 And so we're going to be very interested in
10 figuring out the lowest cost approaches for the standards.
11 But once again, you know, walls will be a component of
12 that. But we need to get all that stuff, and of course we
13 will work with the Energy Commission staff and some product
14 manufacturers as we're developing our analysis to make sure
15 we're not screwing up and that all of this stuff is going
16 to be readily available. So that'll be a lot of work that
17 we'll be doing in June, July, and August.

18 And as we indicated in our testimony, you
19 understand that our numbers to date for compliance with the
20 walls and attics are few and far between. It's very normal
21 for us to get high costs when a new standard takes place.
22 There's usually a significant period of rollout where we've
23 got a new thing and we're learning how to do it and
24 maximize savings and all that. And right now that isn't
25 happening.

1 We're probably going to be seeing a lot more
2 compliance for the 2016 regs in the third and fourth
3 quarter of this year. A lot of permits that are being
4 pulled now will -- that were pulled, are still complying
5 with the 2013 regs. So unfortunately, we've got some
6 rather significant costs numbers that are coming in. As I
7 said, those are few and far between. We're going to have a
8 much better handle on the actual cost of the 2016 regs the
9 same time you're doing the 45-day language in December,
10 which is you know, not good but that's the best we can do.
11 As always, though, we'll keep you guys in the loop. Okay?

12 MR. BOZORGCHAMI: Thank you, Bob.

13 MR. SHIRAKH: So, Bob.

14 MR. RAYMER: Yeah.

15 MR. SHIRAKH: As far as CBECC working to have a
16 beta version of it released we're working with
17 [indiscernible] team around June 15th. That will have the
18 PV, the battery storage, the precoating and some other.

19 MR. RAYMER: Then that'll be great. And just as
20 always, we really like it when you look over our shoulder
21 to make sure that we're doing all this right. On occasion
22 we might find a bug or two.

23 MR. SHIRAKH: But we're releasing it, you're
24 going to be our beta tester.

25 MR. RAYMER: Yeah. And so once again, though,

1 we'll be actively working with you guys in a very
2 cooperative fashion to make sure that what we're crunching
3 out is correct. So thank you.

4 MR. BOZORGCHAMI: Yeah. And with the costs that
5 I think Megan has sent us over or you have sent us, we're
6 going to be talking to Megan next week after our next
7 workshop and we're going to go over those numbers. And we
8 have some questions and I think there's going to be some
9 discussion going back and forth on those.

10 MR. RAYMER: Great. Thanks.

11 MR. NESBITT: George Nesbitt, HERS rater.

12 When the 2013 code came out, I had an architect
13 call me and he said, gee, we're going to have to build 2x4
14 walls with R-5 insulation. I said, no, you're not.

15 We often -- I think people confuse the
16 prescriptive packages as being what you have to do. Since
17 most people comply with performance method, you don't
18 actually have to do exactly what's in the package.

19 So, I mean, you know, one-coat stucco has been
20 around awhile with rigid insulation. Some people have done
21 it. You know, the question is, is the market going more
22 that way or not? I mean, some of the numbers I've seen so
23 far shows yeah, a little bit of the market is. And I think
24 in the custom market, there's certainly are those that have
25 gone to exterior insulation. But certainly not widespread

1 in the production. And certainly not -- I haven't seen a
2 multifamily project.

3 So, you know, I think a question you have to ask
4 yourselves is yeah, we've got this requirement that do
5 people have to actually do it or do they do it? Are we
6 actually moving the market? Can they get around it and
7 how? How easy is it to get around it? I think those are
8 questions you have to ask yourselves.

9 A couple other questions, framing factor. I know
10 at one point we talked about having credit for reducing
11 framing factor. Now certainly in the CBECC-Res currently
12 you can describe whether you have, you know, 16 on center,
13 24 on center, and obviously that changes it. But I believe
14 we in the past have talked about having a credit for
15 actually doing maybe even an even better job and getting it
16 lower. So I don't think I've seen any discussion on that.

17 And I'd say in multifamily, if you're using the
18 framing factors the same as in single family, you're
19 probably low. Multifamily is often just chock-full, more
20 so than single family. There's a lot of sloppy framing,
21 more so in multifamily.

22 QII. So in the past you've said that a HERS
23 rater doesn't actually have to inspect the exterior
24 insulation for QII. So are we going to include that? Have
25 we thought about that? Have we talked about that? Because

1 certainly with a lot of these things even though it's on
2 the compliance documentation, does it get done? And the
3 HERS rater is your best tool for making sure that things
4 get done. And so I don't see why we wouldn't want to look
5 at it because you can do a sloppy job with it. You can
6 leave a lot of gaps.

7 The other question sort of following up on Bob's
8 question about CBECC-Res and 2019 and beta, I believe the
9 current beta does not have say like a proposed 2019
10 standard design. Will that be part of the beta when it
11 comes out?

12 MR. BOZORGCHAMI: That is the -- okay, let's go
13 over all of your questions one at a time. But go ahead and
14 finish and --

15 MR. NESBITT: That's the last I think thing at
16 the moment.

17 MR. BOZORGCHAMI: Okay. So with respect to
18 CBECC, CBECC does framing factors for 6-inch on center,
19 which is 25 percent. It does it for 24-inch on center,
20 which is based on the 22 percent framing factor. And it
21 does advance wall framings. So that is based on a 17
22 percent. If you can show that you're doing a high-
23 performance wall with advanced wall framing, it does -- you
24 can model at 17 percent framing factor.

25 This -- these framing factors came from a study

1 done for Davis Energy Group by Rick Chitwood back in the
2 2000, 2001 era. And they're pretty much set in the
3 program. Because really, how do you -- how can you adjust
4 framing factor going from 25 percent to 23 percent? How do
5 you -- how does -- how is it verified? So we're assuming
6 the 25 percent or 22 percent based on analysis that was
7 done by Chitwood. And it's also been adopted by ASHRAE
8 recent -- in the past few code cycles. Program has those
9 three options. Okay.

10 MR. NESBITT: Okay, maybe I've missed the
11 advanced framing option.

12 MR. BOZORGCHAMI: AWF is what it's called in
13 there.

14 MR. NESBITT: Okay. And is it part of when you
15 describe the assembly?

16 MR. BOZORGCHAMI: It's within the construction
17 assembly. It's on the -- when you click down --

18 MR. NESBITT: I can see you have some like --

19 MR. BORZOGCHAMI: Yeah.

20 MR. NESBITT: -- 16 on center assembly or 24
21 assembly that are supposedly advanced framed. Okay.

22 MR. BOZORGCHAMI: Yeah. With respect to QII, I'm
23 going to wait until a little bit later. Mike is going to
24 go over all that with you. He's going to propose it. It's
25 already built in. It's already -- rigid insulation as a

1 part of QII is already built into QII protocol for rigid
2 insulation on the exterior.

3 What was your other question?

4 MR. NESBITT: The other was that multifamily
5 framing factors are actually probably higher than they
6 would be for single family.

7 MR. BOZORGCHAMI: Okay.

8 MR. NESBITT: Actually, one other quick thing
9 would be existing homes. So when we get to existing homes,
10 additions how are we going to handle -- are we still going
11 to assume the addition has the full -- the full code
12 required or are we --

13 MR. BOZORGCHAMI: For insulation for the walls
14 system is going to -- the write-up is going to be the same
15 as it is in 2016. If you're extending an existing wall for
16 an addition, we're not going to make you put in 1½ inches
17 of insulation because you're going to have this little bump
18 out on the stucco or on your cladding that's not going to
19 look appropriate. But when you get to the corner and you
20 have that new wall going 90 degrees you will be required to
21 put rigid insulation.

22 MR. NESBITT: Right.

23 MR. BOZORGCHAMI: And that's already built into
24 Section 150.2.

25 MR. NESBITT: But the standard design, of course,

1 assumes that you have the prescribed wall even for a wall
2 you're extending?

3 MR. BOZORGCHAMI: I think Bruce's team is working
4 on that and then it will be done.

5 MR. NESBITT: You'll have an option to define a
6 wall as an extended and not compare it to --

7 MR. BOZORGCHAMI: Yes.

8 MR. NESBITT: Okay.

9 MR. HAMMON: Good morning Rob Hammon, BIRAenergy.

10 A couple quick questions. I want to follow up on
11 the advanced framing and the 2x4, 2x6. There are a lot of
12 things that you have to do for advanced framing beyond the
13 2 -- 24-inch on center. However, there are some builders
14 whom I've talked to who are very interested in doing 2x --
15 24-inch on center but they don't want to do the single top
16 plate. And if they can do the double top plate and then go
17 24-inch on center, then I think that's a much easier move
18 for them. And I want to verify that there aren't
19 additional, or if there are, what additional requirements
20 are there to qualify for the 22 percent framing factor?

21 MR. BOZORGCHAMI: So I'll have to get back to you
22 on that one.

23 MR. HAMMON: That's fine.

24 MR. BOZORGCHAMI: Because the advanced wall
25 system framing was developed by APA.

1 MR. HAMMON: Uh-huh.

2 MR. BOZORGCHAMI: And we're going to have to have
3 a dialogue with them and see what their thoughts are on
4 that.

5 MR. HAMMON: Okay. And I'd be happy to talk
6 more.

7 MR. BOZORGCHAMI: Wonderful. Thank you.

8 MR. SHIRAKH: What is the reason for running --

9 MR. BOZORGCHAMI: Turn your mic on, Mazi.

10 MR. SHIRAKH: Sorry.

11 MR. HAMMON: The issue is they don't want to have
12 to line up their windows. They want to have -- be able to
13 put windows wherever they want. And if they -- and to do
14 the single top plate, I think you have to line up the
15 windows.

16 The other -- just a brief question. I'm just
17 surprised for the multifamily that it's cost effective in
18 Climate Zones 15 and 16 but not 14. It just seems a little
19 odd because 14 is kind of 15 and 16 mixed together, if you
20 will. And I was just questioning whether that's worth
21 taking another look at.

22 Thanks.

23 MR. BOZORGCHAMI: Thank you.

24 Anybody else, or anybody on the -- okay. So with
25 no more questions or comments we're going to move on to the

1 attics.

2 Some of these slides you'll see again because
3 what I'm going to be doing, I'm going to be breaking down
4 these presentations into three presentations, one for
5 walls, one for attics, and my lovely introduction.

6 Again, my name is Payam if anybody is recently
7 came online. This one was done by Mark Hoeschele of Davis
8 Energy Group on behalf of the California Utilities
9 Statewide Codes and Standards Team.

10 Again, for the 2016 prescriptive requirement we
11 had the high-performance attic, which require -- it had
12 three different types of construction assemblies. For
13 Climate Zones 1, 2, 4, 8 through 16, we required to have a
14 R-13 insulation below the roof deck with a R-38 insulation,
15 no radiant barrier. This is based -- prescriptively we
16 base this on a ventilated attic.

17 If you are going to do a -- and then the basis of
18 our standards assumption for this was based on a tile roof.
19 Tile roof has a natural air movement underneath it, so you
20 were able to meet this criteria with a little bit lower R-
21 value for insulation.

22 If you were doing something like and asphaltic
23 roofing, you would have to beef up that insulation value to
24 an R-18, I believe it is.

25 And if you had above deck insulation, something

1 similar to what RMAX has and what Atlas has developed, you
2 would need to have an R-6 insulation above the roof deck.
3 This is based on a ventilated attic and have tiles attached
4 to the top. If you were going to do the same situation
5 with a asphaltic roofing, it would be an R-10, if I'm not
6 mis -- excuse me, and R-8. I apologize.

7 And if you had no ducts or mechanical systems in
8 the attic, you just have to put the R-38 ceiling
9 insulation, you're done. Move on.

10 Some samples. I apologize this -- to the
11 manufacturers who see these pictures. They might not be
12 the best but this is what I had at the time I was
13 developing this.

14 So you have your advance walls above deck
15 insulation. This is a product that you could put above the
16 roof deck and meet the R-value. We have the below deck
17 insulation. This is Option B for a ventilated attic. And
18 then you have your Option C, which is you remove the
19 mechanical system out of the attic and put it in a
20 conditioned space. And then you could do a sealed attic
21 and do blown in insulation or you could do spray foam. But
22 you -- for that you would have to go to the performance,
23 using the computer trade-off, and do the computer
24 performance alternative.

25 Again, there's multiple other ways of meeting

1 that criteria. They're all explained in this lovely
2 document. And hopefully that will be available within the
3 next few weeks. And the website, again, I apologize is at
4 the lower right of the document, my left. And that will be
5 available shortly.

6 For 2019, the -- our requirement is going to be
7 to go to an R-19 below the roof deck. All right. Again,
8 this is based on a tile roof. And about tile roof
9 versus -- the reason the tile roof was used is because
10 75 percent of the market for newly constructed building is
11 going tile. So the basis of our standard analysis was
12 tile. And if you want to do a asphaltic roofing the
13 studies showed the equivalence would be an R-25.

14 If you want to do insulation above the deck, it
15 would be an R-8. If it's tile, R-10 with a radiant barrier
16 for asphaltic roofing.

17 Once again, remember this is -- this prescriptive
18 requirement is not for all climate zones. The climate
19 zones that do not require insulation of this high you fall
20 back to the 2016 standards. We will in our Table 150.1(a)
21 we will clarify this all for you and have it in our
22 standards.

23 Again, the prototype building that we used and
24 the roof deck areas that we assumed. And again, we did a
25 blend for the new construction single family and multi --

1 excuse me, two-story single family and a one-story single
2 family.

3 What -- the cost of going to an R-19 below roof
4 deck with a high-performance attic versus an R-13 and then
5 how we did the analysis was assumed there. We did a one --
6 again, we did a \$44 per hour labor cost and then we added
7 an extra one per 1050 square feet of roof deck. And then
8 we increased -- it came out to about 8 cents a square foot,
9 but we increased it by one -- about 15 percent to about 9
10 cents or so per square foot plus the additional labor.

11 For the life cycle cost for the dual -- for the
12 single family it showed to be cost effective in 4, 8
13 through 16. The other climate zones again, they were not
14 showing cost effective in 2016 and we knew that it's not
15 going to show cost effective again in 2019. So they were
16 not revisited.

17 The benefit cost analysis for the blend is about
18 \$200 -- the cost was about \$283. And then the benefits
19 differed by climate zone. And these values, the cost
20 values were obtained by a -- by install subcontractors that
21 do installation of attic insulation. The first-year energy
22 savings for climate zones, and then the energy cost savings
23 for the savings over the 30-year period.

24 And then for the multifamily it showed cost
25 effective in climate zones 4, 8, 9, 11 through 15. And

1 then the benefit cost analysis again. The first-year
2 energy impacts for the multifamily. And then the TDV cost
3 savings over 30 years for the 8-unit, the protocol for
4 multifamilies an 8-unit building, two-story.

5 Again, the same links for our caseworks case
6 proposals, our websites, and our comments if you -- please
7 have your comments submitted to us by June 16th again.

8 Again, contact information. If you want, you're
9 more than welcome need more information please contact me
10 in person or others on this website, on this page and they
11 will be able to help you.

12 Any questions?

13 MS. NELSON: Gentlemen, hi, I'm Nancy Nelson with
14 OAG Architects.

15 And it doesn't look like there's going to be any
16 additional option for an unvented sealed attic, that that's
17 not being addressed as a new topic. And I was curious
18 about that, because there's a lot of evidence that the
19 sealed attic performs superior to an unvented -- to a
20 vented attic. And we have clients that are exploring that
21 option and some who are actually installing that. That it
22 seems that there should be some benefit attributed to that.
23 And I know it's somewhat built into ducts in conditioned
24 space. But when will the Energy Commission start dealing
25 directly with an unvented, sealed attic?

1 MR. BOZORGCHAMI: So, Nancy, the unvented sealed
2 attic could be modeled into the compliance program in the
3 performance package and then the credit can be taken in the
4 performance package.

5 The reason we don't have it right now currently
6 in our proposal is because there has been a lot of
7 discussions about moisture on sealed attics from both
8 inside and outside. And we did not want to put something
9 in the prescriptive package that might cause a moisture
10 issue. So if for now if someone wants to do a sealed
11 attic, they can go performance, take a credit and maybe
12 offset a little bit of the insulation if they needed to or
13 whatever they want to do.

14 But Energy Commission right now through our EPIC
15 projects have two projects going to review moisture. And
16 at this time, those projects are not complete. So that was
17 one reason we don't have it into our prescriptive packages.

18 MS. NELSON: That I know that that's kind of an
19 ongoing issue. But it's curious because the California
20 Residential Code recognizes unvented sealed attics as an
21 assembly and they have provisions in it for how to handle
22 that. So it seems that we -- if we could run that in
23 parallel I -- you know, that if that aspect of the building
24 code, you know, is willing to accept it, that we could
25 build it more into the energy standards as well.

1 MR. BOZORGCHAMI: Very well. We'll look into it
2 and I'll communicate with you.

3 MS. NELSON: Okay. Thank you.

4 MR. FISCHER: Hi, Mike Fischer with Kellen
5 Company.

6 Just a couple of thoughts, I'd like to follow up
7 on that last speaker. There were some additional changes
8 made in the last code cycle at IECC on expanding the
9 options for unvented attics, which include some additional
10 building code provisions and how you address some of the
11 moisture issues. So I would encourage you to take a look
12 at the changes that were approved there and how, you know,
13 how some of the moisture issues have been addressed to that
14 point. Because it is getting more -- the more options now
15 but it's also a little more complicated than it might have
16 been a couple of code cycles ago.

17 But a couple of questions on the issue of
18 concrete versus asphaltic roofs on the above deck
19 insulation and then immediately below deck insulation. It
20 sounds like those are -- first of all those are R-value
21 approaches not a U-factor, which you did with the wall, you
22 have a U-factor for the assembly. So if you do above deck
23 insulation, obviously if you use a SIPS-type panel where
24 you've got a continuous sheet, that's different than laying
25 down furring strips for tile.

1 How are you going to look at all those
2 disparities between the different systems that are either
3 developed or being developed?

4 MR. BOZORGCHAMI: So a tile has a natural air
5 barrier -- air movement underneath it. Even if it's not on
6 a batten system, it is above, it's raised above the deck a
7 few, quarter inch, half inch. So that's where that natural
8 ventila -- that air space is acting as an insulator.
9 That's what we're considering.

10 MR. FISCHER: Oh, if you -- but those are also
11 done with sleepers for a tile attachment. So if you -- if
12 you are on an asphaltic system if you had a continuous R-
13 value, you might find that -- I mean, it looks like you're
14 just saying R-value for R-value. But are you also looking
15 at the attachment method as a difference on that?

16 MR. BOZORGCHAMI: We could --

17 MR. FISCHER: That's something we -- we'll
18 probably provide comments on --

19 MR. BOZORGCHAMI: Beautiful.

20 MR. FISCHER: -- as what we're talking about.

21 MR. BOZORGCHAMI: That would be great.

22 MR. FISCHER: The other question on that also has
23 to go with roofing reflectants. Is that -- and when you
24 say asphalt versus tile, there are other types of prepared
25 roof systems in addition to asphaltic systems that don't

1 have that same air circulation --

2 MR. BOZORGCHAMI: Sure.

3 MR. FISCHER: -- that tile does.

4 MR. BOZORGCHAMI: Sure.

5 MR. FISCHER: So is it really about tile versus
6 asphaltic or is about continuous --

7 MR. BOZORGCHAMI: It's tile -- it's more -- in my
8 presentation, I put the difference between tile and
9 asphaltic because it makes it easier for people to imagine.

10 MR. FISCHER: I understand.

11 MR. BOZORGCHAMI: But it's in reality you're
12 right, it -- there's different methods of doing it. It
13 doesn't have to be asphaltic or versus tile. There's other
14 construction assemblies out there that can do that. And
15 CBECC could be able to capture those.

16 MR. FISCHER: Okay, final --

17 MR. BOZORGCHAMI: And -- the --

18 MR. FISCHER: My final question had to do with
19 the HVAC ducts in conditioned space. Two questions related
20 to that application. One is there was a -- your notes said
21 no leakage from the ducts. I mean, does that mean
22 absolutely zero leakage or have you got some quantification
23 with that value?

24 MR. BOZORGCHAMI: Leakage to the outside is what
25 that is.

1 MR. FISCHER: No leakage to the outside to the
2 outside environment. So if you have a flash and batt
3 application in the attic, would that be consistent with
4 inside the conditioned space or would that be considered --
5 because it's actually in the attic space but inside the
6 insulation, would that also qualify or don't you know?

7 MR. BOZORGCHAMI: Bruce Wilcox call.

8 MR. FISCHER: We're basically talking about the
9 ceiling where you encapsulate --

10 MR. BOZORGCHAMI: Sure.

11 MR. FISCHER: -- the ducts, spray foam --

12 MR. BOZORGCHAMI: No, I understand what you're
13 saying.

14 MR. FISCHER: -- and then provide insulation
15 between.

16 MR. WILCOX: So the way we recommend dealing with
17 the -- all the insulated roof deck attic systems is to
18 model the attic, put the ducts in the attic. And it'll
19 handle that situation and give you the right trade-offs.

20 MR. FISCHER: But that's -- you're talking about
21 for a ventilated attic?

22 MR. WILCOX: No, for unventilated.

23 MR. FISCHER: For unventilated. Okay.

24 MR. WILCOX: For both sealed and for --

25 MR. FISCHER: So that would take you back to the

1 performance approach essentially?

2 MR. WILCOX: Yes, sir.

3 MR. FISCHER: Thank you.

4 MR. HILLBRAND: Hello my name is Alex Hillbrand
5 with the Natural Resources Defense Council.

6 NRDC would like to lend its voice in support of
7 strengthening these requirements both for high-performance
8 walls and attics. We support energy efficiency as the
9 primary means for achieving energy savings in buildings.
10 And we think that the 2019 code should feature the
11 strongest measures by climate zone to get us as close to
12 ZNE as possible by 2020.

13 We also would support CEC developing a metric to
14 value the total thermal storage capability of homes such as
15 has been proposed by Passive House California in its May
16 comments. We think total thermal capability and storage
17 capability in a home allows HVAC load shifting that will
18 reduce carbon emissions and will lend grid benefits for
19 which high-performance building shells should receive some
20 credit.

21 Thank you.

22 MR. BOZORGCHAMI: Thank you.

23 MR. HAMMON: Rob Hammon, BIRAenergy. A couple
24 more comments.

25 Regarding the potential for condensation in the

1 sealed attic unfor -- I'm one of the -- I'm leading one of
2 the two projects that are looking at that. And I know
3 Davis -- I'm sorry, LBNL has had measurements through last
4 winter, which is might say fairly wet and cold. And they
5 didn't experience any problems that I'm aware of, just
6 point of interest.

7 The other is I believe that the life cycle cost
8 analyses are done with a 30-year life cycle. And I would
9 submit that the life cycle of an envelope is a lot more
10 than that. And I think that it is worthwhile putting that
11 in perspective in these analyses. I know it's hard to
12 predict anything beyond 30 years, but I would ask how many
13 people in this room have never lived in a house that's
14 younger -- that's -- well, how many people have never live
15 in a house that's beyond 30 years? I venture that probably
16 everybody in here has lived in one that's older. I mean,
17 that's the reality. Everything inside the house is going
18 to change within 30 to 50 years but the envelope is going
19 to stand.

20 So thank you.

21 MR. BOZORGCHAMI: Thanks, Rob.

22 MR. NESBITT: George Nesbitt, HERS rater.

23 Couple questions related to the high-performance
24 attic. When you model what you'd call a cathedral roof or
25 cathedral ceiling are we always assuming that that assembly

1 is vented?

2 UNIDENTIFIED SPEAKER: You're asking --

3 MR. NESBITT: I -- well, I'm looking your
4 direction, because I think you might be the --

5 MR. BOZORGCHAMI: Procedural.

6 MR. NESBITT: -- the one most able to answer
7 that. But --

8 MR. BOZORGCHAMI: By the building code, a
9 cathedral ceiling, if I'm not mistaken, and Greg Mahoney is
10 on -- in the panel -- in audience, has to have an air space
11 between the roof deck and the top of the insulation --

12 UNIDENTIFIED SPEAKER: One inch.

13 MR. BOZORGCHAMI: One inch. That is the standard
14 protocol for a cathedral ceiling.

15 MR. NESBITT: So may I ask the question, what's
16 the difference between a cathedral ceiling or a cathedral
17 roof and a unvented attic?

18 And, I mean, I don't even like the term -- I
19 mean, you know, traditionally an attic has a flat ceiling.
20 The insulation was placed at the ceiling. There's a roof
21 usually pitched and it's vented. Right? But with fire
22 issues, you know, in some sense we wanted to go to
23 unvented. So and then the high-performance attic stuff is
24 basically it's still an attic because the attic is vented.
25 It's still a space that's connected to the outside

1 hopefully more than it is connected to the inside.

2 So the question is, if we build an attic like a
3 cathedral ceiling or cathedral roof, and people have been
4 doing this for years, often with spray foam, what used to
5 be the attic is now within the conditioned enclosure. How
6 is that any different than me building a flat ceiling with
7 a vented attic and dropping -- doing a double ceiling to
8 run ducts to get ducts in conditioned space? And is it an
9 attic anymore if the insulation is at the roof?

10 MR. BOZORGCHAMI: I'm not picturing your design
11 here.

12 I don't know if you did, Bruce. I didn't
13 understand the design too well.

14 MR. WILCOX: Well I'm just wondering when
15 philosophy ends up on the agenda here, because it sounds
16 like that's what mostly what you're talking about, George.

17 In -- to go back to your original question we
18 don't model the air space in a cathedral ceiling. There's
19 an -- there is an air space, but the assumption is that the
20 ventilation in that 1-inch air space is not significant.
21 That it's a moisture issue, not a thermal thing. And so we
22 don't -- we model it just as a static assembly. Attics
23 have a, you know, a much bigger air space and it's
24 certainly in ventilated attics the ventilation is a big
25 thermal heat flow so we model that.

1 And in unvented or sealed attics, we're still
2 modeling the air flow between the conditioned space in the
3 attic and leakage to the outside from that air space and
4 treating it just like another room in the house. And so
5 it's a completely different assumptions and models.

6 MR. NESBITT: Okay. Because I mean, there's a, I
7 think, a lot of confusion over this. I mean, and I'm
8 also -- it -- I think in the past some people have been
9 told they have to put like a heating or cooling supply
10 register up there. And actually I think there is actually
11 evidence that says we should be purposely condition it to
12 some extent for moisture control.

13 But it seems the question has come up if the
14 ducts are in that sealed or unvented attic, are those ducts
15 in conditioned space or are those ducts in the attic?

16 MR. WILCOX: Well the way that the performance
17 model is set up now, those ducts should, according to me,
18 the ducts ought to be modeled in the attic zone and the
19 losses from the ducts then contribute to the U balance of
20 the attic zone.

21 MR. NESBITT: So -- so you're saying if someone
22 wants to do that, they should be modeling the attic as a
23 zone and then between that and the house and --

24 MR. WILCOX: Well, except in CBECC-Res if you
25 have an attic, it is modeled as a zone already. I mean,

1 that's already there. And you can specify the attics are
2 in the -- or the ducts are in that attic and what the
3 leakage is. And it's all, you know, there's sealed attics
4 and there are vented attics. I mean, it's all handled.

5 And you could maybe argue about the gray area
6 between, you know, that model and the model for the
7 condit -- for the cathedral ceiling and it's clear that
8 they're not -- you can't draw really good hard edged lines
9 there, but I think what we've done makes sense and works.
10 So I'm happy with what we're doing.

11 MR. NESBITT: Okay. But I think there's a lot of
12 confusion over it.

13 MR. BOZORGCHAMI: Any other -- any questions on
14 the line? No.

15 MR. SHIRAKH: I actually have a question about
16 high-performance walls again. Can I go back to that for
17 one second?

18 MR. BOZORGCHAMI: For you Mazi, sure.

19 MR. SHIRAKH: Well, from Alea. You mentioned the
20 \$900 cost was largely due to hand nailing. Now if a nail
21 gun becomes available how much would that cost drop, do you
22 have any idea?

23 MS. GERMAN: Well the -- so I think of that 950
24 or so cost, about 175 was attributed to the fastening. And
25 the majority of that 175, I mean, maybe it was 150 to 175.

1 The majority of that is labor.

2 MR. SHIRAKH: Uh-huh.

3 MS. GERMAN: So a good part of that incremental
4 cost would go away. There'd be some incremental cost
5 related to whatever fastener or automatic fastener could be
6 used. So we're talking something on the order of a 100 to
7 \$150 maybe.

8 MR. SHIRAKH: Okay. Thank you.

9 MR. BOZORGCHAMI: No other questions. I'm going
10 to sit down and have Mikey do his presentation.

11 Thank you.

12 MR. SHEWMAKER: Good morning. My name is Michael
13 Shewmaker. I'm a residential CEA with the Building
14 Standards Office and here to talk about the proposal for
15 residential QII.

16 Before I begin, just want to acknowledge the hard
17 work by the California Utility Statewide Codes and Standard
18 Team and give a specific thank you to Bill Dakin and Alea
19 German from Davis Energy Group who acted as the case author
20 for this proposal.

21 So what is QII? QII does not refer to a specific
22 insulation product but instead refers to the level of care
23 and attention utilized when installing insulation. QII can
24 be applied to both wood and metal frame construction as
25 well as nonframe construction and encompasses the entire

1 thermal envelope, that's your walls, roofs, ceilings, and
2 floors.

3 Like I previously said, QII does not refer to a
4 specific insulation product. And each of the products
5 shown can be used to achieve QII.

6 So why do we have QII? Well improperly insulated
7 assemblies simply do not perform as they should or as they
8 could. And so QII was developed to sort of help alleviate
9 some of the common issues that we have seen with insulation
10 installation.

11 So here's a few examples. In the picture on the
12 left you've got a narrow cavity along the side of a window
13 that has some very loose insulation stuffed in there, not
14 quite filling the void. For those types of situation, the
15 QII protocol dictates that narrow spaces less than one inch
16 in width at windows and door jambs shall be filled with
17 minimally expansive foam.

18 The picture in the middle you've got some
19 compression and then you got a -- oh you can't see it. And
20 then you got a big old gap right here at the bottom.
21 Insulation shall uniformly fill the cavity side to side,
22 top to bottom and front to back.

23 In the third picture you've got again some
24 stuffed insulation as well as an exposed wire. QII
25 protocol dictates that you delaminate that insulation so it

1 forms around the wire or any sort of obstruction without
2 compression.

3 A few more examples. For nonstandard width
4 cavities in the picture on the left, protocol says that
5 insulation -- narrow cavities shall be filled with
6 insulation to snugly fit into the space or with minimally
7 expansive foam sealing material.

8 In the photo on the right, you've SPF with a few
9 voids and gaps. SPF insulation shall uniformly cover the
10 cavity side to side and end to end and shall be installed
11 to cover and form an air barrier at the top and bottom of
12 each cavity.

13 So what should QII look like? In the upper left-
14 hand corner you have unfaced batts. Upper right-hand
15 corner you've got your faced batts. Bottom left-hand
16 corner you've got loose fill insulation. In the middle
17 you've got sealed SIPS. And in the bottom right-hand
18 corner you've got SPF insulation.

19 So what we're proposing for 2019 is to make QII a
20 prescriptive measure both for new construction and for
21 additions greater than 700 square feet. For single family,
22 this is going to apply to all climate zones. And for
23 multifamily, it will be all climate zones except for
24 Climate Zone 7. And it will continue to require a HERS
25 verification.

1 Brief history on QII. So the concept of QII has
2 been around since 2005, so this isn't necessarily a new
3 concept. In 2013, the verification procedures were revised
4 to better align with ENERGY STAR's thermal bypass
5 checklist, which resulted in a more stringent inspection
6 procedure. Then in 2016, QII was proposed as a mandatory
7 measure. But ultimately removed from the case report and
8 left as a compliance option. This was done to allow
9 builders and insulation installers more time to adopt QII
10 as common practice.

11 So the methodology for our savings analysis. So
12 we used CBECC-Res 2019 software to perform our energy
13 simulations, and that was done with 2019 TDV values. We
14 used our three standard building prototypes, our 2100 and
15 2700 single family, and then our 8-unit two-story
16 multifamily building. We then compared standard versus
17 improved insulation construction quality. Here's a graphic
18 rendering of those building prototypes.

19 And now for incremental costs. So our estimates
20 came from detailed interviews with HERS raters and builders
21 as well as previous research. Cost estimates were made to
22 reflect the cost expected in the year 2020. And all
23 incremental costs for QII include additional labor costs to
24 install an air seal to QII standards and HERS rater
25 inspections. All of the incremental costs are based on

1 labor only. There was no incremental material costs
2 assumed.

3 So for labor, we assumed a rate of \$44 per hour
4 that came from RS Means after applying a California
5 Regional multiplier of 1.1. For single family we assumed
6 two additional hours of labor. And for multifamily, one
7 additional hour per dwelling unit. For HERS verification
8 our costs came from interviews with raters and builders.
9 And we included assumptions for sampling. We assumed a
10 50 percent test rate for single family as well as a
11 25 percent test rate for multifamily.

12 So these are the HERS rater costs that we assumed
13 for QII. We assumed three inspections per single family
14 building with a third inspection completed at the time of
15 other final HERS inspections. And that led to an average
16 cost of \$433.

17 Costs for sample units are based on the average
18 costs for a single inspection of \$183. So taking into
19 account your tested versus your sampled, we came up with an
20 average cost per home of \$308. And that's without labor.

21 For multifamily, we assumed four site visits per
22 building at \$225 per visit for a total of \$900. The
23 assumption includes inspection of all units during the same
24 visit. The reason why we assume four site visits for
25 multifamily is because multifamily -- assumes inspection of

1 all eight units, which can't always be completed in the
2 same day. And from the interviews that we had with HERS
3 raters, we've been told that they typically budget for one
4 additional visit for multifamily. So taking into account
5 your tested versus your sample, we came up with an average
6 cost of \$525 for multifamily.

7 And so now adding in that cost of labor, which
8 for single family we assumed two hours at \$44 per hour. So
9 \$88 led to a total of \$396 per single family dwelling unit.
10 For multifamily, we assumed \$352 of additional labor. So
11 that results in an average cost per building of \$877.

12 And so now we'll dive into the energy and cost
13 effectiveness results. I apologize but there's going to be
14 a lot of numbers flashing up on the screen for you.

15 So this first slide is your first-year energy
16 impacts. You've got your electricity savings, your peak
17 demand reduction, as well as natural gas savings, and TDV
18 energy savings.

19 This next table then takes those energy savings
20 and converts them into a dollar figure over the 30-year --
21 life expectancy of the building.

22 This table then takes that total benefit and
23 compares it against your incremental cost to give you a
24 benefit cost ratio. Perhaps a better way to illustrate
25 this is the graphic you see now. The horizontal line that

1 you see is the total incremental cost, and each of the
2 green bars represent the TDV energy cost benefits. So
3 anything exceeding that horizontal line shows cost
4 effectiveness.

5 And then for your 2700-square-foot prototype,
6 your first-year energy savings. Those energy savings now
7 converted into a dollar figure over the 30-year life of the
8 building. And then the benefit cost analysis, which again
9 for single family proves cost effective in all of the
10 climate zones.

11 For multifamily, your first-year energy savings.
12 The negative values that you see in Climate Zones 3, 5, and
13 7 do represent an increase in electrical consumption. But
14 this is offset by the savings from natural gas. So here
15 you've got your dollar figures, and your benefit costs.
16 And so multifamily proved cost effective in all climate
17 zones except for Climate Zone 7.

18 So to recap, for 2019 we're proposing QII as a
19 prescriptive measure for new construction as well as
20 additions greater than 700 square feet. That will be all
21 climate zones for single family and all climate zones
22 except for 7 for multifamily.

23 Our proposed changes to code language, we're not
24 proposing anything major. There's -- it's mostly all
25 cleanup and clarification with the exception of an added

1 special situation for roof deck insulation in the RA 3.5
2 QII protocols.

3 And just wanted to touch on some of your
4 alternative options. So QII, we're proposing as a
5 prescriptive measure which means it will be able to trade
6 away. However, just want to be aware that that difference
7 is going to have to be made up by utilizing some sort of
8 alternative compliance option. Your best alternative is
9 going to vary on a case by case basis and may require more
10 than one in order to get your building to comply. However,
11 we've provided a few examples such as reduced building
12 envelope leakage, cool roof, and cooling dominated climate
13 zones, high efficiency furnaces and AC, as well as zonal
14 control, ducts located at -- in directly conditioned space,
15 high efficiency water heaters, as well as drain water heat
16 recovery.

17 And that pretty much concludes my presentation.
18 Again, here's a few helpful web links and resources. If
19 you could please submit your comments to the docket by
20 June 16th. And our contact information.

21 So with that, I'll open it up for questions.
22 Please don't all jump at once.

23 MR. COTTRELL: Good morning. I'm Charles
24 Cottrell with the North American Insulation Manufacturers.

25 Our members produce fiberglass and rock and slag

1 wool insulation products. NAIMA supports the Commission's
2 move to reduce the prescriptive U-factors for walls.

3 In addition to the lower prescriptive U-factor,
4 we urge the Commission to consider more efficient mandatory
5 minimums for walls. This is one of the building envelope
6 components where there is only one chance to get it right
7 cost effective -- to get it right cost effectively in a
8 home that will last for more than 50 years.

9 NAIMA also strongly supports the Commission's
10 proposal to make the QII a prescriptive requirement. Our
11 manufacturer's installation guidance require proper
12 installation. Proper installation assures builders and
13 homeowners get the performance they pay for. We have seen
14 the higher density batt materials are easier to install to
15 meet the QII criteria and would like to explore how to give
16 credit to that factor in the 2019 code.

17 We support the Commission's well-rounded approach
18 to increase the 2019 requirements by improving mandatory
19 measures, prescriptive measures, and QII. Addressing all
20 these issues will help optimize the envelope efficiency
21 while giving builders flexibility and drive manufacturers
22 to provide innovative and cost effective solutions.

23 NAIMA looks forward to working with the
24 Commission and other parties to make the 2019 Title 24 a
25 code that drives energy efficiency in a cost effective

1 manner.

2 Thank you.

3 MR. SHIRAKH: Charles.

4 MR. COTTRELL: Yes.

5 MR. SHIRAKH: Can you be a little bit more
6 specific about what you mean by requiring higher mandatory
7 minimums?

8 MR. COTTRELL: We are looking at the cost of some
9 of those measures. And I'm not ready to propose any
10 specific numbers today, but we'll be doing so in our
11 written comments.

12 MR. SHIRAKH: Thank you.

13 MR. PENNINGTON: I'm sorry. This is Bill
14 Pennington, the Energy Commission.

15 Could you explain your rationale for why you
16 would want mandatory -- lower U-factors --

17 MR. BOZORGCHAMI: Closer to the mic, Bill.

18 MR. PENNINGTON: -- for residential walls? Do I
19 need to repeat that or do you have it?

20 MR. COTTRELL: I have it.

21 MR. PENNINGTON: Okay.

22 MR. COTTRELL: Sure. As I stated, the -- when
23 you build wall, walls are one of the building components
24 that you really only have one chance to do correctly. And
25 so by having a mandatory minimum that is a little bit

1 higher than what we have today, those are measures that
2 will have an effect over the life of the building, which as
3 I said is at least 50 years if not upwards of a 100 years.
4 And so by not trading those off for measures that may or
5 may not last that long, we feel that that would be cost
6 justified and we'll be, as I said, looking at some of the
7 numbers and bringing proposals forward.

8 MR. SHIRAKH: Thank you, Charles.

9 MR. SHEWMAKER: Thank you

10 MR. NESBITT: George Nesbitt, HERS rater.

11 I agree with the statement from NAIMA. It --
12 walls especially, but although even roofs or attics, the
13 way a lot of buildings are built now without a traditional
14 attic where you can actually go in and add more insulation
15 later.

16 We're building buildings you can't alter and
17 we've always been. I mean, it's not that you can't alter.
18 It's just to go in and open a wall, or to drill walls, or
19 to do an exterior insulation retrofit is expensive unless
20 you're already having to strip off all the siding and do
21 it. And it's amazing to see how many buildings get new
22 siding and don't get insulation. So, you know, like he
23 says, you have one chance to do it right.

24 They also had a blog recently -- NAIMA had a blog
25 where they basically said RESNET Standard 1 or essentially

1 our QII doesn't meet manufacturer specs for installation.
2 So we're giving credit for mediocrities -- mediocrity.

3 And just in general, I have to tell you I've
4 walked on a number of projects I've worked on -- either I
5 was working on as contractor or as a HERS Rater where you
6 have things like people putting in R-13 2x4 wall insulation
7 in a 2x6 and the building inspector had left, had just left
8 and passed it.

9 I've failed ten multifamily attics, buildings,
10 buildings, twice, twice, not even talking QII because the
11 installer didn't actually put in a minimum R-value. So you
12 have construction companies who are hiring subcontractors,
13 paying them for work they haven't done. They often refuse
14 to actually go up in an attic and look. So we have a
15 serious problem of things not being done and not being done
16 right.

17 I think QII should be mandatory until or at least
18 mandatory and in the sense that in the changeout world we
19 do sampling, some of the sampling is based on the installer
20 rather than, you know, necessarily by the project. So
21 worked with plenty of installers who say they've done QII
22 and oh, they've always passed yet they've always failed.
23 There's high turnover, you know, there's pressure just to
24 get things done. People aren't trained. So we need to get
25 it right.

1 And actually going to something like NAIMA
2 proposed, going to a minimum U-value for a wall assembly or
3 essentially requiring -- if we required continuous exterior
4 insulation. And we may be getting to the point with the
5 code where it's harder and harder. It might be -- whether
6 it's still going to still be possible to build a wall
7 without continuous insulation I'm not sure. We may
8 actually be close to being there.

9 But if we don't require it -- well, if we did
10 require it, the thing is it makes things like efficient
11 framing a lot easier. It -- because it's -- most people
12 don't frame efficiently. Even people who try often don't
13 do a great job. Very few people do it right. So if we go
14 to continuous insulation we sort of minimize the effect of
15 things like framing factor.

16 MR. BOZORGCHAMI: George, this is Payam real
17 quick. What you do you mean by framed efficiency?

18 MR. NESBITT: Framing efficiency or framing
19 factor. I mean, I've -- yeah. It's hard to do it right.

20 MR. SHEWMAKER: Thank you, George.

21 MR. HILLBRAND: Hi, this is Alex Hillbrand with
22 NRDC again.

23 NRDC strongly supports QII as a prescriptive
24 measure and further requests that CEC consider mandatory
25 blower door testing, reporting, and documentation of air

1 tightness.

2 We strongly support including QII as a
3 prescriptive measure as demonstrated in the case reports.
4 QII's critical to achieving in the field performance of
5 insulation and air sealing commensurate with code
6 requirements. It also provides major environmental and
7 energy cost saving benefits.

8 While insulation and air sealing inspection are
9 firm steps in the right direction we believe blower door
10 testing should be performed as the main strategy to verify
11 the codes prescriptive requirement of air tightness at 5
12 air change per hour at 50 pascal.

13 Air leakage is one of the largest remaining
14 energy savings opportunities in the code. There's no
15 currently required verification of that level of
16 performance. However in many cases new homes are likely
17 built with air sealing results better than the requirement.

18 HERs raters are trained to perform blower door
19 testing adding little time and cost to QII and other
20 inspection-related activities. So NRDC does propose that
21 CEC require blower door testing, reporting, and
22 documentation of the resulting tightness as a part of the
23 2019 code. Thank you.

24 MR. BOZORGCHAMI: Alex, I have a couple of
25 questions for you.

1 MR. HILLBRAND: Sure.

2 MR. BOZORGCHAMI: As QII is becoming
3 prescriptive, one of the criteria of I think QII is to make
4 sure everything is sealed tight. Maybe I'm not using the
5 right term but everything is sealed, caulked, and gasketed
6 properly.

7 MR. HILLBRAND: Uh-huh.

8 MR. BOZORGCHAMI: And when you're requiring a
9 blower door test into the prescriptive option as an extra
10 cost, that may not show cost effective. And us looking at
11 the CalSERTS directory of the homes that are done at QII
12 and so forth, it shows that they're already above that 5
13 air changes. So I don't --

14 MR. SHIRAKH: Below you mean.

15 MR. BOZORGCHAMI: Below 5 inches -- 5 inches,
16 5 air changes. So I don't know if it's -- there's a value
17 to have a blower door test and a QII together as a package
18 in the prescriptive requirement.

19 MR. HILLBRAND: Thanks, Payam. Yes, I'm not in a
20 position to comment on cost effectiveness. But I believe
21 perhaps if it's taken as in lieu of other QII steps or
22 looking forward as one may wish to change the prescriptive
23 requirement for air tightness in the home, it will be
24 important to have data from the current tightness which I
25 agree with you is often well within the compliance level of

1 the code as it stands today. Thank you.

2 Did you have any more questions, Payam?

3 MR. BOZORGCHAMI: Fine, thank you.

4 MR. HILLBRAND: Thank you.

5 MR. SHEWMAKER: Do we have any more comments in
6 the room? Nothing online?

7 All right. Well, thank you.

8 MR. BOZORGCHAMI: We're going to take a 10-minute
9 break. I need to get some water.

10 (Off the record at 10:36 a.m.)

11 (On the record at 10:49 a.m.)

12 MR. NITTLER: I'm Ken Nittler. Today I'm talking
13 on behalf of the Statewide Utility Codes and Standards
14 Team. And I'm going to talk a little bit about window and
15 door performance proposals for 2019.

16 By way of background a little bit, here's a
17 little chart that looks at the performance. When I'm
18 talking about performance, I'm talking about in terms of
19 U-factor and solar heat gain coefficient of fenestration
20 products. And we really during my career seen a tremendous
21 improvement in this product category.

22 This chart goes back to 1998. That top line, for
23 instance, we had a .75 U-factor in a whole bunch of the
24 cooling climates, the Central Valley -- or sorry, Southern
25 California, the inland Southern California climates. Now

1 we're down at .32 and then you'll see what the proposal
2 here is a minute for 2019.

3 Another area where there's been dramatic
4 improvement in window performance with the emergence of low
5 emissivity coatings is that we now have products that have
6 much lower solar heat gain coefficients. And anyplace
7 where cooling's the name of the game, that turns out to be
8 a pretty important change. The current standard is at .25.

9 How many of you in this room remember when we
10 used to require shade screen on the outside of the window?
11 How about that for -- how about that for a slight
12 difference? And whoever saw it put in a new home?
13 Everybody raise your hand on that one.

14 So why are windows such a big deal? Anybody who
15 runs the software and tries to do compliance knows that
16 better window products can really affect things both on the
17 in the buildings that have heating issues and ones that
18 have cooling issues. Here's an example of a quick run
19 where even with the relatively modest improvement of U-
20 factor and solar heat gain being proposed here, in Climate
21 Zone 12 it reduced the TDV energy 3.4 percent for a very
22 modest improvement in efficiency.

23 Another issue whenever you start looking at
24 windows especially is they have a lot of different
25 qualities. They provide daylight, ventilation, emergency

1 egress. You know, so your windows in your bedrooms have to
2 have a certain operable opening to make sure a fireman can
3 get through with their gear on.

4 Another thing that complicates looking at windows
5 is that in a given building, you might have 15 to 25
6 openings, maybe more, sometimes, maybe a little bit fewer.
7 And each window is a different size, it's pretty typical in
8 homes to have four maybe five different kinds of windows.
9 You might have some fixed windows, some vertical sliding
10 windows, maybe you have a sliding door. And each one of
11 those products potentially has a different U-factor and
12 solar heat gain.

13 So sometimes when you figure out -- trying to
14 figure out how to draw a line in the sand to say the
15 product should be .3 U-factor or lower, you have to make
16 sure you look across the array of products that are going
17 in a home. Because I think the most common practice would
18 be for a builder or designer or the homeowner to want to
19 have the same window appearance no matter which orientation
20 they're on. So we don't, for instance, in most cases
21 anyway, want to put say a tinted window facing west but a
22 window that looks largely clear on the orientations. Most
23 people wouldn't care for that.

24 When you look at the existing code requirements
25 and sort of related programs, on the left-hand side here is

1 our current Title 24. Generally the U-factor is .32 across
2 all climate zones. Solar heat gain coefficients everywhere
3 except Climate Zones 1, 3, and 5 that are heating dominated
4 is a .25 solar heat gain coefficient. And then in this
5 funny anomaly which we'll discuss, the solar heat gain
6 coefficient in Climate Zones 1, 3, and 5 is in the
7 standards is listed as a no requirement. In the ACM
8 software, that's modeled at .5 solar heat gain coefficient.

9 You know, basically you can't model a window with
10 an input of no requirement, you have to say something for
11 that solar heat gain coefficient. The middle and the
12 right-hand slides look at a couple of other cases, the IECC
13 is the center, depending on what climate zone you're in.
14 IECC packs everything into eight climate zones. They
15 always chuckle when we show them our 16. And they have
16 climate zones that currently range down to .32. And just
17 to prove for the 2018 IECC, it gets to .30 in many climate
18 zones.

19 On the right-hand side is ENERGY STAR. I know
20 ENERGY STAR is a voluntary program but it has a very high
21 market penetration. And so it is relevant, I think, when
22 we look at it in new construction as well. And generally,
23 in our climate areas, ENERGY STAR already has a requirement
24 of .3 U-factor and a .25 solar heat gain.

25 The second bullet point on the right-hand side.

1 There was also an interesting thing that happened during
2 the downturn, there were federal tax credits for
3 fenestration. And the line in the sand that got drawn
4 there was a .30 U-factor and a .30 solar heat gain
5 coefficient. And there were a majority of the window
6 companies making products in this space figured out how to
7 make a .30 U-factor window because the tax credits were
8 pretty important at a time when construction was very low.

9 On doors, for those of you interested in doors,
10 got to read these definitions. So we have a definition
11 called door, but it talks about swinging doors put it also
12 includes things like pet doors and the garage door, the
13 door between that you drive your car through. So it has
14 multiple meanings. When I'm talking about doors here
15 today, I'm talking about swinging entry doors, okay.
16 That's -- I've -- we've worked to try and craft a language
17 to focus only on that.

18 The other twist in our door thing, door
19 definitions is the second bullet point there that -- we
20 have a definition that says if the door is more than 50
21 percent glazed, then gets called a glazed door and
22 generally the window requirements then apply. If it's
23 below 50 percent glazing, this is in the current standard,
24 then it gets treated as a swinging door.

25 And we have this table at the bottom. It's from

1 the joint appendices that has different sorts of products
2 to help you deal with that.

3 We'll skip this one for now.

4 As I mentioned a minute ago, the industry, the
5 window industry knows how to meet this criteria. Sort of
6 the recipe as I like to call it is a low conductance frame
7 so that's things been around forever like wood but it's
8 also materials like PVC vinyl, fiberglass, there are other
9 possibilities as well.

10 The second major component of the recipe is low
11 solar gain, low emissivity coating. And there are, I don't
12 know, five or six major flat glass manufacturers in the
13 U.S. and most of them have products in the categories that
14 we're talking about here.

15 The cavity between the glazings often gets filled
16 with argon gas, gas that reduces the amount of convection.
17 There are also other possibilities, krypton. Anybody been
18 watching their Superman? Krypton can work too. And
19 interestingly, the prices on krypton have gone down
20 dramatically.

21 And finally the spacer which is the little block
22 of material that keeps the two layers of insulated glass
23 apart. But it also has a very important function of
24 keeping your IG unit, insulating glass unit, from failure.
25 Anybody seen foggy windows where there's been some sort of

1 seal failure. So it's a part of the window that you really
2 need to do right if you want it to be durable because you
3 don't want that seal to ever fail.

4 So we know how to make these windows and I would
5 venture to say a majority of the windows that are being
6 installed in new California construction likely already
7 meet the criteria that I'm about to propose.

8 Another issue when you're doing this kind of work
9 is to look at, you know, what other technology is out
10 there. So in 2013 when we last updated the standards, we
11 had one easy low hanging piece of fruit to grab which is
12 the emergence of these extra low solar gain low-e coatings
13 that got us down into the .23, .24, .25 range.

14 Sitting here today, I don't see any obvious new
15 easy technology on low-e coatings. There's no new products
16 have emerged. It's like the next step if you wanted the
17 lower solar heat gain starts to get into tinting and -- or
18 glass that has a lower visible transmittance. And
19 generally I think most people would agree that that's
20 probably not desirable, at least by most homeowners.

21 Another product category that's still emerging is
22 chromogenics or they're products that change their solar
23 heat gain or visible transmittance depending on sometimes
24 it's powered that has little circuit that would say yes,
25 make it opaque, make it clear. There are also ones like

1 your eyewear, you know, where you walk outside and they're
2 photosensitive and they change their solar properties. As
3 things stand right now, don't see too much use in
4 residential and they tend to be fairly costly. Although
5 someday probably that'll be something to consider.

6 There are two -- two other things that are
7 reasonably possible. One is triple glazing. I don't know,
8 nationwide it's less than 1 percent of the windows sold out
9 there. For a lot of the windows sold into production
10 building, one of the difficulties with triple glazing is
11 basically it causes the product to weigh 50 percent more
12 because most of the weight of the product has to do with
13 the glass. If you add an extra layer, you know, make it
14 heavier. Sliding glass doors, then, for example would get
15 a lot heavier. Has anybody ever tried to install a sliding
16 glass door at home and lift that thing? You'd probably
17 need an extra person to do it in triple glazing.

18 Another issue on triple glazing, I don't see any
19 window industry people here, maybe they're on the phone is
20 that the physics of the situation is such that there's an
21 ideal insulating glass unit thickness. It turns out that
22 you want an air cavity, the cavity on this previous slide
23 here in the center on the bottom. With the current
24 technology we have, you want that air space or argon space
25 to be approximately a half inch to three-quarters inch,

1 that's the optimal. If you make it narrower, energy use
2 goes up. If you make it wider, energy use goes up. So
3 there's a sweet spot.

4 And so if you're talking about triple glazing,
5 the dilemma becomes that to make it work, instead of
6 accommodating a 1-inch or $\frac{3}{4}$ -inch overall product, we'd need
7 to ask a lot of our window industry to redesign to
8 accommodate something like an inch and three-eighths
9 overall dimension, and there's a lot of money in those
10 extrusions and practices to make that sort of product. So
11 we didn't look real hard at that because that wasn't
12 desired at this point. Someday I think it'll be there.

13 There are always and there have been for many
14 years other possibilities, suspended films inside an
15 insulated glass unit is one of them. Another is there's a
16 product called a skinny triple where you make the center
17 piece of glass a very thin piece of glass. So there's some
18 possibilities.

19 The fourth bullet point on here talks about
20 another emerging technology. So these low-e coatings, you
21 know, can improve the U-factor anytime they face an air
22 space. So why not put a low-e coating facing in? And in
23 fact, for a little while, anyway, you could buy paint for
24 your house that had low-e coatings for your interior paint,
25 as an example. I don't know that I believe that didn't

1 catch on either.

2 Anyway, in the window industry, what this would
3 let them do is achieve sometimes near triple glaze like U-
4 factor simply by altering the coating on the glass. It's
5 manufacturing-wise fairly easy to do. Most of the
6 companies that work with these sort of products have --
7 have offer a low-e coating face in, but the use of those
8 products is very low at this point.

9 So what is our proposed code change? It's a U-
10 factor of .3. So it goes from .32 down to .3. And the
11 solar heat gain in all the climates that feature any
12 significant amount of cooling goes down to .23 from .25.
13 So in terms of actual product, it's pretty much the product
14 we're actually already installing, it's just refining the
15 line in the sand to match what's actually being installed.

16 Now Climate Zones 1, 3, and 5, and now with this
17 analysis Climate Zone 16 fit into categories where higher
18 solar heat gain offer additional energy savings. Climate
19 Zones 1, 3, and 5 literally for the standard homes we have
20 have zero cooling. So anytime you -- there's no penalty,
21 if you will, energy-wise in terms of TDV energy to a higher
22 solar heat gain.

23 Climate Zone 16 is interesting, it's actually the
24 mountainous climate zone and it's typified by Blue Canyon
25 weather data. And surprisingly, it does have a cooling

1 load. And so it's actually a case where a lower solar heat
2 gain saves energy, but a higher solar heat gain saves
3 energy, too, it's just that it saves more because you're
4 knocking down the heating budget the most.

5 So right now, those are typified, Climate
6 Zones 1, 3, and 5 and now 16 have a no requirement in the
7 standards. What the ACM says is that that should be
8 modeled at .5 solar heat gain coefficient. So as I
9 mentioned, in a lot of cases, it's the same window we're
10 already using.

11 Here's a little bit about what the standards
12 language looks like. You can see the changes to the top
13 two rows on the U-factor and the solar heat gain
14 coefficient.

15 One of the things that came out of the
16 stakeholder meetings that the Statewide Utility Codes and
17 Standards group held is a reoccurring element that certain
18 stakeholders, usually energy consultants, are concerned
19 about how the ACM treats Climate Zones 1, 3, 5 and now 16.
20 Basically, their -- their argument is that -- the standard
21 right now of no requirement sets a very high bar. And
22 almost all the windows they buy, whether they have the low
23 solar gain glass or even an extra low solar gain glass have
24 much lower solar heat gain. So they feel like they're
25 getting penalized in our scheme of things because that

1 increases energy use. So if they install the commonly
2 available window, it ends up hurting their chances of
3 compliance.

4 After thinking about this a little bit, what the
5 team's proposing is -- is really a fix in some respects to
6 the ACM that -- that one of the problem is that we're
7 modeling the no requirement with a solar heat gain
8 coefficient that is so high and it's very advantageous.
9 And the dilemma is that sure, we can do these runs, we can
10 run it with other numbers like .23. And the problem is it
11 increases the energy use so you can't show energy savings
12 from this measure in Climate Zones 1, 3, and 5. In 16,
13 there's a little bit of savings.

14 So in the case report, you'll see that there's a
15 proposal -- an alternative proposal to change the no
16 requirement in the standards and instead to substitute what
17 I like to call a mid-solar product. So we'd have in
18 Climate Zones 1, 3, 5, and 16 a .35 solar heat gain
19 coefficient or higher, okay, so it establishes a minimum
20 instead of a maximum.

21 And basically the logic I'm thinking of anyway
22 when I did this is so two code cycles ago, this was the
23 glass that was in our prescriptive standard mid-solar
24 products are widely available. Most manufacturers that
25 operate in different reaches of the country might have a

1 higher solar gain product if they're in northern climates
2 as an example. So it's widely available product. It still
3 has the better U-factor properties of a good low-e coating.
4 So it's kind of a balanced approach.

5 In terms of compliance, it sends the right
6 message. If you put a higher solar heat gain in in these
7 mild climates, then your compliance will improve. If you
8 put too low of a solar heat gain, then your compliance gets
9 worse which is what the numbers show with our TDV
10 valuation.

11 So the little chart at the bottom there is that
12 row of the table where it now would say a maximum or
13 minimum solar heat gain coefficient, Climate Zones 1, 3, 5,
14 and 16 would be a .35 minimum.

15 On doors, you might recall that first chart I
16 had. We haven't touched doors during my entire career. I
17 think doors, swinging doors, have had the same U-factor
18 dating back to the 1970s. So probably time to look at
19 that. It turns out there are insulated doors. They're in
20 wide use. You can go in to your big-box store and see
21 racks of them. Typically, it's an insulation product with
22 either a steel or fiberglass or perhaps some of the
23 material skin. They're already in wide use.

24 What this will do, probably its biggest impact
25 comes that we'll now need to verify that those products

1 have the lower U-factor, it's going to require wider use of
2 NFRC labels, so that's probably the biggest impact there.

3 The bottom -- since the stakeholder meetings,
4 here's an important change which is after looking at all
5 the language related to fire protection products, an
6 exemption has now been added that exempts products that are
7 subject to a swinging fire door, fire protection doors. So
8 if you were in a case, this would typically be the door
9 between the house and attached garage. If there weren't
10 fire sprinklers in the garage, for example, then I'm not
11 exactly sure how you get away with that given our fire
12 sprinkle requirements in California. But if you did, it
13 certainly could occur in existing housing, then that door's
14 exempted from meeting this .2 U-factor. So it seems like
15 that addressed the biggest concern we heard at those
16 stakeholder meetings.

17 Finally, the last point here is about this
18 strange definition where we say if it's more than 50
19 percent glazing, then it's called a glazed door and treated
20 as window; otherwise, it's treated as an opaque door. This
21 proposal recommends changing it down to 25 percent. Logic
22 being that products with lots of glass have solar heat gain
23 implications and it would seem like given the availability
24 of labels widely throughout industry, that why not take
25 advantage of those labels on more products. So that's the

1 25 percent definition.

2 In terms of implementation, conveniently there's
3 an empty Section 5 in 150.1c so I grabbed that and called
4 it "Doors," instead of "Reserved." And you can see the
5 exception in the middle there, that's the one that exempts
6 fire protection doors. And then there's a new row in the
7 Table 150.1a that shows the .2 U-factor.

8 Okay. In terms of issues related to are these
9 products out there on windows? It doesn't seem like
10 there's really a significant market barrier to this.
11 Products are already in frequent use. There's some
12 CalCERTS data that shows a lot of the windows are at or
13 lower than .24. If you go to your favorite big-box store,
14 you'll find that the stock window likely meets this
15 criteria, including argon gas.

16 ENERGY STAR which is already there in terms of
17 the U-factor, has very large market penetrations. And
18 there are lots of products meeting this criteria.

19 So on doors, first of all there's also an ENERGY
20 STAR program on doors, it's -- it is widely participated
21 in. Something like 70 percent of the swinging doors have
22 these labels. So those products are out there. And it
23 turns out the ENERGY STAR criteria for an opaque door is
24 .17 U-factor. We're a little bit higher at .2, so it gives
25 a little margin for comfort there.

1 In terms of compliance and enforcement, there's
2 really not too much different here, we're just talking
3 about a different window going into the opening. Maybe the
4 one added thing is that the entry doors should be inspected
5 to have that NFRC label.

6 Okay. In terms of cost effectiveness, some of
7 the details of how this analysis was pretty much done. All
8 three of the other proposals you've heard today were
9 analyzed in the same fashion. In this case, we modeled the
10 houses with the current prescriptive requirement, then we
11 modeled them with this new criteria. And here are those
12 prototypes. In terms of incremental cost, we're estimating
13 on the single family, the total incremental cost for a
14 building is \$147. It's mostly in the door, the insulated
15 door. Multifamily, it's \$412.

16 So here are the energy savings. This is the
17 single family, the weighted values, you can see it saves a
18 little bit of energy everywhere. Interesting when you look
19 down in Climate Zone 16, remember that that is the case
20 that's switching from a low solar gain climate to a high
21 solar gain climate. And it turns out that the therm
22 savings is enough in TDV terms to show more savings but
23 certainly there is the potential for slightly increased
24 cooling in Climate Zone 16.

25 You move on from looking at the energy use to the

1 incremental cost savings. And here's the right-hand column
2 is the TDV energy savings accrued over 30 years. You can
3 see that there's definitely an income stream. Climate
4 Zone 7 is the least benefitted by these changes. It's all
5 single family still.

6 And then here's looking at the benefit to cost
7 ratio. And the one that stands out is those mild Climate
8 Zones 6 and 7 but especially 7 in this slide where the
9 benefit to cost ratio is slightly less than 1. But there
10 is energy savings, it's just that it doesn't pass the
11 benefit to cost ratio of one. So that's single family.

12 When you look at it statewide, the benefit to
13 cost ratio statewide weighted value is 5.5. So there's
14 considerable room even if these products cost more that
15 they'd still be cost effective.

16 Multifamily, I saved you a lot of the details and
17 just skipped straight to the slide that shows the benefit
18 to cost ratio. And in that case, it shows that it's above
19 1 in all climate zones.

20 So some conclusions. It's a modest improvement
21 in window performance. We're capturing the product that's
22 already in wide use. This is the first time I can see that
23 we've touched opaque doors at least since 1983. So we're
24 looking at requiring swinging insulated doors.

25 Probably the biggest thing to note in summary is

1 the proposal even though it's slightly not cost effective
2 in Climate Zone 7, after testing this at the stakeholder
3 meetings, we went ahead and proposed that even in Climate
4 Zone 7, we move to these new numbers. And that's one when
5 you think about it, one of the reason -- one way that
6 products become successful is if the same product can work
7 in all climate zones, there's some market value to having
8 that product mass produced and available everywhere. So in
9 an effort to keep the standards a little bit simpler with a
10 few fewer specifications, we're recommending that Climate
11 Zone 7 also use the same window and door product.

12 Okay. On behalf of the Utilities Statewide Codes
13 and Standards Team, thanks for listening. A lot of the
14 information is at the title24stakeholders.com. I don't
15 have that beautiful picture of the Yosemite Valley floor.
16 Sorry. But I think what I heard today is written comments
17 on these proposals are due on June 16th. Did I get that
18 right? And my contact information is on the front page if
19 you'd like to talk to me about it.

20 Any questions? Looks like we have George.

21 MR. NESBITT: George Nesbitt, HERS rater.

22 First I'd like to start by saying thanks for the
23 change on Climate Zone 1, 3, 5, and 16. I think this is
24 actually a change in the right direction. Unfortunately,
25 there have been changes in the past on some things that

1 turned out to either not be a change or a change in the
2 wrong direction to -- to problems.

3 And just to sort of illustrate kind of the issue
4 is in Zone 3 say 2008 code, the prescriptive requirement
5 was no requirement for solar heat gain coefficient. Yet in
6 all the other climates, all the other nonheating climates,
7 the solar heat gain coefficient requirement was let's just
8 say for argument sake .4 at the moment. So I walk into
9 Truitt & White in Berkeley in Zone 3 wanting to get a quote
10 on window orders for a passive house and Marvin Windows has
11 a glazing option with let's say a solar heat gain
12 coefficient of .5 just for argument sake.

13 So they told me sorry, can't quote you, that
14 window's illegal in California. I look at them and say oh
15 really? That's interesting. And I had to tell them that
16 of course it wasn't illegal, Zone 3 had no requirement and
17 even in every other zone, even though it was a prescriptive
18 requirement with the performance method, you can do
19 whatever the heck you want. Back to my point earlier.

20 Just another sort of example of tax credit
21 project or rehab, essentially all they did was the windows.
22 So I showed compliance with the windows. They went from
23 aluminum, I believe an aluminum dual pane clear window to a
24 vinyl low solar heat gain coefficient. Well, we got their
25 minimum 10 percent TDV savings but of course this is a

1 project in Oakland with no cooling. Of course, you know,
2 increase the heating energy use. So, you know, this is a
3 place where TDV savings can actually mean increased energy
4 use.

5 So, you know, I think it's important when we're
6 analyzing code changes that we not just look at TDV even
7 though TDV may be the ultimate our only and ultimate metric
8 at the moment, I think we should actually look at actual
9 energy savings and do the cooling savings. Or in the case
10 of windows, it would be the increase in heating energy is
11 that more than the decrease and the cooling energy use?

12 So couple of other things on windows. The
13 default tables need work. There is no default for triple
14 pane windows. There's also what got dropped out was I
15 think in 2005 code, there was still sort of a solar heat
16 gain coefficient deduct for I think it actually
17 specifically said low-e. And so I think the default tables
18 need little more work, little expanding, triple pane. An
19 actual definition between clear and tinted, does low-e
20 qualify for the tinted? Because the issue goes back to
21 my -- essentially my tax credit project and also a lot of
22 existing building projects where you have to use a default
23 but that default may not reflect reality significantly and
24 where you may be generating large savings because of those
25 defaults being unrealistic versus what you are actually

1 realizing.

2 MR. BOZORGCHAMI: George, let me ask you a quick
3 question. Why would you need a default triple pane window
4 where someone who's installing a triple pane window is
5 going to get a better U-factor SHGC and wouldn't want to
6 take credit? I mean, that's a lot of cost to install a
7 triple pane window and not be able to take the compliance
8 credit for a window performance?

9 MR. NESBITT: Because a lot of the triple pane
10 windows are not necessarily NFRC rated yet and therefore --
11 and therefore, we are forced to use defaults. We're not
12 even getting a minimum credit for having a low-e value on a
13 triple pane window and what we're getting typically is then
14 a high solar heat gain coefficient that may not actually
15 meet the window.

16 But my point, it's one of these things that is
17 potentially something that good consultants -- good
18 consultants, let me take that word back. Manipulative
19 consultants can manipulate.

20 So and another sort of issue related to that
21 would be at what point is your window installed versus what
22 spec so far out of range, especially on the solar heat gain
23 coefficient, I think we can all agree a low-e value is
24 better. But at what point if your documents say you need a
25 .4 or less solar heat gain coefficient and you put in a

1 .25, you know, at what point is a window value no longer
2 valid.

3 And then, sort of a question clarification, I
4 know in someone's comments I think I saw would be I think
5 the language in the past and I would have believe it still
6 does and cleared that for your solar heat gain coefficient,
7 that exterior shading devices can come into play for that
8 requirement. So even if the window doesn't meet it but if
9 you have proper exterior shading, that that would allow it
10 to meet the requirement? Is that still true in the
11 prescriptive --

12 MR. NITTLER: There were no changes made to that
13 portion of the standard.

14 MR. NESBITT: Okay.

15 MR. NITTLER: Anybody else?

16 MR. HODGSON: Mike Hodgson, ConSol.

17 Ken, I just have a quick question about the mild
18 climate zones and the default currently in the ACM is .5
19 and you're proposing to take it down to .35?

20 MR. NITTLER: Yeah, but it's a minimum not a
21 maximum.

22 MR. HODGSON: Minimum. Okay. So if I'm trying
23 to model a high solar heat gain coefficient window that I
24 possibly buy in the northwest but bring it down into
25 California so maybe it's a .58 or something like that, then

1 there would be a larger compliance credit.

2 MR. NITTLER: There would be credit for that for
3 sure.

4 MR. HODGSON: Okay. All right. Thanks.

5 MR. NITTLER: Just to amplify that point. So a
6 couple of code cycles ago, we had .4 for the solar heat
7 gain coefficient but that was on the maximum side so it was
8 .4 or less. So the most logically complying product
9 probably was somewhat lower than .4 because of the
10 technology that's out there. When you flip it around and
11 you need to do that number or higher, we looked at sort of
12 the available flavors of these low-e codings and tried to
13 draw a line in the sand that would make it work across the
14 different operator types. So it really is the same product
15 as that .4 but because we're trying to look as a minimum or
16 higher, we needed to provide a little bit of room to make
17 sure that a whole family of glazed window products could
18 meet that criteria.

19 But it definitely gives credit for higher solar
20 if you go below the .35, obviously, and it's in a climate
21 that has no cooling, it starts to hurt compliance. It's
22 the middle of the road choice.

23 MS. NELSON: Hi, Ken. Again, my name is Nancy
24 Nelson with OAG Architects. I'll be brief, I know
25 everyone's ready for lunch.

1 But, Ken, I had a couple of concerns about what
2 you said about triple glazed windows. We recently did a
3 study on a production housing product in Manteca and it was
4 a smaller sized product but we talked to the window
5 manufacturer and they said triple glazed windows were
6 readily available that they're produced in large
7 quantities. Many states up north and Canada all are used
8 triple glazed windows as a standard and they said it
9 wouldn't be any problem to get them in our region. So that
10 was one issue.

11 And what we found the -- the increase in cost to
12 go from dual glaze to triple glaze was about 20, 25
13 percent. And these were smaller homes, but it ranged about
14 \$400 to \$600 per house. But when we ran the Title 24 on
15 it, the results were astonishing how much credit we got for
16 the triple glazed window, much better than even using the
17 solar tradeoff or other things where you get a lot of
18 points. That the dollar spent for the energy points
19 received was a phenomenal result.

20 So I do think this is something that production
21 builders could look at. It's a type of product, there's no
22 difference in insulation or assembly. The weight of the
23 product, that is something we have to look at. I mean,
24 even right now with an 8-foot 8050 slider in vinyl window,
25 there's some installation issues. We probably want to

1 avoid windows that are that size and also maybe carve out
2 the sliding glass doors. But there's tremendous energy
3 efficiency in the triple glaze windows that help our
4 performance. I mean, actual performance and Title 24
5 compliance. So I don't want to see anyone get discouraged
6 from thinking that these windows aren't available.

7 And a final thought, too, we didn't talk about
8 this with high performance walls, but installation with
9 siding over foam, we've had trouble with window flanges.
10 Legacy has now come out with an adjustable site window
11 flange and they have additional sizes that we seem to be
12 resolving some of the window issues with the flange sizes.

13 So I just wanted to put that out there because we
14 have -- we have explored this as an option for production
15 building and I don't think it's off the table looking at
16 the triple glazed windows.

17 So thank you very much for your presentation.

18 MR. NITTLER: Okay. And thank you for those
19 comments.

20 Let me just hit a couple of items. On the window
21 installation issues, that's really sort of under the wall,
22 a high performance wall issue, so I'm going to duck that
23 one.

24 UNIDENTIFIED SPEAKER: [Indiscernible]

25 UNIDENTIFIED SPEAKER: [Indiscernible] UAC.

1 MR. NITTLER: Different kind of ducks.

2 So on the triple glazing. Absolutely, there's
3 triple glazing out there. I disagree that it's in wide
4 use. The only area that has U-factors low enough right now
5 to require triple glazing is British Columbia and that's
6 only just really getting rolling. And the number one way
7 that they meet the criteria is by using a fourth surface
8 low-e rather than using triple glazing.

9 So absolutely you're right it's there. For our
10 builder friends, they certainly have a compliance option to
11 put a better window in and I agree that the energy savings
12 can be significant.

13 One thing -- another thing on triples is how you
14 get the right solar heat gain coefficient and whether
15 there's any issues related to looking at the window or
16 looking out the window with two highly reflective coatings
17 is an interesting issue.

18 And let me just say one final thing. You look at
19 this is what ENERGY STAR requires, this is the program that
20 went into effect January 1st, 2016, so a little over a year
21 ago. And that top left corner is windows in northern
22 climates. The U-factor that they chose, ENERGY STAR after
23 huge negotiations with the window industry was .27 which
24 can be generally be met with a dual glaze product or really
25 good dual glaze product or perhaps that inside surface low-

1 e coding. The window industry vigorously opposed making
2 triple glazing the standard. And so at least part of the
3 calculus here, you know, hinges on those facts. I think
4 it's a great compliance option, but I hear you that it's
5 possible. It wouldn't surprise me next code cycle to be
6 talking about that in more detail.

7 Anything online, R.J.? No? Okay.

8 Thank you very much.

9 MR. BOZORGCHAMI: So I guess this afternoon we'll
10 talk about water heating so we'll meet you back here at 1
11 o'clock.

12 Thank you.

13 (Off the record at 11:32 a.m.)

14 (On the record at 12:38 p.m.)

15 MR. BOZORGCHAMI: Good afternoon. We're going to
16 start with the --

17 (Pause in proceedings)

18 Sorry, we lost connection on our WebEx so we'll
19 try to get that back.

20 (Pause in proceedings)

21 MR. BOZORGCHAMI: We lost connection, and so
22 we're trying to get that back. R.J.'s trying to.

23 Well, so good afternoon, this is Payam again.
24 We're going to start with Danny presenting the water
25 heating protocol compliance option.

1 And I just wanted to let you know that as of now,
2 all but the windows case report is posted online. So you
3 can go ahead and grab them as you like.

4 MR. TAM: I'm Danny Tam from the Building
5 Center's Office, I'll be presenting the water heating
6 proposal for 2019.

7 First thing we're going to talk about is compact
8 hot water distribution design. I'd like to thank Mark
9 Hoeschele and Peter Grant, they're the primary case author
10 for this proposal and of course the Statewide Case Team as
11 well.

12 So here's a diagram of a hot water energy flow
13 diagram of a hot water system. So before you get to
14 Number 3, the actual hot water, the fixture, you have, you
15 know, some standby losses, some losses in the water heater
16 efficiency. And you have distribution losses at Number 2.
17 Typically distribution loss about 30 percent of your entire
18 hot water use.

19 So for 2016 we moved to an instantaneous water
20 heaters to prescriptive standards so that greatly reduce
21 the standby loss. Also for the new cycle, the plumbing
22 code require pipe insulation in all hot water pipes so that
23 reduced the distribution loss slightly. And having lower
24 flow shower head and fixture, that reduce Number 3. So for
25 2019 this proposal we'll focus on further reducing

1 distribution loss.

2 So the problem is right now typically plumbing
3 design, you know, nonexistent, it's basically afterthought.
4 PEX piping is very easy to install but that also leads to,
5 you know, larger than needed plumbing designs. So impact
6 of lower flow devices is that, you know, given the same
7 plumbing distribution design, having a lower flow shower
8 head, you actually increase your wait time.

9 So recirculation system is a partial solution,
10 you definitely save a lot of water but having a
11 recirculation system in larger than needed distribution,
12 you still get a lot of energy loss in the system.

13 So what is some of the advantage of a compact
14 distribution system compared to a conventional system? So
15 any hot water sitting in the distribution, you've got
16 experience some losses. Even with, you know, pipe
17 insulation, eventually that energy could be lost.

18 Okay. So having a more compact system can reduce
19 the energy loss. Also when the water is cold you need to,
20 you know, flush that cold water before you get the hot
21 water. So having a more compact system you've got reduce
22 that wasted water. So you reduce them both and you also
23 happen to reduce away time.

24 So Mazi here, he's enjoying his compact system.
25 He's, you know, very happy.

1 UNIDENTIFIED SPEAKER: You can't even see that.

2 MR. TAM: So we all want to be like Mazi. So.

3 UNIDENTIFIED SPEAKER: I want to hear the song.

4 UNIDENTIFIED SPEAKER: No, you don't.

5 MR. TAM: So here's a typical plumbing
6 distribution layout. The use point [indiscernible]
7 randomly scattered throughout the house. In this case, the
8 water heater is okay on the outside wall, you know, very
9 far from the use points. In my house, it's even worse than
10 this, my water heater is down here so it's absolutely the
11 furthest point where you want to put the water heater.

12 So more compact layout would be can move the
13 water heater closer to center location of the garage.
14 Another way you can do it if you can install the water
15 heater located outside close to one of these use point. Or
16 sample the master bathroom here or the kitchen. Can also
17 build an interior closet to put the water heater in.

18 So the goal of this measure is to encourage
19 builders to start thinking about plumbing design from the
20 beginning and not as an afterthought. So the main focus is
21 going to be the distance from the water heater to the
22 master bedroom and kitchen because they're the largest
23 number of eventual use points.

24 So some relevant code history. Currently in 2016
25 code, there's the HERS verified compact distribution

1 credit. However, we think there's close to zero uptake and
2 we hope, you know, to change that with this new proposal.

3 Some other relevant specification, EPA water spec
4 is .5 gallon between hot water source and fixture. They
5 consider hot water -- distribution line as part of the hot
6 water source. So if you have a recirculation line, that's
7 considered a hot water source. So that saves a lot of
8 water but, you know, like we said before, there's still
9 energy loss in the system. And CALGreen, and I know they
10 have their own spec but not whole lot of uptake so we hope
11 to change that.

12 So the proposed change for update the existing
13 compliance option and they will apply to a newly
14 constructed building for single family. We're proposing to
15 have a two-tier credit versus the current HERS credit. So
16 we have a basic more simple credit that doesn't require
17 HERS verification, and expanded credit with some limited
18 HERS verification.

19 So summary, there's no changes in the mandatory
20 prescriptive at the [indiscernible] alteration requirement.
21 Under RA there's going to be some modification to
22 accommodate the new two-tier credit. And we're proposing
23 to make some small modification to hot water calculation.
24 We want to introduce a new term called a compactness
25 factor.

1 So why are we proposing this? We want more
2 option for builders to achieve, you know, compliance and
3 hit their ETR target and of course achieve energy and water
4 savings. And we think it's going to be a win-win for
5 homeowners and builders. I think one of the biggest
6 complaint is the amount of time it takes to get, you know,
7 the hot water to where you're using it.

8 So with more compact system, there's going to be
9 less waste -- less wait time, less waste, less energy use.
10 And for the builders, you're going to get, you know, less
11 complaints.

12 So again, it's a two-tier credit. It's got to be
13 based on a plan view calculation. We've got to be
14 comparing two things we call weighted distance and
15 qualification distance. And those two terms is going to
16 vary based on whether it's a recirculation system or not,
17 number of stories, the condition floor area. And this
18 compactness factor, default for noncompact system will be
19 one. So if you qualify for the basic credit, it's going to
20 be a .7. And for the expanded credit, it's going to be
21 less than .7.

22 So this is the weight, distance equation. We've
23 got to measuring the distance of the master bathroom,
24 kitchen, and the furthest fixture. You know, we give the
25 greatest weight to the master bedroom and kitchen for

1 noncirculating system, 40 percent both. And for
2 recirculation system is 100 percent to the first fixture.

3 So the qualification distance should be
4 automatically calculated by the software but here's an
5 example how that was derive. And this sample is a one-
6 story nonrecirc house. So the black dots are on the survey
7 houses with water heater located on the exterior wall. The
8 green dots are water heater in a more central location. So
9 you see this qualification line, I think the goal was to
10 have 75 percent of the exterior mounted houses to not
11 qualify for this credit and have 75 percent of the more
12 central located house to qualify for this credit. If that
13 makes sense. So somewhere in between the two, more closer
14 to the central system.

15 So if you calculated weighted distance less than
16 the qualification distance, then you qualify for the
17 credit. So for the expanded credit it's -- you meet the
18 same requirement as the basic credit plus you have HERS
19 rater verify that you have less than 8 feet of 1-inch pipe
20 and there's no hot water pipe in the attic for two- and
21 three-story buildings. And if it's a recirculation system,
22 it has to be a demand recirc with manual control. So if
23 you meet these both, you can have your compactness factor
24 further reduced, so we'll go for that right now.

25 So for this house, it's a two-story house, the

1 master bath is located on the second floor. The furthest
2 fixture is also located on the second floor. So those
3 points will be superimposed on the first floor. And you
4 draw the direct distance to those three points to the water
5 heater. So it's a little hard to see, but the calculated
6 weight at distance in this case is 30.9 feet and the
7 qualification is 23.2. So in this case, this house does
8 not qualify for the basic credit.

9 So for the exact same house, if you move the
10 water heater closer to more central location, you notice
11 the furthest use point is now on the first floor bathroom.
12 So in this case, the weighted distance is 13.1, it's less
13 than the qualification distance so it meets the basic
14 credit.

15 Okay. So what happens if you have a HERS rater
16 come verify? So the exact same house, they verify that
17 there's less than 8 feet of 1-inch pipe, there's no pipe in
18 the attic. So the new compactness factor is calculated at
19 3.53, so that's further reduced from .7 of the basic
20 credit.

21 Some barriers. There's got to be some increase
22 cost in the vent and labor for, you know, having the
23 water -- the gas water heater further, you know, to be in
24 more central location. Potentially impact garage space as
25 well. We think one of the solution can be that you can --

1 if you use the condensing water heater, you don't have to
2 use the more expensive, you know, stainless steel pipe, you
3 can use plastic pipe. So we think the cost saving from
4 that will actually offset the cost of using condensing
5 water heater. So in that case, you not only get the credit
6 from compact, you also get the credit from condensing water
7 heater.

8 Another possible solution, you can put the water
9 heater on the outside. You come out directly on the
10 outside or you can put it on the exterior closet like this.
11 So you mount it next to the kitchen or the master bath.

12 Another solution, people might not like this, you
13 can put it in the garage. Another thing you can do with
14 heat pump water heaters, it's more flexible where you
15 locate it in the garage. You can move it closer, you can
16 put it in an interior closet.

17 So as with any compliance credit we need, you
18 know, very good communication between the Title 24
19 consultant, the builders, and the plumbers. Plumbers need
20 clear direction what they're doing. And of course we need
21 additional training for the plumbers.

22 For expanded credit. It's going to be additional
23 labor cost if you have to put the pipe between the floors.
24 But you can always default to the basic credit if you don't
25 want to go through that.

1 So the architecture provide or to calculate the
2 weighted distance on the floor plan and for the expanded
3 credit, you've got to make sure it's clearly specified on
4 the plans. So the plan review verify the weight, the
5 distance, qualifications met. So for the basic credit, you
6 know, this is all you need to do, the plan reviewer
7 verifies it and that's it. If you want expanded credit,
8 then you have a HERS rater verify those three conditions.
9 Again, is less than 8 feet of 1-inch pipe, no pipe in the
10 attic, and has to be a demand recirc with manual control
11 system, if it's a recirculation system.

12 So for energy impact, the baseline condition is a
13 minimum we comply in 2016 house. We looked at varying
14 square footage and we assume all hot water pipe is
15 insulated. And for the proposed condition, it's the same
16 house using a compact distribution design. So for this
17 example, a 2430 square feet single family house, we expect
18 therm savings of about 5 to 6 therms per year and about
19 1,000 kilo BTU per year.

20 Here's a graph savings based on square footage.
21 Of course larger house get larger savings because flow is
22 bigger. The estimated water savings more difficult because
23 it's highly dependent on user behavior. So the case team
24 look at this building America report and they estimated for
25 2,000 square feet house, we should get water savings about

1 1,000 gallons per year.

2 Okay. So that's it for compact distribution.

3 Any questions?

4 MR. RAYMER: Yeah. Bob Raymer, CBIA. I'm
5 assuming this is a no-brainer, but when you said no
6 plumbing in the attic, you meant no hot water plumbing,
7 right?

8 MR. TAM: Yes.

9 MR. RAYMER: Okay. Thanks.

10 MR. KLEIN: This is for questions, not comments
11 or both?

12 MR. TAM: Whatever you want, Gary.

13 MR. KLEIN: I just want to know where we're at in
14 the process.

15 Okay. So it's Gary Klein with Gary Klein
16 Associates. A couple of things I see in the proposal. The
17 plumbing code currently has rules in it for pipe sizing.
18 Now admittedly there are issues with pipe sizing and the
19 plumbing code is starting to figure out how to address it.
20 But if there's a certain number of fixture units between
21 Point A and Point B, they will tell you whether or not you
22 need 1-inch pipe or $\frac{3}{4}$ -inch pipe, or $1\frac{1}{2}$ -inch pipe. Okay.
23 Now in most single family dwellings, one and a half is way
24 too big, but the plumbing code currently governs pipe size
25 not the energy code. So putting in a stipulation that

1 limits the length of 1-inch pipe, may not work in
2 accordance with the plumbing code. And that will cause
3 everybody a great deal of stress when it comes time to
4 build the building.

5 It's unclear to me why one needs to limit the
6 feed of 1-inch pipe on a dist -- on a circulation loop. I
7 understand why we don't want lots of water in the plumbing
8 system, I get that point. But if you tell me it's only
9 8 feet and I need ten feet to get to the branch point where
10 I lose the fixture units, the code says I've got to put the
11 ten feet in. And we don't need a debate between the energy
12 code and the plumbing code when it gets to the inspection,
13 that's way too late in the process. So that issue, I
14 think, needs to be addressed.

15 The other thing that I think is interesting in
16 the proposal is that the -- the feet of pipe between the
17 water heater and the fixture is essentially a random
18 number, it's wherever people put it. And I don't want to
19 control where people put plumbing fixtures. Okay. If I
20 tried to do that, you'd all kill me, right? Pretty
21 straightforward.

22 UNIDENTIFIED SPEAKER: No, we would not kill you.

23 MR. KLEIN: No? No? Worse. Worse. Okay. I
24 get it.

25 The point is that it's, look, it's not

1 appropriate to do that, but it is appropriate to think
2 about how to best plumb things. And the customer doesn't
3 care about feet of pipe. You all know this. I've been
4 interviewing people about hot water use for 20-something
5 years, talked to over 50,000 people and they all tell me
6 they want hot water to show up quickly. And that's what
7 compact means to consumers. So the real question I think
8 we actually have to ask is how long do we want people to
9 wait for hot water to arrive? Pick a number. Do we mean
10 ten seconds? Do we mean five seconds? Do we mean 30
11 seconds?

12 If you could bring back one of the slides with
13 the feet of pipe on it, please, I'll use an example to
14 explain what it's going to mean. Yeah. One of those.
15 That's a good one.

16 Okay. So the distance is on the order of 30
17 feet. Everyone okay with that approximation? Plus
18 vertical. Okay. So the first thing is that there's --
19 this one goes 30 -- less than 30 feet to almost 35 feet.
20 Those extra five feet don't change time much, it's
21 proportional to the volume and the pipe. But let's assume
22 that each of these branches would end up being a half-inch
23 branch. And I think that's probable in the plumbing code
24 with the exception of the master bath suite which might say
25 we need to put $\frac{3}{4}$ -inch pipe.

1 Okay. We'll assume that all cases in this
2 example are 30 feet just to make the math simple of
3 horizontal length. But we have to count vertical length.
4 And to be simple about it, we're just going to add 10 feet.
5 It could vary from 10 feet to 15 or 20 feet, depending on
6 if you're going up and down and back again or just up.
7 But -- so we'll just add ten feet so it's 40 feet. Forty
8 feet of $\frac{3}{4}$ -inch copper pipe is equal to a gallon of water.

9 Forty feet of $\frac{3}{4}$ -inch PEX pipe is equal to $\frac{4}{5}$ of
10 a gallon of water, .8. Call it about a gallon. Don't get
11 hung up on the exact math because all these numbers move.
12 Right?

13 So if there's about a gallon of water in the
14 pipe, our research that was funded by the Energy Commission
15 shows clearly that it takes one and a half to two and a
16 half times that volume before hot water comes out other
17 end, whether it's insulated or not. First draw, that's
18 what it takes. Okay? So if there's a gallon in the pipe,
19 approximately, it's going to take roughly two gallons till
20 hot water gets there. And if showers are operating at
21 around two gallons a minute, that means it's going to take
22 a minute for hot water to get there when the distance is
23 about 30 feet.

24 I'm going to tell you that customers don't think
25 a minute is satisfactory. So let's imagine we now have

1 half-inch pipe, well the numbers are roughly cut in half.
2 So it's going to take 30 seconds for hot water to arrive.
3 Again, I'm not convinced the customers want that. What
4 customers have told me consistently, three to five seconds
5 they want hot water to arrive. Now I'm going to tell you
6 that's hard to build. Ten to 15 seconds is buildable
7 without having to make any changes to the plumbing code.
8 Okay. And what customers will be -- if we can deliver hot
9 water within 10 to 15 seconds every time someone turns on a
10 tap, they will be -- they will perceive that hot water is
11 meeting their need -- the service is meeting their need of
12 arriving quickly.

13 What we're enabling to do in this proposal is to
14 say some fixtures will arrive in 15, 20 seconds, others
15 will arrive in a minute, minute and a half and all of those
16 are considered acceptable. Customers won't see that. They
17 will complain because there's a big difference between the
18 short ones and the long ones. Okay, yeah, it's better than
19 the last house because which took four minutes, but that's
20 not what they're buying, they're buying a future house.

21 One last point. The plumbing is going to be put
22 in, it's going to last there for 50 to 100 years. This
23 decision we're making is not a decision that gets changed
24 out when the thing breaks in 10 or 15 or 20 years. It's
25 going to be there effectively for the life of the building.

1 So I think we have to revisit it and look much more
2 carefully at the time to tap question. Which right now the
3 allowance is effectively a random event and that will drive
4 consumers nuts.

5 Thank you.

6 MR. HOESCHELE: Mark Hoeschele, Statewide Utility
7 Codes and the Standards Team.

8 To respond to some of Gary's comments, the -- I
9 mean, the basic premise of this is the energy focus and,
10 you know, realizing wait time is an issue that's out there.
11 You know, what we're striving to do is to reduce the
12 footprint of where the plumbing is going to exist and by
13 doing that we're going to -- with an emphasis on the master
14 bath suite and the kitchen that predominant satisfaction
15 use points in the house.

16 I mean, as you point out, different -- other use
17 points will be affected differently but, you know, we
18 wanted to constrain the size of plumbing systems where they
19 are now and, you know, move in a positive direction.

20 Regarding the eight-foot length requirement. You
21 know, the thinking, we talked to several plumbing designers
22 and the thinking there was even though the plumbing code
23 may require, you know, depending how the fixture units and
24 the layout of the plumbing may require more than 8 feet of
25 1-inch pipe, there's always the option of branching that

1 close to the water heater. And so that was -- that was the
2 thinking with this approach. We want to minimize the
3 larger diameter piping which is the primary contributor to
4 the wait time issue.

5 In all insulated piping, the first draw's always
6 the problem. But all insulated piping will, you know,
7 improve clustered draw event performance. And overall on
8 the wait time issue, you know, the recirculation systems
9 are still have a place in this methodology. So that's
10 always an option available to the builder, you know, if
11 that's the issue that, you know, they feel they want to
12 resolve.

13 MR. STONE: Nehemiah Stone, Stone Energy. I have
14 two questions.

15 One, I was happy to see that you included the
16 cost of the extra vent for moving the gas water heater in
17 the middle. But there's -- and the comments I made on
18 the -- at the last workshop, there's a -- there's a large
19 cost of natural gas infrastructure if you don't have
20 natural -- you know, compared to not having natural gas in
21 your buildings. And I think when you're looking at things
22 like this and what the cost is of doing it one way versus
23 the other, you should include the cost of bringing natural
24 gas down the street or if that's already there, at least
25 bringing the tie from the street to the house, installing

1 the meter, putting gas piping through the house. That will
2 show the heat pump water heater to be a more cost effective
3 option.

4 So the question is: Did you include those costs
5 or not? And I don't know if I'm asking Mark or Danny or?

6 MR. HOESCHELE: Yeah, well, I'll answer.

7 I mean, you know, since we didn't deal with
8 anything specific to the -- the water heating system itself
9 so whether gas or electric heat pumps, those costs weren't
10 factored in. I mean, tankless is the predominate solution
11 in new homes. Not that in the future that may change, but
12 for this proposal, we didn't address any -- as a compliance
13 option, we didn't address any cost issues per se.

14 MR. STONE: All right. Well, I'd like to
15 recommend that we do include that on any -- anything where
16 we're looking at the differences between, you know, gas
17 water heater and electric water heater, whether it's just
18 we replace it or anything else.

19 Second question: It seems to me that this
20 proposal would work equally well when we're talking about
21 the interior space of a multifamily building as it is for a
22 single family. And you started off, Danny, by saying it
23 applies to single family only. And so my question is why
24 are we not applying it to multifamily?

25 MR. HOESCHELE: Well, also the thinking there was

1 a with insulated pipe requirements and the small size of
2 multifamily units that, you know, there wasn't -- you know,
3 there wasn't a lot of the value of the savings and the, you
4 know, the uncertainty when you're dealing with smaller
5 units and use patterns which are so highly variable that we
6 didn't think it was worth the --

7 MR. STONE: Mark, I'm not talking about the
8 central system, I'm talking about the piping just within
9 the apartments.

10 MR. HOESCHELE: Right. No, I'm talking --

11 MR. STONE: So the use patterns would be not
12 that -- are you saying that --

13 MR. HOESCHELE: Well, I'm saying the more --

14 MR. STONE: -- that use patterns would be
15 different than single family?

16 MR. HOESCHELE: The more compact multifamily
17 units, you know, typical sizes -- you know, that's a six
18 to -- I don't know exact sizes, but they're much smaller,
19 the plumbing is already more compact, and you know, we just
20 in our assessment, you know, we felt the yield and the
21 value wasn't -- wasn't worth pursuing that. And if there's
22 other -- I mean --

23 MR. STONE: So you did look at --

24 MR. HOESCHELE: -- reconsider that.

25 MR. STONE: So you did look at the cost or did

1 you just assumed it wasn't going to be [indiscernible] --

2 MR. HOESCHELE: Well, you know, the --

3 MR. STONE: -- you didn't look. I'm not sure.

4 MR. HOESCHELE: -- the graph that Danny showed
5 with energy savings, you know, we did -- we did go down to
6 -- we did go down below 1,000 square feet and, you know,
7 run -- the way the hot water model works in CBECC, it's
8 tied to number of bedrooms, the hot water usage, and that's
9 why the loads and the benefits are diminishing in this
10 graph.

11 So we're looking at, you know, for typical
12 multifamily units savings of, you know, under 2 therms.
13 You know, it -- certainly we could revisit if there's a
14 desire to look at multifamily. But we thought, you know,
15 it wasn't --

16 MR. STONE: I'd like to recommend you do revisit
17 it. The thing is, the average size for multifamily, yes,
18 it's down below 1,000. But it's a Bell Curve and there's
19 an awful lot that are over 1200 square feet. And at 1200
20 square feet, you're at about 3 therms, so. If it's worth
21 it to do it for homes that are -- what? About 1200 square
22 feet, then it's certainly worth it for multifamily. It's
23 the same.

24 MR. HOESCHELE: Yeah, and we could solve that by
25 just making it a -- I mean, a size criteria or something

1 like that.

2 MR. STONE: Thank you.

3 MR. KLEIN: So Gary Klein, Gary Klein and
4 Associates.

5 To support Nehemiah's point. I would observe
6 that the plumbing can't read, it doesn't know what
7 occupancy it's in and length is length and volume is
8 volume.

9 I can show you 5,000-square-foot houses with
10 better plumbing than 2,000-square-foot houses. Has nothing
11 to do with the size of the home. You have a choice of
12 where things get put and it's that choice of layout that
13 drives the distances.

14 So I think that we should look at as a size
15 criteria. If it's smaller, it's got fewer feet so the
16 marginal cost of improvement is less. The benefit's still
17 probably there. And I think that it's absolutely worth
18 doing that way. I would observe that it doesn't matter, by
19 the way, whether there's a single branch coming off of a
20 central system or there's a water heater in that same
21 point. Length is length and volume is volume. And if that
22 length is 30 or 40 feet, it doesn't matter how big the unit
23 is. Right? It doesn't make any difference. You'll still
24 have the same benefit by making the compactness more
25 compact. And so I think that that needs to be considered.

1 MR. NESBITT: George Nesbitt, HERS rater.

2 I'll probably add more philosophy in what I say.
3 So, you know, we often talk about compliance uptake. So
4 there's several things that can be going on. Either no
5 one's taking the credit because no one's doing it or
6 they're doing it but they're not taking the credit because
7 it's not worth it because they don't need it. Because it's
8 too small or the cost involved of meeting the credit and
9 taking it is too much.

10 So as Gary pointed out, you know, plumbing --
11 plumbing is essentially the life of the building. Maybe
12 not quite the life of the building. But the thing is we no
13 longer build crawlspaces and attics. A house with a
14 crawlspace and an attic, you can always go in and add
15 things, subtract things, alter things. But we build slab
16 on grade, more and more people build cathedral ceilings,
17 whether they have vented or sealed attics under them or
18 not. The point is that the plumbing is buried in the walls
19 and the floors and it's not easy or inexpensive to change.
20 So if we don't get it right, it's wrong for a long time.

21 And remember the -- you know, you can show a
22 plan and say well, a compact layout is if this horizontal
23 line is less than X feet, well, remember the plumbing is
24 not -- it never takes that shortest path. It goes up, it
25 goes horizontal one direction before it goes horizontal

1 another direction. You know, and then in multifamily, you
2 have some apartments that are three stories tall. And I've
3 worked on projects where they had individual water heaters
4 but the thing is they put them into a central mechanic --
5 mechanical room. So you could have had a compact layout
6 but you don't now because they sort of centralized the
7 equipment.

8 So I guess my point is what we care about is
9 water and energy savings. And from the code perspective, I
10 think what we really want to do is penalize the people
11 doing the wrong thing. Not doing the layout, putting in
12 too long of pipes, too big of pipes, wasting water, wasting
13 the time. And we want to incentivize people doing the
14 right thing, saving the energy and the water. So either we
15 need to -- we need to make our assumptions for your lack of
16 design a larger penalty to start with which may actually
17 reflect a little bit more reality. And then any credits we
18 give actually have to achieve water and energy savings. So
19 honestly this compact design proposal is not a compact
20 design.

21 So we're saying we're going to give you credit
22 for doing a bad job. So if we're going to give credit,
23 have it truly be a compact design and that's if there's no
24 recirc pump, it has to really minimize the length and
25 diameter of pipe or it has to be a recirc loop with a limit

1 on the branch runouts. The code isn't completely with us
2 as Gary says on sizing always. Unfortunately, we have
3 those limits and those things do need to be changed too.
4 So let's try to send the right signal.

5 MR. RAYMER: Thank you. Bob Raymer with CBIA. I
6 had intended to testify on water but a couple of comments
7 were made that I'd like to respond to.

8 First off in general, we strongly support what
9 the CEC is doing here. This design option, the goal is to
10 reduce the length of travel and that's a good idea for
11 domestic hot water.

12 And I also agree with some of the comments that
13 Gary made. There are instances where this could sort of
14 come up to conflict with the Uniform Plumbing Code and
15 ACM's adoption of that in part by the California Plumbing
16 Code, that's how that materializes here in California. But
17 there's any number of ways that either the CEC or HCD or
18 together you could figure out ways to avoid comments -- or
19 conflict. You could effectively come up with something
20 that says 8 feet unless otherwise required by the CPC, et
21 cetera, et cetera. So we definitely like you going forward
22 with this proposal.

23 In response to a comment that Nehemiah's made
24 today and earlier, I definitely get where he's coming from
25 and infrastructure cost are certainly appropriate in

1 certain instances but there's a couple of things you need
2 to understand here. Our electric and gas line extension
3 rules are governed by the PUC codes, namely Rules 15, 15.1,
4 and 16. And utility line extensions can, you know, for the
5 last 30 years they can be designed by the utility, they can
6 be designed by what they call the applicant, that's a fancy
7 word for the builder's consultant. So in essence, it can
8 be designed by the utility or the private sector. It can
9 also be installed by the utility or the private sector.

10 And therein lies some issues that's going to
11 make it very difficult for the case or a case group or the
12 CEC to come up with a way of identifying infrastructure
13 cost because these design costs and installation costs are
14 all over the board. Whether it be for electric line
15 extension or gas line extensions, we tried back in the
16 1990s to get a very specific idea here. And man, depending
17 to the project and which utility these costs for both
18 design and installation are all over the board. The one
19 thing we could uniformly find is it doesn't seem to be any
20 uniformity in all of this. And so not only are cost all
21 over the board, you've also got to consider the fact that
22 for all new homes, the vast majority have three to four gas
23 usages not just domestic hot water.

24 So once again, I get where Nehemiah is coming
25 from in terms of let's consider all the relevant cost, but

1 it's going to be an enormous undertaking to try to get an
2 accurate handle on what the gas infra -- or the gas for
3 domestic hot water infrastructure cost would be.

4 And so with that, that's our comments. Once
5 again, we like where you're heading with this and there's
6 certainly ways of working with HCD and CALBO. We can make
7 sure we don't have conflicts in the code. That's something
8 that BSC would be looking for way down the road and there's
9 certainly ways to resolve that.

10 Thank you.

11 MR. TAM: I just want to add we know this is not
12 the be all end all plumbing design, we know there's lot of
13 room for improvement. So the problem with the current
14 existing credits it's too complicated, it require actual
15 measurement of the pipe length. And, you know, no one's
16 doing it. So that's why we're proposing this is more
17 simple. I mean, we know there's more improvement to be
18 had. But. So, that's all I have.

19 Next, we're going to go into drain water heat
20 recovery. Oh, okay.

21 MR. WICHERT: Were going to go to the online
22 questions now.

23 Frank, I'm going to unmute you now.

24 MR. STANONIK: Yeah.

25 MR. WICHERT: Frank.

1 MR. STANONIK: Can you hear me?

2 MR. WICHERT: Yes, we can.

3 MR. STANONIK: All right. So in one of the
4 slides, you mentioned --

5 UNIDENTIFIED SPEAKER: Identify yourself, please.

6 MR. STANONIK: Oh, I'm sorry. Frank Stanonik
7 with AHRI.

8 You mentioned that the cost of going to a
9 condensing tankless product might be offset by the fact you
10 could use cheaper vent material. Did you actually run the
11 numbers or is that at the moment just an estimate?

12 MR. HOESCHELE: This is Mark Hoeschele.

13 So that was a discussion with a few plumbing
14 contractors and designers that we talked to in the process.

15 MR. STANONIK: Okay. So it's an estimate.

16 MR. HOESCHELE: Yes.

17 MR. STANONIK: Okay. Thanks.

18 MR. WICHERT: We have one more question online.
19 This is from Kelly Murphy.

20 I believe that the normal warranties for
21 traditional water heaters is void if the water heater is
22 installed outside the home. Are we confident that
23 instantaneous are warrantied -- or would be warrantied
24 given a waterproof enclosure?

25 MR. TAM: Yeah, we're talking about instantaneous

1 water heater. Some of them are designed to be mounted on
2 the outside. So that's what we're talking about.

3 Okay. We're going to go into drain water heat
4 recovery device. Like to thank Mark Esser and Bo White,
5 they're the primary case author for this proposal. And
6 also Peter Grant did a lot of work in the Phase I of this
7 project.

8 So brief introduction. Drain water heat recovery
9 is a device that capture heat from wastewater typically
10 from a shower and use that heat to preheat cold water
11 coming in. So there's two different configuration. So the
12 one on the left is called Equal Flow. So cold water come
13 in, gets preheated by the wastewater. It goes into both
14 into the water heater and to the shower. Okay.

15 And in the center is an Equal Flow to the water
16 heater so the preheated water only goes to the water
17 heater. And on the right is an Equal Flow to the shower so
18 only goes to the shower. Typically the Equal Flow
19 configuration is the most efficient configuration.

20 So it's not currently in Title 24, Part 6. Some
21 other relevant code requirement, CSA 51.1 and .2, those are
22 the Canadian standard that deals with drain water heat
23 recovery devices. They've been installing them in Canada
24 for quite a while, in fact province of Ontario and Manitoba
25 actually is in their building code as a prescriptive

1 requirement.

2 Okay. And IAPMO PS 92 and the plumbing code
3 Appendix L those are code that deals with drain water heat
4 recovery devices mostly health and safety and accessibility
5 requirement.

6 Senate Bill 7 is a new requirement for
7 multifamily that each dwelling needs a water meter. Okay.
8 There's a new IAPMO standard that's in draft form that
9 deals with both vertical devices and horizontal devices.
10 So we'll talk about that.

11 So the proposed code change we're proposing at
12 drain water heat recovery as a compliance option. It will
13 be applied to localized residential devices both single
14 family and multifamily. They're in IACC and RESNET
15 already. We're proposing to have some slight modification
16 based on the research that we've done to equations.

17 So summary, no changes to the mandatory addition
18 alteration requirement. For prescriptive, we're proposing
19 to add a prescriptive alternative to central system. So
20 we're not changing the primary requirement, we're proposing
21 we add an alternative if you install one of these devices,
22 you can reduce the solar fraction requirement.

23 Okay. Under the RA, we'll add some new sections
24 to add this credit. And in the water heating calculation
25 in the reference manual, we'll add some updates to the hot

1 water consumption and cold water temperature equations.

2 So kind of the same reason for the compact, we
3 want more options for builders to hit -- to hit their
4 compliance and EDR target and possibly hit some significant
5 energy savings.

6 Some technical barriers. We found that for
7 vertical units, if you install it at an angle, can have
8 some degradation in performance. So we're proposing to
9 require for vertical units to no more than five percent
10 tilt. That's similar to the Canadian codes. So of course
11 it's a new, you know, device, we're going to need more
12 additional training for plumbers.

13 So there are horizontal drain water heat recovery
14 device out there. Here's one example from Ecodrain. So
15 one of the barriers that the Canadian standard does not
16 currently address horizontal units. The proposed IAPMO
17 code does but because we cannot adopt draft standards so
18 that's -- so that's something we're in discussion with the
19 manufacturer. We hope to eventually incorporate that into
20 Part 6.

21 So architect designer will incorporate drain
22 water heat recovery in their design. So the second point
23 I'm going to tell about in the next slide. We're proposing
24 to have a central listing of drain water heat recovery
25 devices that someone can easily look up. And the designer

1 would choose one of those devices in their design. So plan
2 reviewer which is reviews the plan to make sure they match
3 the CF1R. And HERS rater will visually verify the system,
4 make sure the install product match the plans. They also
5 make sure the product is one of the ones on the listing.

6 So if you go to our main page, there's a link for
7 requirements for manufacturers, certified equipment
8 products, and devices. So these are the devices that have
9 Title 24, Part 6 requirement but they don't fall under
10 Title 20 so our office keep a separate listing. So you see
11 some of the examples that's currently there. So we're
12 proposing to add drain water heat recovery as a new device
13 here. Here's the example of what the low leakage air
14 handling unit looks like. It's pretty simple process.
15 Manufacturers submit the units to us with their efficiency
16 rating. So we review and verify and once we do that, then
17 we update our master listing which is down here.

18 Okay. Some compliance enforcement barriers.
19 Again, it's relatively new to the market so we require
20 additional training for building departments and HERS
21 raters. And again as with any compliance option, we need
22 good coordination between Title 24 consultant, the
23 builders, and the plumbers.

24 Accessibility, we heard there's about 100,000 of
25 these devices been installed in Canada. Reports of

1 failures are pretty negligible. Currently the Canadian
2 code does not require these built with accessibility so
3 we're proposing to do the same. I mean, it would be a good
4 thing to do but we're not going to require it in Part 6.

5 Okay. Mentioned Senate Bill 7 earlier as the new
6 requirement for submetering for multifamily buildings.
7 There's some exceptions for low income housing, elderly
8 residential care, student housing, and timeshare. So that
9 potentially can add some complication in how you run the
10 plumbing lines. So we think it's still doable for adding
11 additional water meter but if the configuration of the
12 building require you to add extra water meter, that might
13 potentially modify the cost savings.

14 In our analysis, the baseline, we look at two-
15 story, 2700 square feet prototype house and 6960
16 multifamily house for all 16 climate zones. And the
17 proposed condition, it's 46.6 Canadian rated effectiveness
18 device. So for single family, we assume the -- all the
19 fixture on the second floor shower will be connected to a
20 single device in an Equal Flow configuration. And for the
21 multifamily configure, we assume all fixture on the second
22 floor will flow to one device. And for our analysis, we
23 didn't assume extra water meter.

24 So here's what the prototype building looks like.
25 For single family, you have the two showers on the second

1 floor, so they both flow to the drain water heat recovery
2 device here. It's right here on the first floor. Cold
3 water comes in, go through the device, gets preheated and
4 goes to the upper floor showers and to the water heater and
5 Equal Flow configuration.

6 So for multifamily, we assume each of the four
7 units will share one device. So four showers flow to a
8 single drain water heat recovery device. And it'll preheat
9 the showers on the upper floor.

10 So some cost savings, TDV savings for 16 climate
11 zones. And therm savings.

12 Okay. So this shows the savings for all 16
13 climate zones and various number of bedroom and
14 multifamily. The green is where you get the most savings.
15 So you can see works very well in the colder climates just
16 as we predicted. Also, in Climate Zone 15 it doesn't work
17 as well because, you know, the incoming cold water is
18 already pretty warm. Also we said the Equal Flow
19 configuration is the most efficient, you get the most
20 savings from that configuration. And an Equal Flow to the
21 shower, you get the least savings.

22 Okay. Just the ratio of an Equal -- Equal Flow.
23 Like we said, Equal Flow has the maximum amount of saving.
24 However, if you have an Equal Flow configuration to the
25 water heater, you actually get most of the savings, about

1 92 percent compared to Equal Flow. And if you have Equal
2 Flow to the shower, you only get about 70 percent.

3 All right. That's it. So we'll open up for
4 questions.

5 MR. STONE: Nehemiah Stone, Stone Energy.

6 I was involved in the initial scoping of this
7 measure back in 2015. And at that time, we were -- we were
8 not to my recollection, we were not separating high-rise
9 versus low-rise multifamily because the savings, you
10 know -- can you go back a couple of slides? That one.

11 See, what you notice there is a greater savings
12 are in multifamily not in single family and the same would
13 be true for high-rise multifamily as low rise. So I'm
14 curious as to why high-rise was not included in this
15 measure.

16 MR. TAM: Bo, do you want to answer that?

17 MR. WHITE: This is Bo White, I'm part of the
18 Statewide Team, Utility Team.

19 The reason we didn't include it is that there's
20 not the same hot water draw schedules that we have for low-
21 rise residential. So on low-rise residential, we have
22 these new hot water draw schedules that allow us to pretty
23 accurately calculate the savings of having the drain water
24 heat recovery device. And these are compliance options
25 and, you know, most of the work was going into calculating

1 the savings and giving those savings in the software so
2 there was no easy way for us to do that in the high-rise.
3 You know, maybe high-rise residential might have similar
4 draw schedules to what we have for multifamily, but those
5 schedules are not in the software. So that was our main
6 reason for [indiscernible] --

7 MR. STONE: I'm actually kind of glad that's your
8 answer because if we needed more evidence that we needed to
9 have a multifamily chapter to focus on multifamily
10 regardless of whether it's up to three stories or over
11 three stories, there it is. I mean, we -- it's important
12 to do it right and we can't do it right when we keep
13 pretending it's either a single family or commercial
14 building.

15 MR. BOZORGEHAMI: So this is Payam.

16 Nehemiah, you know that the Commissioners'
17 commitment was that by 2022 we will have a separation of
18 multifamily from both low-rise residential and high-rise --
19 excuse me, commercial buildings, nonresidential.

20 MR. STONE: Twenty years after the first time
21 it's proposed. That's not bad. That's not bad.
22 Considering.

23 UNIDENTIFIED SPEAKER: That's a record.

24 MR. STONE: It is in a way.

25 One other question, it's a minor question but --

1 and the answer is probably of course, but I didn't see it
2 on the slide so I want to ask.

3 So in the CEC's directory of these products, is
4 it going to make it clear which ones are approved for
5 vertical only, horizontal only, or vertical versus
6 horizontal -- vertical and horizontal?

7 MR. TAM: That would be yes.

8 MR. STONE: Because if you take one that's only
9 approved for vertical and you put it in horizontal --

10 MR. TAM: Yes.

11 MR. STONE: -- you're going to get a lot less
12 savings than you thought.

13 MR. TAM: Yes, that will be the plan.

14 MR. STONE: It will be in that --

15 MR. TAM: Clearly separate the two.

16 MR. STONE: As I said, I thought the answer was
17 yes.

18 Thank you.

19 MR. NESBITT: George Nesbitt, HERS rater. I
20 thought that hot water was one of the things from the low-
21 rise standards that went to high-rise multifamily as well
22 as all the internal lighting.

23 Did we diverge again at some point? Are we using
24 a different calculation in CBECC-Com for multifamily for
25 the apartment level?

1 MR. WHITE: I -- are you just asking about like
2 how much, how the hot water --

3 MR. NESBITT: The --

4 MR. WHITE: -- load is calculated?

5 MR. NESBITT: Have the standards not applied the
6 low-rise residential water heating section to high-rise
7 multifamily for some time?

8 MR. TAM: It does. It's a software issue between
9 CBECC-Res and Com.

10 Bruce, do you want to --

11 MR. NESBITT: So then -- so then maybe we need a
12 CBECC-Com and a CBECC-Res that actually -- well, they
13 either need to be using the same calculation or we need to
14 be able to run a building that has mixed occupancies and
15 one piece of software and not have multiple pieces of
16 software.

17 MR. WILCOX: This is Bruce --

18 MR. NESBITT: It make 60 years. But.

19 MR. WILCOX: This is Bruce Wilcox.

20 To my knowledge, the Com program is running the
21 low-rise residential water heating calculation. Although
22 I'm not an expert on that Com program, that's my
23 understanding.

24 MR. NESBITT: Yeah. I mean, [indiscernible] I
25 would say that any HERS measure, I mean, anything --

1 anything -- honestly, the high-rise multifamily apartment
2 unit I think belongs in the residential. We can argue
3 whether -- I mean, there are certainly are differences
4 between single family versus multifamily and there may be
5 some differences, but there's really -- I've been on plenty
6 of high-rise multifamily, I've certainly seen commercial
7 projects and all the issues we face in single family, low-
8 rise, multifamily. Those -- all those issues exist in the
9 nonres and honestly I think HERS raters and HERS credits
10 and any credit in for residential apartment that's
11 available should be available for high-rise too.

12 MR. STONE: Nehemiah Stone. Okay, now I'm
13 confused. So if -- if it is the same model in the high-
14 rise, in CBECC-Com, why are we -- why is this measure only
15 then applying to low-rise residential?

16 MR. WHITE: So I wasn't aware that the model is
17 so exactly similar to what we have for low-rise
18 residential. But the good news is that the algorithm we're
19 developing, it's very simple and it's a thermodynamic
20 model. And, you know, we take inputs of water temperature
21 and what the shower flow rates are. So that whole
22 algorithm if it's easy enough for the CBECC-Com team to add
23 it at some point in the future, then they would be able
24 to -- our algorithm is, you know, just takes inputs and
25 puts out these outputs and it needs a draw schedule.

1 So for high-rise residential, if they're using
2 the multifamily draw schedule that's used in the Res
3 software, then it's very easy for them to add, in fact --

4 MR. STONE: In the words of Jean Luc Picard, make
5 it so.

6 MR. VELAN: Hello, my name is David Velan, and
7 I'm CEO of Ecodrain, a drain water heat recovery
8 manufacturer.

9 We have pioneered horizontal solutions for drain
10 water heat recovery. Horizontal drain water heat recovery
11 solutions are recognized by IAPMO Product under PS 92 which
12 has been in effect since 2008 and which is also recognized
13 in the California Plumbing Code.

14 Almost half of the drain water heat recovery
15 units installed in California are horizontal reflecting the
16 reality of the housing stock in California. We've been
17 working on this for a long time, and we have e-mails dating
18 back to 2010 with both the Energy Commission and with SDG&E
19 inquiring about Title 24 inclusion in making our products
20 available for testing.

21 I'm here today to object vigorously to the case
22 team's recommendation to recognize only vertical drain
23 water heat recovery devices in the Title 24 language.
24 Horizontal solutions must also be recognized. There's
25 ample time to fix the final language to include all kinds

1 of drain water heat recovery devices rather than
2 discriminating against horizontal devices.

3 During the case development and review process,
4 I've on many occasions requested that the case process
5 include consideration for horizontal solutions. On each
6 occasion, my requests have either been rejected or ignored
7 by the case team. The case team has come up with a list of
8 alleged shortcomings of horizontal without citing any
9 evidence and despite never communicating with any of the
10 users of the technology nor being willing to engage with
11 the manufacturer. We will address this in detail in a
12 written statement.

13 Most recently it was stated by the case team that
14 only vertical solutions could be included because the CSA
15 standard only recognizes vertical solutions. In the March
16 case stakeholder meeting, a representative of IAPMO
17 publicly stated that it would be possible to easily adapt
18 the CSA testing protocol to measure the efficiency of
19 horizontal solutions. It was agreed as an action item from
20 that meeting that the case team would discuss and access
21 the possibility with IAPMO. To the best to my knowledge,
22 no one ever followed up with IAPMO.

23 Nonetheless, IAPMO is in the process of
24 publishing their own standard. IGC 346 for measuring drain
25 water heat recovery effectiveness. Using the same

1 conditions at the CSA B55 standard but allowing for
2 different slopes. IGC 346 will not discriminate against
3 any category device, just as IAPMO PS 92 does not
4 discriminate. IGC 346 is already available for review and
5 is expected to be a published standard by July of this
6 year.

7 It is not too late to adjust the code language.
8 We, along with IAPMO, and other interested parties in
9 California have come up with language to do so. I implore
10 the Energy Commission to adopt code language that does not
11 discriminate against an entire class of drain water heat
12 recovery devices. Please constructively consider the
13 proposed change to the code language that we will be
14 submitting.

15 Thank you.

16 MR. TAM: Thanks, David.

17 MR. SHIRAKH: Any response? Do you have a
18 response to --

19 MR. TAM: Yeah, the IAPMO code is still in draft
20 form. So its timing is an issue. Once we become
21 finalized, then we can consider, you know, as part of the
22 [indiscernible] but right now it's still in draft form so
23 we, you know.

24 MR. BOZORGCHAMI: Yeah, as Danny said earlier,
25 this -- it's not off the table, it's just put aside for now

1 until the standards are approved. We can't base a standard
2 on something that's pending approval.

3 MS. BROOK: Is there any -- this is Martha Brook,
4 advisor to Commissioner McAllister.

5 Is there any reason that your algorithm you're
6 developing wouldn't work equally well for horizontal and
7 vertical?

8 MR. TAM: No, there's not. It's going to work
9 very well with both of them as long as this new test
10 procedure is substantially similar to the CSA standard.
11 And I've seen the draft, read through it, and it is
12 substantially similar. So that will go through review, all
13 the vertical manufacturers will have a chance to comment on
14 it as well.

15 And I think in the end, it looks like it's going
16 to be similar enough so that our algorithm can just work,
17 it won't have to be changed. And it'll just be a product
18 that ends up in the database, the CEC database, at a later
19 date. And once it's in there, it should just work with our
20 algorithm.

21 Yes.

22 MR. VELAN: The reason the standard is pending is
23 because our position had been in the past that the CSA
24 standard could be used to rate units at different slopes.
25 And this is what IAPMO had said also. They could take the

1 unit, test it with the same conditions using the CSA slope
2 but saying this is the result, test it at minimum slope.
3 And they testified in March that that was perfectly normal
4 to do. And for whatever reason, nobody looked into that.

5 So that's -- so that's why we decided to write
6 the standard but -- and we could have done it a long time
7 ago if we were told that -- that if we did so, we could be
8 included.

9 And as far as we understand, the decisions have
10 not been made yet.

11 MR. TAM: Thank you, David.

12 MR. KLEIN: Gary Klein, Gary Klein and
13 Associates.

14 Before I forget, there is a plumbing trailer
15 that's here in California with live water on it. It's in
16 Concord starting next Monday and Tuesday and then again the
17 following week. About an hour and a half or so worth of
18 discussion, we can actually analyze many of the questions
19 related to the previous question of compact design and
20 other ways to improve hot water distribution systems. We
21 can debate it all day long here, but we don't have any
22 significant facts in evidence. If we have live water, we
23 do a much quicker job. I highly recommend you see me
24 afterwards and I'll give you a link to come to the class.

25 So comments on drain water heat recovery, I

1 believe there's somebody on the phone from IAPMO or waiting
2 on the phone to give comment about where the standard is so
3 let them say to that. And if they don't, I'll come --
4 we'll reiterate it.

5 So in approximate terms, drain water heat
6 recovery sort of needs a three- to eight-foot long in order
7 to be an effective device for getting enough energy back to
8 make it worth the trouble of installing it. And it doesn't
9 matter whether it's horizontal or vertical, if you design
10 them right, the efficiencies are the same or essentially
11 the same. So if we pick a minimum efficiency, it's got to
12 be a minimum of 42 percent. Shouldn't matter what angle
13 the slope is. And the Commission should do that, make it
14 no matter what.

15 If you do a good job, you'll get 40 to 60 percent
16 of the temperature difference between the temperature
17 running down the drain and the cold water coming in. So if
18 you only have five-degree temperature difference like in
19 the summer in parts of the state, it won't make much
20 difference. If you have lots of temperature difference,
21 you'll get more energy benefit out of it. Again, still
22 makes sense to do. They have similar efficiencies.

23 Vertical units drain water heat recovery units
24 can in fact be installed horizontally but it takes more
25 length to get the same benefit. So if someone specifies

1 that they have a vertical unit and they wish it to be
2 installed horizontally, it shall also be tested
3 horizontally and its rating listed. You can't just assume
4 it's double or one and half, you need to test it and it
5 should be tested both ways. So it's fine if we have a
6 method for people to list to, it's possible to test to it
7 and that's a great thing.

8 CSA developed two standards for drain water heat
9 recovery some years ago. I don't remember exactly how
10 long, it's almost 20 years, I think. And one was for
11 efficiency, the other was for product safety and
12 performance. And at the time the standard was developed,
13 they made a decision not to include horizontal. But the
14 physics don't indicate that at all as you pointed out,
15 right? Inputs the energy, you get an answer out, and
16 efficiency is efficiency, effectiveness is effectiveness.
17 The physics are fine, it's just in the charging paragraph.

18 And so the substantial similarity between the IGC
19 and the CSA standard is clearly there. The physics are the
20 bulk of it, right? And so as long as the physics works out
21 to be correct, then we should get good answers that are
22 worthwhile presenting.

23 There are very few total installs in California.
24 I don't remember what the case report said. What? 20, 50,
25 something like that. Not a very large number. Right? I

1 don't remember the exact --

2 MR. WHITE: Probably around there.

3 MR. KLEIN: And about half of those are actually
4 horizontal units. Since there's only one manufacturer of
5 horizontal units, they're already half of the market. But
6 they're not allowed yet. That doesn't make sense to me. I
7 understand that there's issues with when the standard
8 becomes effective.

9 I actually know one house in Hermosa Beach that
10 has both, a vertical one and a horizontal one. And the
11 reason they have both is because of the space availability
12 for height. They picked a horizontal one for their
13 crawlspace and a vertical one for the second floor shower.
14 And that makes sense. It gives options to builders so that
15 we can actually put them in where they're appropriate and
16 how they fit.

17 There are some issues in the draft case report
18 that appear to be inaccurate to me and some confusions. I
19 think that those should be discussed in writing. But let's
20 go over it and if the draft is changed, that's fine and if
21 not, we should discuss what might be changeable in it. I'm
22 not clear if it's a finished report or a draft report, but
23 there seem to be a few inaccuracies.

24 I'm confused. I need some help about where this
25 fits in the Title 24 process. Is it a prescriptive test?

1 MR. WHITE: It's a compliance option.

2 MR. KLEIN: That's not what the original document
3 said; is that right?

4 MR. WHITE: No, it's in there for the current
5 draft report. It's in the prescriptive section of the code
6 but it's an option.

7 MR. KLEIN: Okay.

8 MR. WHITE: It's not the primary prescriptive
9 option, it's, you know, an alternative.

10 MR. KLEIN: Okay. I admit to confusion and I
11 realize what that says but please explain it to me some
12 point later. I want to make sure it's a performance option
13 as opposed -- it's a compliance path -- compliance option
14 as opposed to an alternating prescriptive base.

15 MR. WHITE: Yeah. You can see in the proposed
16 code language how we have it written. And then --

17 MR. KLEIN: I did and I'm now confused. So I
18 shouldn't be on this particular item.

19 Okay. I think that we need to have both
20 included. If the IGC is available for public use sometime
21 in July or August which under likely conditions will be
22 true, that's plenty of time for it to be included in this
23 process. And I think that would be appropriate.

24 Thank you.

25 MR. WHITE: Thanks, Gary. This is Bo again. So

1 I agree that the physics are very similar. And one of the
2 similarities is that is likely to be in this horizontal
3 test is to have the same temperature and flow conditions
4 because obviously you want to have this one metric that
5 comes out of it, you want it to be similar to the metrics
6 coming out of the vertical tests. And that's how it's
7 written right now so that's good. And that way it could
8 feed right into the algorithm and just work.

9 And you were mentioning that even a vertical unit
10 can be tested horizontally. And we agree and using this
11 new test procedure, the vertical manufacturers can test
12 their vertical products horizontal if they want to. But
13 since theirs are designed, you know, with a round shape and
14 have the benefit of the water flowing on the outside of the
15 pipe as it goes vertical, then when they go horizontal
16 their effectiveness is going to be lower but the test will
17 just show that. And when they report their results, you
18 know, it's either going to be reported as a vertical test
19 or it's going to be reported as a horizontal with the slope
20 that they tested at.

21 So they could put both of those numbers into the
22 database and then the product just has to be above the
23 minimum of 42 percent and it could be installed either way
24 using the proper efficiency from that test.

25 And our report is a draft so there are

1 opportunities to change it. So when you see it, should be
2 on the website now, you can comment and we'll look into
3 those issues.

4 MR. HUNT: Good afternoon, this is Marshall Hunt,
5 Pacific Gas and Electric Codes and Standards, and I want to
6 thank Daniella Garcia from the gas company who's joining us
7 and cofunding the horizontal testing. And I just wish I
8 could get it out my door sooner but now I know I really
9 need to.

10 So I think in a few months we'll have a lot of
11 these answers and I appreciate that we can test the
12 vertical in a horizontal configuration. I also see a great
13 advantage of this in commercial dishwashing in restaurants,
14 laundry rooms, major facilities. So this isn't strictly
15 residential concept, we'll be sure to look at it in a more
16 complete manner.

17 Thanks.

18 MR. WHITE: Thanks, Marshall.

19 MR. HILLBAND: This is Alex Hillbrand from NRDC.

20 In addition to the discussed proposals, NRDC
21 supports the development of an electric water heating
22 baseline so as to remove biases against electrified water
23 heating from the code. We're enthusiastic that CEC had
24 indicated its plan to devise one and respectfully request
25 stakeholder engagement in that process.

1 We've also proposed renewable water heating model
2 ordinance as an adder to the CEC Solar PV ordinance. We
3 think it's a good opportunity to allow cities to take the
4 lead on reducing emissions from water heating. And so we
5 request that CEC endorse this model in a timely manner.
6 And look forward to that happening.

7 Thanks.

8 UNIDENTIFIED SPEAKER: Are we finished talking
9 about heat recovery? Can I introduce another topic before
10 we --

11 MR. TAM: Anyone online, R.J.?

12 We're going to online comments. Kyle Thompson,
13 I'm going to unmute you now. Go ahead, Kyle.

14 MR. THOMPSON: Hi there, R.J., can you hear me?

15 MR. TAM: Yes, we can.

16 MR. THOMPSON: Okay. Just wanted to make sure
17 that my mic was working.

18 So I just wanted to say thanks Danny for the
19 presentation and the inclusion of IGC 346 and sounds like
20 from those comments that, you know, you're going to
21 consider or take the horizontal TWH recovery system into
22 consideration in the code. And that's good. I support the
23 inclusion of those horizontal units and vertical. I think
24 it'll be a benefit for all of the building industry to use
25 these systems.

1 So the only thing that I wanted to comment on,
2 really, is development of IGC 346 and to say that, you
3 know, it's already been confirmed that it's very similar to
4 the CSA B55.1 with the exception of the orientation of the
5 device. That's really the only -- only significant
6 difference between the two standards. And also to confirm
7 that our expected publishing of the standard is July 10 or
8 shortly thereafter.

9 Other than that, I wanted to make sure that --
10 and from what I understand in the code development and your
11 code development procedure, that we'll have sufficient time
12 to include the draft which is what is now a draft standard
13 into the code. Once it's published, if it's published in
14 July of 2017, there's sufficient time to include it into
15 the -- into the proposal.

16 So I'm really happy with the way that the project
17 was presented and go forward from here. That's all.

18 MR. WHITE: Thank you.

19 Okay. Next we're going to go to Frank. I'm
20 going to unmute you now. Go ahead, Frank.

21 MR. STANONIK: Yeah, this is Frank Stanonik of
22 AHRI. This may have been said and I missed it but as I
23 understood it, the previously proposal about compact
24 distribution does provide some reduction in hot water use.
25 Is that correct?

1 MR. TAM: Yes.

2 MR. STANONIK: Okay. So then my question is when
3 you ran the calculations as to the benefit of the drain
4 recovery unit, did you factor in that that might be going
5 into a house that has a compact water distribution system?

6 MR. TAM: So you can take both credit. It's, you
7 know, not mutually exclusive. So, yeah, you can take
8 compact credit and --

9 MR. STANONIK: No, I was looking at your -- was
10 looking at your estimated savings and, you know, the cost
11 benefit part. Because on the one hand, I mean, and, you
12 know, maybe it's inconsequential, but, you know, the one
13 measure is really aimed at reducing the amount of hot water
14 that's used in the home, you know, whatever that amount is.
15 And then you're putting in a device that is -- who's, you
16 know, who's really driven by being able to -- whose benefit
17 comes from being able to take energy out of heated water.
18 And just -- I guess just wanted to make sure that when
19 you're analyzing those economics, you're factoring in
20 things that might affect each other.

21 MR. TAM: So compact really reduce water waste
22 right before the hot water get to the shower so that
23 wouldn't affect, you know, drain water heat recovery at
24 all. So you get recovery when you get hot water in the
25 drain. So the amount of time that you take to shower is

1 going to be the same in either case.

2 MR. WHITE: This I Bo. I'll add that our
3 algorithm is such that we take as an input what the
4 distribution system is like. So there is a metric of
5 distribution loss and so we just take that as an input. So
6 if that changes because somebody has a compact hot water
7 system, then it'll just be taken care of when you calculate
8 the savings.

9 MR. STANONIK: Okay. All right. Yeah, that was
10 really the question. You answered it.

11 Thanks.

12 MR. WICHERT: And, Frank, do you have a company
13 you're associated with?

14 MR. STANONIK: I'm with AHRI.

15 MR. WHITE: Okay. Thank you.

16 MR. STANONIK: Air Conditioning, Heating,
17 Refrigeration Institute.

18 MR. WICHERT: Okay. Let's see. Next we're going
19 to Amin.

20 Amin, go ahead and state your name and company if
21 you're associated with one.

22 MR. DEZAGAH: Sure. I'm Amin Dezagah with
23 Frontier Energy.

24 We operate the PG&E [indiscernible] technology
25 center in San Ramon. And we've had that same experience

1 with Ecrodrain, drain water, horizontal heat recovery
2 device. And I agree with Marshall's comments regarding
3 there are significant commercial applications as well,
4 including conveyor dishwashers and other applications. We
5 have tested the unit in our laboratory on conveyor
6 disruption and we have -- we have a report available to
7 download on our website at [indiscernible] dot com.

8 As a user of horizontal heat recovery devices in
9 my pioneer plus old home in Oakland, I can say that it's
10 very useful as it can be installed in the crawlspace. I
11 don't have a second story or a use for a vertical-type heat
12 changer. And to make comments towards the [indiscernible]
13 energy goals of the state, the horizontal unit allows for a
14 all these older homes especially to utilize different kind
15 of technologies and especially with combination of
16 photovoltaics and plain views electric heating or any type
17 of heating that can really get to the goal of what Gary's
18 trying to do, as well as do it a way that meets the energy
19 types.

20 So in conclusion, horizontal heat recovery device
21 should really be put forward as a [indiscernible] solution
22 in this -- in this phase of proposing different heat
23 recovery options to whatever can [indiscernible] tucked in
24 there.

25 That's all I had. Thanks.

1 MR. WICHERT: Thank you. We have one written
2 comment that I'm going to read from Dan Johnson.

3 Dan just wanted to make the comment that CBECC-
4 Res and CBECC-Com both use the same California Water
5 Heating system algorithm since CBECC-Com B3EE.

6 MR. TAM: All right. Thank you everyone.

7 MR. WICHERT: Sir, want to make a comment?

8 MR. MAHONEY: Greg Mahoney, City of Davis,
9 representing CALBO. And I want to -- CALBO supports the
10 Energy Commissions' efforts and development of the 2019
11 standards. But I would like to make a couple comments on
12 the usability of the code. And like to propose a couple of
13 strategies.

14 One would be reinstatement of an index. In the
15 1987 through 1998 versions of the standards, an index was
16 included and I think it helped the code users navigate the
17 code and especially because the table of contents and table
18 in 100a are very kind of general and don't really give you
19 a page number or you can kind of narrow it down to a few
20 pages. So I think that would be very helpful and help
21 increase compliance, approved-upon compliance.

22 And the second would be -- and I know this one's
23 a little bit tougher nut to crack would be reformatting the
24 standards to be more consistent with the other building
25 codes or the other codes that we enforce, building,

1 elect -- or plumbing, mechanical, CALGreen. They all have
2 kind of an established format.

3 And I know that everyone in the room probably has
4 a pretty good understanding of the format and
5 organizational structure of the code. But that knowledge
6 is not ubiquitous in the construction industry. And I
7 teach building inspection technology at Cosumnes River
8 College and I really have to spend an inordinate amount of
9 time teaching people how to navigate the code. I don't
10 have to do it with any of the other codes. And I know it's
11 kind of a large undertaking but I think if we improve the
12 formatting to make it more consistent, that it would make a
13 significant difference in compliance or people's ability to
14 use the code.

15 Right now I have, you know, when some of my
16 inspectors come and ask me questions, I ask them if they
17 looked it up and they just kind of, you know, sheepishly,
18 you know, say, well, no. And it's because they don't know
19 how to. They -- you can't just pick up that code and know
20 how to use it like the other codes. So.

21 Anyway. I actually developed a table of contents
22 that kind of lays out how a potential reformatting and I'm
23 happy to share that. And Doug Hensel actually started
24 reformatting the code, the 2016 standards. He's retired
25 now, so I don't know where he left that. But, we would be

1 willing, CALBO, our committee, would be willing to work on
2 that effort if it's something that would -- the Energy
3 Commission would be receptive to.

4 MR. SHIRAKH: Do you use electronic or paper
5 documents?

6 MR. MAHONEY: Paper.

7 MR. BOZORGCHAMI: So, Greg, I think we talked
8 about this awhile back, about six months, maybe. In
9 reality it sounds great, the problem is trying to change
10 something that's already embedded into the program, it's a
11 big uptaking. It's not just doing it on papers, going out
12 and providing training to local jurisdictions exactly to
13 where that information is moved to now. The energy gurus
14 out there that have to use the systems are going to have a
15 harder time looking for it because it's already embedded in
16 their heads. 150s is residential. 140s is nonresidential.
17 It's going to be little bit difficult. And I think Chris
18 Meyer -- Christopher Meyer is going to say a little bit
19 more about that.

20 MR. MAHONEY: I would say that the energy gurus
21 are the only ones who know how to use it.

22 MR. BOZORGCHAMI: Yeah.

23 MR. MAHONEY: They're the only ones who use the
24 energy codes.

25 MR. BOZORGCHAMI: I agree.

1 MR. MEYER: This is Christopher Meyer, the
2 manager at the building standards office.

3 You know, originally when you said that I thought
4 oh, that's an amazing idea, just get it. We started
5 running into some, you know, serious concerns of the people
6 who just they know it by rote or all the places it's
7 referenced, and how extensive. So we said instead of
8 saying okay, we're just not going to do that because of the
9 complexities, we started taking a step back and looking at
10 what are we trying to do? Without hampering the work of
11 the people who know the code back and forward and they know
12 how it is, how can we make it easier sort of for the next
13 generation, you know, that are maybe think in a different
14 way, access information in a different way, learn in a
15 different way, make it easier for them?

16 So Todd Ferris who leads our Standards Tools
17 Development Unit and some of his staff have been noodling
18 on this. And so the -- Larry who's, you know, the engineer
19 there, he and Todd, Alexis, others have been noodling on
20 this to try and find ways of making it smarter, finding
21 ways of having sort of live online searches where you can
22 go in and find information in the code a lot easier. So
23 that's the kind of stuff we're looking at. And if that's
24 something that would useful, I think that might be
25 something that we could definitely help with. And even if

1 something that we have is sort of a database, a search
2 vehicle on our website where people could go in and have
3 search engines there that made it a lot easier for people
4 to find things. And if that's something, maybe we could
5 sit down and talk about that if there's a way that we could
6 find an alternative to sort of reordering the code that
7 would make it easier for your staff to find things and use
8 them.

9 That's our thinking at this point but we're
10 definitely, we're open to ideas on that.

11 MR. MAHONEY: Yeah, it's not just my staff, it's
12 everyone except the people who are in this room.

13 MR. MEYER: Yes, understood.

14 MR. MAHONEY: And I guess short of -- I guess I'm
15 not convinced that we should continue doing it this way
16 because that's the way we've always done it. I'm not
17 certain that that's necessarily the best approach. But I
18 think if we at least had a tool, maybe that's the index
19 where you could look something up and it would give you a
20 page number that you can go to. Right now you can't do
21 that. You go look in the table of contents. You go look
22 at, you know, 100(a) and it doesn't give you a page number
23 to go to. It gives, you know, you have this kind of range
24 of pages --

25 MR. MEYER: Yeah.

1 MR. MAHONEY: -- very long range of pages in the
2 table of contents.

3 MR. MEYER: Yeah, we're thinking of something --

4 MR. MAHONEY: All I'm --

5 MR. MEYER: -- much, much smarter than that that
6 would be just not just a page number, we give you more
7 detail.

8 MR. MAHONEY: Yeah.

9 MR. MEYER: But no, it's -- it's something we're
10 still, we haven't closed the door on it but we're still
11 thinking of it. And when we start sort of breaking things
12 out, you know, high-rise, res, commercial, all that, in the
13 future, it's like is that the time to look at sort of
14 revamping things.

15 But, yeah, it's one of the things we wanted to --
16 this is actually a great way of doing this in a forum like
17 this where you have the industry listening and we can get
18 some feedback on that. So it would actually be very
19 helpful if we got some comments in, you know, our public
20 comments in this workshop of what people's feelings are if
21 we did do a change like that. You know, would it be more
22 disruptive or more helpful. And if we get no verse --
23 well, I mean, you know, it would be really helpful, then we
24 can look at, you know, what's involved in doing that.

25 MR. MAHONEY: Okay. And aside from reformatting,

1 is there any objection to an index? There was an index in
2 the standards before.

3 MR. SHIRAKH: We had an index. The reason we
4 took it off is because we were hoping people would be using
5 the electronic documents. And that's what I do, I search
6 for the topic and I want to go straight to it. But.

7 MR. MAHONEY: We spend all this money on code
8 books.

9 MR. SHIRAKH: But, yeah, there's --

10 UNIDENTIFIED SPEAKER: A lot.

11 MR. SHIRAKH: -- there's no objections to
12 bringing back the index.

13 MR. MEYER: And I think we can probably find in
14 our budget we'll send you some tabs that will help.

15 MR. BOZORGCHAMI: Greg. Greg, before you leave,
16 could you share your index with us?

17 UNIDENTIFIED SPEAKER: Only if you give him
18 credit.

19 MR. MAHONEY: I don't have an index, I have a
20 table of contents.

21 MR. BOZORGCHAMI: Oh, give me your table -- that
22 would be fine.

23 MR. MAHONEY: But I'm happy to share that with
24 you.

25 MR. BOZORGCHAMI: Yeah, wonderful.

1 MR. NESBITT: George Nesbitt, HERS rater.

2 As one of those energy geeks, there are times
3 when I had some -- I've had something -- I just didn't know
4 off the top of my head and needed to look up, it's do I
5 look in the standards? Do I look in the manual? Do I look
6 in the appendices? Do I look in the ACM? So there are
7 times I have to hunt, I'm not sure where to look. Where I
8 look, I don't find it there. I look somewhere else, don't
9 find it there. The, you know, doing a search of an
10 individual document, well you get every word that matches.
11 So there's plenty irrelevant Energy Code A's. You get
12 plenty of irrelevant things that come up when you do a
13 search.

14 So there are I think ways to make it better.
15 Whether -- whether you'd be willing to give up having so
16 darn many manuals and so many pages. I think when I added
17 it up in one of the code cycles, I think there was
18 something like at least half as many pages in the energy
19 code between all the manuals as in all the rest of the
20 Title 24 building codes.

21 MR. HODGSON: Mike Hodgson, ConSol.

22 I just want to get back to my favorite subject,
23 drain water heat recovery. I just wanted to be clear, it
24 sounded like the issue was that the IAPMO standard was not
25 going to be published in time to be referenced and that's

1 why it's not currently being proposed. What we heard, I
2 guess, from the gentleman on the phone is that it will be
3 published around July 10th. So and the gentleman who did
4 the case study said the algorithm worked either way.

5 So is it clear to, I guess I just want to make
6 sure I understood this, is it sounds like you could go
7 either horizontal or vertical once the standard is
8 published, right? And that by the time you get 45-day
9 language, the standard will be accessible to you to
10 reference and so we shouldn't have a problem, correct?

11 Thanks.

12 MR. TAM: Correct, if it all goes to plan. Yes.

13 MR. BOZORGCHAMI: So with that, I'm going to open
14 up the floor to any other questions or comments.

15 MR. NESBITT: George Nesbitt, HERS rater.

16 So TDV -- see, everyone laughs. I think TDV is a
17 great metric for cost effectiveness, but I think that
18 considering we have goals of 80 percent carbon reductions,
19 various other goals for renewables and the grid, so on, so
20 forth, that TDV doesn't necessarily capture that. While
21 some of that goes into those values, it's ultimately
22 essentially an hour by hour time of use rate so we get one
23 answer when we look at that.

24 So I think we really need to bring in an hourly
25 carbon calculation, and we need to actually look at therms,

1 gallons of propane, and actually kilowatt hours and look at
2 those savings and those impacts and not just the TDV cost.
3 So I think yes, using it for cost effectiveness makes sense
4 but doesn't necessarily answer or give us the right answers
5 for other goals.

6 The other broad comment would be enforcement.
7 It's obviously common and a big problem. So the legislator
8 mandated many, many years ago that the Commission have a
9 rating system for new and existing homes. We came up with
10 one. It's in Title 20. We have HERS raters who are
11 trained and certified. And we don't use it. We've come up
12 with a design rating which is really a HERS rating, yet not
13 done by a HERS rater.

14 So I think that the Energy Commission needs to
15 consider that essentially to build a new building, you have
16 to have a HERS rater now. We have HERS raters who are and
17 has been and are certified as energy consultants through
18 Title 20 that we actually need to utilize the HERS rating
19 system fully. RESNET seems to just be growing leaps and
20 bounds in the amount of ratings that are done with their
21 system.

22 So it also, you know, we talk about things like
23 things aren't utilized. Well, they may be being done, but
24 in the process we have, someone does a document, they get a
25 permit, maybe it gets installed, maybe it doesn't. But

1 when you have a HERS rater involved in the process, we can
2 do as-builts. We can actually reflect what got done and
3 then we actually may know better what is happening.

4 Thanks.

5 MS. CUNNINGHAM: Kelly Cunningham, Pacific Gas
6 and Electric.

7 Just wanted to add one more comment in regards to
8 the drain water heat recovery horizontal testing protocol
9 that there is a deadline associated with that being in the
10 case report which of course is only one part of the
11 standards and rulemaking process. But July 14th is our
12 approximate deadline, plus or minus a few days. We haven't
13 announced that or finalized it yet, but that's when we
14 would need this to be complete in order to be considered
15 for the final draft of the case report.

16 That doesn't mean it's not going to be part of
17 the process, the process extends beyond that. But we would
18 really like to emphasize that if an accelerated adoption of
19 that standard could occur by any type of industry body,
20 then that is the date that we would like to note for today.
21 July 14th.

22 Thank you.

23 MR. KLEIN: Gary Klein, Gary Klein and
24 Associates.

25 To the last point that was raised, the IAPMO IGC

1 is going to be heard on June 12th for its first hearing. It
2 will be published shortly after that. That committee meets
3 again I believe close to the date you just described, it's
4 an early July meeting. And assuming no significant issues,
5 it will be adopted and approved shortly before or on the
6 day described. Okay.

7 It just has to do with their timing of their
8 cycle. If it goes into August, they have one meeting a
9 month. And so that's sort of how that game gets played.

10 UNIDENTIFIED SPEAKER: You would stay
11 communication [indiscernible].

12 MR. KLEIN: Yes, we'll do that.

13 Thank you.

14 MR. BOZORGCHAMI: I'm going to stick my neck out
15 here for a minute and talk about this IGC 346. Even if it
16 does not get approved and it gets approved in let's say
17 August, September, whatever it be, we could bring it back
18 as a compliance option. Okay. The door's not closed. So
19 if we have to, we'll move on with the vertical system. And
20 as we have the testing procedure approved, we could come
21 back, revisit this and do this as a compliance option for
22 the standard cycle.

23 MR. WICHERT: We have a question online.

24 Chris, I'm going to go ahead and unmute you now.
25 Go ahead, Chris, state your name and company association.

1 MR. BRADT: Great. Can you hear me all right?

2 MR. WICHERT: Yep.

3 MR. BRADT: Hi, this is Chris Bradt with the
4 BayREN, Bay Area Regional Energy Network Codes and
5 Standards Program.

6 Just wanted to kind of reiterate or support Greg
7 Mahoney's comments regarding both the idea of the index as
8 well as if and when possible, the idea of reformatting the
9 other [indiscernible] line with some of the other parts of
10 the building code. You know, we hear that concern and
11 complaint from many of the Bay Area Building Departments.
12 And, you know, I just -- I think the argument that the
13 energy experts, we don't want to upset their ability
14 navigate the code I think is, you know, just a little
15 short-sighted. I guess, if we are really trying to,
16 especially with this update for ZNE make sure that we're
17 moving these goals forward. I mean, we need this building
18 code to be as accessible as possible to industry and
19 building departments.

20 The church realized they weren't going to convert
21 a bunch of people by doing the Bible and, you know, mass in
22 Latin. It's the same thing here, you know, we've got to
23 make sure that this language is accessible and searchable
24 and find -- intelligible to the people who are going to be
25 needing to make these changes. And that's the building

1 professionals and the building departments.

2 So just wanted to reinforce Greg's comment there.

3 So thank you very much.

4 MR. WICHERT: Thank you.

5 MR. STONE: Nehemiah Stone, Stone Energy.

6 I absolutely agree with what both Greg said and
7 what Chris said. However, I think it's important to
8 realize that there isn't any other place in the code where
9 contractors have asked for so much flexibility. Let us do
10 this or let us do that as long as we meet this budget. And
11 so it is a more complex code. It has to be. Either that
12 or we can, you know, go the route that Oregon did years ago
13 and just say you will do this and make it prescriptive
14 only.

15 If we weren't trying to provide enough
16 flexibility that builders could choose the most cost
17 effective way to build their homes, it would be as simple
18 as the rest of the code.

19 MR. BOZORGCHAMI: Well, I guess there's no more
20 questions or comments.

21 So thank you, folks, for participating today and
22 we'll see some of you guys next week, June 6th.

23 Thank you.

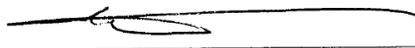
24 (Whereupon, at 2:21 p.m., the workshop
25 was adjourned)

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