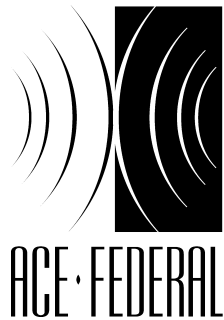


Date: April 30, 2015

Case: The Residential Standards Boilers Meeting



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U.S. DEPARTMENT OF ENERGY PUBLIC MEETING
THE RESIDENTIAL STANDARDS BOILERS MEETING

U.S. Department of Energy
Forrestal Building, Room 8E-089
1000 Independence Avenue, SW
Washington, DC 20585

9:14 a.m.

Thursday, April 30, 2015

1 Appearances for Department of Energy Meeting

2

3 Doug Brookman, Chair

4 John Cymbalsky, DOE

5 Eric Stas, DOE

6 Andrew Allen, Navigant

7 Catherine Rivest, Navigant

8 Adam Darlington, Navigant

9 Christopher Lau, Navigant

10 Caroline Davidson-Hood, Air-Conditioning, Heating, &
11 Refrigeration Institute

12 Nicholas Mislak, Air-Conditioning, Heating &
13 Refrigeration Institute

14 Amy Shepherd, Air-Conditioning, Heating &
15 Refrigeration Institute

16 Aykut Yilmaz, Air-Conditioning, Heating &
17 Refrigeration Institute

18 Frank Stanonik, Air-Conditioning, Heating &
19 Refrigeration Institute

20 Don Farrell, Oilheat Manufacturers Association

21 Victor Franco, Lawrence Berkeley National Laboratory

22 Alex Lekov, Lawrence Berkeley National Laboratory

- 1 Roger Marran, Energy Kinetics
- 2 Joanna Mauer, Appliance Standards Awareness Project
- 3 Sarah A. Medepalli, ICF International
- 4 Gary Hainley, U.S. Boiler Company
- 5 Christine Hazelbaker, ACCA
- 6 Richard D. Murphy, American Gas Association
- 7 John A. Roda, Burnham Holdings
- 8 Steven J. Rosenstock, Edison Electric Institute
- 9 Paul Sohler, Crown Boiler Co.
- 10 Gregory J. Stunder, PGW
- 11 Cory Weiss, Fieldcontrols
- 12 Anurag Maheshwary, Department of Justice
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1 P R O C E E D I N G S

2 MR. BROOKMAN: Good morning everyone.
3 Welcome. So glad to see you here this morning. This
4 is the Notice of Proposed Rulemaking Public Meeting
5 on Energy Conservation Standards for Residential
6 Boiler. Today is Thursday, April 30, 2015, here in
7 the Forestal Building in Washington, D.C.

8 My name is Doug Brookman, Public
9 Solutions, Baltimore. Nice to see you this morning.
10 We're going to start with welcoming remarks from John
11 Cymbalsky.

12 MR. CYMBALSKY: Thank you Doug. My name
13 is John Cymbalsky. I'm the Program Manager for
14 Appliance and Equipment Standards here at DOE. I'd
15 like to welcome everyone here today for the public
16 meeting for our proposal on residential boilers.
17 Also, welcome all of those on the webinar.
18 Hopefully, today we'll have good connection to the
19 webinar and the audio.

20 We're in a room that we're generally not
21 in for our meetings, so hopefully all will go smooth.
22 If not, please, folks on the webinar just try to get

1 in contact with us if things aren't going smoothly so
2 we can try to rectify that, but DOE appreciates
3 everyone's comments on this rule as we go along
4 today. So, please don't be shy about raising any
5 comments you have with the presentations here. Thank
6 you.

7 MR. BROOKMAN: And just to be a little
8 more specific, we're hoping that those of you joining
9 us via the web that you can hear everything that's
10 going on in the room. And some of you have
11 representatives here in the room. If you could text
12 them or communicate with them via email if you're
13 having a hard time picking up the audio or the visual
14 -- I think the audio is the one we're concerned
15 about. The visual seems to be working well, but
16 hopefully this will all come together the way it
17 should.

18 All of you received a packet of
19 information, I hope. On Slide Number 6, you can see
20 an agenda as listed. Immediately following this
21 agenda review and a few preliminary slides, there's
22 an opportunity for summary remarks here at the

1 outset, brief opening remarks from anyone who wishes
2 to here at the outset.

3 Moving on from there, we will go through
4 this packet of information and this content, starting
5 with marketing and technology assessment and then
6 screening analysis, and then engineering analysis,
7 and proceeding markups analyses and energy use
8 characterization.

9 We'll take a mid-morning break around
10 about 10:30 or so. We'll proceed with life cycle
11 costs and pay period analysis and then shipments,
12 national impact analyses, RIA. We'll take lunch
13 around about 12:30 or so, probably, and then
14 proceeding or whenever we get there manufacture
15 impact analysis, environmental impacts, indirect
16 employment, and then at the end of the day today,
17 whenever we arrive there, yet another opportunity for
18 comment.

19 We want to make sure everybody gets the
20 chance to say everything they need to say or want to
21 say here during the course of this meeting.

22 Comments, questions on the agenda?

1 (No response.)

2 MR. BROOKMAN: Seeing none, I'd ask for
3 your consideration. Please speak one at a time, if
4 you would, here today. You can get used to turning
5 these microphones and off. We're going to do
6 introductions in a moment. You can get used to doing
7 that. If you'd say your name for the record each
8 time you speak. You don't need to say your
9 organizational affiliation unless you wish to.

10 If you could keep the focus here and try
11 and make your comments as succinct as possible, and
12 please turn your cell phones on vibrate, on silent
13 mode, if you would, so that we don't interrupt the
14 meeting here. And those joining via the web, we
15 certainly do welcome you. Hope you can participate
16 fully in this meeting. If you'd turn your telephones
17 on mute, and then you can raise your hand in the
18 software provided. And if we're luckily -- this is a
19 new room, as John Cymbalsky said, for us.

20 If we're lucky, we ought to be able to
21 hear you in the room. The audio seems to be
22 excellent so far. We'll see if the technology works

1 to our advantage or not.

2 Questions and comments before we proceed
3 with introductions?

4 (No response.)

5 MR. BROOKMAN: So, let's do that. The
6 little green light gets illuminated, name and
7 organizational affiliation. We'll just go around.

8 MR. SOHLER: Paul Sohler, Crown Boiler
9 Company.

10 MR. MARRAN: Roger Marran, Energy
11 Kinetics.

12 MR. FARRELL: Don Farrell, Oil Heat
13 Manufacturers Association.

14 MS. HAZELBAKER: Christine Hazelbaker, Air
15 Conditioning Contractors of America, or ACCA, the
16 Indoor Environment and Energy Efficiency Association.

17 MR. ROSENSTOCK: Steve Rosenstock, Edison
18 Electric Institute.

19 MR. STANONIK: Frank Stanonik, Air
20 Conditioning, Heating, Refrigeration Institute.

21 MR. MURPHY: Rick Murphy, American Gas
22 Association.

1 MS. MEDEPALLI: Sarah Medepalli, ICF
2 International, representing EPA.

3 MR. RODA: John Roda with Burnham
4 Holdings. We're the parent company of Crown Boiler,
5 U.S. Boiler, and New Yorker Boiler.

6 MR. HAINLEY: Gary Hainley, U.S. Boiler
7 Company.

8 MS. MAUER: Joanna Mauer, Appliance
9 Standards Awareness Project.

10 MR. LEKOV: Alex Lekov, Lawrence Berkeley
11 National Laboratory.

12 MR. FRANCO: Victor Franco, Lawrence
13 Berkeley National Laboratory.

14 MS. RIVEST: Catherine Rivest, Navigant
15 Consulting.

16 MR. DARLINGTON: Adam Darlington, Navigant.

17 MR. STAS: Eric Stas, DOE General
18 Counsel's Office.

19 MR. CYMBALSKY: John Cymbalsky, DOE.

20 MR. STUNDER: Greg Stunder, Philadelphia
21 Gas Works.

22 MR. LAU: Chris Lau, Navigant.

1 MR. ALLEN: Andrew Allen, Navigant.

2 MR. MAHESHWARY: Anurag Maheshwary,
3 Department of Justice.

4 MR. YILMUZ: Aykut Yilmuz, AHRI.

5 MR. MISLAK: Nicholas Mislak, AHRI.

6 MS. DAVIDSON-HOOD: Caroline
7 Davidson-Hood, AHRI.

8 MR. WEISS: Cory Weiss, Field Controls.

9 MR. BROOKMAN: Okay. Great. Thanks to
10 all of you. Welcome again. Glad to see you this
11 morning.

12 There are a few preliminary slides that
13 John Cymbalsky is going to read through. Okay.
14 Great. Thanks to all of you. Welcome again. Glad
15 to see you this morning.

16 There are a few preliminary slides that
17 John Cymbalsky is going to read through.

18 MR. CYMBALSKY: Okay, so again, welcome
19 everyone to the meeting and welcome to those on the
20 web. The slide just reiterates that we want to make
21 these meetings as accessible as possible, not only in
22 person but obviously around the country and around

1 the world on the webcast, so please feel free to
2 speak up. Even though you're not in the room, you
3 are virtually here and we appreciate your attendance.

4 So, the purpose of today's meeting is to
5 present the Proposal for Residential Boilers. We're
6 going to go through the slide deck and detail our
7 analysis, both on the engineer side and on the
8 economic side.

9 As we go through this, please feel free to
10 chime in with comments and questions. You will also
11 see little comment boxes as we go along, and you can
12 see one on this slide on the bottom. That's what a
13 comment box looks like, and we will point out
14 specific items of interest to DOE, not that all of
15 them aren't important, but there are some that we
16 find we need more information if we can get it. So,
17 at this time, we'll take opening remarks from anyone
18 who might have one.

19 MR. BROOKMAN: Summary statements here at
20 the outset. Joanna?

21 MS. MAUER: We're supportive of the
22 proposed standards that would result in significant

1 national energy savings and savings for consumers,
2 and there are a large number of models available
3 today at the proposed AFUE levels.

4 We do note that there is a large
5 additional opportunity for energy savings at
6 condensing levels for hot water boilers. DOE
7 estimates that national energy savings at condensing
8 levels would be more than five times larger than the
9 savings at the proposed standard levels and so we
10 encourage DOE to continue to consider condensing
11 levels for hot water boilers.

12 MR. BROOKMAN: Thank you. We're going to
13 have to get close to these microphones as we speak.
14 Steve Rosenstock.

15 MR. ROSENSTOCK: Steve Rosenstock, Edison
16 Electric Institute.

17 I just wanted to thank the Department in
18 this case for doing a rule that is fuel and market
19 neutral by looking at all different types of boilers
20 that are competing in the marketplace. Looking at
21 them and deciding on standards that are going to
22 affect at the same time. I believe that whatever the

1 final result is, by doing this process, I believe it
2 will be better for overall in terms of the final
3 result. Thank you.

4 MR. BROOKMAN: Thank you. Additional
5 comments here at the outset? Opening remarks?
6 Nothing additional?

7 (No response.)

8 MR. BROOKMAN: Okay, we're going to press
9 on with the content.

10 MR. CYMBALSKY: This is John Cymbalsky,
11 DOE, again.

12 I did receive from our staff a request to
13 do a presentation at today's meeting. Does that
14 still hold? I think it was maybe Crown Boiler?

15 MR. STUNDER: It wasn't Crown.

16 MR. HAILEY: Burnham Holdings Group had an
17 opening statement not a presentation.

18 MR. CYMBALSKY: Okay. I think now would
19 be your time before we move on.

20 MR. HAINLEY: So, I'm Gary Hainley with
21 U.S. Boiler Company and I'm also speaking on behalf
22 of the Burnham Holdings Group of Residential Boiler

1 Companies, which is U.S. Boiler, Crown, and New
2 Yorker.

3 We thank the Department for allowing us to
4 make oral comments. One of the concerns we have is
5 the simultaneous promulgation of the test procedure
6 as well as the rulemaking. And just find that it's
7 challenging for us to make final comments on the
8 proposed rule until we know how we're actually going
9 to be measured.

10 We feel that the test procedure will
11 reduce existing products by 1 to 2 percent AFUE
12 points and we really need to get a handle on that
13 before we can fully comment on this rulemaking.
14 Additionally, we feel that the biggest concern for us
15 is the 85 percent standard for gas-fired hot water
16 boilers, that, in essence, we run the risk of
17 eliminating chimney venting, that at 85 percent the
18 flue gas temperatures are reduced to such a extent
19 that many of the chimneys in place today just won't
20 be able to be used.

21 And with 85 as the federal minimum,
22 consumers no longer have the choice of using an 82,

1 83 percent product as they do today and it would
2 force them either into repairing an existing product
3 at lower efficiency and not upgrading or going to a
4 much more expensive retrofit to be able to get that
5 newer product.

6 MR. BROOKMAN: Thank you Gary. Additional
7 comments, perhaps final comments here before we
8 proceed with the content.

9 (No response.)

10 MR. BROOKMAN: Okay, proceed.

11 MR. CYMBALSKY: Okay, John Cymbalsky
12 again.

13 (Slide.)

14 MR. CYMBALSKY: So, this slide just shows
15 you what the request for comment boxes look like, and
16 they'll be sprinkled throughout the presentation
17 today.

18 As noted on the slide, the deadline for
19 submitting comments is June 1, 2015. Doug already
20 went through the agenda, and so we're going to dive
21 right in with the regulatory authority. So, several
22 pieces of legislation that became --

1 MR. BROOKMAN: We have a quick question or
2 comment.

3 MR. RODA: Yes, a question as to the June 1
4 deadline. I understand a request has been made to
5 extend that. Is that pending right now, a decision
6 on that?

7 MR. CYMBALSKY: I personally have not
8 received a request for extension.

9 MR. BROOKMAN: Please say your name.

10 MR. FARRELL: This is Don Farrell from the
11 Oil Heat Manufacturers Association. We did send a
12 request for an extension on the 27th, so it was very
13 recently. Basically, the thought is that with --
14 it's just too big of an issue for us to properly
15 comment on in that short time period. We request an
16 extension to at least 120 days so that we can
17 properly digest the 900-page technical document, the
18 changing of the testing procedure, along with
19 changing the efficiency ratings.

20 In order for us to be able to give a
21 proper, thought out, digestible response, we feel
22 that the June 1 deadline is just way too short.

1 MR. CYMBALSKY: Okay. Thank you. So, if
2 you don't mind emailing that to me personally so I
3 have it.

4 MR. FARRELL: Okay.

5 MR. CYMBALSKY: I'm fairly certain it
6 didn't come to my inbox.

7 MR. BROOKMAN: Frank Stanonik.

8 MR. STANONIK: Frank Stanonik, AHRI.

9 Yes, we submitted a request for extension
10 for an additional 60 days, and I directed it to the
11 people identified in the NOPR, so it went to Eric and
12 Ron Majet. I'll be glad to send you a copy of it.

13 MR. CYMBALSKY: Okay. Yes, unfortunately,
14 Ron's fairly ill recently, so that could fall through
15 the cracks; but if you could email and the docket as
16 well that would be very helpful.

17 MR. STANONIK: Okay.

18 MR. BROOKMAN: Thanks for that
19 clarification. Now, we're going to proceed with the
20 content.

21 MR. CYMBALSKY: Okay, so we're going to
22 start off with our regulatory authority. So, there's

1 three particular pieces of legislation that are
2 applicable here. So, there's EPCA of 1975, NAECA of
3 1987, and then EISA of 2007. Each one of these set
4 different requirements for DOE in order to go forward
5 with standards for boilers.

6 (Slide.)

7 MR. CYMBALSKY: So, NAECA established the
8 initial standards for boilers, and you can see the
9 cite to the U.S. Code there. DOE published a final
10 rule in November of 2007. And then EISA in 2007
11 further revised the AFUE requirements and also set
12 several design requirements for each product class.

13 So, for gas-fired hot water, oil-fired hot
14 water, and electric hot water boilers manufactured
15 after September 1, 2012, must have an automatic means
16 for adjusting the water temperature and also
17 disallowed the use of constant burning pilot lights
18 in gas-fired hot water and gas-fired steam boilers
19 manufactured after the same date.

20 (Slide.)

21 MR. CYMBALSKY: So, this table here just
22 gives a summary of what the AFUE requirements and the

1 design requirements are for the five product classes
2 shown here. I will not read through them. I'm fairly
3 certain most people are familiar with what the
4 requirements are at this stage.

5 (Slide.)

6 MR. CYMBALSKY: The next slide shows the
7 criteria for selecting standards levels. So, we have
8 what we call the EPCA seven factors, which are listed
9 here. And so for each one of those seven factors DOE
10 does some rigorous analysis around each one of those
11 factors to determine how to move forward with its
12 proposed standard level. Today we will walk through
13 each of these. I won't read them now, but we will go
14 through them one-by-one.

15 (Slide.)

16 MR. CYMBALSKY: The next slide shows where
17 our schedule is today. I understand we have a
18 request for comment extension, and so that may not be
19 factored into what you're seeing here today. So,
20 once we get all those comment extensions filed and
21 thought about, we will certainly let the stakeholders
22 know what the decision is from the Department and we

1 will adjust the schedule accordingly; but you could
2 see the different milestones here.

3 So, at this point, we project the
4 compliance date to whatever standard might become
5 final to be December 2020, and that's when
6 manufacturers would be required to meet any standard
7 that DOE goes final with.

8 (Slide.)

9 MR. CYMBALSKY: And then here is our flow
10 chart where we sit today. So, you could see the four
11 chevrons. We're at the NOPR stage. Once we have all
12 the public comments, we will proceed to the final
13 rule stage where DOE will let stakeholders know what
14 its final decision is.

15 And then at this point, we're going to
16 turn it over to the market and technology assessment
17 and pass it over to Catherine Rivest of Navigant.

18 MR. BROOKMAN: Question, please. Say your
19 name.

20 MR. MURPHY: Rick Murphy.

21 John, quick question on the request for
22 extensions, are those posted to the docket folder for

1 the rulemaking.

2 MR. CYMBALSKY: They will be if they're
3 not already, yes. I just need to gather them all.
4 I'm sorry I didn't get them personally, but we will
5 make sure they're in there.

6 MR. MURPHY: Thank you.

7 MR. BROOKMAN: Catherine Rivest.

8 MS. RIVEST: Thank you, John. I'm
9 Catherine Rivest of Navigant Consulting, and I'll be
10 going over the market and technology assessment, the
11 screening analysis, and the engineering analysis.

12 (Slide.)

13 MS. RIVEST: So, the purpose of the market
14 and technology assessment is to pull together all of
15 the information needed to structure the engineering
16 analysis so we can build representative cost curves.
17 So, the type of information DOE is interested in
18 answering our questions that include what types of
19 residential boilers are being sold, in what
20 quantities are they being sold, at which efficiencies
21 are they being sold, what technologies are included
22 in them, who manufactures them, and all of this

1 information is used to inform the engineering
2 analysis.

3 (Slide.)

4 MS. RIVEST: So, as you can see, the
5 Department breaks up residential boilers into six
6 different product classes on the basis of both fuel
7 type as well as heating median. And one thing to
8 note on this slide is that DOE did not analyze
9 electric boilers for active mode standards, only
10 standby and off mode standards.

11 (Slide.)

12 MS. RIVEST: So, looking at the relative
13 sales of the different product classes, you'll see
14 that gas-fired hot water boilers are accountable for
15 the majority of the shipments, along with oil-fired
16 hot water boilers, so DOE focused its analysis on the
17 hot water product classes. And depending upon the
18 product classes as well as the efficiency levels,
19 residential boilers could be made up of a variety of
20 different heat exchanger materials.

21 (Slide.)

22 MS. RIVEST: So, this figure here shows

1 the distribution of AFUE levels among gas-fired hot
2 water boilers. And so this distribution is useful to
3 DOE in the engineering analysis where there is a
4 selection of efficiency levels to analyze.

5 So, as you can see, the distribution is
6 broken out into two different segments, with the left
7 being non-condensing boilers and the right being
8 condensing boilers. And you'll notice that the
9 majority of non-condensing boilers are made up of
10 cast iron with some copper and some steel, while
11 condensing boilers are typically made with a more
12 corrosive-resistant heat exchanger, such as stainless
13 steel or aluminum.

14 So, gas-fired steam boilers tend to have a
15 much narrower band of efficiencies from 81 to 83 AFUE
16 and are generally made up of cast iron heat
17 exchangers. And so, for oil-fired hot water boilers
18 the range is much larger with the baseline coming in
19 at 84 and the max on the market at 93 AFUE, and
20 they're primarily comprised of cast iron and steel in
21 the non-condensing efficiency ranges. And oil-fired
22 steam goes from 82 to 86 AFUE, with the majority of

1 models coming in at 84 AFUE and being comprised of
2 cast iron.

3 (Slide.)

4 MS. RIVEST: So, in the technology
5 assessment, DOE developed a list of technology
6 options that could be used to improve residential
7 boiler efficiency as measured by the test procedure.
8 So, the two tables here list the technology options
9 that could be used to improve AFUE as well as standby
10 and off mode energy consumption. And one thing to
11 note is that this list includes all of the technology
12 options that could be used for every product class
13 and they're not all relevant to every product class.

14 And another thing to note is that this
15 list includes technologies that are incorporated in
16 the baseline, so DOE accounted for that.

17 (Slide.)

18 MS. RIVEST: And so the purpose of the
19 screening analysis is to screen out technologies that
20 won't be used in the engineering analysis. And DOE
21 does this by looking at every technology option and
22 screening it from the criteria to see if it's

1 technologically feasible, if it's practicable to
2 manufacture, install, and service, and if it has any
3 adverse impacts on the product utility or impacts on
4 health and safety.

5 So, in the screening analysis, DOE
6 screened out three technology options on the basis of
7 potential impacts to product utility, and those were
8 pulse combustion, burner de-rating, as well as
9 control relay to depower VPM motors.

10 (Slide.)

11 MS. RIVEST: So, moving on to the
12 engineering analysis.

13 MR. BROOKMAN: Yes?

14 MR. ROSENSTOCK: Hi, Steven Rosenstock.

15 When you say could reduce a customer
16 utility is that because some of these technologies
17 have reduced the utility in the marketplace or --
18 again, maybe it's in the technical support document
19 -- when you say could reduce, does it mean that in
20 certain cases that it has and that's why it's too
21 much of a risk to do that for a standard?

22 MS. RIVEST: It sort of depends on the

1 technology, but it could be seen as producing product
2 utility. Sorry.

3 MR. DARLINGTON: So, Steve, I think the
4 customer utility is a little bit subject, depending
5 on the customer, right? So, I think that this is
6 just saying that you know -- so, for instance, a
7 pulse combustion system you know it might be louder.
8 It might be you know less reliable. Depending on the
9 consumer, that may or may not be a big deal, Burner B
10 rating you're going to get a little bit less heat
11 output when you temper your burner down. So,
12 depending on that consumer's needs, it would reduce
13 the utility if they need the full heat output, right?
14 So, I guess that's why we said could reduce consumer
15 utility. But yes, I mean they presumably would in
16 certain instances, right, so that's why they were
17 screened out?

18 MR. ROSENSTOCK: Thank you.

19 MR. BROOKMAN: Frank Stanonik.

20 MR. STANONIK: Frank Stanonik, AHRI.

21 Yes, before we get off or too far away
22 from this, I understand you looked at distribution of

1 listings by efficiency and made the point before
2 that's really not the distribution of what gets
3 shipped and we will try and provide some information
4 that can better characterize what actually is rolling
5 out people's doors as opposed to what gets listed.

6 MS. RIVEST: That would be very helpful.
7 Thank you.

8 MR. BROOKMAN: Additional comments here
9 before we move on to the engineering analysis?

10 (No response.)

11 MR. BROOKMAN: Okay.

12 (Slide.)

13 MS. RIVEST: So, the purpose of the
14 engineering analysis is to see how manufacturer costs
15 and selling price changes with increased efficiency.
16 And so for the active-mode efficiency analysis DOE
17 used an efficiency level approach where DOE selected
18 efficiency levels and to determine their manufacturer
19 production costs at those levels.

20 For the standby and off mode analysis, DOE
21 used a design option approach and DOE relied on a
22 variety of sources of information in the engineering

1 analysis, so this included product tear downs,
2 manufacturer interviews, product testing, product
3 literature as well as product databases.

4 (Slide.)

5 MS. RIVEST: And this slide is just meant
6 to provide a general overview of the steps in the
7 engineering analysis, starting from the information
8 that's fed in from the market and technology
9 assessment to the selection of efficiency levels and
10 the selection of units for tear down up until the
11 determination of the industry average manufacturer
12 production cost. And we'll go through each of these
13 in the coming slides.

14 (Slide.)

15 MS. RIVEST: So, as you'll see from the
16 table, DOE performed a full tear-down analysis for
17 those product classes with the highest percentage of
18 shipments, and this consisted of many tear downs
19 across a range of efficiency levels. And DOE used an
20 alternate analysis for lower shipment product
21 classes, which relied on a smaller number of tear
22 downs as well as information obtained from similar

1 product classes and product literature.

2 (Slide.)

3 MS. RIVEST: So, discussing the baseline
4 units, so a typical baseline unit is a unit that just
5 meets the federal minimum efficiency standard and
6 this table lists the baseline characteristics of the
7 different product classes that were analyzed for
8 active mode efficiency standards.

9 So, you'll see some common characteristics
10 include cast iron sectional boilers, and the
11 representative input capacity for gas-fired products
12 was determined to be 100,000 BTUs per hour and that
13 of oil was determined to be 140,000 BTUs per hour.

14 (Slide.)

15 MS. RIVEST: So, the first step of the
16 engineering analysis is the selection of AFUE levels.
17 And between the baseline and -- DOE also selected the
18 max tech AFUE levels, which is the maximum efficient
19 models on the market.

20 And in between those two levels, DOE
21 selected intermediate efficiency levels where the
22 majority of products were determined to be as well as

1 anywhere there was a major change in technology. And
2 so this slide just shows all of the efficiency levels
3 that were analyzed in the active mode AFUE standards
4 analysis.

5 MR. BROOKMAN: Yes, question? John,
6 microphone, please and say your name.

7 MR. RODER: Catherine, I'm relatively new
8 to this. Can you define a term for me? What do you
9 mean by full tear-down analysis? I know that takes
10 you back a slide or two.

11 MS. RIVEST: Sure. So, a full tear-down
12 analysis is when DOE completely disassembles a unit and
13 catalogs each and every part according to its
14 material, the weight, and the processes used and then
15 creates a bill of material, which is ultimately
16 determined -- is ultimately used to determine the
17 manufacturer production costs, the estimated
18 manufacturer production cost.

19 MR. RODER: Okay. Thank you.

20 MR. BROOKMAN: Yes, please. Rick.

21 MR. MURPHY: Rick Murphy.

22 Just a process question, is this work --

1 was this work done prior to the Notice of Data of
2 Availability that was issued last year or after or
3 both?

4 MS. RIVEST: Both. It built upon the
5 information that was disclosed in the Notice of Data
6 Availability.

7 MR. MURPHY: Thank you.

8 MS. RIVEST: So, DOE selected units for
9 tear downs spanning all efficiency levels, and DOE
10 also chose products for tear down from multiple
11 manufacturers in order to account for different
12 fabrication techniques that may have been used. And
13 so DOE used three different practices in the
14 engineering analysis to come up with the cost
15 efficiency curves.

16 So, this included physical tear downs
17 where DOE disassembles the units into its component
18 parts, a process called catalog tear downs, which is
19 similar to physical tear downs, which DOE estimates
20 the difference between a unit that has had a physical
21 tear down and another unit that is very similar. So,
22 an example of this might be the addition of a heat

1 exchanger to a model that has been torn down.

2 And DOE also used an alternate analysis
3 for the steam product classes, so rather than
4 conducting tear downs at each efficiency level for
5 the steam product class; DOE relied on information
6 obtained from the hot water boiler product classes
7 along with product literature information.

8 MR. BROOKMAN: Yes, Frank Stanonik.

9 MR. STANONIK: Frank Stanonik, for HRI.

10 So, I guess not specific to the tear down,
11 but I think maybe this is the place to ask the
12 question, in the case of residential boilers you
13 really have a wider range of inputs available
14 compared to like furnaces. I mean you know the
15 definition of residential boilers stops at, what,
16 just under 300,000 BTUs per hour. And so the
17 question would be, so yeah, you've tear down baseline
18 units and that's typical. It's understandable, but I
19 guess I'm curious as to is there at some point where
20 you look at trying to, in this case, extrapolate that
21 -- actually go both ways, I guess, that tear down
22 information to some of the let's say larger input

1 boilers that are still out there and maybe even some
2 of the smaller ones?

3 MS. RIVEST: So, we hadn't seen the
4 efficiency really varied based off the size, the
5 capacity, and so, no, we did not extrapolate.

6 MR. STANONIK: Frank Stanonik.

7 MS. RIVEST: Well, directly in the
8 engineering analysis.

9 MR. STANONIK: Yes, I guess my concern is,
10 and I certainly will talk to our members about it,
11 but my concern is that maybe the cost becomes a bit
12 different when you're looking -- again, you tore down
13 the baseline. That's logical. That's appropriate,
14 but I'm starting to wonder because they're still
15 offering units with higher inputs and again, I will
16 probably say it more than once, we're not talking
17 about the big market of furnaces. We're talking
18 about a relatively small market of residential
19 boilers, so the issue of what might be the
20 manufacturing cost for a let's say 250,000 BTU boiler
21 may not just be a simple linear scale.

22 MR. BROOKMAN: Gary.

1 MR. HAINLEY: Gary Hainley, U.S. Boiler.

2 Frank's correct in that our cost structure
3 is going to change as we get to the larger boilers.
4 The lower boiler, the smaller boilers we manufacture
5 in higher volume, but once we start going above that
6 our cost to manufacture will be different because of
7 size of the parts and also just the volume. We don't
8 have the economies of scale to hard tool some of the
9 parts that we may hard tool for smaller boiler sizes.
10 That's a good point, Frank.

11 MR. BROOKMAN: Okay. Thank you.

12 (Slide.)

13 MS. RIVEST: So, this slide provides an
14 overview of the active mode engineering analysis of
15 each specific AFUE level, and AFUE levels highlighted
16 in green indicate that one or more tear downs were
17 conducted at that efficiency level. And those
18 highlighted in purple indicate that those results
19 were obtained through linear interpolation. And as
20 noted in the previous slide, a few of the efficiency
21 levels in the steam product classes were determined
22 using the alternate methodology, which relied on

1 information, obtained from the hot water product
2 classes.

3 (Slide.)

4 MS. RIVEST: So, after developing the
5 manufacturer production costs for each unit that was
6 torn down, the next step is to aggregate the
7 individual results into an industry cost efficiency
8 relationship. And so this is the industry average
9 cost efficiency relationship for gas-fired hot water
10 boilers. And what's primarily driving the increase
11 in costs in the non-condensing level is an increase
12 in heat exchanger service area and the jump at 90 is
13 due to the need for condensing, condensing heat
14 exchanger.

15 So, the cost associated with gas-fired
16 steam is largely driven by, again, a need for an
17 increase in heat exchanger surface area. And again,
18 in the non-condensing AFUE levels the cost is driven
19 by an increase in surface area, while for the 91 AFUE
20 point that's caused by a need for an increased heat
21 exchanger area as well as the need for a secondary
22 heat exchanger. And the cost for oil-fired steam are

1 due to a need for an increase in heat exchangers
2 surface area, for the large part.

3 MR. BROOKMAN: Frank Stanonik.

4 MR. STANONIK: Frank Stanonik, AHRI.

5 If you could actually step back, Slide 33.

6 Okay, I guess I just want to make sure I'm
7 understanding what I see here. So, the first bullet
8 says you created cost efficiency curves for each
9 major manufacturer, and then we have the little I'll
10 say simulated pairs down there on the left. And the
11 note says "Stylized graphics not based on actual
12 data." So, okay, I'm reading the first one that you
13 talked to some manufacturers and came up with rough
14 approximations; is that an incorrect understanding on
15 the first bullet there?

16 MS. RIVEST: That we came up with rough
17 approximation for?

18 MR. STANONIK: Well, it says, "DOE created
19 cost efficiency curves for each major manufacturer."
20 I guess which major manufacturer? Are we talking
21 about a general manufacturer of hot water boiler or a
22 general manufacturer ^^^^ something's not tracking

1 for me. I'm sorry.

2 MR. DARLINGTON: This is Adam from
3 Navigant.

4 So, what the first bullet is trying to say
5 is that we did tear downs looking at mainly the major
6 manufacturers. So, for each major manufacturer we
7 were looking at their units specifically. So, say we
8 had Manufacturer A or Manufacturer Number 1 in this
9 little simulated graphic here, so we had multiple
10 points for that manufacturer.

11 We would look at what does it cost for
12 that manufacturer to go from 82 to 84 to 95 or you
13 know whatever the efficiency levels were that we were
14 looking at and then we would have a cost efficiency
15 curve for that specific manufacturer. We would have
16 it for Manufacturer 2 and Manufacturer 3, look at
17 them all separately to see what each individual
18 manufacturer what it cost them to increase efficiency
19 and then we would merge those together to create sort
20 of an industry weighted average for increasing the
21 efficiency.

22 MR. STANONIK: Okay, it was based on the

1 tear down stuff. I missed that. Okay. Thanks.

2 (Slide.)

3 MS. RIVEST: So, the non-condensing
4 boilers may come equipped with inducer fans; however,
5 inducer fans were not show in the graphics that we
6 just saw and the manufacturer production cost
7 efficiency curves shown in the preceding slide did
8 not include the cost of an inducer fan. DOE did
9 estimate the cost of an inducer fan between a boiler
10 with natural draft and the same model with induced
11 draft, and it was found to be \$94. And this cost
12 adder is included in the downstream analysis based on
13 a percentage of models that would be expected to need
14 induced draft at a given efficiency level.

15 MR. BROOKMAN: Frank.

16 MR. STANONIK: Frank Stanonik, AHRI.

17 Catherine, can you tell us what that
18 assumed percentage was; do you know offhand?

19 MR. DARLINGTON: It's in a later slide.

20 MR. STONONIK: Okay. All right, well then
21 I'll wait.

22 MS. RIVEST: So, DOE is seeking comments.

1 MR. BROOKMAN: So, a fair amount of
2 content in those engineering analysis slide.
3 Comments here? Frank Stanonik.

4 MR. STANONIK: Frank Stanonik, AHRI.

5 I mean I'll wait, but I'll also make the
6 comment that at the level that DOE's proposing we
7 think because of the manufacturer's need to make sure
8 that products will be properly and safely installed
9 in the field and trying to address what is the
10 variety of installations we think that that level
11 will, in fact, probably drive a majority of products
12 to have some kind of draft inducers or some
13 additional mechanical component added to the boiler,
14 and so we think there's a real issue there.

15 MR. BROOKMAN: Yes, Rick.

16 MR. MURPHY: Rick Murphy, AGA.

17 I'm trying to understand what actually
18 happened between the point in time where the Notice
19 of Data Availability came out that indicated that
20 there was not a justification for raising the
21 efficiency levels and where we are today. So, in the
22 engineering analysis, can you share with us some of

1 the additional engineering analysis work that was
2 done after the Notice of Data Availability and what
3 prompted that?

4 MS. RIVEST: So, in terms of the
5 engineering analysis, several more tear downs were
6 performed for the cost efficiency curve side.

7 MR. MURPHY: I'm a little confused by the
8 note -- your statement that it showed that it was --
9 the NODA didn't do anything of the sort.

10 MR. DARLINGTON: I thought in the NODA it
11 had identified that based upon the preliminary
12 analysis that DOE did not see a justification for
13 increasing the statement.

14 MR. MURPHY: That statement was never
15 made.

16 MS. RIVEST: I think the statement that
17 was made is that DOE was not advocating for a
18 specific efficiency level in the NODA. It was just
19 providing information without giving a stance.

20 MR. BROOKMAN: Yes, please, Gary.

21 MR. HAINLEY: Gary Hainley, U.S. Boiler.
22 To the comment about standards above 82

1 percent, we're concerned -- and again, I think Frank
2 commented that we feel that at 85 percent nearly all
3 of the product will need to go to an inducted draft
4 product, likely sidewall, because the chimneys just
5 won't work in a large extent of the installations at
6 85 percent because of reduced flue gas temperatures
7 and reduced buoyancy, that you'd need some mechanical
8 means.

9 Our concern with that, and we're working
10 with customers now to try to understand the
11 restrictions that they have in sidewall venting in
12 high density urban areas. Historic areas don't allow
13 sidewall venting in some situations. There's some
14 situations in metro New York, Philadelphia where
15 sidewall venting is not practical and not cost
16 effective. So, we're working with customers to
17 provide more comment on that and more specifics; but
18 we are aware of situations where a standard level at
19 85 percent will essentially drive some customers to
20 just repair existing product. They're not going to
21 be able to afford to do the significant retrofits to
22 get to that level.

1 MR. BROOKMAN: Thanks. Additional
2 thoughts, comments here? Yes, Roger.

3 MR. MARRAN: Roger Marran, Energy
4 Kinetics.

5 To add on to Gary's point, I think, one of
6 the things that we've had is on Slide 29 we noted max
7 tech for a different type of technology and modality.
8 And there's certainly a max tech for natural and
9 atmospheric draft as well as condensing technology
10 and I think it's important to recognize that how the
11 max tech impacts the market from the standpoint of
12 what products can be produced and serve that market
13 as we look forward.

14 So, if there's certain adjustments to AUE
15 where you can squeeze that market it may have a
16 dramatic impact towards what can be served and how
17 you can work with those particular products.

18 MR. BROOKMAN: Okay. Thank you. Yes,
19 please, Paul.

20 MR. SOHLER: Paul Sohler.

21 Can you maybe elaborate a little bit on
22 the -- you know one of the issues that goes into

1 screening analysis is impact on health and safety.

2 I'm wondering if you could elaborate a little bit on
3 exactly how you go about applying that standard.

4 MS. RIVEST: So, if the technology is
5 shown to have any impacts on health and safety, then
6 that's something that's considered. Although if it's
7 something that might have an impact on health and
8 safety, but if it just needs a safety measure in
9 order to prevent the impact ^^^^ from having an
10 impact, then it would not be screened out.

11 MR. SOHLER: Is there some consideration
12 on the probability that you know a given technology
13 -- you know if it's a technology that will, in a
14 perfect world, be safe, but let's say in practice it
15 increases the odds of a safety issue; is that looked
16 at?

17 MR. DARLINGTON: Let me answer this one.
18 More pointed, it sounds like you're asking whether or
19 not the installers, for example, will be able to
20 install a condensing technology correctly?

21 MR. SOHLER: Not whether they'll be able
22 to, but is it really going to happen in a reasonable

1 percentage of cases?

2 MR. DARLINGTON: Right. And I think we
3 have someone from ACCA here. Maybe they want to
4 comment on the installer issue, but the condensing
5 technology has been around for a while. It's
6 installed safely, as far as I know most -- all the
7 time, but maybe the ACCA person can comment as to how
8 the installers go about making sure they install the
9 product safely.

10 MR. BROOKMAN: Christine, you want to
11 comment?

12 MS. HAZELBAKER: Not at this time.

13 MR. BROOKMAN: Not at this time. Paul,
14 keep going.

15 MR. SOHLER: Yes, I guess, my concern is
16 basically just you know this issue that I think
17 several people have alluded to about putting 85
18 percent AFUE boilers into you know chimneys -- you
19 know atmospheric boilers it's not that that may not
20 be technically possible to do. The reality is that
21 in a lot of cases when you look at the skill set of
22 the people who are installing this type of equipment

1 you know inability to size equipment properly you
2 know and just you know the condition of a lot of
3 chimneys that if that level is kind of driven it's --
4 you're basically reducing the margin of safety that
5 you have you know by moving the level up to that
6 point for things like chimneys that are a little
7 undersized, maybe the liner is not in real good
8 shape, maybe it does need to be relined and there's a
9 water heater there and now the liner is smaller and
10 you know like I said it's --

11 MR. DARLINGTON: So, we account for all
12 those costs, and you'll see that later, that we do
13 assume that when this replacement happens that all of
14 those things have to happen to install that
15 technology, so yes.

16 MR. STUNDER: So, I guess what he's
17 getting at ^^^^ Greg Stunder from PSW is there can be
18 certain situations where -- and how does it factor
19 into your analysis where it wouldn't be properly
20 installed and that could impact on safety. Did I
21 state it correctly?

22 MR. STOHLER: That's exactly what I'm

1 trying to drive at, yes.

2 MR. DARLINGTON: I mean we assume that the
3 installers know how to install the equipment.

4 MR. STOHLER: And I guess I would go on
5 the record and say I don't think that assumption is
6 valid, put bluntly, in a lot of cases, not all.

7 MR. STAS: Eric Stas.

8 Are you aware of any data to document the
9 problem you think might be out there because that
10 would be helpful for the record if you do.

11 MR. STOHLER: I think that you know
12 there's plenty of incidents that involve chimneys
13 that are you know not -- that had problems that
14 resulted in flue products spilling into buildings. I
15 mean as far as getting -- I might direct you to CPSC
16 possibly may have some data. We might be able to
17 provide some as part of our written comments.
18 Obviously, a lot of it's antidotal, but you know it's
19 definitely an issue. It's a big issue.

20 MR. BROOKMAN: Christine, you want to
21 comment here?

22 MS. HAZELBAKER: Christine Hazelbaker.

1 I just reached out to one of my
2 contractors and we'll get back with a comment, but I
3 just want to check with the field first.

4 MR. BROOKMAN: Thanks very much. John,
5 please.

6 MR. RODER: John Roder, Burnham Holdings.

7 The issue of carbon monoxide is always
8 front and center for us. And you have a situation
9 where you're creating -- where you're asking a
10 contractor to install a boiler that's 85 percent
11 efficient into a chimney that's inadequate. You are
12 creating a risk there.

13 In an ideal world, they'd say, yes, we've
14 got to line this. Yes, it has to be so big; but the
15 reality is in the urban markets where these are sold
16 there's not rigorous inspection programs by most
17 municipalities. They're installed and then it's left
18 to the manufacturer to try to deal with the problem
19 that the installer created who may or may not be
20 around after it's been installed.

21 So, I think to Paul's point it's extremely
22 troubling for us to think about, oh, this is going to

1 assume that the contractor base will all be qualified
2 and recognize these issues that we find out sometimes
3 in very serious situations.

4 MR. BROOKMAN: Okay. Frank Stanonik.

5 MR. STANONIK: As far as Issue 2 there,
6 our position is -- okay, we certainly support DOE's
7 decision to not go to a condensing level, but we have
8 very serious concerns about going to 85, which is
9 kind of we would say mex tech, not max tech, not in
10 condensing.

11 I think you're hearing some of those
12 concerns, but I think -- I just want to point out
13 something that I will say underscores the difference
14 and why we have a heightened level of concern about
15 difficulty of installing these products so that
16 you'll have a properly operating venting system and a
17 safely operating boiler.

18 And this is from the 2009 EIA housing
19 characteristics, okay. And so this is simply by
20 their estimate number of homes -- and I'm just going
21 to use natural gas -- that uses either a natural gas
22 furnace or a boiler, okay. "Prior to 1950, 50

1 percent of all homes -- 2009 data, okay -- but 50
2 percent of all homes that had a boiler were built
3 before 1950. Only 12 percent of homes that had a
4 furnace were built between 1950." Okay.

5 Now, take it one step further, "Only about
6 5 percent of the homes that have furnaces have two or
7 more housing units. Almost 50 percent of the homes
8 that have a gas boiler have two or more housing
9 units." Okay. So, what are we talking about? We're
10 talking about older homes ^^^^ and again, you look
11 where boilers are installed. We're talking about
12 older homes probably in major urban areas that were
13 -- you know my best example is one I always think
14 about, and you have them in D.C. and in Baltimore,
15 row houses you know, or they might be multi-families,
16 but basically there is not -- certainly not four
17 walls that you might have access to vent the product.

18 You have the roof, yes, but some of these
19 if you start talking about trying to vent them
20 through the roof with an 85 percent product or an 86
21 oil, you're asking for trouble and we know that. And
22 so I think that's why we're going -- we are more

1 concerned about an 85 percent level, which is
2 non-condensing, which nominally is atmospheric
3 vented, but to install base of where these boilers
4 are, and this is replacement business. Where they
5 are in the venting systems they're using now, okay,
6 because we're talking about half the homes were built
7 before 1950

8 You know the manufacturers that's their
9 market and they have to deal with that. And so this
10 level at 85 is, for us, just too far as a minimum.

11 MR. CYMBALSKY: This is John from DOE.

12 So, I'm just looking at Slide 17. So,
13 this is the gas-fired hot water market disposition
14 from the AHRI directory. So, I'm just looking at the
15 disposition of the model. So, we have at the 85 AFUE
16 level you have -- it looks like 80 models. Now, I
17 know we keep talking about 85. Is what you described
18 the problem at 84 as well, or no?

19 MR. STANONIK: Frank Stanonik, AHRI.

20 Well, the magnitude certainly goes
21 downward. You know whether it becomes more of a
22 manageable issue or not that's something we're still

1 looking at.

2 MR. CYMBALSKY: So we have, just looking
3 at this chart, we have about 180 models at 82 and 83
4 and we have 140 models at 84 or 85 -- well, actually
5 if you add 86, go about 150. So, to me the market
6 looks a 60/40 split below 84 and 84 and above. That
7 seems to tell me that lots of people are installing
8 84 and above.

9 So, the question then back to you guys is
10 if that's, in fact, true then if there was a problem
11 installing these I would assume it would make
12 national headlines. I hadn't seen it, but please
13 provide the data if it has.

14 And then secondly, it seems to me that if,
15 in fact, Frank's statistics bear out that all these
16 things go into older homes, then 40 percent of them
17 are doing it already. So, I guess the models don't
18 bear out the logic that you've -- and I'm not
19 disagreeing. The statistics are what they are, so I
20 agree wit them, but the market data tells me that
21 this is happening at a fairly high rate already.

22 MR. BROOKMAN: Paul, go ahead.

1 MR. SOHLER: Paul Sohler.

2 You know as far as the 85 percent units
3 that are shown here, looking in the AHRI directory at
4 those that are atmospheric there are three cast iron
5 basic model groups. One of them has venting
6 requirements that go above and beyond what's in the
7 National Fuel Gas Code. The other two go up to about
8 120,000 BTUs per hour at the top end. That was as
9 far as cast iron.

10 So, you know you're looking at, yes, those
11 models are out there. It doesn't mean that they're
12 widely used. You know basically they exist. And I
13 don't have that data for the 84 percent at my finger
14 tips. I think you will find something similar if you
15 look at that.

16 MR. BROOKMAN: Go ahead, John.

17 MR. CYMBALSKY: Just a follow on, so my
18 other thought is -- again, these are thoughts for
19 everyone to chew on here. So, if, in fact, you are
20 in an older home and in a home that appears to be in
21 some disrepair, it appears to me that the installer
22 would actually be more -- and the homeowner would be

1 more cognizant of potential venting issues like
2 chimneys that don't work so well or what not. To me
3 the problems -- the oops come in where you look at
4 something and you say this looks great, so you kind
5 of ignore it.

6 When you go to a home that's built before
7 1950, nothing's been done to it, it seems to me that
8 any mildly intelligent person would come in and say
9 we got to look at these other things because this is
10 an old home. There's bricks missing from the chimney
11 you know further down the line. So, to me, I would
12 take all those points into consideration before we
13 say that a qualified installer is just going to
14 ignore obvious problems with potential installation
15 issue. So, that's where I'll end it.

16 MR. BROOKMAN: So, we have a comment from
17 an individual who's joining us on line. Michael
18 McDonald from PB Heating says if the chimneys must be
19 relined would this also make the replacement of a
20 water heater in that same chimney necessary? This is
21 especially burdensome for an urban customer.

22 MR. DARLINGTON: We're going to get to

1 that.

2 MR. BROOKMAN: Okay, so we'll be
3 responding to that. So, we left off, I believe, on
4 Slide Number 39. Yes, please, Gary.

5 MR. HAINLEY: Before we move on, I wanted
6 to comment. Gary Hainley with U.S. Boiler.

7 Frank had commented earlier that when we
8 look at the statistics of distribution of models
9 available that doesn't represent models sold. And
10 models sold is really what impacts our history in the
11 field and the experience, so U.S. Boilers sells
12 products at each of these atmospheric levels, 82, 83,
13 84, 85; but the models sold at 85 is significantly
14 lower than those sold at 82, 83. We also sell
15 fan-induced products at the 85 percent level, and I
16 think that's where we see most of the model numbers
17 in this at this level.

18 So, the field experience isn't with a
19 chimney-vented product. A lot of it would be with an
20 induced-draft product, so again, I think Frank will
21 try to work with the manufacturers to -- or AHRI will
22 work manufacturers to try to get some of that data

1 that doesn't specifically provide manufacturer sales
2 numbers.

3 MR. CYMBALSKY: This is John from DOE.

4 Thank you for that. So, my request was
5 going to be a data request that the -- you know
6 that's the Holy Grail of analysis, right, the
7 shipment data by efficiency level. And obviously, we
8 don't want to publish manufacturer-specific data, so
9 anything you can provide through the NDAs that you
10 may have set up with the consultants we would love
11 that data. We would aggregate it to the
12 industry-wide numbers and would certainly help us in
13 our analysis and get to the points that we've been
14 just debating here today. So, thank you so much for
15 actually saying that for the record that you would
16 try to provide that. That's awesome.

17 MR. HAINLEY: And to your comment or your
18 question about do we have the same concerns at 84
19 percent as we do 85, I think the answer is, yes, that
20 flue gas temperatures are very low for both of those
21 compared to an 82 percent product. So, I think it
22 really takes away the utility of existing chimneys.

1 And I think to think to the comments of you know what
2 do installers do I think we need to get more data on
3 that before we can comment further on what would the
4 average installer do if they saw a chimney with
5 pieces missing. I think the answer is most of them
6 are going to fix it.

7 MR. BROOKMAN: Okay. Thank you. We're
8 going to keep pressing ahead here, okay? Catherine.

9 MS. RIVEST: Thank you very much for all
10 of your comments.

11 (Slide.)

12 MS. RIVEST: So, this rulemaking also
13 considered a standby and off mode standards. So, DOE
14 considered a single standby and off mode standards
15 for each product class as it was found that most
16 boilers do not come equipped with an off mode switch
17 and in cases where off mode switches are present
18 they're often not used as off switches, and so DOE
19 used the design option approach due to the fact that
20 there are currently no federal standards for standby
21 and off mode for boilers and the measurements are not
22 currently published by manufacturers. And the design

1 options that had been selected in this engineering
2 analysis were identical for each product class;
3 however, the efficiency levels differed by product
4 class due to differences in the baseline levels.

5 So, DOE established baseline levels based
6 on product test data, along with manufacturer
7 feedback. So, as I mentioned there's currently no
8 ratings for standby and off mode, so DOE created a
9 baseline product to be the most consumptive product
10 on the marketplace. And DOE did this by adding
11 together the most consumptive components for each
12 product class. And you can see some of the key
13 drivers are the transformers as well as the controls
14 caused a lot of the standby and off mode.

15 MR. BROOKMAN: Steve Rosenstock.

16 MR. ROSENSTOCK: Steve Rosenstock, Edison
17 Electric Institute.

18 I see that these are all I'll say the
19 worse case scenarios for all of these different types
20 of standby. And I was wondering what was the low end
21 of the range if they were using, for example, a
22 display that had the most efficient LED lights out

1 there, for example, or they had the -- I'll say the
2 mid-range transformer? I'm just kind of wondering
3 what is the range? These are the worse case, but how
4 low did it go in some of the actual installations out
5 there.

6 MS. RIVEST: I'll have to get back to you
7 on that, but generally, the best case units were ones
8 with almost no electronic controls.

9 MR. ROSENSTOCK: Steve Rosenstock, EEI.
10 So, there were some things where the
11 standbys were as low as I'll say 1 or 2 watts, right?

12 MS. RIVEST: That's correct.

13 MR. ROSENSTOCK: Okay, Steve Rosenstock,
14 EEI.

15 I have some issues with this. Just again,
16 just because I believe -- and this is going further
17 on in the analysis is like it seems like it's a worse
18 case analysis where what is the range of actual
19 wattage in the standby is -- it's anywhere from 1 to
20 2 to 11 and the median or the average value is
21 actually closer to I'll say 7 or 8 watts. I don't
22 know what the actual number is. And then you have --

1 eventually, you're doing all this analysis where you
2 know if they put in these more expensive controls
3 you're actually using more watts than the baseline
4 was using.

5 MR. CYMBALSKY: This is John from DOE.

6 So, what you're confusing here is what
7 this chart is trying to represent, which is the
8 baseline. Worse case scenario, as you put it, or
9 most consumptive, as we put it. What the analysis
10 does is then goes and sees what is the market share
11 in there, and so this is trying to tell you what the
12 worse case scenario is, the most consumptive case.
13 And so it is "the baseline." And if you'd look to
14 the next slide, if we could just advance you could
15 see some of the best case scenarios, which is what we
16 evaluated.

17 The disposition in the market today will
18 come later and Victor will describe that, but just
19 like every other rulemaking the market share is
20 different than what is the most consumptive. Here
21 we're just showing the most consumptive.

22 (Slide.)

1 MS. RIVEST: So, then starting from the
2 baseline, DOE identified technology options that
3 would produce the standby and off mode and
4 implemented them in order of cost effectiveness. Are
5 there any requests for comments on the standby and
6 off mode? No?

7 MR. STANONIK: Quick question. Frank
8 Stanonik, AHRI.

9 Okay, so on your standby -- the power
10 reduction in the column on the preceding slide the
11 reduction you're showing is that -- that wasn't clear
12 to me. Is it cumulative or is it per the measure?
13 In other words, so the first -- you know level one
14 reduces it by 1.5. So, is level two is the total
15 reduction, the 1.8?

16 MS. RIVEST: Yes, the total reduction is
17 1.8.

18 MR. STANONIK: Okay, so assuming all
19 things are correct here, so for one dollar you would
20 save 1.5 watts and for basically another 950 you're
21 going to save me .3 watts? Okay.

22 MR. BROOKMAN: Steve Rosenstock.

1 MR. ROSENSTOCK: Steve Rosenstock, EEI.

2 And again, I don't know if it said in the
3 technical support document -- if I did, please
4 forgive me. What was the range of savings for these
5 technologies? Is this the best case or worse case
6 savings for this technology, or is this an average or
7 median?

8 MS. RIVEST: These are the estimated --
9 what it was estimated to be.

10 MR. ROSENSTOCK: Estimated based on?

11 MS. RIVEST: Based on virtual tear downs.

12 MR. ROSENSTOCK: So, did you have watt
13 meters when you put the technology in that you were
14 always saving 1 watts or did it vary by a certain
15 amount?

16 MS. RIVEST: So, it was done really more
17 as an exercise of what would happen if we were to
18 switch out these components, so we didn't actually
19 you know change out the power supply from one unit to
20 another.

21 MR. DARLINGTON: So, some of the estimates
22 for the reduction are based on discussions that we

1 had with the manufacturers and some of them are based
2 on technical literature, papers that we found where
3 they've actually looked at these design options and
4 looked at what the difference is. And actually, I
5 think some of them may have been observed differences
6 in testing, in which case it would probably be the
7 average.

8 So, for instance, you know we've seen
9 units that use the switching mode power supply, but
10 things like the low loss transformer that's going to
11 be more based on literature. And if you go to the
12 TSD, it cites the different papers that were used to
13 determine those.

14 MR. ROSENSTOCK: Steve Rosenstock, EEI.

15 Again, I was trying to read through the
16 technical support document, but it's still a matter
17 of does this represent, again, because I think it's
18 important. Does this represent an average savings
19 with all the technologies out there, or would this
20 represent the best case savings?

21 MR. DARLINGTON: No, it's more of a
22 typical saving. So, if you put this in --

1 MR. ROSENSTOCK: So, you think it's the
2 average.

3 MR. DARLINGTON: I wouldn't say it's
4 definitely an average, but I would say it's supposed
5 to be typical.

6 MR. ROSENSTOCK: Typical.

7 MR. DARLINGTON: If you put the best low
8 loss transformer that you can find on the market in
9 this is it you know it's more what was the one that
10 was looked at in this paper.

11 MR. ROSENSTOCK: One model?

12 MR. DARLINGTON: Yes. Well, I'd have to
13 go look at what they did in the paper.

14 MR. ROSENSTOCK: Again, Steve Rosenstock,
15 EEI.

16 It all kind of pulls together because,
17 again, depending on the range you know if the actual
18 low end of the range by doing -- you know level one
19 is you know .5 watts versus 1.5 watts then you have
20 to scramble to get those extra watts from somewhere
21 else. Now, it's probably available, but again, it's
22 still a matter of -- you know you're talking about

1 very you know kind of minimal savings here.

2 And so that's why -- you know if there's a
3 significant range that could make a difference in
4 terms of the actual design options that the
5 manufacturers have. Just again, if it's somewhere in
6 and buried in the support document or paper that's
7 great, but again, I'm just trying to determine -- you
8 know to make sure that there's multiple options here,
9 that this wasn't just the best case or that there was
10 some sort of a testing that kind of backs this up.

11 MR. BROOKMAN: Do we have additional
12 comments on this table talking about standby mode and
13 off mode? Comments here?

14 (No response.)

15 MR. BROOKMAN: Okay.

16 MS. RIVEST: So with that, I'll pass it
17 along.

18 MR. FRANCO: Thank you, Catherine. Good
19 morning. My name is Victor Franco from Lawrence
20 Berkeley National Lab.

21 Next we will be talking a look at markup
22 analysis and energy use characterization.

1 (Slide.)

2 MR. FRANCO: Markups are used to determine
3 consumer prices from manufacturers' selling price for
4 both baseline and higher efficiency products. The
5 appropriate markups for determining consumer product
6 prices depend on type of distribution channels
7 through which the product moves from manufacturers to
8 purchasers.

9 At each point of distribution channel,
10 companies mark up the price of the equipment to cover
11 their business costs and profit margin. There is one
12 primary type of distribution channel describing the
13 way most equipment passes from the manufacturer to
14 the consumer, as shown on these two charts, the
15 manufacturer going to wholesaler, wholesaler to
16 mechanical contractor, and to consumer.

17 DOE also distinguishes between new
18 construction and replacement application. Now, the
19 replacement applications also include new owners for
20 hot water gas boilers. The new construction
21 applications are expected to include the general
22 contractor, as shown in these graphs. The channels

1 are shown again in these flow charts.

2 Also, for residential boilers in
3 commercial applications represent about 7 percent of
4 residential boiler shipments. DOE considers an
5 additional distribution channel for which the
6 manufacturer sells the product to a national account
7 under both replacement and new construction markets.
8 Further details are included in chapter six.

9 Based on information provided by
10 manufacturer interviews, there's another possible
11 distribution channel, which includes retail store
12 instead of wholesaler. In this case, the
13 manufacturer sells the equipment to a retailer who,
14 in turn, sells to a mechanical contractor who, in
15 turn, sells it to a consumer. However, DOE does not
16 have enough information at this point to make a
17 separate markup estimate for this distribution
18 channel. DOE would assume that retail markup is
19 similar to the wholesale markup.

20 DOE is also aware that there may be two
21 additional distribution channels for residential
22 boilers. One is the online distributions where the

1 manufacturer sells the product to online retailers
2 who, in turn, sell them directly to consumers. And
3 rebranding distribution channel where the wholesaler
4 or retailers negotiate good pricing from the boiler
5 manufacturer based on high volumes and have the
6 product customized to carry their name and then send
7 it through the normal distribution channel to
8 contractors. DOE did not use both of these based on
9 limited data, and assuming that the market share for
10 both of these is not very significant.

11 (Slide.)

12 MR. FRANCO: The method used to calculate
13 the markups is based on analyzing the company's
14 direct cost expenses and profits, using the data
15 provided as shown in this table below. For the
16 wholesaler markup, DOE uses the Hardy 2012 Profit
17 Report. For the mechanical contractor markup, DOE
18 uses both ACCA 2005 Financial Analysis Report data
19 and 2007 Economic Census data. For the general
20 contractor, DOE uses U.S. Census, 2007 Economic
21 Census data. Sales tax data is available from 2013
22 Sales Tax Clearinghouse data.

1 Using this data, regional distributor and
2 contractor markups as well as sale taxes were
3 calculated for both residential boiler prices in both
4 residential and commercial applications to match the
5 regions in the building sample, which we'll be
6 talking later in later slides.

7 MR. BROOKMAN: Steve Rosenstock.

8 MR. ROSENSTOCK: Steve Rosenstock, EEI.

9 Just a quick question, there was no more
10 recent data for the markups from 2005 or 2007?

11 MR. FRANCO: Thank you for that question.
12 Victor Franco.

13 The latest data is 2005 from ACCA. The
14 Economic Census just came out with 2012 and we plan
15 to use that more recent data. We believe ACCA
16 produces every 10 years, 2015 would be the next one.
17 We're expecting that at some point that might be
18 updated.

19 MR. BROOKMAN: This is John from DOE.

20 Steve, do you have a reason to believe
21 markups --

22 MR. ROSENSTOCK: Steven Rosenstock, EEI.

1 No, I was just kind of curious about the
2 age of the data, that's all.

3 MR. CYMBALSKY: Okay. Thank you.

4 (Slide.)

5 MR. FRANCO: So, going on to the next
6 slide, the baseline markups relate manufacturers'
7 selling price to the consumer purchase price. To
8 accomplish this, DOE applied the baseline markups to
9 the manufacturers' selling price of the baseline
10 equipment. The incremental markups relate to
11 increase in the manufacturers' selling price of more
12 efficient products to the increase in consumer
13 purchase prices.

14 These markups only cover the expenses that
15 vary with the manufacturers' selling price. Fixed
16 costs such as overhead and labor do not scale with
17 increased efficiency. The incremental markups were
18 applied to incremental difference and MMP at each
19 level above the baseline.

20 Based on the shipment analysis for 2012,
21 the table below shows the fractions of replacement
22 and new construction fractions. As you can see, the

1 gas-fired boilers represent 90 percent of
2 replacements and 10 percent new construction. Just
3 to note, replacements in this case also include new
4 owners, and we'll go over that in a little more
5 detail.

6 In terms of new owners, 20 percent of that
7 90 is new owners, so 18 percent, oil-fired accounts
8 for 2 percent of new construction. For electric hot
9 water, 23 percent are new construction. And for all
10 steam boilers, we assumed zero percent new
11 construction.

12 (Slide.)

13 MR. FRANCO: This next slide provides the
14 overall results for the markups. The first table
15 presents the results for the market participants in
16 the residential applications. The manufacturer
17 markup is 1.41 and then the wholesaler, mechanical
18 contractor, general contractor for the new
19 construction is show as well in the sales tax. Based
20 on these numbers, we come up with the overall markup.
21 Again, this is an average. In the analysis, we
22 applied this by region.

1 The average markups by product class
2 accounting for replacement, new construction,
3 commercial applications and the regional difference
4 in markups are shown below by product class. For
5 example, for gas-fired hot water boilers, the
6 baseline average markup is 3.27 and the incremental
7 average markup is 2.107. DOE requests comments on
8 its markups analysis.

9 MR. BROOKMAN: Frank Stanonik.

10 MR. STANONIK: Frank Stanonik, AHRI.

11 We're just -- well, not just, but we're
12 kind of digging into this one a little bit for the
13 furnace rulemaking. And I'm going to hedge a little
14 bit here because we're still gathering the
15 information and trying to make sure we properly
16 analyze it, but starting to get a hint that this idea
17 that as you have incremental improvement in the
18 product or whatever that the markup changes.

19 We're getting feedback from -- we're
20 surveying -- trying to survey contractors and we're
21 getting feedback that that's not the case, that their
22 markup is their markup and they don't really care

1 whether it's a baseline or a deluxe or whatever. We
2 hope to do a similar attempt at a survey with people
3 who install boilers and try and get that done in time
4 for whenever the comment period closes.

5 But again, in the past, I think we've kind
6 of just not dug into this one too much, but now that
7 we do have a kind of -- at least getting some hints
8 of answers that say there's, at least some segment of
9 the contractors, this isn't the case. I'll try and
10 give you better data.

11 MR. BROOKMAN: Thank you, Frank, that's
12 helpful. Appreciate that. Additional comments here
13 on markups because we're about to take a break.
14 Final comments on markups?

15 (No response.)

16 MR. BROOKMAN: Let's take a break. We've
17 covered a lot of ground already. It's 10:35
18 approximately. We're going to break for 15 minutes,
19 which means we'll resume at 10:50 here in this room.

20 (Whereupon, a short recess was taken at
21 10:35 a.m.)

22 MR. BROOKMAN: We are going to pick up

1 where we left off. Thanks for your comments so far,
2 good comments, and we're going to keep on with that.
3 Victor Franco's going to continue.

4 MR. FRANCO: This is Victor Franco again.
5 We're going to continue on to the energy
6 use characterization.

7 (Slide.)

8 MR. FRANCO: We're going to continue on to
9 the energy use characterization. The purpose of the
10 analysis is to determine the annual energy
11 consumption at every efficiency level to find the
12 annual energy costs and savings.

13 DOE considered three components to the
14 energy use analysis. It considered the space heating
15 fuel, the water heating fuel, and the electricity use
16 associated with the water heating and space heating.
17 DOE did not consider other applications such as snow
18 melting or other applications where boilers are used.

19 In terms of each individual component,
20 we'll go into more detail, but basically space
21 heating is calculated by using the burning operating
22 hours and multiplying it times the input capacity.

1 And we determined the AFUE of the -- used by
2 determining the AFUE efficiency level. We used RECS
3 2009 and CBECS 2003 to determine the heating energy
4 used, and we used some other adjustment factors we'll
5 be describing in further detail.

6 For water heater, we used the AFUE at each
7 efficiency level. We used RECS 2009 and CBECS 2003
8 data for the water heating energy use and we applied
9 some adjustment factors.

10 The electricity is determined using the
11 burner operating hours to determine for space heating
12 and water heating and multiplying those time the
13 power ratings of the electrical components. Standby
14 and off mode is also considered. The electricity use
15 was calculated using the standby and off mode
16 operating hours as well as the power ratings for each
17 technology option. It is important to note that for
18 this analysis we're considering single-stage controls
19 for all non-condensing boilers and condensing hot
20 water oil boilers. For all condensing hot water
21 boilers, we assume modulating controls. Obviously,
22 there are models out there with two-stage modulating

1 controls for non-condensing and there's some
2 condensing with single-stage controls.

3 (Slide.)

4 MR. FRANCO: Since we discussed that CVAC
5 and RECS data is very important for the development
6 of the energy use characterization, here a slide
7 describing the determination of the building sample.

8 So, we start up with the whole RECS 2009
9 sample and CBECS 2003 sample to determine what
10 buildings have a residential boiler. The
11 considerations are listed here.

12 First, the boiler is the main or secondary
13 source of heat. The boiler uses heating fuel that is
14 natural gas, LPG, electricity or fuel oil. The
15 heating energy consumption is greater than zero and
16 the heated square footage is less than 10,000.

17 Next, we disaggregate to come up with a
18 byproduct class, first, by fuel, gas, oil, and
19 electricity. RECS and CBECS do not distinguish
20 between hot water and steam applications, so DOE used
21 all the sampled households for the gas-fired hot
22 water, oil-fired hot water, and electric hot water

1 sample and assumed that the gas-fired steam sample
2 were building built before 1970. Before 1970, steam
3 was more prevalent, so we assumed that buildings
4 before 1970 might include steam, so that's where the
5 sample comes from.

6 Some of the samples statistics are
7 provided in this table. It's important to note these
8 are the weights of the number of buildings from RECS.
9 DOE adjusted these weights based on shipments data
10 provided by AHRI from 2008 to 2012.

11 Next, let's go into more detail about the
12 energy used in the space heating. Again, the annual
13 fuel use is a multiplication of the burning operating
14 hours and the boiler input capacity. For this
15 analysis, we calculated the fuel use using the
16 currently proposed federal test procedure for
17 boilers, which is in the NOPR stage. A public
18 meeting was a month ago.

19 The boiler input capacity is derived using
20 a sizing criteria methodology. We assume that the
21 same size input capacity is the same for all
22 efficiency levels. So, if a household is designed at

1 200 KBTU per hour boiler at 82 percent for hot water
2 gas boilers, at 90 percent AFUE the input capacity is
3 the same, 200 KBTU even though the output would be
4 different.

5 We used the following household
6 characteristics to come up with the sizing. We used
7 the square footage of the building provided in CBECS
8 and RECS data, the vintage, the foundation type,
9 shell characteristics, and number of floors. In
10 addition to this, we matched each household to an
11 outside design temperature and we matched each
12 household to an existing AFUE based on the age of the
13 boiler and historical shipment data by efficiency.

14 Lastly, we assumed an oversized factor,
15 that currently test procedure assumes at 1.7 oversize
16 factor and that's what we used for this analysis.
17 The results of this is we pretty closed matched the
18 historical shipments data that we have by input
19 capacity. The comparison is available in Appendix
20 7B.

21 (Slide.)

22 MR. FRANCO: Next, we come up with the

1 burner operating hours. The burner operating hours
2 are the building heating load divided by the useful
3 output. We assume that the building heating load is
4 the heating load served by a single boiler. So, if a
5 household has multiple boilers, we assumed the
6 heating load by that one single boiler were being
7 analyzed.

8 The useful output includes the energy
9 delivered to supply the water, the energy to the
10 environment that's provided from the boiler, and the
11 electrical losses that also go into the space
12 potential.

13 (Slide.)

14 MR. FRANCO: Let's go into more detail
15 into the burner operating hours. So again, the
16 burner operating hours are the building heating load
17 divided by the useful output. The burner building
18 heating load served by a single boiler is described
19 by the follow equation. We use the fuel consumption
20 of the heat based on RECS for 2009, that's the QYR
21 parameter, that's the fuel consumption of the
22 household or building. We adjust this to account for

1 the existing boiler efficiency.

2 The existing boiler efficiency is further
3 adjusted to account for the field conditions. And
4 what we'll describe how the AFUE both for the
5 existing and take into account the installation hot
6 water return water temperature and other factors. In
7 addition, we make some further adjustments to the
8 building heating level. We take into account any
9 secondary heating equipment that's being used. RECS
10 do list some households that use other equipment,
11 such as direct heating equipment in the same
12 household and so we subtract that.

13 We take into account also the building
14 shell efficiency in 2020. This is based on the AEO
15 2013 data. The average climate conditions come from
16 the 10-year average from NODA heating degree data.
17 To account for potential trends in heating degree
18 data from 2013 to 2020, we base it on AEO 2013 data.

19 We take into account the boiler count.
20 So, if there's more than one boiler in the household,
21 we divide that by the number of boilers and the
22 number of units household or housing units that are

1 served by the boiler. So, for example, in the
2 multiple family application if the boiler is shared
3 between many households, then we multiply that time
4 the number of units that are being shared by the
5 boiler.

6 Lastly, we determine the useful output.
7 The useful output is basically the useful electrical
8 heat. And this comes from the current test
9 procedure, depending on the installation location and
10 the input capacity we described earlier times the
11 AFUE of the new boiler. We adjust the AFUE to
12 account for field conditions.

13 MR. ROSENSTOCK: Steve Rosenstock, Edison
14 Electric Institute.

15 Looking at Table 733 and 734 of the
16 technical support document, I'm seeing the range of
17 heating loads and boiler annual operating hours. And
18 I appreciate you know this very well done. It's
19 showing the averages and then the percentiles. And I
20 guess 50 percentile that would be kind of the median
21 value. Wouldn't that represent kind of the median
22 value based on the analysis?

1 MR. FRANCO: That is correct, yes.

2 MR. ROSENSTOCK: So again, I'm just being
3 a numbers geek here -- Steve Rosenstock, EEI.

4 I'm seeing a significant difference
5 between the median value and the average value
6 somewhere along the order of like 20, 25 percent for
7 many of the categories. So, I was just kind of
8 curious. I know that's going to vary by climate zone
9 and everything, but when I see such widely scattered
10 data, wouldn't it be better to start with the median
11 value rather than the average value when they're so
12 wide apart, when they're so -- when there's such a
13 wide range of data and there's such a big difference
14 between the average and the median values?

15 MR. FRANCO: This is Victor Franco.

16 So, in our analysis, we calculate
17 household-by-household, so we don't use average or
18 median.

19 MR. ROSENSTOCK: Thank you.

20 MR. BROOKMAN: This doesn't really fit in
21 the current stream, but we might as well as it now.
22 One of the individuals joining us on line, Mark

1 Krebs, asks there are many makes and models of
2 tankless water heaters with sufficient capacity to
3 take the place of boilers. Are tankless water
4 heaters considered in this Notice of Proposed
5 Rulemaking?

6 MR. FRANCO: So, we'll go into a little
7 bit of detail into that actually in this next slide,
8 but we assume tankless the terminology we got from
9 manufacturers and others is we define them as low
10 mass boilers, and so some of the tankless are low
11 mass boilers. And we'll discuss how we consider
12 those into the analysis in terms of energy use.

13 MR. BROOKMAN: Thank you. Yes, Frank
14 Stanonik.

15 MR. STANONIK: Okay, Vic, are we still on
16 Slide 52?

17 MR. FRANCO: Yes.

18 MR. STANONIK: No, back up a minute, if
19 you will. Let's go back to -- yes, that one. Okay.
20 Thank you.

21 Not being real familiar with the AEO data
22 on building shell efficiency, do you know is that

1 looking only at single-family dwellings?

2 MR. FRANCO: This is Victor Franco.

3 The model is actually looking at
4 single-family, multi-family buildings. The value
5 that we used is an aggregated value, but it's
6 separated between single- and multi-family in the
7 actual AEO values, how it's produced.

8 MR. STANONIK: Okay. And Frank Stanonik,
9 AHRI.

10 I guess then I'll have to -- we'll have to
11 dig into it. I guess my concern is, again, I'm even
12 becoming more aware -- you know we have a huge
13 percentage of boilers that are in multi-unit
14 buildings and so now I have an issue -- not an issue,
15 but a factor that you have shared walls between units
16 and I would say that's not really even a shell,
17 right? I mean you know, again, I keep thinking of
18 either multi-family or the row house as well. If I'm
19 one of those middle row houses, my shell is very
20 different than the people on the end. We'll look at
21 that. Thanks.

22 MR. CYMBALSKY: This is John Cymbalsky

1 from DOE, former EIA employee for 20 years, and
2 actually developed the model you're talking about, so
3 maybe I can add some expertise.

4 So, the building shell, like Victor said,
5 is parsed out by housing type. The attached homes
6 that you're referring to are in the single-family
7 bucket. The multi-family bucket, the high rises, my
8 understanding -- and Victor can correct me if I'm
9 wrong, but the vast majority of the big, multi-family
10 units are the big boilers that are not residential
11 boilers, so they would not be in this rulemaking.
12 So, I think you can just pretty much ignore that.
13 And if your comment is for us to just use the
14 single-family value, maybe that's the helpful comment
15 here. That might be more appropriate.

16 MR. STANONIK: Frank Stanonik, AHRI.

17 John, I'm kind of definitely more focusing
18 on let's say certainly not high rise. You know
19 maybe, again, easily visual idea is the row home, but
20 even maybe garden units where maybe you have only two
21 or three stories of units which still might lean
22 towards individual products as opposed to -- you know

1 when you get into big buildings you got a big boiler.

2 MR. CYMBALSKY: This is John again from
3 DOE.

4 I don't think that's very common. I could
5 be wrong, but I think the majority of these, the row
6 houses definitely I can understand, the old row
7 house; but the garden style apartment type stuff
8 they're not going to have boilers.

9 MR. STANONIK: I would think post-1950.

10 MR. CYMBALSKY: I would think so too.

11 MR. RODA: This is John Roda, Burnham
12 Holdings.

13 There are a number of rental units in
14 Lancaster, Pennsylvania. And I don't think this is
15 so atypical that were broken into two and three unit
16 apartments. At one time, they were a single-family
17 home. Before codes got around and started
18 restricting it, people converted the three or
19 four-bedroom, three bath house to three units and
20 those do use residential boilers.

21 MR. FRANCO: Thank you. Victor again.

22 MS. SHEPHARD: Actually, can I ask a

1 follow-up question. So, you mentioned -- Amy
2 Shephard from AHRI. You mentioned it used the AEO
3 2013 data. Is that same data available in the AEO
4 2014?

5 MR. CYMBALSKY: Actually, now AEO 2015.

6 MS. SHEPHARD: Okay. And so why did not
7 use the 2014 data; is there any difference in the
8 data?

9 MR. CYMBALSKY: I'm sure it's different.
10 The analysis here was done quite a long time ago, so
11 we will update it as we normally do for every
12 rulemaking. The analysis here -- this rule was at
13 OIR for quite a bit of time, as you're probably
14 aware. So, I'm thinking this analysis was done in
15 2013. Yes, because we submitted it I think April
16 2014. So, we did this analysis in the calendar year
17 of 2013, for the most part.

18 MS. SHEPHARD: Okay. So, I guess we would
19 be interested in whether there's any significant
20 changes in the data. And then I just wanted to
21 clarify something. The slide on 51 says that the
22 calculations were based on the proposed test

1 procedure, but you said the useful output was that
2 using the current test procedure? Did I get that
3 right or did I mishear?

4 MR. FRANCO: No, everything is accounting
5 for the new test procedure.

6 MS. SHEPHARD: Everything's under the new
7 test procedure?

8 MR. SHOLER: So, I guess my question --
9 Paul Sohler.

10 The burner operating hours I think that is
11 different in the 2015 proposed procedure versus what
12 we're currently using; is that correct, the method by
13 which one calculates burner operating hours?

14 MR. FRANCO: That is correct. In the test
15 procedure there's kind of an appendix not related to
16 AFUE calculations that calculates burner operating
17 hours and then those are used to calculate ESAEVE,
18 which is electricity EF. Those do change. They're
19 mainly due to the calculating two -- more properly
20 calculating two-stage modulating equipment. We used
21 those calculations for this analysis.

22 MR. SHOLER: Okay. I guess my question is

1 is there -- well, is there a reason for using the new
2 -- you know this is a proposed procedure versus what
3 is established right now.

4 MR. FRANCO: Yes, those, again, don't
5 affect the AFUE rating. Those are mainly to better
6 calculate the electricity and fuel use. The
7 corrections are to account for modulating equipment
8 in two-stage equipment. They don't really impact
9 single-stage boilers.

10 MR. SOHLER: Okay. Thank you.

11 (Slide.)

12 MR. FRANCO: Okay, so the next couple of
13 slides describe how we adjust the AFUE to account for
14 field conditions. So, it's important to note first
15 that we do the adjustments for both the AFUE of the
16 existing and new boiler. So, what we were trying to
17 take into account is what type of applications that
18 the boiler is in, in terms of the return water
19 temperature.

20 We also make some assumptions about the
21 automatic means that's being used for the boilers and
22 any accounting of the jacket losses associated with

1 the boilers. So, for instance, let's talk about the
2 return water temperature adjustments.

3 They're based on the high and low return
4 water applications. The high return water
5 applications are mostly to units associated with
6 non-condensing boilers. We assume at average 160
7 degrees Fahrenheit, and these applications include
8 corrective baseboards and panel radiators that
9 typically are about from 140 to 180.

10 The low return water temperatures are
11 mostly associated with condensing technology. We
12 assume an annual average of 110 degrees. These are
13 associated with in floor radiated tubing as well as
14 it could potentially be a little bit higher for
15 either roof or wall panels, and also associated with
16 panel radiators, which have a potential to have a low
17 return water temperature.

18 We assume it's similar to the test
19 procedure that the temperature difference between
20 supply and return water temperature is 20 degrees.

21 Next, we account for the automatic means
22 adjustments. So, we apply adjustments to all

1 equipment installed after 2012, which mandates the
2 use of automatic means. For single stage, we assume
3 that the adjustment is -2 degrees and just for the
4 return water temperature. For modulating equipment,
5 we assume that's a 10-degree difference in the low
6 return water temperature applications.

7 In terms of the jacket losses, we applied
8 jacket losses to boilers installed in non-condition
9 spaces. We'll describe in the installation model the
10 fractions and further detail of how we determine
11 non-condition basements and garages, but 35 percent
12 of gas-fired boiler installations are in
13 non-condition basements and garages and 53 percent of
14 oil-fired boiler installations.

15 So, for these we take the jacket loss
16 factor into account based on the current test
17 procedure, which is based on EISA 103, the proposed
18 test procedure -- sorry -- based on EISAR 103 2007.
19 The jacket loss factor is 2.4 percent. For low mass
20 boilers, we assume that this is much lower, so we
21 assume that it's 10 percent of this value, and that
22 would 0.24 percent.

1 In terms of low mass and high mass, we
2 assume that 75 percent of condensing boilers are low
3 mass and 25 percent of non-condensing boilers are low
4 mass.

5 MR. BROOKMAN: Yes, go ahead, Roger.

6 MR. MARRAN: Yes, Roger Marran, with
7 Energy Kinetics.

8 I just want to point out I guess when
9 we're taking a look at a few things with jacket loss
10 adjustments and that jacket loss being in a
11 non-condition space or weatherized there's a
12 difference in how that plays out. And I know the
13 standard treats it in some ways, but some of the
14 field studies and some of the Department of Energy
15 lab studies treat it very differently without a loss.

16 And from that standpoint, I just want to
17 point out also that jacket loss for the mounting
18 place inspection and access work panels can be
19 omitted in the standard and for a lot of equipment
20 that's a huge section of loss that's not addressed
21 when we look at these two, and that plays more into
22 the idle loss characteristics too, so it's much

1 greater opportunity for gains based upon better
2 installation application in those kind of areas
3 without the need to maybe adjust the AFUE base
4 structural thereto.

5 MR. BROOKMAN: Thank you. Yes, Frank
6 Stanonik.

7 MR. STANONIK: Frank Stanonik, AHRI.
8 Victor, the last thing about your
9 percentage assumptions on low mass and not low mass
10 is that for all boilers? I don't have a real good
11 sense of the oil boiler market, but those numbers to
12 me would look a little off if I were just talking
13 about oil boilers in terms of the low mass/high mass
14 issue.

15 MR. FRANCO: Thank you for that comment.
16 Yes, for this analysis we do assume these fractions
17 are the same for all. Condensing boilers are a small
18 fraction of the market in the oil, but yes, they are
19 assumed to be. So, if you have any information or
20 input that would be really useful to us.

21 MR. BROOKMAN: Yes, Paul.

22 MR. SOHLER: Paul Sohler.

1 I'm trying to find it right now, and I'm
2 not able to, but my recollection was that the default
3 jacket loss for all indoor or all boilers was 1
4 percent. I don't recognize that 2.4 percent number.
5 Where'd that come from?

6 MR. FRANCO: This comes from the test
7 procedure. There are actually two kind of jacket
8 loss factors in the test procedure. One is a 1.7
9 percent factor and this is 2.4 percent factor. This
10 is to adjust for the AFUE. They're factors used
11 just for the output capacity.

12 MR. SOHLER: Okay. And this is, again,
13 different in the current versus new standard?

14 MR. FRANCO: This actually does not
15 change. It's actually the same between those.

16 MR. SOHLER: Okay. Thank you.

17 (Slide.)

18 MR. FRANCO: So, next, we'll look at a
19 little bit more detail the actual factors and how
20 they're applied. So, here on these tables we show
21 the actual decrease or increase of AFUE rating based
22 on our assumptions that we described earlier. So,

1 the first table describes boilers, single-stage
2 boilers, both non-condensing and condensing with high
3 and low return water temperatures. In addition, for
4 high return water temperatures we account for when
5 the boilers don't have automatic means and have
6 automatic means.

7 So, as you can see for non-condensing, we
8 decrease the AFUE rating by 1 percent. So, if the
9 boiler is rated at 82 percent AFUE, the actual
10 efficiency in the field would be 81 percent. For
11 condensing boilers, we decreased it by a little more
12 than 3 percent. So, if a condensing boiler is at 90
13 percent AFUE, the actual field efficiency would be a
14 little bit less than 87 percent AFUE. So, this is to
15 take into account that sometimes it won't be actually
16 condensing.

17 For low return water temperatures, since
18 this is below the AFUE -- I forgot to mention. The
19 AFUE's rating is at 120 degrees. Because it's below
20 the 120 degrees the adjustment is a positive 2
21 percent. So, if the AFUE of the boiler condensing is
22 at 90, the field adjusted rating would be at 92.

1 Similar adjustments are done to the modulating
2 boilers and you can see the numbers there.

3 (Slide.)

4 MR. FRANCO: To further describe, the
5 graph below shows how we come up with these for
6 condensing equipment. So, as you can see the rating
7 is at 120; that would give you maybe a rating of 90
8 percent. If you go below that to 100, then you would
9 go to 93. If you go above that to 140, you go to
10 97.5. That's how we determined these values.

11 These trends or this graph is based on
12 manufacture literature and models, but specifically
13 this graph is based on thermal efficiency. This is a
14 commercial product, and we assume for this case it's
15 similar to AFUE.

16 Now, the return water temperature for
17 condensing installations -- this is mostly applicable
18 to hot water gas boilers as follows. So, based on
19 market segments, we have new construction and new
20 owners. We assume that 100 percent of installations
21 would be at the low return water temperature. So, we
22 assume that the people that are going to be

1 installing in new construction and new owners will be
2 installing the low return water temperature, which is
3 the most beneficial for condensing.

4 In terms of replacements, in households
5 built after 1990, we assume that half of those would
6 be using a low return water temperature application.
7 For replacements built before 1990, we only assume 10
8 percent. And that 10 percent is really to account
9 for some situations where some of the building owners
10 actually did do a remodel of their building.

11 MR. BROOKMAN: Frank Stanonik.

12 MR. STANONIK: Frank Stanonik, AHRI.

13 Victor, I'm thrown a lot here, okay, and
14 I'm hoping I'm reading this wrong. So, this slide is
15 telling me that when you factored in the affect of
16 the automatic means it lowers the AFUE, that there's
17 no energy savings in the standard that was passed
18 whatever many years ago; is that what I'm
19 understanding?

20 MR. FRANCO: So, it does increase it, but
21 very, very slightly. It would be very interesting to
22 understand better how the current automatic means of

1 non-condensing equipment, which we believe for
2 single-stage equipment, is this post-purge, does
3 actually affect the AFUE. Our understanding it does
4 lower the temperature very, very little, but it would
5 be good from manufacturers perspective to get a
6 better understand.

7 MR. STANONIK: Frank Stanonik, AHRI.

8 And so what about those non-condensing
9 products that might be multi-staged? It looks at the
10 moment you didn't look at that one, or didn't try to
11 estimate that one.

12 MR. FRANCO: That is correct. Thank you
13 so much for pointing it out. So, the first slide for
14 energy use I did point out that for all
15 non-condensing and condensing for hot water oil
16 boilers we assumed that they're all single stage.

17 MR. STANONIK: Okay.

18 MR. FRANCO: And it would be good to have
19 either shipments data to account for those or have
20 input.

21 MR. BROOKMAN: Paul.

22 MR. SOHLER: Paul Sohler.

1 This curve here you said is based on
2 manufacturers' data. Is it residential or
3 commercial, the data where that came from?

4 MR. FRANCO: This is commercial. There is
5 a similar graph in the ACCA handbook which is
6 supposed to be applicable for both residential and
7 commercial applications. We don't have how the ACCA
8 chart was derived, so we used this which we had the
9 data for. We'd appreciate it if you have actual data
10 for residential application.

11 MR. SOHLER: I think some actual data is
12 in order as opposed to using sales literature or
13 whatever published literature it is. If DOE needs to
14 go and generate that, so be it.

15 MR. FRANCO: Thank you. Appreciate that.

16 MR. BROOKMAN: Yes, please, Gary.

17 MR. HAINLEY: Thank you. Gary Hainley,
18 U.S. Boiler.

19 Question on the return water temperature
20 fraction for condensing installations lower left
21 chart, I recall that it was mentioned that for
22 replacements where there was a new owner that that

1 was still considered part of the replacements. So,
2 your assumption is that if there's a new owner to the
3 home that they're going to have a system with low
4 return water temperature?

5 MR. FRANCO: That is correct in terms of
6 if they're installing a condensing boiler. Since
7 they have the option, at that point of installing a
8 non-condensing, for the non-condensing they would go
9 to potentially a high return water temperature
10 application. For the condensing, they would go to
11 below return water application is the current
12 assumption.

13 MR. HAINLEY: So, Gary Hainley, U.S.
14 Boiler.

15 I don't believe that's a reasonable
16 assumption because it requires that the heat
17 distribution system be replaced and that's a huge
18 cost to do that. I think if you have you know let's
19 just say 10,000 square feet of radiation that
20 requires a certain temperature to provide the heat
21 output. To get that to a lower temperature system,
22 you're going to increase the square foot of radiation

1 or in the case of radiant flooring you have to do a
2 whole new staple up application.

3 So, I think that's an incorrect
4 assumption. I think that the new owners, for the
5 most part, are going to be exactly the same as just
6 any other replacement. What's there is the heat
7 distribution system, whether it's condensing or
8 non-condensing.

9 And the other statement I would make would
10 be replacements built after 1990 for homes built
11 after 1990 I'm not convinced -- and again, I don't
12 have data to support that, but I don't believe that's
13 going to be any different than the home built in the
14 1950s. I think the majority of these are going to be
15 some type of high temperature radiation. You know
16 high level homes there's always been a percentage of
17 those that have gone to low temperature baseboard or
18 in-floor radiant heat, but that's a small percentage
19 of the population. Thank you.

20 MR. BROOKMAN: Thank you. Yes, please.

21 MR. MARRAN: Yes, Roger Marran with Energy
22 Kinetics.

1 Yes, I think to add to that too I think
2 with new construction the builders, in general, are
3 going to go low cost if they can, which means if
4 somebody can put in the minimum amount of radiation
5 they need in order to satisfy the home the contractor
6 may move in that direction certainly, arguably for a
7 large percentage of that market. Custom homes may be
8 a little bit different.

9 So, from that standpoint, I think they
10 would dial up the temperature of the boiler and
11 minimize the radiation to reduce the overall cost.
12 So, it's something to look at there to support that
13 point too.

14 MR. BROOKMAN: Okay. Thank you.

15 MR. FRANCO: Thank you so much for all
16 those comments. Just to clarify, because I went
17 really quickly over the new owners. The new owners
18 we're considering for the LCC, and we'll go to the
19 shipments analysis, are potentially people that
20 switch from other prior classes from boilers. So,
21 you would be correct in that case. They currently
22 have a distribution system. A fraction of those also

1 include people that do actually purchase this as new
2 equipment, so they might do a major remodel. They
3 might've had some other type of distribution or
4 something.

5 The 20 percent that we apply in this sale
6 for the analysis is for people that do completely
7 boiler, so they didn't have a boiler before. They're
8 actually doing a new distribution. And we'll go into
9 further detail in the shipments analysis, the other
10 fraction that actually do product switching that's
11 not accounted here in this LCC.

12 (Slide.)

13 MR. FRANCO: So, the next slide we look at
14 the distribution of heating energy use. So, this is
15 concluding the heating energy use discussion. Here
16 is the distribution based on the 10,000 households,
17 and below are some of the values for the four prior
18 classes we are considering for the AFUE standards.

19 The first column presents the results
20 based on just the raw energy use data provided from
21 CBECS and REIS and the median and average values.
22 The median is in parentheses, and the estimated

1 energy use in 2020 is provided in the next column.
2 As you can see, there's a significant decrease, about
3 23, 24 percent in the energy use that we're
4 calculating.

5 MR. ROSENSTOCK: Steve Rosenstock, EEI.

6 For the 2020 value, what was the primary
7 driver for that reduction? Is that building shell or
8 just overall -- just new shipments or what's the
9 primary driver?

10 MR. FRANCO: It's actually pretty
11 interesting there. Actually, all about the same, the
12 different adjustments, so building shells is slightly
13 greater. It's about 7 percent. Actually, the
14 adjustment from the heating degree data is from 2009
15 to 2013 to an average, heating degree data accounts
16 for another 5 percent, adjusting for trend between
17 2013 and 2020 another 5 to 6 percent, and finally,
18 doing the adjustment -- instead of the current AFUE,
19 which might be below 80 AFUE to the new at least 82
20 percent AFUE that accounts for another 4 or 5
21 percent. The last bit of the change is due to this
22 adjustment for secondary heating equipment.

1 MR. BROOKMAN: Frank.

2 MR. STANONIK: All right, Victor, the
3 distribution of heating energy use, the X axis I'm
4 reading as dollars, so either if you could help us
5 out by maybe telling us what you assumed is the per
6 unit fuel cost or maybe fix whatever needs to be
7 fixed; but right now I'm having trouble trying to
8 look at what appears -- you know the peak seems --
9 the peak on this chart, if I had to guess, looks it's
10 maybe 40 something, whatever that unit is. And yet,
11 you're telling me the average is like 95 million BTU.
12 Something needs to be fixed, please.

13 MR. FRANCO: Thank you so much for that
14 comment. Well, let me clarify. So, this chart shows
15 the second column, which is the estimated heating
16 energies in 2020. The average value -- and this is
17 just for hot water gas boilers. The axis should be
18 labeled a million BTUs per year, so it would be
19 around -- the peak would be around 50 -- 45 to 50 and
20 the median is listed on this table as 56. The
21 average would be 75, so it's -- as you can see,
22 there's like a --

1 MR. STANONIK: Okay, so this is a million
2 BTUs.

3 MR. FRANCO: A million BTUs per year, yes.
4 And I'm sorry about that.

5 MR. STANONIK: (Off mike.)

6 MR. FRANCO: That is correct.

7 MR. ROSENSTOCK: Steve Rosenstock, EEI.
8 The graphics is for 2020 is what's being
9 shown here, right? Okay.

10 MR. FRANCO: That is correct. And this is
11 just for efficiency level zero, so it's 82 percent
12 AFUE.

13 MR. CYMBALSKY: I think just to clarify so
14 it's the first row of the table, essentially, plotted
15 out for the distribution in the year 2020.

16 MR. MARRAN: Yes, Roger Marran with Energy
17 Kinetics.

18 When I was looking at Table 7B2.8, the
19 heating degree, the adjustment factors in the
20 baseline year I think that at Hughes actually had the
21 highest heating degrees of all the samples of that
22 10-year period was taken. It was the coldest period,

1 the coldest baseline year. The one in the RECS, 2009
2 regions, that was based on the NODA data. I just
3 wanted to bring that up because I thinking about the
4 5 percent reduction going from 2009 towards the 2013
5 and that may have a significant impact towards that.

6 (Slide.)

7 MR. FRANCO: So, moving on to water
8 heating energy consumption. So, DOE took into
9 account the energy use by this boiler for domestic
10 hot water. RECS and CBECS do not report of the
11 boiler's use for water heating, but DOE are aware
12 that a lot of these boilers are used for water
13 heating as well, so DOE used the following
14 assumptions.

15 For buildings that are listed with the
16 tank water heating and using the same fuel between
17 the space and water heating, DOE assumed that 50
18 percent of the time the boiler is used for water
19 heating. For buildings with tankless water heating
20 -- and this is mainly for oil equipment -- 100
21 percent of the buildings are assumed to be used with
22 both the boiler -- the boiler for both space heating

1 and water heating.

2 In terms of the actual calculations of the
3 annual water heating fuel consumption, DOE uses the
4 hot water formula that's been used before in other
5 rulemakings and adjusts it to be applicable to
6 boilers. So, in that sense, the formula has the
7 water heating load divide by the AFUE, which was
8 adjusted so that it becomes an actual kind of a water
9 heating efficiency. And the last part of the
10 equation adjusts for the standby losses associated
11 with using the water heating. We'll be describing
12 those in a little bit in further detail.

13 The adjustment factors for water heating
14 in terms of AFUE account for the differences between
15 the AFUE and the water heating efficiency, adjusting
16 for the difference between AFUE and the study state
17 efficiency, jacket losses in non-condition space, and
18 also adjustments for tankless coil. This is mostly
19 associated for oil equipment.

20 Lastly, we take into account water heating
21 loss. We assume a .5 kilowatt KBTU per hour for
22 indirect tanks and zero loss for tankless coil water

1 heaters.

2 The last equation in this component is the
3 water heating load. We take the water heating load
4 from the RECS data that reports the water heating
5 energy use and we further adjust it based on the AFUE
6 of the existing boiler and make the similar
7 adjustments that we did before.

8 MR. ROSENSTOCK: Steve Rosenstock, EEI.

9 On that, where you say 100 percent of
10 buildings uses tankless water heatings, if they had
11 gas equipment would that same assumption apply?

12 MR. FRANCO: That is correct. In RECS
13 2009, there is a very, very small fraction of
14 tankless.

15 MR. ROSENSTOCK: Steve Rosenstock again.

16 So, even though the tankless water heater
17 efficiency is higher than the boiler efficiency that
18 no one would ever use the tankless water heater; is
19 that what I'm hearing?

20 MR. FRANCO: No, let me clarify it. What
21 happens is that RECS reports just that there's a unit
22 of water heating that has either a tank or is

1 tankless and it doesn't mean that it's a tankless
2 water heat. It just means that there's no tank
3 associated with it and that its fuel. So, for
4 example, that's an oil or gas.

5 If we find that the boiler is of the same
6 fuel, then we make this assumption that they're
7 actually using the boiler for doing both, so space
8 heating and the water heating.

9 MR. ROSENSTOCK: Okay, Steve Rosenstock,
10 EEI.

11 Again, I don't have that type of
12 equipment, but again, if someone -- so again, looking
13 at the RECS data, if for some reason they put in the
14 tankless water heater because they wanted to do that
15 to shutoff the boiler, you can't really account for
16 it because the data doesn't really break it out even
17 though that's what the homeowner wants to do for I'll
18 say efficiency reasons or they just wanted to keep
19 the space heating and water heating systems separate
20 you're not able to adjust the analysis for that.

21 MR. FRANCO: Just to clarify, so for gas
22 equipment it's a very small fraction. It's less than

1 1 percent, and so we didn't make any further
2 adjustments. For oil it's very common that you would
3 use kind of a tankless coil in that situation and
4 that's --

5 MR. ROSENSTOCK: It's really a separate
6 system, so understood. Yes.

7 MR. FRANCO: And the tankless is mostly
8 associated maybe with a forced furnace, for a draft
9 furnace situation.

10 (Slide.)

11 MR. FRANCO: So, the next slide shows the
12 similar distribution of water heating energy use. So
13 again, we have the hot water fuel energy use. The
14 access is correct now. It's a million BTUs per year
15 and it's for efficiency level zero. And you can see
16 the distribution here. This is for 2020 values. The
17 values by product class are provided in the table.

18 The actual fraction of boilers that use
19 water heating equipment is similar. It's about 40
20 percent for all products. And the water use is very
21 similar. It decrease by about 1 million BTU, but the
22 main difference between -- the RECS provided data and

1 the energy use that we're calculating in 2020 is
2 because of the efficiency of the equipment. There's
3 no other adjustments in this analysis.

4 MR. MARRAN: Yes, Roger Marran with Energy
5 Kinetics.

6 I think some of these where I look at, for
7 example, hot water oil boilers there's a huge market
8 penetration for the tankless coil type boilers that
9 make heat and hot water. I think that number is
10 going to be a lot higher than what was shown here.
11 I'm not sure how you can get industry data to
12 demonstrate what that might be, but I suspect that
13 number is much greater than that. And I've heard
14 other companies cite also the percentage that has
15 indirect tanks with a boiler that's much higher than
16 those, the 40 percent average as well. So, those
17 couple of things might impact this too.

18 The other question that I had was the
19 adjustment factor to AFUE to calculate the hot water
20 efficiency do you have a magnitude of what that
21 adjustment number was that was used.

22 MR. FRANCO: It's provided in chapter 7.

1 There's actually a pretty big equation there.
2 There's actually three components to that equations
3 which is similar accounts for the jacket losses and
4 it depends on what the water heating, but it's around
5 2 to 4 percent, depending on what type of -- low
6 mass/high mass. If it's an indirect tank, it's a
7 tankless coil.

8 MR. MARRAN: Yes, Roger Marran again from
9 Energy Kinetics.

10 So, my question relative to that or
11 statement, I guess, relative to that would be I know
12 -- to refer back again to the Dr. Butcher study on
13 the performance of integrated hydraulic heating
14 systems in that study he published some of the water
15 heating efficiency factors and those numbers varied
16 from around 30 percent for some tankless coils all
17 the way up to I think 79 percent for the
18 top-performing system, but there's a significant gap
19 between the AFUE for that study and how it was
20 treated.

21 I understand that the idle loss that's
22 treated in there is considered as a gain in the

1 condition space for the purposes of AFUE, but in that
2 study it wasn't considered as a gain, so there's a
3 disconnect between those two, but it's certainly a
4 broad factor that should be applied in the
5 application of where the energy efficiency comes from
6 and for the opportunity for gains in home performance
7 would be.

8 MR. FRANCO: Thank you. I appreciate that
9 comment. And let me just clarify that when we do the
10 energy use for the water heating the efficiency that
11 was mentioning, the 2 to 4 percent is applied to the
12 AFUE component. There's also the standby losses.
13 So, if you account for standby losses that would be
14 different that's similar to what you're mentioning.
15 So, for applications it could be a 10 percent say or
16 greater.

17 MR. MARRAN: Roger Marran from Energy
18 Kinetics.

19 Now, earlier we mentioned there was a
20 certain percent that were in condition space and some
21 were weatherized, so that's taken into account? That
22 flows through the process to address that?

1 MR. FRANCO: That's correct.

2 MR. MARRAN: Okay. Thank you.

3 MR. FRANCO: Just one clarification, also
4 for the oil burners, I think one thing to be
5 considered, this is RECS data. There's a lot of oil
6 boilers that are associated with different water
7 heating types, so there's significant market that has
8 for, example, electric water heaters associated. So,
9 these fractions take that into account, but we really
10 appreciate data on that.

11 MR. BROOKMAN: Yes, please, Frank.

12 MR. STANONIK: Frank Stanonik, AHRI.

13 Victor, these numbers on the average water
14 heating energy use seem high, and we will certainly
15 try and give you some much better analysis numbers on
16 that, okay, but I'm just going to use my own history,
17 okay. And you know I'm probably one of those weird
18 people that look at their gas bill. So, in the
19 summer my gas bill when I'm basically heating water
20 and maybe running my grill, okay, I'm using about 15,
21 16 therms a month, okay. So, the crude calculation
22 here, so if that's my water heating energy on an

1 annual basis I'm using like 180 therms per month,
2 okay.

3 You're showing roughly for a gas product
4 probably about 50 percent more than that. I'm going
5 by the 28, okay. And again, there may be other
6 factors here, but we'll try and get into that a
7 little further and even look at some of the other
8 data on average water energy use. I mean for other
9 reasons I did something looking just a California
10 because we've got an issue with the California Energy
11 Commission. And again, California a typical
12 residential hot water use ran about -- I think it was
13 maybe 17, 18 therms a month, so it's a little high
14 and we'll try and maybe better identify maybe where
15 it's overestimating.

16 MR. BROOKMAN: Thanks Frank. Yes, Paul.

17 MR. SOHLER: Yes, Paul Sohler.

18 I would, yes, just note, and I'm having a
19 little trouble and I don't want to belabor trying to
20 understand how you came up with the fractions as
21 boilers used for water heating. The one thing that
22 definitely jumps out to me is the steam gas boiler

1 number being you know 40 percent basically seems
2 very, very high. And I think we can probably provide
3 some data to you know better reflect what that
4 actually is.

5 MR. BROOKMAN: Okay. Thanks.

6 MR. FRANCO: Thank you. We really
7 appreciate that. That's actually one of the
8 questions we were going to propose to ask. And
9 basically, we assumed the same for all of them and we
10 wanted to get your feedback on that.

11 To come back to the water heating just
12 really quickly --

13 MR. BROOKMAN: Yes, Rick, a question. Go
14 ahead.

15 MR. MURPHY: Yes, Rick Murphy, AGA.

16 Just curious as to how these fractions of
17 boilers that are used for water heating how that
18 comes into play in the water heating standard. Are
19 these numbers considered in that and are they
20 consistent?

21 MR. FRANCO: The last time the water
22 heating standard was 2010. We used RECS data from

1 2005 at that point. We didn't account for a fraction
2 of boilers that might be using water heating. That
3 would certainly be considered for the next round.

4 So, just to clarify, the estimate this is
5 just for boilers for water heating. If you looked at
6 all households, it runs about 18 to 20 in BTUs. It
7 would be interesting to see what kind of
8 characteristics -- this is just boilers. We
9 appreciate any feedback.

10 MR. STANONIK: Yes, Frank Stanonik, AHRI.

11 And Victor, I think the part we want to
12 look at ^^^^ I mean, again, certainly there's an
13 immediate difference that let's say your heat
14 generator is probably firing at least at twice the
15 rate of what your standard stand-alone water heater
16 would be doing, but you know there are some
17 differences. We need to kind of filter it out and
18 see, okay, but does that really explain why when you
19 do this you have what appears to be a higher energy
20 use for heating you know on the average basis the
21 same amount of hot water, right? We'll look into
22 it.

1 MR. FRANCO: Thank you.

2 (Slide.)

3 MR. FRANCO: Moving on to electricity use,
4 so DOE accounted for electricity used both in the
5 active mode and the standby and off mode, taking into
6 account when the boiler is used for space heating and
7 water heating. DOE took into account, based on this
8 equation shown here, the electrical power used during
9 the space heating and water heating, the standby, and
10 also accounted for some adjustments in terms of the
11 AC use because some of the heat in the condition
12 space might be used during the non-heating season and
13 that would impact the AC consumption.

14 MR. BROOKMAN: Yes.

15 MR. ROSENSTOCK: Steve Rosenstock, EEI.

16 Again, I could find it or I didn't bring
17 those pages in the technical support document. In
18 those situations, what kind of energy consumption are
19 we talking about? How much -- what's the magnitude,
20 what's the scale, what's the range in that case?

21 MR. FRANCO: These are fairly small, but
22 it depends on obviously the situation, but it could

1 be a positive to a negative effect, depending on
2 what's your baseline, but it's about 50 to 100 -- no,
3 it averaged about 50 kilowatt hours.

4 MR. ROSENSTOCK: 50 kilowatt hours a year?

5 MR. FRANCO: Yes.

6 MR. ROSENSTOCK: So, you're saying typical
7 of a central air conditioner uses about 2500 kilowatt
8 hours a year, central air conditioner. So, you're
9 saying it would increase the cooling load by 2
10 percent?

11 MR. FRANCO: Sorry. This also accounts
12 for the space heating, so a little bit of adding to
13 the space heater, so about --

14 MR. ROSENSTOCK: No, I understand the
15 electric use AC. It's just that 1 percent, so you're
16 saying --

17 MR. FRANCO: Yes, it's about 50 kilowatt
18 hours.

19 MR. ROSENSTOCK: Steve Rosenstock, EEI.

20 Again, just looking at the fractions and
21 then you show kind of where they're installed, again
22 I want to talk about it when we get to the

1 assumptions because especially if they're no where
2 near the thermostat they're not going to have any
3 impact whatsoever on the cooling load because ^^^
4 again, I don't know what the BTU output of that water
5 heater, what the BTU losses of that water heater, but
6 if it's only like 500 BTUs versus a cooling load of
7 36,000 BTUs per hour it's not going to change that
8 air conditioning compressor use and indoor fan use --
9 again, in my view.

10 I know it gets kind of where they're
11 located. I'm just again worried about that number
12 being assumed that every BTU is automatically into
13 the cooling load and they all affects the thermostat.
14 I'm a little worried about that. Thank you.

15 MR. BROOKMAN: All right, Frank.

16 MR. STANONIK: Frank Stanonik, AHRI.

17 Related question, and just understand how
18 you factored that particular energy use in, okay.
19 So, you know let's talk about boiler installation.
20 So, you have a certain estimate of how many boilers
21 are not in the condition space, so they wouldn't
22 affect the air conditioning.

1 When we talk about homes with boilers,
2 there certainly is some percentage that don't have
3 air conditioning, so how do you factor those factors
4 into what number you plug in because I'm assuming
5 that number gets plugged in in all cases, right? It
6 doesn't?

7 MR. FRANCO: No, it's an individual case.
8 And obviously, it takes into account where they have
9 an air conditioner where the --

10 MR. STANONIK: Okay, I misunderstood.
11 Right. Okay.

12 MR. FRANCO: And the 50 is just for the
13 houses that do have an air conditioner and have these
14 impacts applied, not to all households, just to the
15 ones that are impacted.

16 MR. ROSENSTOCK: And Steve Rosenstock,
17 EEI.

18 Was it different impacts for houses with
19 room air conditioners versus central?

20 MR. FRANCO: That's correct. Yes.

21 MR. ROSENSTOCK: Okay. Thank you.

22 (Slide.)

1 MR. FRANCO: Just moving through the
2 equations, so the burner operating hours take into
3 account the space heating and water heating. The
4 electrical power is of the electrical components.
5 Some of these are according to test procedure, other
6 comes from manufacturer literature, and we'll talk in
7 more detail in the next slide.

8 (Slide.)

9 MR. FRANCO: We take into account again
10 the energy use of the standby and we just discussed
11 the cooling energy impact of this. The standby and
12 off mode calculation is shown here as well, and
13 basically it's the power of the standby and off mode
14 times 876 to minus the burner operating hours of the
15 space heating and water heating. So, let's go
16 through the assumptions in further detail.

17 MR. BROOKMAN: Paul.

18 MR. SOHLER: Paul Sohler.

19 Question, when you say the definition of
20 active mode is when the boiler is being used does
21 that mean when the boiler is firing or is that when
22 the boiler is responding to a call from a thermostat?

1 MR. FRANCO: The burner operating hours is
2 actually when the burner is on, so when it's actually
3 on. And just to clarify, this equation is slightly
4 simplified. When we multiply this times the power of
5 the electrical component, we take into account the
6 ratio between the burner on time, so when the burner
7 is on and when the electrical component is on.

8 MR. SOHLER: Sorry. I was actually asking
9 about active mode. In other words, do you define
10 active mode as including just the time the burner is
11 on or is it the time that there is a call for space
12 heat from a thermostat?

13 MR. FRANCO: So, for the burner operating
14 hours is just when the burner is on.

15 MR. SOHLER: Right. In other words, okay,
16 does active mode -- I guess what I'm asking is does
17 active mode go beyond burner operating hours or is
18 the active mode time, if you want to call that equal,
19 to burner operating hours?

20 MR. FRANCO: When we do the analysis, we
21 account for active mode and standby use. We don't
22 differentiate. Why?

1 MR. SOHLER: What I'm asking is do you
2 define active mode as -- you know is the boiler only
3 in active mode when the burner is firing or is the
4 active mode include the entire time -- the time the
5 burner is on, plus any other time where let's say the
6 target temperature has been reached. There's still a
7 demand for space heat, but the burner is not firing.
8 Doesn't that make sense what I'm asking?

9 MR. FRANCO: No, it doesn't. In terms of
10 the equations, how we apply it we apply just the
11 burning operating hours and then we take into account
12 other things that are going on to the system in terms
13 of the other components, electric use. So, how we
14 define it in terms of energy consumption is just the
15 burner operating hours and any adjustments to those
16 hours in terms of the electrical components.

17 MR. BROOKMAN: So, Victor, the active mode
18 powers are greater than burner on hours?

19 MR. FRANCO: Yes, potentially. Yes.

20 MR. BROOKMAN: Because there are other
21 factors you include in active.

22 MR. FRANCO: Exactly, yes.

1 MR. BROOKMAN: Okay. That's consistent
2 with where I thought you were going.

3 MR. SOHLER: Okay, let me think about
4 that. Thanks.

5 MR. FRANCO: Okay. Thank you.

6 (Slide.)

7 MR. FRANCO: So, now let's look at in more
8 detail the assumptions for electricity use. So, one
9 of the components we consider is the primary
10 circulating pump. Obviously, there are systems that
11 have more than one pump. For this analysis, we
12 considered just the primary circulating pump. And
13 for both non-condensing and condensing units, we used
14 the same motor type. It's PSC average 81 watts
15 motor. DOE did not consider higher efficiency pumps
16 in this analysis, although DOE knows that there are
17 more efficient pumps associated with, for example,
18 condensing technology.

19 In terms of induced-draft and force-draft
20 fan, DOE derived values based on the 2013 AHRI
21 directory. In the directory there's an induced-draft
22 wattage that's available. It's called PE. And the

1 values that are listed here are based on using
2 non-condensing natural draft, non-condensing induced
3 draft, and condensing technology. The average values
4 we applied to all models.

5 It is important to note for two-stage and
6 modulating we assumed that the reduced inducer power
7 would be 70 percent of these values. That's mainly
8 applicable to condensing equipment and for
9 gas-powered hot water boilers.

10 In terms of ignition, we assumed that they
11 use spark ignition for all products and the power is
12 equal to 25 watts. In the cases when the condensing
13 pump is present -- and we'll discuss this in further
14 detail in the installation cost model -- we assume
15 that the power will be equal to 60 watts.

16 Finally, in terms of standby and off mode,
17 we assume that 25 percent of consumers shut off the
18 boiler during the non-heating season. This is based
19 on stakeholders' comments on the previous NODA
20 analysis that we should account for a fraction that
21 do shut it off, so we have this fraction.

22 MR. BROOKMAN: Steve Rosenstock.

1 MR. ROSENSTOCK: Steve Rosenstock, Edison
2 Electric Institute.

3 Again, in terms of the pump motors, you
4 know there's been you know movement towards UCMS and
5 also the small motor efficiency by DOE went into
6 effect March of this year, so you're saying you're
7 not considering pumps with higher efficiency motors,
8 but they are in the marketplace, so won't that have
9 an impact; especially, starting in 2020 where the
10 average wattage might go down?

11 We'll start with that one. I have a few
12 other questions after that.

13 MR. FRANCO: Thank you so much for that
14 comment. Because that just became effective. It was
15 before we did conduct this analysis. We will take
16 that into account for the next portion.

17 MR. ROSENSTOCK: Okay. Thank you. Next
18 question I had was you said the spark ignition for
19 all products, the ignited power of 25 watts was that
20 also based on AHRI directory or where'd you get the
21 25 watts? The reason I'm asking is I just remember
22 someone -- neighbor had a propane grill. They just

1 replaced their AA battery for the igniter and I'm
2 like why would you need 25 watts when an AA battery
3 would work? So, I'm just kind of curious where'd
4 that 25 watts come from?

5 MR. FRANCO: Thank you so much. We got
6 that from manufacturers.

7 MR. ROSENSTOCK: Manufacturers? Okay.
8 And the pump, again, that's 60 watts is from the
9 manufacturers?

10 MR. FRANCO: This is actually from
11 manufacturer literature of pumps, related to pumps
12 for two or three pump models.

13 MR. ROSENSTOCK: And Steve Rosenstock,
14 EEI.

15 What was kind of the range and some of the
16 values for the condensate pump or the ignition or the
17 pump motor? What kind of range did you see, just out
18 of curiosity, range of wattages?

19 MR. FRANCO: Pumps were around -- well,
20 the ones that we considered were for like an average
21 use and it was about the 60 watts.

22 MR. ROSENSTOCK: 60 to 100, maybe,

1 something for the pump, for the primary pump.

2 MR. FRANCO: It could be a little bit
3 lower than 60, but yes.

4 MR. ROSENSTOCK: Okay. Okay. And what
5 about for the ignition of the condensate pump, what
6 kind of range did you see?

7 MR. FRANCO: For the ignition, that's the
8 only value that we have.

9 MR. ROSENSTOCK: That's the only value?
10 Okay. And how about the condensate pump?

11 MR. FRANCO: That's the one that I
12 mentioned, the condensate pump.

13 MR. ROSENSTOCK: Okay, the same with the
14 ignition, you just had the one value?

15 MR. FRANCO: We had two or three values.

16 MR. ROSENSTOCK: Two or three? Okay.

17 MR. FRANCO: Yes.

18 MR. BROOKMAN: Joanna.

19 MS. MAUER: Steve, you were mentioning the
20 small motor rulemaking. I don't think the small
21 motor rule affects any of the motors used for
22 circulating pumps.

1 MR. BROOKMAN: Yes, thank you. Frank.

2 MR. STANONIK: Frank Stanonik, AHRI.

3 Victor, on the information here for the
4 oil-fired products, okay, so every oil-fired product
5 uses some electricity in the burner to essentially
6 atomize the fuel, right? So, the natural draft
7 oil-fired you have a certain number there, which
8 would be let's say the standard oil-fired boiler.
9 So, now if you add that other component, which would
10 be the draft inducer, which is totally independent of
11 whatever is happening with my burner, shouldn't the
12 total watts of the non-condensing induced-draft model
13 be higher not lower?

14 This is saying that the wattage usage for
15 I'll call it standard oil-fired product is 236 and
16 yet, if I add the feature of another component,
17 electric-using component, which would be the draft
18 inducer, my total wattage usage goes down. Something
19 seems to -- I'll defer to the people who make the oil
20 boilers, but it doesn't seem right, though.

21 MR. FRANCO: Thank you so much for that
22 comment. We would appreciate feedback on that.

1 These are averages that are in the AHRI directory.
2 There could be other things going on in terms of the
3 burner, in terms of the induced draft, and we would
4 be taking a look at that in more detail in the
5 engineering analysis to help determine what actually
6 going on.

7 MR. BROOKMAN: Gary.

8 MR. HAINLEY: I can comment for any --
9 Gary, U.S. Boiler Company.

10 I can comment on our products with induced
11 draft oil that the burner is the same, whether it's
12 an induced draft or an atmospheric vented product.
13 So, I would agree with Frank's assertion that that
14 number for induced draft should be at least equal to
15 if not higher than the atmospheric vented product.

16 MR. BROOKMAN: Okay. Thanks Gary. Let's
17 press on here, Victor.

18 (Slide.)

19 MR. FRANCO: Thank you. So, going into
20 more detail in terms of the induced draft, this is
21 going to be important in terms of the installation
22 costs, which we will be talking about in a little

1 bit.

2 We came up with fractions of models that
3 have induced or forced draft based on the 2013 AHRI
4 directory. So, this slide shows those fractions.
5 So, for a gas hot water boilers, 82 percent there
6 about 22.25 percent. If you go to 85, they're about
7 63 percent. And we did the same for all the
8 products. We'll get back to these fractions when we
9 talk about installation costs, but this is just to
10 highlight this in terms of energy use.

11 (Slide.)

12 MR. FRANCO: The next slide shows the
13 final results in terms of the annual energy
14 consumption savings in terms of the active mode or
15 AFUE standard for the four products being considered
16 -- four classes being considered for each of the
17 efficiency levels. So, you can see the fuel energy
18 use savings and electricity consumption savings.

19 MR. BROOKMAN: Yes, Rick.

20 MR. MURPHY: Rick Murphy, AGA.

21 Victor, I'm assuming that the annual MM
22 BTUs for gas boilers is a weighted average based upon

1 the distribution of where the boilers are currently
2 in place today.

3 MR. FRANCO: That is correct.

4 MR. MURPHY: Okay. Thank you.

5 MR. BROOKMAN: Yes, Gary.

6 MR. HAINLEY: Gary Hainley, U.S. Boiler.

7 Back to the previous Slide 60, just to
8 clarify that you looked at fraction of models in the
9 AHRI directory that's not -- just to confirm not
10 sales, but just listed models.

11 MR. FRANCO: That is correct. Yes, those
12 are listed models. And we would really appreciate to
13 match that to shipments in this analysis. We assume
14 that the models would be similar to shipments.

15 (Slide.)

16 MR. FRANCO: This next slide provides the
17 same results for the standby in terms of electricity
18 consumption, and you can see the same exact.

19 MR. ROSENSTOCK: Steve Rosenstock, Edison
20 Electric Institute.

21 I think here and also in the technical
22 support document EL3. I think there's a math error

1 there in terms of your savings.

2 MR. FRANCO: That is correct, yes.

3 MR. ROSENSTOCK: I think it should be 19.6
4 or 19.7 kilowatt hours for that EL3.

5 MR. FRANCO: Yes, that is correct. Thank
6 you so much for bringing it up.

7 MR. ROSENSTOCK: Steve Rosenstock.

8 Again, just looking at this -- and again,
9 you were talking about kind of a -- well, I haven't
10 really divided it. When I'm looking at this, again
11 also thinking about the boiler operating hours, it
12 looks like it's the -- like for EL3 it's the full
13 almost 2 watts of savings based on I'll say 8100
14 hours of operating in standby. So, it looks like --
15 again, I had to dig through I guess a little more,
16 but again, it seems like when you talk about the
17 wattage savings it does look like for this
18 characterization that if it gets you know put in for
19 the full analysis of the national impact it does look
20 like it's the full I'll say 2 watts savings at EL3.
21 It does look that way based on my -- again, I'm just
22 trying to match up all the numbers and calculations,

1 so it might be a little overstated. Thank you.

2 MR. FRANCO: Thank you. So, this
3 concludes the energy use characterization. And let's
4 look at some comments.

5 So, we request comments on using RECS and
6 CBECS data for calculating energy consumption, both
7 water heating and space heating. We request comment
8 on the fraction of boilers that are used in
9 commercial applications. We're 7 percent. We also
10 request comments on the approach for adjusting AFUE
11 based on the field considerations for automatic
12 means, jacket losses, return water temperatures. And
13 we also request comment on the fractions of
14 installations of low temperature and high
15 temperature.

16 MR. BROOKMAN: Comments here? John? No?

17 (No response.)

18 MR. FRANCO: And next, DOE requests
19 comments on the fraction of boilers that are used for
20 domestic water heating. We request comment on the
21 fractions that are installed with draft inducers, so
22 that would be shipments by efficiency level. DOE

1 also requests comments on the 25 percent assumption
2 used for the boilers being shut off during the
3 non-heating season. And we invite any other comments
4 associated with energy.

5 MR. BROOKMAN: Frank Stanonik.

6 MR. STANONIK: Victor, one of the things
7 in looking -- you know you mentioned the use of the
8 RECS data, and on Slide 50 it says that it references
9 RECS 2009. and it indicates that the total number of
10 buildings that would have a gas product -- and again,
11 I'll just use that as an example -- either hot water
12 or steam comes out to be about 10.5 million. And I
13 didn't bring my whole copy of RECS with me, but the
14 excerpt I had indicates that number is at least that
15 chart -- I'll send it to you, but indicated the total
16 was only about 8.6 million buildings that either had
17 a gas, steam or hot water.

18 I guess we need to get that settled
19 because obviously if, taking my viewpoint, if you're
20 10 million and ^^^^ a half numbers high then you know
21 by a factor of 25 percent overestimating the savings
22 benefit because there's not that many buildings that

1 have boilers. I'll send you what I'm looking at.
2 You know RECS numbers are RECS numbers, right?
3 Either I'm looking at the wrong chart or something
4 got slipped here.

5 MR. FRANCO: Thank you so much, Frank.
6 Let me just explain a little bit what these numbers
7 represent. So, the first row, which is hot water gas
8 boilers, is actually all the samples that have a gas
9 and that we consider based on the criteria that they
10 have a boiler. That's the number.

11 The steam boiler is actually a subset of
12 that number, so we're actually using only six million
13 buildings that we think that have a residential
14 boiler and that would match up to your numbers a
15 little bit better. So, don't add up those two
16 numbers. The whole sample is what we're using for
17 the hot water boilers.

18 MR. STANONIK: Okay, Victor, now be
19 careful because if steam is a subset then -- you know
20 we know that they're selling a whole lot more hot
21 water boiler than they're selling steam boilers.
22 Again, we'll look at that, but I think there's more

1 -- I think today we have more hot water boilers
2 installed than steam, but your numbers would say two
3 out of three are -- based on the count two out three
4 are steam and that's off.

5 MR. FRANCO: Probably it would've been
6 better to use the -- actually, these numbers that
7 we're using in terms of the weights that we used in
8 our analysis are provided in Table 7.2.1 and beyond.
9 The first column is just the RECS weighting and the
10 next column is actually the number of boilers, sort
11 of our weighting based on whether it's a replacement
12 or a new construction.

13 And for example, for gas-fired hot water
14 boilers we assume that that represents four million.
15 And for gas-fired steam boilers that represents .4
16 million, so that's 10 times more for the steam.

17 MR. STANONIK: I stopped looking at that
18 table, okay.

19 MR. FRANCO: Yes, sorry about that.

20 MR. BROOKMAN: Take a peek at these
21 request for comment boxes, see if we have any
22 additional comments here, and also acknowledge the

1 offer from Frank and I think also Gary to see if they
2 could come up with some additional data, some
3 additional shipments data. Steve comment here?

4 MR. ROSENSTOCK: Yes, again, Steve
5 Rosenstock, EEI.

6 When you say that they're "shutting off
7 the boiler," for those that are not doing hot water
8 heating so it really doesn't go off, you know it's
9 springtime and summertime and they set the thermostat
10 -- you know if they have a common thermostat it's set
11 to air conditioning. How would the boiler be on, or
12 if they have this room air conditioner? The air
13 temperature boiler never comes on. How is I'll say
14 not shut off?

15 I guess I'm a little loss here. I know
16 there's some electric standby, but in terms of I'll
17 just say the main boiler function is you know after a
18 certain day in the spring when it's warm enough the
19 boiler really isn't going to come on. Yes, no one
20 has pushed a switch, but how is it "not off" for the
21 warm weather?

22 MR. FRANCO: So, obviously the standby is

1 this value that even though it's not operating
2 there's still this standby. We assume based on some
3 input that there were some situations where people
4 might unplug the appliance or do something else and
5 that this would be this 25 percent.

6 MR. ROSENSTOCK: And Steve Rosenstock,
7 EEI.

8 There aren't any boilers with I'll say
9 like shutoff valves or anything?

10 MR. FRANCO: Not that we are aware of, but
11 we requested from manufacturers if that's the case.

12 MR. BROOKMAN: Yes, please, Gary.

13 MR. HAINLEY: Gary Hainley, U.S. Boiler.

14 Just to summarize a comment I made earlier
15 about low temperature versus high temperature
16 applications, I think the data that was presented
17 overestimates the number of low temperature systems
18 out there, that the majority of the systems out today
19 for replacements are going to be high temperature,
20 high-end homes. Certainly, there are going to have
21 low temperature systems with radian in bathrooms and
22 kitchens, et cetera, but that's a small percentage.

1 And the second comment is on the fraction
2 of boilers that require draft inducer by efficiency
3 level, and I think it's our contention that as you
4 get 84 or 85 percent if that became a federal minimum
5 that that starts to drive the inducer percentage
6 almost to 100 percent for a gas water boiler just
7 because chimneys aren't functional in a broad sense
8 at that point. Thank you.

9 MR. BROOKMAN: Thanks. Look at the
10 request for comment boxes on your sheet, please, both
11 4-2 through 4-9 and see if we have anything
12 additional at this point. Joanna.

13 MS. MAUER: Gary, if I can just ask you a
14 question about your last comment on inducer fans.
15 Are you saying that the portion of shipments is at 85
16 percent those inducer fans would be higher than the
17 portion of models at 85 percent with inducer fans? I
18 guess it looks like DOE collected data on all
19 available models and whether they have an inducer fan
20 or not. And I think for gas hot water they're
21 showing 63 percent would have an inducer forced draft
22 at 85 percent AFUE.

1 MR. HAINLEY: I think that the shipments
2 -- Gary Hainley, U.S. Boiler.

3 My comment was more specifically if the
4 proposed rulemaking went into effect that it would
5 drive a higher percentage of inducer fans, but I do
6 believe that for both atmospheric and for induced
7 product today that shipments will be different from
8 the models listed in the directory. I can't comment
9 on whether that percentage of models matches
10 shipments or not.

11 MR. BROOKMAN: Okay, Frank.

12 MR. STANONIK: Frank Stanonik, with AHRI.

13 But Joanna, I think looking at it maybe a
14 little bit differently, yes, we would expect a huge
15 percentage of models would now have to have that
16 draft inducer and so that, in fact, it would be
17 likely that even in terms of shipments you know the
18 shipments of actual units with draft inducer because
19 now you know not even in most. We're talking you
20 know probably 70, 80 percent or whatever you know
21 that were to go up because that's what would be
22 available.

1 You'd certainly flip the current situation
2 where there's probably more models without inducer
3 motor -- yes, draft inducers on them at the 80
4 percent level or whatever and that would certainly
5 flip. Whatever the percentage might be, without
6 question, the actual shipments of models with draft
7 inducers would go up a lot.

8 MS. MAUER: I mean I think DOE is
9 capturing that to some extent.

10 MR. STANONIK: I think it's going to be
11 higher than that even.

12 MS. MAUER: Okay.

13 MR. BROOKMAN: Additional comments here?
14 We're about to break for lunch. We're at a natural
15 break point. Let's pause for lunch. It's now almost
16 12:25, so let's break for an hour, which means we'll
17 resume at 1:25.

18 (Whereupon, a lunch recess was taken at
19 12:25 p.m.)

20 MR. BROOKMAN: Hope you all had a nice
21 lunch. We're going to pick up where we left off on
22 life cycle costs and payback period analysis, and

1 back to Victor.

2 MR. FRANCO: Thank you. Welcome back.
3 This is Victor Franco again. We're going to next be
4 talking about life cycle cost and payback analysis
5 and at the end subgroup analysis in this section.

6 (Slide.)

7 MR. FRANCO: This first slide shows the
8 flow chart of the analysis input for the life cycle
9 costs and payback period analysis. The two yellow
10 boxes show the end result to payback period and life
11 cycle costs. We consider the total install cost
12 incremental. That's the top portion. We've gone
13 over markups, which is part of the consumer prices.
14 We'll talk a little bit more on consumer prices and
15 installation costs.

16 The bottom portion shows the annual
17 operating cost savings, which are also an input.
18 Those also have the annual energy costs, and we
19 discussed energy consumption related to that, and
20 we'll talk about all these parameters in more detail
21 in the next few slides.

22 The last component that's important that

1 we'll be discussing is the base case efficiency
2 distributions.

3 (Slide.)

4 MR. FRANCO: This next slide provides a
5 little bit of an overview about the life cycle costs.
6 So, just as a reminder, the purpose of this is to do
7 an economic evaluation from the residential
8 consumers' perspective and this is over the lifetime
9 of the equipment. The method and the equations are
10 available down here. And just the last thing to
11 point out is we model this using certain variability
12 inputs using Monte Carlo approach and so a lot of the
13 inputs that we'll be using our hard lay distributions
14 using an Excel spreadsheet, which is available for
15 the public to take a look at.

16 (Slide.)

17 MR. FRANCO: This next slide provides an
18 overview of all the inputs that we'll be discussing,
19 so it basically has a basic purpose definition and
20 more or less a summary of the methodology, so I won't
21 be going through this, but this might serve as a good
22 -- going back to and seeing the different inputs that

1 we're talking about.

2 So, I'll go through these in order. So,
3 first, we'll start with the consumer product price.
4 So, the consumer product price is the manufacturing
5 costs times markup times sale taxes. We already
6 discussed markups and sales taxes and manufacturing
7 costs previously.

8 The only topic we haven't discussed here
9 is we have a product price trend based on historical
10 PPI data. For this product we looked at the PPI data
11 and found that there wasn't much of a trend, and so
12 we assume a constant price trend for this. We would
13 request any data that's available.

14 We do have two scenarios that we look at.
15 We look at a decreasing and an increasing. And the
16 results are provided the MIA analysis in chapter 10.

17 MR. BROOKMAN: Steve.

18 MR. ROSENSTOCK: Steve Rosenstock, EEI.

19 Especially for some of the newer people
20 this is real prices, not nominal. This is real. So,
21 when you're showing this graph of price factor index
22 for your one that I'll say both increasing or

1 decreasing it looks by 2048 it's a 60 percent real
2 price increase versus about a 40 percent real price
3 decrease in your sensitivity analysis, and that's
4 over and above inflation. Correct? That's a real.
5 Thank you.

6 MR. FRANCO: That's correct. Thank you
7 for that.

8 So, the next component of the total
9 install costs are the installation costs. These are
10 about 14 to 15 slides that we'll be taking a look at
11 carefully on the installation cost, and I assume
12 you'll have comments and questions, so we'll go
13 through this in a little bit more detail.

14 (Slide.)

15 MR. FRANCO: This first slide provides,
16 more or less, a general overview of the installation
17 cost model. We take into account three basic
18 components in terms of the installation costs. The
19 first one is the basic installation cost. I'll be
20 describing those in more detail in the next slide.
21 Then we take into account venting costs, both for
22 non-condensing and condensing boilers, and we'll be

1 talking in a few slides about that. And for
2 condensing equipment, we take also into account
3 condensate withdrawal installation costs.

4 It's important to note that these costs
5 are for the individual households, so any value that
6 I've provided are average values, but we do have a
7 value for each household that's specific for that
8 household and that installation location. So, in
9 that regard, we'll be starting in terms of looking at
10 the installation location, which is an important
11 component of this model.

12 The last thing to point out here is the
13 sources. We use 2013 RS means, residential and
14 mechanical cost data. We also based some of our
15 assumptions and data based on the 2007 furnace and
16 boilers final rule and 2011 direct final rule for
17 furnaces as well as manufacturer literature.

18 (Slide.)

19 MR. FRANCO: So, this slide shows the
20 determination of installation location, the
21 assumptions based on RECS 2009 housing sample. RECS
22 does not provide the exact installation location

1 where these boilers are located, so we have to make
2 some assumptions where we might think the boiler is
3 installed.

4 Since many boilers are installed in
5 basements, we assume that if the household has a
6 basement it will be installed in the basement. The
7 RECS does report if the basement is finished or
8 conditioned or unconditioned, so what we do
9 differentiate between conditioned and unconditioned
10 basements.

11 We next take a look if the household has a
12 garage. If the household has a garage, we assume
13 that it's in the garage. And if it doesn't have any
14 of those, we assume that it's in another location
15 indoors.

16 The fractions of installation based on
17 these assumptions are reported here. So, for gas
18 boilers, 35 percent are in conditioned basements, 27
19 in unconditioned basements, 8 percent in garages, and
20 30 percent in other indoor locations and the similar
21 values are for the oil boilers as well.

22 MR. BROOKMAN: Steve.

1 MR. ROSENSTOCK: Steve Rosenstock, EEI.

2 When you're saying other indoor locations,
3 what part of the house would they be placed in? Are
4 you assuming that they would be on the first floor or
5 second floor? I'm just kind of curious. It says
6 other indoor, and I know that some of that's just
7 commercial buildings, but I'm just saying for those
8 residential locations would that included an occupied
9 floor and an attic? I'm just trying to get my arms
10 around what -- you know when you say 30 percent that
11 is significant. I'm just kind of curious where the
12 assumption would be.

13 MR. FRANCO: Yes, that's a very good
14 question. We do actually assume that a fraction do
15 go in the first floor. The locations would be kind
16 of like in a closet area, kind of like maybe a
17 utility room, but it's kind of indoor location inside
18 the building that's connection -- more connected to
19 the building. There's a fraction that we assume that
20 are potential on the second floor if the household
21 has a second floor.

22 MR. ROSENSTOCK: Steve Rosenstock, EEI.

1 Other indoor conditioned space is what the
2 analysis is considering, right?

3 MR. FRANCO: That's correct. Yes, that's
4 correct.

5 MR. ROSENSTOCK: Okay. Thank you.

6 MR. BROOKMAN: Paul.

7 MR. SOHLER: Paul Sohler.

8 If there's a garage and a basement, you're
9 assuming the boiler is where, in the basement?

10 MR. FRANCO: So, first consideration is
11 the basement, yes.

12 MR. SOHLER: The other thing, and I think
13 this maybe comes back to the previous section, but
14 you know I think it's been kind of a longstanding
15 assumption that a boiler in a basement the heat
16 that's lost from it, whether it's -- not really
17 differentiating between whether there's radiation in
18 it or not, is considered useable energy because it's
19 going to tend to rise through the house. So, I'm a
20 little lost as to why you even need to consider you
21 know the losses out of the jacket of the boiler
22 really, which you've done previously and I guess it

1 you know loops back into here for differentiating.

2 MR. FRANCO: That was our assumption that
3 since it was unconditioned for a lot of this it might
4 not trickle up. It would be good if you could
5 provide feedback on that so that we could make the
6 proper adjustments.

7 MR. SOHLER: All right, we could provide
8 feedback, but I think, like I said, there is an
9 understanding -- well, actually, in 103 nowhere else
10 -- I mean it's not -- something I think you guys kind
11 of have access to if you look at you know indoor
12 boilers. In EISA 103, you do not measure jacket
13 loss; yet, you seem to be assuming that there is
14 jacket loss there, which kind of contradicts the
15 standard that you know using.

16 MR. FRANCO: Yes, our understanding is
17 that there are some situations where the boiler is
18 kind of -- it's not directly impacting the heating of
19 the household because it's kind of in a space that's
20 not directly connected to the house. Those losses
21 may be different from what we're assuming, but we
22 assume that there's a certain fraction. We would

1 appreciate your comments if those are -- if that's
2 not appropriate.

3 MR. SOHLER: So, you're assuming, as I
4 read this 27 percent of gas boilers are installed in
5 a place where the jacket loss is of no use to heating
6 the building is what this is saying.

7 MR. FRANCO: Correct; 27 plus the 8
8 percent for gas, so that's what we looked at before,
9 which is the 35 percent. This has implications in
10 terms of the installation as well because we'll be
11 looking at other factors that play into this.

12 MR. BROOKMAN: Yes, please, John.

13 MR. RODER: John Roder from Burnham
14 Holdings.

15 There've been a number of occasions where
16 we've been asked to provide more data. And I was
17 just wondering; John, will that be taken into
18 consideration with respect to the extension that's
19 been requested? I understand now it's also
20 formalized.

21 MR. CYMBALSKY: We'll take data at any
22 time during this process, so a good way to give data,

1 particularly, business-sensitive data is through the
2 NDAs with our consultants. You can do that at any
3 time during the comment period or out. We will
4 consider it as much as we can in the analysis.

5 MR. RODER: But we have a hard date to get
6 written comments back to you, and that's got to be
7 the priority unless you give us a little latitude on
8 that.

9 MR. CYMBALSKY: Right. So, like I said,
10 DOE's considering the comment extension. I could say
11 that we will grant some period of time. I can't tell
12 you the number of days, but I can say confidently we
13 will extend it. It's hard for me to sit here and
14 tell you how to prioritize what you what to give us.
15 From a selfish point of view, the numbers are really
16 good for us, but your concerns are obviously very
17 important to you on the rules. So, we want
18 everything, but again, if the numbers come later
19 through the NDAs we'll take it. You know but at some
20 point we're going to go forward with what we have.

21 MR. RODER: Okay. All right. Thank you.

22 MR. CYMBALSKY: Fair enough?

1 MR. RODER: Yes.

2 MR. BROOKMAN: Steve Rosenstock.

3 MR. ROSENSTOCK: Steve Rosenstock, EEI.

4 I'm also again kind of interested --
5 again, I know you've looked at the RECS data a lot
6 more than I have. In terms of the homes with I'll
7 say unconditioned basements and garages, is there
8 also data in there in terms of tying them into homes
9 that also have either room air conditioning or no air
10 conditioners versus central systems?

11 MR. FRANCO: Yes, that is correct.

12 MR. ROSENSTOCK: Is there a good
13 correlation the higher percentage in unconditioned
14 basement the more likelihood its room air conditioner
15 or no air conditioning?

16 MR. FRANCO: No, I don't have that data.

17 MR. BROOKMAN: Rick.

18 MR. MURPHY: John, just a follow-up
19 question to the point on incremental data, I would
20 assume it's depending upon the level of data that's
21 shared. But based upon data that is provided, would
22 DOE re-run their spreadsheets and re-publish those

1 that would then become available for review again?

2 MR. CYMBALSKY: You know I can't say one
3 way or the other at this point until -- those
4 decisions are made based on what we get, but at this
5 point, no, we plan on going final after this unless
6 there's a reason to do something different.

7 (Slide.)

8 MR. FRANCO: So, next, I'll be going into
9 more detail into these three installation components.
10 So, first, let's quickly go into basic installation
11 costs. So, the basic installation costs include the
12 following. A trip charge in case of replacements,
13 removing of old boiler in case of replacements,
14 placing and set up the boiler, circulating pump,
15 installation gas and oil piping, water piping,
16 electrical hookup to a thermostat, and permanent and
17 removal of disposal piece.

18 The basic installation costs are the same
19 throughout for all the efficiency levels. That's we
20 call them basic installation costs. These do not
21 include any adjustments to the distribution itself.
22 So, in our analysis, we consider that the

1 distribution is not impacted and that's why we
2 decreased the efficiency of, for example, condensing
3 boilers.

4 In terms of the overall average basic
5 installation costs, the numbers are provided in this
6 table. They're about 2,700 for gas-fired hot water
7 boilers. And again, these take into account
8 geographical location as well as the installation
9 location and installation time, whether it's
10 residential or new owner or replacement.

11 Next, we'll take a look at the venting
12 installation costs. So, there will be quite a few
13 slides regarding this.

14 (Slide.)

15 MR. FRANCO: In terms of the venting
16 installation costs, we take a look at cost related to
17 non-condensing boilers, which might include chimney
18 re-lining, metal vent modification, metal vent also
19 for new construction, and stainless steel venting.
20 So, we'll go into these in more detail in the next
21 few slides.

22 (Slide.)

1 MR. FRANCO: For condensing boilers, we're
2 talking a look at new PVC venting, orphan water
3 heaters potentially, combustion air direct vent
4 installation costs, and also concealing pipe
5 replacement.

6 (Slide.)

7 MR. FRANCO: One of the major components
8 of the venting is the venting length. Here's the
9 methodology that we used, all the different inputs we
10 take into account and a floor chart. First, we
11 consider whether it's a vent vertical length or
12 horizontal. Typically, in non-condensing this would
13 be a vertical, a stainless steel or PVC piping for
14 condensing would be a horizontal length.

15 In terms of getting the actual distance,
16 we come up with all these different components,
17 including the ceiling height, the floor height, if
18 the household has a cathedral ceiling, number of
19 floors above the boiler, and whether it has a
20 horizontal distance as well and that goes into the
21 vertical length.

22 In terms of the horizontal length, we take

1 into account where the boiler is installed, assume
2 that the boiler is installed somewhere. On average,
3 it will be installed in the middle kind of the
4 household, so that would be the average length
5 diagonally. And in some situations, it might be able
6 to vent directly through a wall, so it might be a
7 short length. In other situations, it might be all
8 the way at the other side of the household,
9 diagonally, which would be the maximum distance. So,
10 for each household there's a distribution that's
11 applied and that takes into account the average wall
12 length and average horizontal to vertical vent ratio.

13 MR. BROOKMAN: Rick.

14 MR. MURPHY: rick Murphy, AGA.

15 Victor, I didn't see any costs associated
16 with the relocation of the boiler. Does that assume
17 that that would never take place?

18 MR. FRANCO: Yes, this analysis does not
19 assume any relocation of the boiler. This assumes
20 that it's in the same location. And the venting is
21 what actually travels a distance to wherever it needs
22 to be vented. So, let's say you have a situation

1 non-condensing where you're venting vertically at a
2 certain location in the building and you can't vent
3 through the wall that's closest to the boiler. And
4 so, you don't move the boiler, but you do have to
5 vent through for say, for example, the other side of
6 the room and so we consider the cost of having the
7 vent go through that wall on the other side.

8 MR. BROOKMAN: Yes, Paul. Roger.

9 MR. MARRAN: Roger Marran.

10 I just wanted to add onto the vent cost.
11 So, when we look at installations that are for
12 wall-hung boilers, oftentimes the original boiler is
13 free-standing in the middle of the basement, for
14 example, and they'll have to move the boiler to the
15 wall. Sometimes they have to build a wall. They
16 definitely have to re-pipe some of the piping to get
17 over there, so there are additional costs
18 considerations that maybe additional there. I'm not
19 sure if that's incorporated as well.

20 MR. FRANCO: Thank you for that comment.
21 No, we didn't actually apply it that way, but that
22 would be good if you could put that into a written

1 comment. That's something that we could consider
2 actually moving the boiler in a situation and then
3 having to do re-piping.

4 MR. BROOKMAN: And Roger, if you have any
5 estimate of costs also that would be very helpful.
6 Yes, Paul.

7 MR. SOHLER: Paul Sohler.

8 The orphan water heater issue, if I'm
9 understanding this correctly, was not considered in
10 the non-condensing boiler levels?

11 MR. FRANCO: In terms of stainless steel,
12 it is considered. So, if you had to do a stainless
13 steel that would be an orphan water heater. Yes,
14 it's not listed here as a specific. Sorry about
15 that.

16 MR. SOHLER: Okay.

17 MR. FRANCO: And we'll go into that in
18 more detail in the next slides.

19 MR. SOHLER: Thanks.

20 (Slide.)

21 MR. FRANCO: So, let's go into more
22 details in terms of looking at the case where we're

1 doing a replacement case, non-condensing to
2 non-condensing. So, we have a few considerations.
3 First, depending on the input capacity we assigned 2
4 inches to 6 inches, depending on the vent size,
5 depending on the input capacity of the boiler. We
6 have fractions based on data from 1990s about the
7 fraction of units with a masonry chimney. Of these
8 we assume that a fraction require re-lining. If the
9 household has a chimney and the boiler is installed
10 before 1995, we assume that it has to be relined.

11 In terms of venting re-sizing of vent
12 connectors that might be required, first, we consider
13 whether the chimney has been relined. If it hasn't,
14 then we might consider vent re-sizing. To consider
15 the household to be re-sized, in terms of the
16 venting, the house also has to have an existing
17 natural draft boiler and the last boiler replacement
18 has to be before 2020. We base the efficiency of the
19 boiler based on the RECS data about the boiler age
20 vintage and the historical shipments data provided by
21 AHRI.

22 The last piece of the non-condensing to

1 non-condensing is the stainless steel venting. We
2 assume that half of the fraction of the models that
3 we previously reported would require the households
4 to install a stainless steel, new stainless steel
5 venting. So, for 82 percent at hot water, gas water,
6 there were 22 percent of the models had an induced or
7 a forced-draft fan. We assume that 11 percent of
8 those then would have to install a new horizontal
9 stainless steel vent.

10 Similarly, for the 85 percent, we assume
11 half of the previous fraction, so 83 percent was from
12 32 percent had to do this vertical venting. When you
13 do this vertical venting, obviously, you have to --
14 and you're doing a Conley vented with the water
15 heater you come into a situation orphan water heater.
16 So, in the situation where you have this stainless
17 steel, vertical -- horizontal venting we do take into
18 account orphan water heater.

19 MR. BROOKMAN: Paul.

20 MR. SOHLER: Paul Sohler.

21 I would take serious issue with the
22 statement that -- or the assumption that the masonry

1 chimney requires re-lining if the boiler was
2 installed or the building built before 1995. It is
3 true that the National Fuel Gas Code does require
4 re-lining of some chimneys and then generally outdoor
5 ones, but if you've got an indoor terracotta chimney
6 that's correctly sized there is, in a lot of cases,
7 no reason to reline it. That seems to be kind of a
8 built-in assumption that you're going to do that no
9 matter what type -- what efficiency level you have
10 and I do not think that's correct.

11 MR. FRANCO: Thank you for that comment.
12 So, just to emphasis, we're assuming that building
13 build after 1995 would meet the fuel code, so those
14 are okay, right? You agree that those --

15 MR. SOHLER: Agreed.

16 MR. FRANCO: Those would be okay? Now,
17 the boilers that might be installed after 1995 what
18 you're saying is that a portion of those might not be
19 relined?

20 MR. SOHLER: No, I'm saying the ones built
21 before 1995, a lot of those will not need to be
22 relined. The assumption you're making that they all

1 will need to be regardless of what you know tech
2 level you go to.

3 MR. FRANCO: Yes, as we'll see, the
4 fraction is fairly small due to the fact that a lot
5 of boilers have been installed after 1995, so if the
6 boiler has been installed after 1995 -- between 1995
7 and 2020, which is a large fraction of the boilers,
8 2020, that there won't be any chimney re-lining in
9 our analysis.

10 MR. SOHLER: Okay.

11 MR. FRANCO: We'll go into those fractions
12 in the next few slides.

13 (Slide.)

14 MR. FRANCO: So, now let's briefly go into
15 the non-condensing to the condensing situation. So,
16 in the non-condensing to condensing situation, you
17 have to look at replacing the metal vent with PVC
18 flue vent. In terms of the materials, we assume a
19 certain fraction are PVC or PP, polypropylene and a
20 certain fraction are CPVC installations.

21 (Slide.)

22 MR. FRANCO: The venting also is between 2

1 inches and 3 inches. The fractions are provided
2 here. Again, we take into account several
3 installation locations in terms of what the venting
4 length will be. We take into account the wall types
5 that the penetrations will have to go through and the
6 vent determinations are also taken into account. In
7 addition to this, there's a cost added for the air
8 combustion vent for direct vent installations. The
9 fractions are provided in chapter 8 appendices for
10 installations.

11 Further, there's also an additional costs
12 for concealing vents in indoor installations. So,
13 for the fraction of installations that are indoors
14 there might be a cost for actually concealing the
15 vent piping. Say, for example, you have to go
16 through a living space and you don't want to have the
17 piping through there, so we add a cost for concealing
18 that.

19 The last we've discussed briefly for the
20 stainless steel is the orphan water heaters. So,
21 that's the case where you're venting the water heater
22 together with the boiler. And when you're installing

1 that either stainless steel or the PVC venting for
2 the condensing equipment, you'd have to disconnect
3 that. In that case, there might be a situation where
4 you might have to reline the chimney, re-size the
5 venting, and we do take that into account.

6 MR. BROOKMAN: We have a comment from
7 someone online. Mike McDonald says one other
8 consideration is that not all installing contractors
9 offer chimney re-lining. This can be a problem with
10 85 percent non-condensing boilers. This can also
11 limit the choices that a consumer has when choosing
12 an installer.

13 MR. FRANCO: Thank you for that comment.

14 (Slide.)

15 MR. FRANCO: Next, we'll be talking about
16 the fractions.

17 MR. ROSENSTOCK: Steve Rosenstock, EEI.

18 When you talk about concealing vents in
19 indoor location, vent pipe concealing wouldn't that
20 be tied into the current location of the boiler, like
21 if it's in a basement would you really need to
22 conceal it?

1 MR. FRANCO: Often in the basement not
2 unless you're going through the condition space. So,
3 for example, if you have a game room or something --

4 MR. ROSENSTOCK: Gotcha.

5 MR. FRANCO: -- or a living area and you
6 have to go through there.

7 MR. ROSENSTOCK: Thank you.

8 MR. BROOKMAN: Yes, Frank.

9 MR. STANONIK: So, Victor, so you're
10 assuming 75 percent of installations would use a
11 2-inch PVC or polypropylene. And I don't know the
12 exact number. I'm sure we can dig it up, but when
13 you get to a certain input level the standard PVC
14 pipe won't be 2 inches. It'll be 3 inches. My guess
15 right now it isn't that much pass the baseline unit.
16 The baseline unit is 100,000, right? And so I think
17 that the 75 percent estimate that they're going to
18 have 2-inch PVC is probably a little high. I think
19 it's going to be more that have a larger and then
20 more costly because it's going to be 3-inch. I don't
21 think you would ever run into any 4-inch on a
22 residential, would you? No?

1 MR. BROOKMAN: Yes, Paul. Paul wants to
2 follow on.

3 MR. SOHLER: The short answer is yes.
4 When you get up to the upper 200 -- you know close to
5 the upper limit of a residential range you do run
6 into boilers with ^^^^ condensing boilers with 4-inch
7 vents.

8 MR. BROOKMAN: Okay.

9 MR. FRANCO: Thank you. I appreciate
10 that. And you can have that in written comment that
11 would be better.

12 (Slide.)

13 MR. FRANCO: So, the next two slides
14 provide the fractions that we are applying, so
15 they're kind of a little bit of summary in terms of
16 both the fractions and the installation costs. So,
17 I'll go fairly quickly through the fractions, and
18 these are all provided in the appendices to chapter
19 8.

20 So again, we consider the cases where
21 we're going from a non-condensing to a non-condensing
22 situation. And we're accounting for unlined

1 chimneys, re-lining those, installing new vent
2 connectors, re-sizing the vent system. And these are
3 the fractions that we applied to the appropriate
4 installations that might require this, and we also
5 apply stainless venting. We do the same for the
6 condensing, and here are the different fractions,
7 especially for the orphan water heater situation.
8 The next slide will actually provide the costs that
9 were associated in the fractions. So, let me go to
10 the next slide.

11 (Slide.)

12 MR. FRANCO: So, this slide provides the
13 cost for just the non-condensing hot water gas boiler
14 installations, but obviously, we did this for all the
15 different product classes. So, in terms of vent
16 re-sizing for 82 percent we assume that .3 percent
17 need a vent re-sizing, 2.2 percent need a vent
18 connector, 5.7 percent need chimney re-lining. And
19 again, we're applying these fractions with new
20 stainless steel venting 11 percent. So, this is the
21 overall fraction of installations that when you're
22 going from non-condensing to non-condensing would

1 require some vent modifications at 82 percent.

2 (Slide.)

3 MR. FRANCO: The other fractions for the
4 other prior classes are provided here. The last four
5 rows provide the average cost, so again, this is an
6 average cost. When we apply this to a specific
7 household the range is pretty wide in terms of the
8 actual costs. So, in terms of vent re-sizing and
9 chimney re-lining it's about \$1500. The vent
10 connector would be about a little less than \$300, and
11 a new stainless steel vent, which again,
12 horizontally, would be around \$500.

13 When we put all this together in terms of
14 doing this by efficiency level, we come up with these
15 additional costs. So, at 82 percent the average cost
16 -- so, for all households if we average them
17 altogether is \$159 due to the venting. At 85 percent
18 the cost is 238, so the differential would be those
19 two.

20 MR. BROOKMAN: John.

21 MR. RODER: John Roder, BHI.

22 Is that for just the materials, or is that

1 labor and materials?

2 MR. FRANCO: This includes labor and
3 materials for the venting, so this includes the
4 stainless steel vent, for example, and also the labor
5 required.

6 MR. RODER: Okay.

7 MR. FRANCO: And again, the details are
8 provided in the appendices.

9 MR. BROOKMAN: Rick.

10 MR. MURPHY: Victor, when you do consider
11 or take into account orphan water heaters, in 100
12 percent of those instances are they doing the
13 appropriate venting installations to retain that
14 water heater, or do you account for any water heater
15 switching?

16 MR. FRANCO: No, for this analysis we
17 don't account for any water heater switching. We
18 assume that they have to do a re-lining of the water
19 heater.

20 (Slide.)

21 MR. FRANCO: So, the next slide provides a
22 similar cost in fractions data for going from a

1 non-condensing to a condensing situation. The
2 fractions and the costs are both for gas-fired and
3 oil-fired hot water boilers. Those are the only two
4 prior classes I have condensing efficiency levels.

5 So again, the first column lists the
6 fraction of installations t hat this would be
7 applicable to and the average cost. So, this again
8 is an average cost. The weighted average cost would
9 be essentially multiplying the fraction of
10 installation to the average cost and that would be
11 \$776 of installed cost for installing the gas-fired
12 hot water boiler in terms of venting costs and the
13 similar situation for oil-fired hot water boilers.

14 (Slide.)

15 MR. FRANCO: so, now moving onto new
16 construction and new owners, so new construction is
17 applicable to oil-fired and gas-fired hot water. We
18 assume that steam there are no new construction. For
19 new owners, it's just for hot water gas boilers. And
20 again, new owners in this analysis is just for people
21 that don't have previously a boiler.

22 So, these installation costs include

1 adding the new flue vent for non-condensing boilers,
2 so it includes either a metal vent and a fraction
3 that will install a stainless steel vent. For
4 condensing gas boilers we have PVC, new PVC vent,
5 combustion air vent, direct vent installation. This
6 says PVC, but this includes the other venting types,
7 the similar fractions -- venting material. Sorry.
8 And we also account for commonly vented water heater,
9 what would be the impact in terms of the costs as
10 we're looking at the next slide.

11 (Slide.)

12 MR. FRANCO: So, in terms of the
13 condensing boiler, the venting installation costs
14 with the water heater we added half of the venting
15 costs of the water heater, and we'll see this in the
16 next slide.

17 (Slide.)

18 MR. FRANCO: So, the next slide, again
19 this is just for new construction and new owners.
20 And this is just for gas-fired and oil-fired. We
21 have the metal vent system and the stainless steel
22 vents. Here are the fraction that we assume have a

1 metal vent and the fraction that have stainless
2 steel, and the average costs of weighting these two
3 is the last column. So, on average, we assume that
4 the total venting is about \$1600 for gas-fired at 82
5 percent and \$2000 for oil-fired hot water boilers.

6 (Slide.)

7 MR. FRANCO: Next, we considered the
8 condensing boiler installation costs. And again, the
9 first column is the fraction, the next column is the
10 average cost, and at the bottom is the weighted
11 average of these two.

12 Just to point out, we have, for example,
13 orphan water heater assign 20 percent. Half of the
14 cost of the venting for that is 446. So, it's
15 included in the 717.

16 (Slide.)

17 MR. FRANCO: So, moving from the venting
18 costs, we go into condensate withdrawal. So, this
19 flow chart goes over a little bit the overall
20 condensate withdrawal methodology. We take into
21 account the condensate pump, so we apply that to all
22 condensing installations. We also take into account

1 for a fraction of the time the condensate
2 neutralizer. For units that's applicable we take
3 into account the condensate pump, and for some of
4 those we take into account the electrical outlet.

5 So, for some of these equipment there
6 might not be an extra outlet for the plug in the
7 condensate pump, so we assume that 50 percent of the
8 time they'll have to install an extra electrical
9 outlet.

10 MR. BROOKMAN: Frank Stanonik.

11 MR. STANONIK: Victor, I'm going back one
12 slide. Showing in your new construction slide -- in
13 your new construction slide, you're estimating that
14 only 60 percent of the condensing boiler
15 installations in new constructions would use a
16 combustion event. So, based that only 60 percent
17 would go to what we'd call a two-pipe system, what's
18 the basis for -- why 60 percent?

19 And we will certainly see if we can come
20 up with a number that has you know some relevance or
21 some validity, but I mean my experience would say if
22 in a new home they're going to install a condensing

1 boiler and they are going to go sideways that they're
2 going to give you the two-plate system, so you're
3 talking both your combustion air from outdoors and
4 your venting outdoors, obviously. So, what's 60
5 percent?

6 MR. FRANCO: Yes. Thank you so much for
7 that comment. That's actually something that we want
8 to get input on. So, if you go to Appendix 8C,
9 there's a Table 8C.2.8, which is the fraction of
10 direct vent condensing boiler installations. Based
11 on the interactions with the consultants, we came up
12 with fractions based on installation location. You
13 don't have the table probably in front of you, but
14 for a basis we assumed 50 percent would require
15 direct vent installations, for garage is 90 percent
16 and for indoor 67 percent. If you multiply that
17 times the installation of fractions previously, you
18 would get the 60 percent. Obviously, if you have any
19 feedback on those fractions that would be really
20 appreciated.

21 MR. BROOKMAN: Yes.

22 MR. RODA: Victor, just going back to the

1 categories of installation locations and the
2 condensate, just wondering is there any cost
3 associated with condensate management from a freezing
4 standpoint particularly in unconditioned spaces?

5 MR. FRANCO: So, in this case we assumed
6 that it's in the location where there is no issue
7 regarding freezing even though it's in a
8 non-conditioned basement. Usually, it will be above
9 freezing, but if there's any feedback or data on
10 that. We assumed that there isn't in this analysis.

11 (Slide.)

12 MR. FRANCO: Okay, so the next slide shows
13 the fractions again and a little bit more of a
14 description of each of these components with the
15 condensate withdrawal. The bottom part again shows
16 the fraction of installations that are impacted. So,
17 for example, we assume 18 percent would require
18 condensate pumps, so that takes into account in new
19 construction wouldn't apply or new owners. And the
20 average costs are also provided. So, on average for
21 gas-fired hot water boilers, the average cost is \$98
22 that's added.

1 (Slide.)

2 MR. FRANCO: So, putting all this together
3 this next slide comes up with the average total
4 installed costs results. So, the total install cost
5 includes the consumer prices, the installation costs,
6 and the total cost is provided here as well as the
7 incremental.

8 (Slide.)

9 MR. FRANCO: So, moving on from
10 installation costs, now we're going to be talking
11 about energy prices. There are two components to
12 energy prices --

13 MR. BROOKMAN: Paul, please, go ahead.

14 MR. SOHLER: Paul Sohler.

15 Before we move on, maybe I missed it, but
16 in the incremental installation costs you're going
17 kind beyond the -- you have basic costs for things
18 like plumbing that apply to all classes of equipment.
19 In the case of condensing boilers, did you allow
20 anything additional for secondary -- you know a lot,
21 maybe not all, but I would say most you know
22 manufacturers require a primary/secondary pumping, so

1 you've got changes to the new boiler, piping around
2 the boiler that you would not have with a
3 non-condensing boiler in a lot of cases.

4 MR. FRANCO: That's very good feedback.
5 We did not. We considered just a single pump. And
6 we're considering actually the same type of pump as a
7 non-condensing. So, that would really be feedback if
8 we can get -- and especially if we can get fractions
9 where it would be applicable. We do understand that
10 there are a lot of systems that -- for example, zone
11 systems that would require potentially separate
12 pumps, maybe even valves and to understand what's the
13 differences between non-condensing and condensing
14 would be really valuable to us.

15 MR. SOHLER: There are, I would say,
16 almost always even on a single-zoned system two pumps
17 on a condensing boiler and the one that pumps through
18 the boiler is often considerably larger than the one
19 that you might use to circulate water through the
20 system, which, by the way, is going to drive up the
21 energy -- the electrical consumption. So, that
22 should be taken into account.

1 MR. FRANCO: Great. No, that's great
2 feedback. Thank you so much.

3 MR. SOHLER: Thanks.

4 MR. BROOKMAN: Thanks Paul. Yes, please,
5 Alex.

6 MR. LEKOV: Alex Lekov, LBNL.

7 So, just about this secondary pump is it
8 part of the boiler design or this is something that
9 is installed additionally in the field?

10 MR. SOHLER: In some cases the
11 manufacturer supplies a pump with the boiler that's
12 designed to provide adequate flow through the heat
13 exchanger and then the installer supplies the second
14 pump. In some cases the manufacturer supplies no
15 pump, but the installer is directed to provide two
16 pumps. And there may be some cases -- I don't know
17 this for sure -- where the manufacturer supplies
18 both. I would say that's probably the minority.
19 Again, some inspection of installation manuals would
20 tell you, you know, but it's basically a matter of
21 getting adequate flow through the heat exchanger,
22 which typically has a higher pressure drop than that

1 through a conventional boiler regardless of what the
2 flow is out in the system.

3 MR. BROOKMAN: Okay. Thanks.

4 (Slide.)

5 MR. FRANCO: Thank you for all those
6 comments.

7 So, next, we will be talking about energy
8 prices. And again, energy prices there are two
9 components to them. First, the energy prices related
10 to the household and the year that we were
11 considering 2012 and that we would be escalating
12 those based on energy price trends in the next slide.
13 We'll be discussing that.

14 So, we developed average marginal monthly
15 prices for each household and building. The marginal
16 prices are significantly different than the average
17 prices for natural gas and electricity. There are no
18 marginal prices assumed to be different between
19 average and marginal between LPG and oil monthly
20 prices.

21 The methodology is to come up with, first,
22 regional average annual prices by month, and then

1 multiply those by monthly price factors and then
2 marginal price factors. And we do take into account
3 differences within certain buildings and regions.
4 So, based on CBECS and REIS data, we come up
5 household building price factors.

6 The data sources are primarily EIA to come
7 up with these average annual prices, the monthly
8 energy price factors, and the marginal price factors.
9 Details of this are provided in the appropriate
10 appendix in chapter 8. And the household and building
11 energy price factors comes from the RESI and CBECS
12 building data.

13 MR. BROOKMAN: Yes, John.

14 MR. RODER: Victor, I have to apologize.
15 This is John Roder from Burnham Holdings.

16 Can I take you back because I'm really
17 struggling with one part of this?

18 MR. BROOKMAN: Which page?

19 MR. RODER: Back to Slide 79. I've had
20 some experience personally and professionally with
21 re-lining chimneys. And it says here "Chimney
22 re-lining for orphan water heater \$840." Where did

1 you get that data?

2 MR. FRANCO: This is re-lining, yes. So,
3 this is based on the venting -- again, we taking a
4 look at these household, single floor, two floors,
5 depending on that venting and depending on -- we're
6 assuming kind of like a flexible aluminum liner kind
7 of situation going through. Based on the
8 installation location and the vent length, we come up
9 with the 840. The orphan water heater usually the
10 vent size could be significantly smaller. Usually,
11 it's about 2 or 3 inches because the input capacity
12 of the water heater is --

13 MR. RODER: Right. We have pretty much
14 determined that the boiler installed base is
15 intercity row homes typically more than one or two
16 stories. I mean so I think that needs to be factored
17 in. All right, but let's take that piece of data and
18 go back over to slide 84. If you look at the -- we
19 believe, and my colleague, Paul Sohler, can give you
20 the technical reasons better than I can for this, but
21 when you move to an 84 or an 85 percent efficiency
22 that causes a need to line a chimney.

1 To line a chimney is going to be at least
2 I think close to a thousand dollars. You're saying
3 \$846 for a water heater. Lining a chimney for a
4 boiler vent is going to be considerably more; yet,
5 you say that the incremental cost is \$56 to go from
6 say 82 to 84 and \$180 if you go to 85. That must be
7 that you're not accounting for the fact that at 84
8 and 85 you need to line chimneys.

9 MR. FRANCO: We do account for lining
10 chimneys, but it's only on these orphan water
11 heaters. You're talking about the case of stainless
12 steel installations, I assume.

13 MR. RODER: As to the particular lining
14 material I think stainless steel is one option.

15 MR. SOHLER: Yes, aluminum would be --
16 again, depending on what type of boiler we're talking
17 about it's conceivable it could be aluminum.

18 MR. FRANCO: I think I understand. Maybe
19 this might --

20 MR. CYMBALSKY: Can we go to Slide 78? I
21 think that's where the chimney re-lining costs are.

22 MR. FRANCO: Yes. That's the water

1 heater. Now, in terms of chimney re-lining of a
2 boiler, if we go back to 78 --

3 MR. CYMBALSKY: So, that \$1600 roughly.

4 MR. RODER: Right. But doesn't that even
5 prove the point more though that if it's \$1600 the
6 incremental cost between 82 and 84 would be at a
7 minimum \$1600.

8 MR. FRANCO: Well, that's only applied to
9 a fraction. And in this case, if you look at the
10 chimney re-lining and then re-sizing there's only a
11 very small fraction, so it's only applied to 4
12 percent of installations, for example.

13 MR. STANONIK: John, I'll explain this the
14 way I understand it; and it's probably not going to
15 be fair to DOE, but I guess they'll have to accept
16 that. I look at that and so they say, okay, that's
17 the cost, but only 5.2 percent of the houses will
18 need that. So, in essence, they're assuming that all
19 the customers that don't need it are going to help me
20 pay for it because I do need it. So, they basically
21 disperse the cost of that across all households that
22 have the installation.

1 MR. FRANCO: No, no, no.

2 MR. STANONIK: Well, then how do you go
3 from \$1600 to \$40.

4 MR. BROOKMAN: Okay, Victor.

5 MR. FRANCO: Thank you. No, that's
6 something I wanted to clarify from the beginning.
7 So, all these values we're saying are average values
8 are essentially what you're saying they're average
9 values. From household-to-household, the specific
10 costs are added. So, for example, for 5 percent of
11 the households they will get this \$1600 cost and they
12 will get that significant cost for that household.
13 The other household would have no cost associated to
14 doing this.

15 MR. STANONIK: All right, so then when I
16 get to the life cycle costs discussion then we see --
17 Frank Stanonik, HIR.

18 Then you see this incremental cost that
19 says, oh, and when we're all done with this analysis
20 the actual incremental costs for these step ups in
21 efficiency is in the tens of dollars.

22 MR. FRANCO: And that's because of how

1 we're averaging. You also need to consider new
2 construction, new owners and that gets all averaged
3 in to those values. Those are average values. If
4 you looked at the individual household, you do have
5 some households that have this huge cost.

6 MR. STANONIK: I'm sorry. I was looking
7 at 84.

8 MR. BROOKMAN: Okay.

9 MR. STANONIK: I'm sorry. My mistake.
10 It's average installed cost.

11 MR. BROOKMAN: Okay.

12 MR. STANONIK: But I'm still looking at a
13 very small incremental increase, and yet, we're
14 talking about some percentage of homes that have
15 incremental increases that are, in this case, 10
16 times that or more.

17 MR. RODER: Paul, did you want to offer a
18 comment?

19 MR. BROOKMAN: Paul, please.

20 MR. SOHLER: See, coming back to that, we
21 talked about this before. At the bottom of page 84,
22 these are incremental costs. So again, you made an

1 assumption that 100 percent of the chimneys built
2 before 1995 you know are going to require re-lining
3 at whatever tech level you happen to be working at is
4 what I see here, so this incremental cost would then
5 be above that baseline; am I not understanding that
6 right?

7 MR. FRANCO: No, so it would be two
8 criteria. One is the household was built before
9 1995, but also the boiler was also installed before
10 1995. There are a lot of households that have a new
11 boiler between 1995 and 2020.

12 MR. BROOKMAN: And if a new boiler was
13 installed after 1995, then you presume that it was
14 re-lined appropriately at that point.

15 MR. FRANCO: Correct. And that's why the
16 fraction of chimney re-lining is only about 5 percent
17 if you go back to Slide 78, if not, it would be much
18 higher if we assumed that it was 100 percent.

19 MR. BROOKMAN: And the great bulk of
20 boilers in the installed base between 1995 and 2020,
21 the great majority of that installed base is in
22 place.

1 MR. FRANCO: Correct.

2 MR. CYMBALSKY: I mean it probably would
3 be helpful to know what the average age of the boiler
4 and the stock is in 2020. I think that would help
5 him with the math.

6 MR. BROOKMAN: Really this is important.
7 I want to get to the bottom of this if we can, so
8 keep thinking about what your questions would be and
9 let's drill down here.

10 MR. RODA: I'll dumb it down and I'll just
11 be natural and that naturally dumbs it down. DOE
12 says go to 85. We want to go to 85 percent. We are
13 asserting that if you go to 85 percent you have to
14 line the chimney every time. That's more than a 42
15 or \$52 incremental cost differential between an 82
16 and an 85. And I just don't know what I'm not
17 understanding here, but it just does not seem to be
18 taken into account.

19 MR. BROOKMAN: Okay.

20 MR. RODER: 85 request flue line -- excuse
21 me, chimney lining. Chimney lining costs a thousand
22 dollars minimum. How you can come up with an

1 incremental cost that is \$56 or \$180 doesn't make
2 sense.

3 MR. BROOKMAN: Okay, Victor.

4 MR. FRANCO: Hopefully, this will explain
5 a little bit, and I would say your feedback, and
6 hopefully this explanation will help you also provide
7 better feedback.

8 So, we're assuming that chimney re-lining
9 is required, for example, here for 5.7 percent.

10 MR. RODER: Non-condensing to
11 non-condensing.

12 MR. FRANCO: Non-condensing to
13 non-condensing at 82 percent. And if you go down
14 further, about 4.3 percent require the chimney
15 re-lining in terms of doing the metal vent. Because
16 a certain fraction go to stainless steel, the
17 stainless steel cost will include the chimney venting
18 for the remaining 1.4 percent.

19 In essence, you have chimney re-lining at
20 82 percent fraction similar to the 85, so there's no
21 differential.

22 MR. RODER: Right. And you're suggesting

1 that they're virtually the same, 5.7 percent to 4.3.

2 Correct?

3 MR. FRANCO: Because the stainless steel
4 includes that cost in the stainless steel. It's kind
5 of included in that -- the 1.4 percent is included in
6 the stainless steel.

7 MR. RODER: And I think perhaps some of
8 the difference may be the issue that we believe that
9 85 percent it's not 30 percent, it's not 4.3 percent.
10 It's virtually all.

11 MR. FRANCO: And that's the type of --
12 yes.

13 MR. RODER: And Paul, I'm going to ask you
14 to help me on the technical side.

15 MR. SOHLER: What you asking a minute ago?
16 I missed it.

17 MR. CYMBALSKY: The question I think I
18 hear is no matter what the situation of the house or
19 the chimney if any of us here today have a boiler
20 installed, no matter what efficiency level it is if I
21 buy an 85 do I need to re-line the chimney every
22 single purchase time.

1 MR. SOHLER: And we would submit, yes.

2 MR. CYMBALSKY: No matter what's in there
3 right now?

4 MR. SOHLER: Yes.

5 MR. CYMBALSKY: Even if I have an 85 in
6 there now.

7 MR. SOHLER: If you have an 85 percent in
8 there now, no.

9 MR. CYMBALSKY: What if I have an 84? I
10 mean do you see what I'm getting at here? I mean
11 you're saying every single -- he's saying every
12 single time, but the market's not all at below 80.
13 It's not all at 82, so what we're asking from the
14 stakeholders is to give us -- we don't have it
15 exactly the way you think it should be we're asking
16 for the data to tell us what it is.

17 MR. BROOKMAN: Amy, I believe.

18 MS. SHEPHARD: Yes, Amy Shephard with
19 AHRI.

20 I want to just point out that in the NOPR
21 DOE notes that Crown Boiler, U.S. Boiler, and New
22 York Boiler didn't think that this venting issue was

1 correct and they urged DOE to get input from building
2 inspectors and code officials, which I think makes a
3 lot of sense. Like let's call up and get some actual
4 quotes and see if we can validate this data.

5 And DOE said that gathering input from a
6 representative sample just wasn't possible in the
7 timeframe of the NOPR preparation, but the NODA, the
8 final comments on that was in February 2014. And you
9 said earlier that it was submitted -- the NOPR was
10 submitted to NIRA in April of 2014, which is only a
11 period of a couple of months. And I would suggest
12 that -- I mean this seems like a big issue and it
13 makes sense and I think that there's some burden that
14 needs to be placed on DOE to also use available
15 avenues to get this data rather than just saying
16 always well the manufacturer should give it us.
17 That's my point on that.

18 MR. CYMBALSKY: So, all I'm saying is if
19 an assertion is made is to back it up with data.
20 That's all we're saying.

21 MS. SHEPHARD: Amy Shephard again.

22 And I think that it's been requested that

1 DOE also take some actions I think that are very
2 reasonable in consulting these code officials. And
3 what it says in the NOPR is we just didn't have time,
4 but it was two months from the NODA in which that
5 comment was raise to when DOE submitted the NOPR, and
6 I think that the time could have been taken to
7 resolve this data as well from DOE's end.

8 MS. MAUER: Joanna Mauer, ASPA.

9 Just a clarification, my understanding,
10 Victor, is that in the analysis the assumption is if
11 you have an unlined chimney and you're installing an
12 85, then you always would re-line the chimney, so I
13 don't think there's any assumption that if you have
14 an unlined chimney you would not re-line it to
15 install it.

16 MR. FRANCO: Correct. Yes, we were
17 referring to the 100 percent of the time that you
18 have an unlined chimney we have to do that. The only
19 thing is the criteria of when potentially you do have
20 that situation and that's one of the slides, Slide
21 85, more or less goes into that criteria. And I
22 think that's the only potential discussion point.

1 So, we are assuming that the boiler is installed
2 before 1995 or the household is built before 1995
3 that you do have an unlined chimney.

4 MR. BROOKMAN: This is 75?

5 MR. FRANCO: This is 75, yes.

6 MR. BROOKMAN: Yes. Okay. Let everybody
7 get there.

8 MR. FRANCO: And in that case when you
9 have an unlined chimney, we do have the cost for the
10 re-lining.

11 MR. BROOKMAN: Okay, any additional
12 clarifying questions or comments here? Paul.

13 MR. SOHLER: Yes, this says -- or I guess
14 what you're saying is that you'd really say a boiler
15 was installed -- well, no. Okay, if either of these
16 happened before 1995 -- yeah, if the boiler was
17 installed or the building was built, so I guess
18 really it would be that that's implying that if you
19 had a building that was -- the chimney was built
20 before 1995, boiler is new, that you'd have to
21 re-line it, which is not what you're saying.

22 MR. CYMBALSKY: I think this is just get

1 at -- '95 was, I guess, the year where this code came
2 in, right? Am I right?

3 MR. SOHLER: That is correct.

4 MR. CYMBALSKY: So, if the event is you
5 built a new house with a boiler it had to meet that
6 code, or the house is older than '95 and it put in a
7 new boiler after '95 it had to meet that code as
8 well. I think that's what that says.

9 MR. SOHLER: Nonetheless, there is, I
10 think, a false assumption here that you must re-line
11 for all these tech classes. You always, always,
12 always put in a chimney liner and that is not what
13 the Fuel Gas Code says.

14 MR. CYMBALSKY: Right. So, I think what
15 you've been saying is that at the 82 level if we
16 assume 100 percent re-lining we're capturing costs
17 that you don't think is actually there.

18 MR. SOHLER: That's exactly right. Yes.

19 MR. CYMBALSKY: Okay.

20 MR. BROOKMAN: Thank you for clarifying
21 that, John. Now, we're going to press on.

22 MR. FRANCO: Thank you for all those

1 comments.

2 MR. BROOKMAN: Rick.

3 MR. MURPHY: I actually have a question on
4 the pricing.

5 MR. BROOKMAN: Rick.

6 MR. MURPHY: Rick Murphy, AGA.

7 So, just going back to the pricing for a
8 minute, if I go to Slide 61 and I see the annual
9 consumption for the various levels of efficiency
10 ratings. For instance, gas-fired hot water boilers
11 ranging from 84.1 to 70.6, and then I look at the
12 life cycle cost analysis spreadsheet and look at
13 first year operating costs I realize that there
14 are ^^^^ part of those first year operating costs
15 include electricity. Correct?

16 MR. FRANCO: That is correct, yes.

17 MR. MURPHY: So, if I try to back that out
18 and then take that dollar number and divide it by the
19 annual MMBTUs, I'm getting rates which you referred
20 to marginal natural gas rates that are significantly
21 higher than the analysis work that AGA and APGA did
22 on marginal gas prices. So, I want to state that for

1 the record. I know in the furnace proceeding we had
2 that same point, but I want to state that our numbers
3 are looking significantly different on the marginal
4 pricing.

5 MR. BROOKMAN: And your written comments,
6 please.

7 MR. MURPHY: Yes.

8 MR. BROOKMAN: Thank you. We have a
9 comment from Robert Glass. Robert asks the question
10 -- he's joining us online -- does the life cycle
11 costs include the necessary replacement of the
12 condensation neutralizer material (calcium silicate)
13 when depleted based on the amount of condensate
14 neutralized?

15 MR. FRANCO: Thank you for that question.
16 That does take into account in the maintenance, which
17 will be two slides from now, so we'll discuss that.

18 MR. BROOKMAN: Okay. So, we'll address
19 that then. Okay. We're going to keep moving on.

20 MR. MURPHY: Just one follow up on
21 pricing. Victor, is this going to be updated, the
22 pricing on the newly released EISA data?

1 MR. FRANCO: That is correct. Thank you.

2 MR. BROOKMAN: Okay.

3 MR. FRANCO: Going back one second. So,
4 we just finished energy prices. Let's talk about
5 energy price trends. So, we use AEO 2013 Licensing
6 Division to make our projections form 2020 to 2040,
7 and the projections are available here in the data in
8 this chart. Further details area in chapter 8.

9 MR. ROSENSTOCK: Steve Rosenstock, Edison
10 Electric Institute.

11 And I know this is from 2013, and I'm not
12 sure how the projections look in the 2015. I'm
13 guessing they're different. They just came out. I
14 didn't get a chance to look at the projections here,
15 and I know it's tough, but you know last winter
16 during the polar vortex propane prices went up to 4
17 or \$5 a gallon when you could get it. Now, they're
18 back down to I'll say the regular prices. Also,
19 there were -- I'm just thinking as a fuel oil thing
20 here and like if you know fuel oil prices were \$4 a
21 gallon. Now, they're about \$2 a gallon, I think,
22 from what I've seen -- some of the information that

1 I've seen. And prices over time for a lot -- well,
2 electricity, I think, looks okay, but I'm just saying
3 just for the fossil fuels, again, it's always
4 projecting an upward trend, especially after 2020.

5 And when I look at history I always like
6 to look at the history of prices of all of these and
7 I know this is a projection, but it seems like
8 actually the real prices for energy don't go up.
9 They tend to flat line or they're below inflation. I
10 know for electricity that's been true for 50 years.
11 So, has there been any thought about doing a
12 sensitivity analysis with flat or declining energy
13 prices on a real basis?

14 MR. FRANCO: Thank you. We appreciate
15 that question. We do have a sensitivity analysis
16 that's based on this low economic growth and high
17 economic grow that does have a little bit different,
18 but we don't have any other scenarios. It would be
19 good if you would provide any comments.

20 MR. ROSENSTOCK: Steve Rosenstock.

21 Yes, there's that one from EIH and I think
22 it goes back to like 1967 or '62 for a lot of

1 commodities showing, so in times of high and low
2 economic growth the prices were pretty much flat or
3 declining on a real basis. It was like the state of
4 economy was irrelevant in terms of what was happening
5 with the prices.

6 There's some correlation, but in a lot of
7 cases when there's -- you know there've been times
8 when the prices stay flat rather than increasing, so
9 the result of this is you know any time there's an
10 increase in projection -- and I can understand why,
11 but you do tend to overstate the savings that will
12 have an impact on the life cycle that this type of
13 projection will overstate the actual savings that
14 consumers will see.

15 And I've said this in other proceedings,
16 but I think it's critical because you know you're
17 talking about you know 1 percent increase here, 1
18 percent increase there. Well, you know this
19 projection could have huge impact on your life cycle
20 cost analysis.

21 MR. CYMBALSKY: We will forward your
22 comment to EIA.

1 MR. ROSENSTOCK: This is Steve Rosenstock,
2 EEI.

3 It's not a matter of whether EIA does it.
4 It's a matter of does DOE in its analysis want to do
5 a sensitivity analysis that would have I'll say you
6 know a low price increase type of sensitivity that
7 says, okay, based on past history over the last 50
8 years well real prices did not increase. This is
9 another alternative. Here's another life cycle
10 result based on flat energy prices or flat real
11 energy prices, which is what's happened over the last
12 50 years.

13 MR. CYMBALSKY: So, we do in the MIA, a
14 sensitivity, as Victor mentioned. We also perturbed
15 in installation cost, which probably has a much
16 bigger impact on the economics than does the energy
17 costs. I mean if you'd like to tell us what you
18 think the 2020 prices are for each of those fuels
19 we'd be happy to take that as a comment.

20 MR. BROOKMAN: Okay, Victor. Go ahead.

21 MR. FRANCO: Thank you. So, just to point
22 out, the Appendix 8I provides this alternative

1 pricing for LCC and 10B for MIA in case you want to
2 look at those projections.

3 MR. ROSENSTOCK: Steve Rosenstock, EEI.

4 Thanks. I didn't bring it with me, but do
5 they assume flat or declining real prices?

6 MR. FRANCO: No, they're different.

7 MR. ROSENSTOCK: They're still increasing.

8 MR. FRANCO: They're still increasing.

9 MR. ROSENSTOCK: So, none flat or none
10 declining. Okay. Thank you.

11 MR. FRANCO: So, next, we'll be taking a
12 look at repair and maintenance costs.

13 (Slide.)

14 MR. FRANCO: So, the repair costs are the
15 costs of replacing or repairing components in the
16 boiler that have failed. DOE considered different
17 sources for this data, primarily, 2013 RS means data,
18 product costs from engineering analysis, and the
19 following assumptions regarding the average lifetime
20 and repair rates of the different components.

21 So, we included the two different types of
22 repaired components. One we called "other," which

1 includes ignition controls, gas valve, and automatic
2 means and also repairing either the mechanical vent
3 for mechanical vent boilers or the inducted forced
4 draft blower. The assumptions about the lifetime
5 come from studies conducted by GOI in the late
6 1980s/early 1990s. And these are the average values,
7 12.2 in 15 years. And the repair rates assumptions
8 that we're making in terms of how often these would
9 be repaired. So, we're assuming that other
10 components would be repaired 50 percent of the time
11 between the lifetime of the appliance.

12 (Slide.)

13 MR. FRANCO: The material costs are
14 provided here as well as the labor hours. The
15 maintenance costs are the labor materials required to
16 maintain the product. The costs are based on 2013 RS
17 means; primarily, the labor costs. And the
18 frequencies are based on REIS sales and CBESC data on
19 whether the household owner reports the unit as
20 repaired frequently.

21 In terms of how frequently that repair is
22 conducted, we used data from American Home Comfort

1 Survey. All the data is provided in the appendix for
2 repair and maintenance.

3 In addition to this, for condensing
4 designs, DOE accounted for the maintenance for the
5 condensate withdrawal system, so to do any
6 maintenance related to that and also, having to
7 replace condensate neutralizers. The details are
8 available in this appendix.

9 Finally, for oil furnaces, we did take
10 into account impacts of low sulfur fuel oil
11 regulations on the frequency of secondary heat
12 exchanger clearing, and this is based on EIA
13 projections about what areas would be regulated by
14 2020. The details are in the same appendix. We
15 assume that 61 percent of oil-fired boilers would be
16 impacted by this.

17 MR. BROOKMAN: Yes, please, Roger.

18 MR. MARRAN: Yes, Roger Marran from Energy
19 Kinetics.

20 I believe all equipment is going to be --
21 all fuel supply by 2020 is going to be low sulfur or
22 ultra low sulfur, I guess, where it is you know with

1 the standards now, so that should be in place even by
2 I think 2018 or something. New York's ultra low
3 right and a bunch of other cities are low sulfur and
4 going that way. I think New England and the
5 Mid-Atlantic state by 2018, something to that affect.

6 MR. FRANCO: Thank you. We appreciate
7 that comment. Thank you.

8 MR. BROOKMAN: Yes, Paul.

9 MR. SOHLER: Yes, Paul Sohler.

10 You said that the lifetimes and some of
11 the data that's in this table came from a GRI
12 research project from the 1990s? There were really
13 no -- I say no. There certainly were some, but there
14 were far fewer condensing boilers in the residential
15 world back then, so I would question whether you know
16 the data that's there is really validate, certainly
17 for condensing equipment.

18 MR. FRANCO: Thank you. We appreciate
19 that comment. We did look at the condensing furnace.
20 Obviously, condensing furnaces is different
21 equipment. It did have some data on condensing. And
22 we assumed that because of their similar lifetimes

1 and fractions of repairs that they could be
2 approximated by these, but we would appreciate your
3 feedback on that.

4 MR. BROOKMAN: Frank.

5 MR. STANONIK: Quick question, so Victor,
6 the hundred dollars you have there as bare material
7 that is the estimated cost of a new draft inducer
8 motor?

9 MR. FRANCO: That's bare material costs,
10 so it does not include any markups. So, if you mark
11 that up two or three times more than that plus you
12 know the labor that would be your repair.

13 (Slide.)

14 MR. FRANCO: So, moving onto the next
15 slide, this just summarizes the repair costs. The
16 repair costs here are annualized, so obviously, even
17 though the household did have repair in the order of
18 3 or \$400, these are annualized, so it might happen
19 every 20 years, and here's the incremental costs and
20 the maintenance is also annualized, and you can see
21 the differentials there.

22 (Slide.)

1 MR. FRANCO: So, next, we move onto to
2 lifetime. So, the next two components are critical
3 to the life cycle cost analysis, lifetime and
4 discount rates. So, lifetime is the age of the
5 residential boiler when it's retired from service.
6 We base this on national survey data from multiple
7 years of RECS and American Housing Survey as well as
8 shipment data, which I'll be describing in further
9 detail in chapter 9.

10 The methodology was developed in this
11 research paper. Based on this methodology, we came
12 up with a lifetime of 25 years and a distribution
13 that's provided in this graph. We assume that the
14 lifetime is the same for all product classes and
15 design options.

16 MR. BROOKMAN: Yes, pleas, Gary.

17 MR. HAINLEY: Gary Hainley, U.S. Boiler.

18 What did you base your assumption that all
19 product classes have the same lifetime?

20 MR. FRANCO: So, we were looking at data,
21 and obviously, there isn't sufficient data for
22 condensing to determine, for example, if condensing

1 or other higher efficiency equipment would have a
2 different lifetime. There have been some studies in
3 other countries, for example, in Europe, that have
4 determined that they do have similar lifetimes.

5 We would appreciate it if there's any
6 lifetime data that manufacturers could provide about
7 that. This methodology uses historical data.
8 Condensing, as we will look at the base case
9 efficiencies distributions condensing equipment
10 started be installed in 2000. And so, by 2009, which
11 is pretty much what we have data from RESC. It's
12 only nine years, so most of the condensing equipment
13 would still be in the stock, and we don't know how
14 that would be impacted.

15 MR. HAINLEY: Gary Hainley, U.S. Boiler.

16 I would agree with that. I think that
17 you're making the assumption that without additional
18 data to suggest that condensing product and
19 non-condensing product last the same amount that you
20 assume it's going to last 25 years; yet, we don't
21 have a product in the United States that have been
22 installed for 25 years. So, I think just the whole

1 basis of that assumption is invalid.

2 The studies that I'm aware of that EPA
3 used in their life cycle or lifetime analysis were
4 from the UK. And my knowledge of UK boiler
5 installations is they're not the same as ours in that
6 most of the product that were installed -- and I
7 believe BRG data suggests 65 percent of the product
8 installed prior to the 2005 regulations in the UK
9 were copper boilers, which are going to have a
10 different lifetime than the traditional cast iron
11 product that we have installed in the United States.

12 So, by then concluding that there's no
13 contradictory data that suggest they won't last the
14 same amount it's not an apples-to-apples comparison
15 for one, and we are trying to find data that is more
16 conclusive, but again, we don't have product that
17 have been installed in the United States long enough
18 to be able to absolutely say that they will or won't
19 last as long. Thank you.

20 MR. SOHLER: And the only thing I would
21 add to that is I think, one, and it's far from
22 perfect, but it's sort of semi-objective source of

1 information on that is simply to go look at
2 manufacturers' warranties. That tells you, at least
3 to a certain extent, what they think the life
4 expectancy is and there is a significant difference
5 between non-condensing and condensing if you look at
6 that, certainly between cast iron non-condensing and
7 condensing.

8 Antidotal, a lot of the Europeans that
9 we've spoken to talk about a 15-year life expectancy,
10 and I think that's kind of consistent with the
11 warranty information that's out there. I'm pretty
12 sure that we have already provided that comment to
13 DOE. I know we did to EPA. We will again if
14 necessary.

15 MR. BROOKMAN: Thank you.

16 MR. FRANCO: We'd appreciate all that
17 feedback in writing. Just to point out that we do
18 have a sensitivity analysis in Appendix 8F. It does
19 still assume that all the lifetimes are the same
20 within the efficiency levels, but it goes give you a
21 sense of the impact, for example, if we assume that
22 the lifetime is 20 years versus 30 years, for

1 example. So, you could take a look at that. It's
2 again in Appendix 8F.

3 (Slide.)

4 MR. FRANCO: The next slide move on to
5 discount rates. So, in terms of discount rates,
6 these are used to determine the present life of
7 lifetime operating costs. We have a different
8 methodology for determining residential and
9 commercial.

10 The main sources for residential are based
11 on the Federal Reserve Board's Survey of Consumer
12 Finances we used from 1995 to 2010. They provide
13 their data every three years. And for commercial, we
14 used a Damodaran online, which provides capital asset
15 -- cost of capital information.

16 MR. BROOKMAN: Yes, Steve.

17 MR. ROSENSTOCK: Steve Rosenstock, Edison
18 Electric Institute.

19 Just a quick question about the
20 residential, the Residential Income Group 1, is that
21 the lowest income and Group 6 is the highest income?

22 MR. FRANCO: Yes. And I can describe in

1 more detail.

2 MR. ROSENSTOCK: Well, I guess, again,
3 looking at this, looking at the table, and I don't
4 know how detailed it was in the technical support
5 document. I guess it seems a little
6 counter-intuitive that the discount rate for Income
7 Group 1 would be lower than Income Group 2 and about
8 the same as Income Group 3. That just seems
9 counter-intuitive to me since they're in the lowest
10 income group.

11 MR. FRANCO: Thank you. We appreciate
12 that comment. Based on this methodology, we made it
13 consistent throughout and we will take a look at that
14 in more detail.

15 MR. ROSENSTOCK: Steve Rosenstock, Edison
16 Electric Institute.

17 Again, I appreciate it and I know you
18 don't have the survey, but again, it's a matter -- I
19 guess it spills over into your consumer subgroup
20 analysis where -- you know you have a rising and
21 rising discount rate and then it goes back down.
22 Again, it could have an impact on that subgroup

1 analysis. And again, I'm just kind of curious how --
2 I'm just really kind of -- it's very interesting how
3 and why did that happen? I'm really kind of curious,
4 if someone could explain that to me.

5 MR. FRANCO: Thank you. And I can go into
6 more details. So, the way discount rates are handled
7 in terms of residential is that we take into account
8 different depths and equity types the household has
9 in its possession.

10 For Income Group 1, usually, they don't
11 have too many debts or equity. They might primarily
12 have a savings account, checking account and those
13 would be the basis for -- main basis for the discount
14 rate. They may have some loans, but they don't have
15 a large fraction.

16 If we come to Group 2, it seems like they
17 have more shares of different assets or debt types,
18 and that accounts for a little bit higher discount
19 rate.

20 MR. ROSENSTOCK: Yes, Steve Rosenstock,
21 EEI.

22 I'd really like to see that because it's

1 usually the lower income groups that are paying the
2 highest interest rates for any sort of credit,
3 whether it's a payday loan or a credit card or any
4 sort of bank loan and you know any dollar that's
5 spent you know is much more valuable because they
6 have so little of it. Again, it just seems
7 counter-intuitive to me. I don't have any
8 statistical data. I just -- you know especially in
9 urban areas that's where all they payday loans are
10 and that's where all the high interest type of
11 entities are that are there and so I would assume,
12 based on some of that, that their discount rates
13 would be much higher.

14 MR. BROOKMAN: So, anybody that's got any
15 data that contradicts the Feds survey it would be
16 great to have that.

17 MR. FRANCO: And just to clarify, we'll go
18 into more detail on low income in a few more slides.

19 MR. BROOKMAN: Keep going, Victor.

20 (Slide.)

21 MR. FRANCO: So, the average overall
22 discount rate is 4.5 for this analysis. Moving on to

1 base case efficiency distributions, we have a few
2 slides for base case efficiency distribution, so I'll
3 try to go over it fairly quickly.

4 (Slide.)

5 MR. FRANCO: So, the base case
6 efficiencies reflect the projected market share of
7 products of different efficiencies levels in the base
8 case, in other words, in the absence of standards.
9 So, this reflects that not all consumers purchases
10 parts at the current minimum standards. Consumers
11 who are already purchases products at higher
12 efficiencies are not impacted by the standard.

13 The methodology used is we tried to use as
14 much of historical shipment data that we had, and
15 also the boiler certification directories. The
16 development of the historical distribution of
17 efficiency levels in 2013 includes AHRI and Energy
18 Star shipments data from 2003 to 2012, estimated
19 historical shipments that will be described in more
20 detail in chapter 9, and a combination of different
21 certifications directories more details are available
22 in Appendix 7D.

1 We assumed that the new Energy Star
2 performance criteria, which is 90 percent for
3 gas-fired boilers and 87 percent for oil-fired
4 boilers will have an impact by 2020. And based on
5 that, we're assuming that in 2013, 32 percent is the
6 current market share for condensing and will rise to
7 46 percent by 2020, and similar 4 percent to 8
8 percent for hot water oil boilers. For gas-fired hot
9 water boilers, we accounted for regional differences,
10 and we'll go over those in a couple of slides.

11 The last point is in terms of the standby
12 and off mode standards. We assumed that 50 percent
13 of the market is at the baseline and 50 percent is at
14 the max tech or above. So, let's go briefly through
15 these, kind of summarizing the historical data and
16 our projections.

17 (Slide.)

18 MR. FRANCO: This is the chart showing the
19 historical and projected --

20 MS. SHEPHARD: Can I just stop because I
21 had a question about something you just said. This
22 is Amy Shephard from AHRI.

1 So, for the standby mode standard you said
2 you assumed that 50 percent were AL zero and that was
3 the baseline that you talked about earlier?

4 MR. FRANCO: That's correct.

5 MS. SHEPHARD: So, are there actual models
6 that are at that baseline because the way I
7 understood the way you described that was before is
8 you took the least efficient of all those different
9 mechanisms and you sort of created a model that had
10 all of those. So, we're assuming -- so, is that
11 correct?

12 MR. FRANCO: That is correct. Yes,
13 basically the 50 percent is accounting for -- all
14 these condensing have controls.

15 MS. SHEPHARD: Right. But you're assuming
16 at 50 percent are at that baseline that you created,
17 so I'm asking are there any actual models in the
18 market that are at that baseline?

19 MR. FRANCO: We don't actually have the
20 measurements, so we don't know what -- this is just
21 an assumption and we appreciate feedback on whether
22 this is too high --

1 MS. SHEPHARD: Okay. And so -- and I
2 guess along those lines, normally, when you're doing
3 like just a regular efficiency standard level and you
4 start with your baseline you either start with what
5 the current standard is or you look at what's the
6 average in the market. So, why for the standby --
7 for these standards did you not kind of look at the
8 market and think, okay, what's the most widely used
9 baseline for these in the market as opposed to
10 creating one that had the worst case scenario in
11 every single factor?

12 MR. FRANCO: So, DOE's approach for the
13 standby and off mode it doesn't want to take out
14 certain technologies that might be beneficial. So,
15 for example, the display might be beneficial for the
16 consumer, and so it's starts with assuming that it
17 has a display. It has a certain high wattage and
18 then it goes down from there.

19 (Slide.)

20 MR. FRANCO: So, going to the next slide,
21 this shows the projections. So, here we have the
22 historical data in blue for hot water and gas boilers

1 and in green for oil boilers, hot water oil boilers
2 and our projections.

3 MR. ROSENSTOCK: Steve Rosenstock, Edison
4 Electric Institute.

5 But these projections were based on the
6 energy price trends that you were using in Slide 86,
7 correct, or what are these? Were these based on kind
8 of more of an extrapolation of what's been going on?

9 MR. FRANCO: Exactly. Yes, this is just
10 an extrapolation. It's not based on energy prices.

11 MR. ROSENSTOCK: Steve Rosenstock, EEI.

12 Again, this is where I'd also -- a
13 sensitivity analysis might be bad too because
14 remember with the very low prices that also might
15 hurt their market share in the absence of standards
16 because you know especially if the price of fuel oil
17 has gone down by 50 percent and natural gas has gone
18 down by 30 percent, et cetera, then you know these --
19 you show these rises through 2020 and you know --
20 again, it could be that it's just because there's you
21 know less savings by going to these products then the
22 market share might not be as high just because prices

1 have collapsed.

2 Again, if you're allowed to do some
3 sensitivity analysis based on lower prices, it would
4 have an impact here as well. Thank you.

5 MR. FRANCO: Thank you for that comment.

6 (Slide.)

7 MR. FRANCO: So, moving on to the next
8 base case efficiency distributions from 2013 to 2020.
9 So, this is a mixture of the fraction of models or
10 fraction of shipments that are at non-condensing
11 versus condensing and the disaggregation using the
12 certification directories. So, if you look at 2013,
13 this is what we come up with in terms of the
14 disaggregated market share for all these product
15 classes. And in 2020, based on the increasing
16 condensing market share, we come up with these
17 updated results. For steam, oil, and gas-fired
18 boilers there are no changes because there's no
19 change in the condensing fractions.

20 MR. BROOKMAN: We have a comment from Mike
21 McDonald, who is online. He asks the question is the
22 growth in condensing based on any tax incentives

1 above the current tax credits?

2 MR. FRANCO: Thank you for that question.

3 No, it isn't. It's mainly based on kind of the
4 Energy Star increased market share over time. It
5 also takes into account once you have a condensing
6 boiler you will be more likely to replace with a
7 condensing boiler. It's really hard to go back to
8 non-condensing once you've gone to condensing. So,
9 this does take into account increasing market share
10 over time of condensing even in the replacement
11 market.

12 MR. BROOKMAN: Okay. Good.

13 (Slide.)

14 MR. FRANCO: So, the next slide provides
15 the disaggregated condensing market share by Census
16 Division. This data was provided by AHRI. From 2008
17 to 2012, we have shipments data, and these are the
18 fractions. So, you can see it does vary by regions,
19 so we did want to use this data because it does vary
20 significantly.

21 Once we apply our projections, you can see
22 that for some regions it goes up to almost 100

1 percent, so it would good to take a look at these
2 carefully and see if you agree.

3 MR. STANONIK: Frank Stanonik, AHRI.

4 Just one caution for everybody, this is
5 percentage of boilers that are shipped into that
6 region, not necessarily percentage of all boiler
7 sales in the nation.

8 MR. BROOKMAN: It's nice to have shipments
9 data.

10 MR. FRANCO: Thank you, Frank, for that
11 clarification. The other clarification is this is
12 just AHRI manufacturers or only HRI manufacturers.

13 (Slide.)

14 MR. FRANCO: So, this finalizes life cycle
15 and payback analysis inputs. Now, we go into the
16 results. So, these are average values that are
17 provided here in terms of the full install cost,
18 lifetime operating costs, average LCC, and the
19 average LCC savings and the median payback period.
20 This is just for gas hot water boilers. For all
21 other product classes, the TSC has the appropriate
22 tables.

1 (Slide.)

2 MR. FRANCO: So, moving on to the consumer
3 subgroup analysis. So, DOE evaluates the impact on
4 consumers who might be disproportionately affected by
5 this national standard. DOE evaluated subgroup
6 analysis for low income and senior-only houses. The
7 results comparisons are provided here for all
8 products.

9 In terms of low income, it is important to
10 note that the DOE's analysis all household pay for
11 the full cost of more efficient boilers and fully
12 benefit from the lower energy bills; however, most
13 low-income households are tenants who benefit from
14 the lower energy bills, but not have a rent increase,
15 which cover for the higher equipment costs. Overall,
16 tenants are probably better off than suggested by the
17 LCC results.

18 MR. BROOKMAN: Steve Rosenstock.

19 MR. ROSENSTOCK: Steve Rosenstock, EEI.

20 This was discussed in the furnace
21 rulemaking. I know this based on a study out of
22 Berkeley, but I think -- they're not here, but the

1 homebuilders had a different perspective on it. And
2 I believe there's Multi-family Housing Council and
3 you know some of their perspectives. To assume that
4 the rent increases aren't going to cover the
5 equipment costs, but assume that all landlords that
6 whenever they're facing an increase in some sort of
7 cost that they can never pass on those increased
8 costs to tenants and there are many parts of the
9 country -- if you look were the rents are increasing
10 much faster than inflation, so somehow maybe not in
11 the first year or the second year, but overall they
12 are going to recover their costs or else they
13 wouldn't be in business, or they might ^^^^ if they
14 can't recover their costs, they might reduce
15 maintenance or other sorts of operating costs in
16 another way that would let the property degrade a
17 little bit and actually increase energy costs.

18 So, I understand the philosophy behind
19 this, but I think there needs to be some checks with
20 the actual building owners and landlords or you know
21 and/or home builders to see how they treat or how
22 they recover their costs because they are going --

1 they have to recover their costs somehow at some
2 point. It might not be in the first year. It might
3 be in the second year. It might just be with the new
4 tenants, but somehow they have to recover their costs
5 or else they're not going to be able to run the
6 building.

7 MR. FRANCO: Thank you for that.

8 (Slide.)

9 MR. FRANCO: The last slide is a request
10 for comment. I will go really briefly through some
11 of these. We request comment on the reasonableness
12 of our consumer prices and also any alternative for
13 the suggestion of using the constant trend, and if
14 there's any data for trends of projections of prices
15 for condensing and non-condensing boilers and any
16 comments on the approach and data sources used for
17 changes in installation costs for more efficient
18 residential boilers. Also, comments that relate to
19 installation costs of the fraction of different
20 material types for condensing, including PVC and
21 CPVC.

22 We've already gone through this, but the

1 fraction of boilers that would be required to be
2 installed with stainless steel venting by efficiency
3 level. And I'll go to the next few.

4 (Slide.)

5 MR. FRANCO: We request any feedback on
6 the sources and data used for maintenance and repair,
7 also on its approach for determining lifetime and
8 estimating discount rates for both residential and
9 commercial consumers. DOE also requests comments on
10 its projections for higher efficiency condensing
11 boilers in 2020 in the absence of amended efficiency
12 standards. DOE request comment on the fraction of
13 boilers at each standby and off mode efficiency
14 level.

15 Finally, any comments related to any
16 aspects of the life cycle and payback period
17 analysis.

18 MR. BROOKMAN: You see the request for
19 comment. Please take a peek there and see if there's
20 anything additional this time, and noting that your
21 written remarks will be very helpful to the
22 Department. Yes, Rick.

1 MR. MURPHY: Doug, I'm assuming that the
2 issue that I raised earlier about marginal prices is
3 covered under 4-20, even though it's not itemized out
4 in the previous ones.

5 MR. BROOKMAN: You'll have to refresh my
6 memory on the details, Rick.

7 MR. CYMBALSKY: It's the marginal price on
8 natural gas. Yes, we'll take comment on that.

9 MR. BROOKMAN: Thank you. Let's take a
10 break. When we resume, we will be picking up with
11 shipments. Let's see if we can make it more like 10
12 than 20 minutes, okay. It's now 10 minutes after
13 3:00. Let's try and pick back up here about 20
14 minutes after.

15 (Whereupon, a short recess was taken at
16 3:10 p.m.)

17 MR. BROOKMAN: Thanks to all of you for
18 being back here in 10 minutes. That was great. Good
19 work. We're going to start with the shipment
20 analysis, and we're going to pick up the pace here a
21 tad to make sure we get through all this content.
22 And we really have done a lot already. There's more

1 to go, so we're going to jump right on it. Victor.

2 MR. FRANCO: Welcome back. So, we're
3 going to start on the shipment analysis, and this is
4 Slide 101.

5 (Slide.)

6 MR. FRANCO: so, the purpose of shipment
7 analysis is to come up with the shipment between the
8 analysis period, 2020 to 2049. This is a major input
9 to the National Energy Savings MPV as well as the
10 manufacturer impact analysis, but it also has a major
11 impact on other inputs like we described lifetime,
12 for example and the base case efficiency
13 distributions.

14 So, the shipment projections are divided
15 by market segment, new construction, new owners and
16 replacements. Again, new owners include existing
17 buildings that acquired a boiler for the first time,
18 and also includes switching between the different
19 product classes, and we'll describe that in a little
20 bit detail next slides.

21 This analysis also includes the impact of
22 standards in terms of consumers purchasing --

1 repairing rather than replacing their residential
2 boiler. The analysis assumes the price elasticity
3 value and assumes that the consumer is influenced by
4 the purchase price and operating costs.

5 (Slide.)

6 MR. FRANCO: The next slide provides an
7 overview of the shipments model. So, the new
8 construction the two major inputs are new housing
9 starts and the average boiler saturation in the new
10 construction market. New owners is based on the
11 difference between the historical shipments that we
12 derived and the model shipment data.

13 Finally, replacements are a combination of
14 annual shipments and the retirement function, which
15 is based on the lifetime distribution that we
16 described earlier in chapter 8.

17 The replacement market also takes into
18 account shipments that are switching to new owners in
19 another product class and demolition, so building
20 that are no longer in the house stock.

21 (Slide.)

22 MR. FRANCO: The data sources for these

1 inputs are available on this slide. We use Census
2 data and AOE 2013 historical data for housing and
3 commercial building square footage. New construction
4 saturations come from CBECS and RESC data as well as
5 new housing characteristics from Census data.

6 Shipments to new owners are estimated
7 based on 2008 to 2012 historical shipments compared
8 to the shipments model estimate. The new owners are
9 derived is the difference between historical
10 shipments and the model of new construction
11 replacement shipments. Most new owners are assumed
12 to switch between product classes. For hot water gas
13 boilers DOE assumed that the fraction are new owners
14 that are installing a new boiler in an existing
15 building did not have a boiler previously. That
16 fraction is 20 percent, and that's the fraction
17 that's being used in the LCC analysis.

18 The historical shipments we'll talk in
19 more detail, but we have taken into account appliance
20 magazine shipments from 1962 to 2008. We have been
21 getting AHRI shipments from 1970 to 2012. Recently,
22 we got a submittal from 2003 to 2012 shipments, and

1 we make several adjustments that we will go into
2 further detail in the next couple of slides. The
3 retirement function, as we described the lifetime, is
4 based on a 25-year average.

5 Finally, we calculate the fraction of
6 commercial ^^^^ shipments to commercial applications.
7 We already described this at 7 percent based on RECS
8 and CBECS.

9 MR. BROOKMAN: Amy.

10 MS. SHEPHARD: Amy Shephard, AHRI.

11 And what price elasticity did you use and
12 what was the source of that?

13 MR. FRANCO: The price elasticity is
14 further described in Appendix 9A. It's based on
15 clothes washer and refrigerator data up to 2012, I
16 believe -- 1990 to 2002. I believe the price
17 elasticity value is 3.4. All the details are
18 provided in that appendix.

19 MS. SHEPHARD: Okay.

20 (Slide.)

21 MR. FRANCO: So, the next slide provides
22 an overview of the historical shipment. So, we just

1 wanted to provide kind of how we came up with our
2 shipments model. So now, all shipments that were
3 provided by AHRI have all the data historical
4 disaggregated by different boiler types. So, we had
5 to make some adjustments in order drive our
6 historical shipments.

7 First of all, the historical shipments
8 primarily consist of cast iron and steel from
9 Appliance Magazine and past AHRI submittals. They
10 did not include coil and tube type and high
11 efficiency condensing, except for the recent
12 submittal that AHRI provided, so for past data we had
13 to make some adjustments to take that into account.

14 In terms of high efficiency, we also took
15 into account Energy Star data since Energy Star
16 includes a little bit more manufacturers than AHRI
17 for the high condensing fraction. There are a number
18 of non-AHRI manufacturers, and we have an adjustment
19 for that.

20 Let me go into more details about -- I
21 won't go too much into this, but all the details are
22 here and they are also provided in chapter 9 in

1 Appendix 9B. Basically, we used the cast iron
2 shipments. We come up with a fraction for years that
3 we don't have this aggregated data. We come up with
4 fractions for years that are in between to come up
5 with cast iron shipments.

6 For other boiler type shipments, we have a
7 combination of sources. For steel boiler shipments
8 we do have some shipments data. For hot water gas
9 boilers, we based it on 1993 AHRI shipment data, and
10 it only accounted for 0.1 percent and that's what we
11 assumed for all years. For steel hot water, all
12 boilers we do have different estimates and we do an
13 estimate between 2010/2012 based on the linear trend
14 AHRI provided.

15 For coil-tube type shipments, we estimated
16 for historical shipments 7.2 percent fraction before
17 2012, and AHRI provided data between 2003 and 2012.
18 For high efficiency condensing boilers we used the
19 data provided AHRI as well as some assumptions about
20 historical data for oil boilers. AHRI only provided
21 condensing for gas boilers number of shipments.

22 Finally, if you notice the equation above

1 has a multiple factor for adjustment for non-AHRI
2 shipments. So, based on the 2013 directory that
3 accounts for non-AHRI manufacturer models, we came up
4 with an estimate of 13.3 percent of hot water gas
5 boiler models are non-AHRI. We used this to estimate
6 manufacturers' shipments. We decrease this fraction
7 going backwards in time. So, we assume in 1980 that
8 fraction is zero percent. We'd appreciate any
9 comments on those. And for hot water oil boilers the
10 fraction is larger, it's 26.5 percent of shipments
11 are non-AHRI.

12 (Slide.)

13 MR. FRANCO: And the next slide provides
14 the overall historical and projected shipments. So,
15 take a look at this and comment.

16 MR. STANONIK: Frank Stanonik, AHRI.

17 Just as a question, did you reach out to
18 those non-AHRI manufacturers to provide shipment
19 information?

20 MR. FRANCO: No, we did not.

21 (Slide.)

22 MR. FRANCO: So, the next slide shows the

1 shipment analysis based on the trial standard levels.
2 We'll discuss the trial standard levels in a few
3 slides from now, but this is based on the different
4 levels for all gas hot water boilers.

5 As you can see, the difference between the
6 base case, which is the blue line which kind of is at
7 the bottom row of this and the TSL5, which is the max
8 tech at the beginning there's about a 5 to 7 percent
9 decrease in shipments. That's to account for the
10 price elasticity repair versus replace.

11 MR. ROSENSTOCK: Question. Steve
12 Rosenstock, EEI.

13 So, even at max tech, you're showing no
14 difference in shipments after 2026? And you're
15 actually showing a possible increase in shipments
16 compared to the base case at max tech? That's what
17 the graphic kind of looks like.

18 MR. FRANCO: That is correct. You do see
19 a decrease up to about five or six years into the
20 standard. Those units will eventually need to be
21 replaced, so those units are then replaced during a
22 couple-year period and then after that it's very

1 close. The shipments are very close. The assumption
2 is that the price elasticity kind of decreases over
3 time. The details are available in the appendix.

4 MR. BROOKMAN: Victor, I'm confused by the
5 graphic. It looks as though, as of about 2030, all
6 you have -- all that I can see really -- maybe my
7 eyes are not working properly -- is TSO1 combined
8 with TSO. What's going on there?

9 MR. CYMBALSKY: They're all the same.

10 MR. FRANCO: They're basically the same.

11 MR. BROOKMAN: Okay.

12 MR. FRANCO: Yes.

13 MR. BROOKMAN: Okay.

14 MS. SHEPHARD: This is Amy Shephard from
15 AHRI.

16 I have a question about what you just
17 said. You said that it assumes that the price
18 elasticity decreases over time?

19 MR. FRANCO: Yes.

20 MS. SHEPHARD: But you said that the --

21 MR. FRANCO: The impact of the price
22 elasticity ^^^^ sorry -- the impact of the price

1 elasticity.

2 MS. SHEPHARD: Okay.

3 (Slide.)

4 MR. FRANCO: This is just to request
5 comment on the shipments analysis.

6 MR. BROOKMAN: Frank Stanonik.

7 MR. STANONIK: This price elasticity
8 question, okay, you indicated right now you're using
9 information that comes from refrigerators and clothes
10 dryers, I think?

11 MR. FRANCO: And clothes washers.

12 MR. STANONIK: And clothes washers, okay.
13 And while I'm going to make the comment, and I don't
14 really know that we have the means to develop other
15 data, but I think it needs to be recognized that
16 you're dealing with products that to some extent are
17 bought either on their physical appeal or some
18 desired features. You know whether it's through the
19 door ice and whatever else, okay, and that is going
20 to affect the price elasticity. Okay.

21 On a boiler you know most people certainly
22 don't care very much what the boiler looks like,

1 although maybe the like certain colors, but otherwise
2 you know the only other thing they may be interested
3 in is the efficiency. And so I think you know
4 there's certainly a very -- you don't have this
5 consumer desire aspect when it comes to you know a
6 boiler. You know I want a refrigerator that does
7 this, or I want a washer that does this. They just
8 want a boiler. And so again, I'm not sure if we can
9 figure out how to give you a better number, but I
10 think you need to keep in mind that really you know
11 it's not a good fit.

12 MR. FRANCO: Thank you. We appreciate
13 that comment. And actually, if you look at the
14 request for comment, we are requesting comments and
15 any data or feedback would be really appreciated.

16 MR. BROOKMAN: Steve.

17 MR. ROSENSTOCK: Steve Rosenstock, EEI.

18 Again, I'm looking back at Slide 84. You
19 don't have to go back. Just for the gas-fired hot
20 water boiler, the consumer price in 2013 in dollars
21 for the baseline is \$2103 and for the max tech it's
22 \$3923, so that's like you know an 80 percent price

1 increase. And you're saying that shipments will only
2 drop about 5 percent when this happens with that kind
3 of price increase?

4 MR. FRANCO: So, this takes into the
5 operating cost savings and the incremental costs.
6 And obviously, it's based on this -- as Frank just
7 pointed out -- on this data that it's based on other
8 products. It might be different for heating
9 equipment.

10 MR. ROSENSTOCK: Well, one thing that
11 could be an analogy is you know -- well, the data
12 won't be in, but you know now with residential water
13 heaters if it's above 55 gallons you have to buy a
14 heat pump water heater, which is double the price of
15 a resistance water heater. I'd be shocked if
16 shipments went down by only 5 percent. Again, it
17 just seems counter-intuitive to me with that kind of
18 a price shock that there'd only be a 5 percent change
19 in shipments, so I'm very surprised.

20 MR. BROOKMAN: Okay. Amy.

21 MS. SHEPHARD: It's a clarification on
22 just what you said where you said the impacted price

1 of elasticity decreases over time. Can you explain
2 that? What would make it -- what would cause it to
3 change its impact over time?

4 MR. FRANCO: Could you repeat that?

5 MS. SHEPHARD: So, your question where you
6 said it's the impact of price elasticity that's
7 decreasing over time what do you mean by that?

8 MR. FRANCO: The impacts, so instead of
9 impacting a certain fraction -- so the price
10 elasticity assumes that there's a certain fraction of
11 installations that would be during this repair versus
12 replace. Over time that impact decreases.

13 MS. SHEPHARD: Why?

14 MR. FRANCO: Over time, people will be
15 installing this equipment. There'd be less pressure
16 to purchase like over six or more years.

17 MS. SHEPHARD: Well, I'm still not getting
18 that because price elasticity is measuring your
19 sensitivity to price changes, right, so what's
20 causing their sensitivity to price changes to
21 decrease over time? You're saying they'll take a
22 larger price increase for less you know reduction in

1 demand over time. So, what's changing the nature of
2 that?

3 MR. FRANCO: Well, you do have energy
4 price trends is one factor that's increasing over
5 time, so that would decrease the fraction.

6 MR. BROOKMAN: You can see the request for
7 comment boxes. Take a peek, see if there's anything
8 additional before we move on here. Anything
9 additional before we move on to NIA?

10 MR. ROSENSTOCK: Steve Rosenstock, EEI.

11 For 5.3, don't you think at max tech that
12 the higher -- a significantly higher percentage of
13 consumers would choose to repair?

14 MR. FRANCO: You mentioned something?

15 MR. ROSENSTOCK: At max tech. If you went
16 to max tech, do you think that the percentage of
17 consumers that would want to repair would go up
18 significantly and that would have an impact on
19 shipments?

20 MR. FRANCO: This is based on -- this
21 methodology the numbers, yes.

22 MR. BROOKMAN: Okay, we're moving on to

1 initial impact analysis.

2 MR. CYMBALSKY: Okay, I'm going to do my
3 civic duty and Victor a little bit of a break. I
4 think he's earned his pay today. And looking at the
5 clock, I think we need to kind of go through this
6 much more quickly. This is basically getting to the
7 end of what we do here.

8 So, the national energy savings is
9 basically is what we want to get out of this. You've
10 seen all the analyses, so now we bundle up the
11 efficiency levels and the TSLs and we propose it and
12 then we just crunch all the numbers to roll up what
13 you've seen on the macro level to the national level,
14 so that's basically what the MIA does.

15 (Slide.)

16 MR. CYMBALSKY: You could see on the next
17 slide we've taken all the different analyses that
18 Victor's described and Catherine and Adam have
19 described earlier, we throw them throw the
20 spreadsheets and we create a net present value of all
21 the costs and savings that accrue or maybe not accrue
22 to the consumer and get the net present value, which

1 was discounted according to the OMB guidelines.

2 (Slide.)

3 MR. CYMBALSKY: So, on the next slide
4 here, you can see all the different data inputs that
5 go into the NIA. I won't read through all of these,
6 but you've heard about all of them earlier today.

7 So, what's important to create the impacts
8 is how the efficiency distribution changes once we
9 put the standard into place. Basically, you look at
10 the market before and after standards. You do a
11 bunch of arithmetic, multiply numbers together, and
12 over 30 years of shipments we come up with the NIA.
13 So, here you could see what the condensing market
14 share does in each of the cases.

15 So, then area graph here shows it by EL.
16 So, it's pretty intuitive you know if we pick the
17 higher EL with market share changes. And if you want
18 the actual percentages of each this slide will
19 through each product class and give you those
20 numbers.

21 MR. BROOKMAN: Frank Stanonik.

22 MR. STANONIK: Sorry, but well I certainly

1 fall into the habit too often of kind of treating oil
2 secondary, but the slide you had on 107 do you or
3 could you prepare a similar slide of projected
4 shipments for oil hot water boilers at each level
5 because it's a hugely different situation when you
6 get to condensing oil-fired boiler and I think you
7 know it's not going to look like this at all I don't
8 think, just a request.

9 MR. CYMBALSKY: Okay.

10 MR. FRANCO: This is Victor Franco.

11 The one you're looking at what you're
12 looking for is figure 9.5.5 in chapter nine.

13 MR. STANONIK: Thanks.

14 (Slide.)

15 MR. CYMBALSKY: Okay, so let's get down to
16 the real business at hand, AFUE level. So, Slide 117
17 we're back on that slide. You could see the
18 Department has proposed TSL3 for AFUE levels, so 85,
19 82, 86, 86. And we've heard your comments today
20 about your concerns. You know we focused a lot on
21 the 85, so we've heard those concerns. And again, in
22 your written comments it would be nice to expand upon

1 what you've said here today. Also, any data you want
2 to provide through the NDAs that would be very much
3 appreciated as well.

4 (Slide.)

5 MR. CYMBALSKY: Then standby and off mode,
6 so here's it's TSL3. You know Amy was talking about
7 you know we bundled a bunch of the worse case
8 scenarios together to get a number, so here you could
9 see that the reduction from that number in terms of
10 the watts isn't very big. So, you'll get an
11 allowance of say 9 watts on TSL3.

12 Then the next series of slides are just
13 going to show a bunch of numbers about energy
14 savings, MPVs for the AFUE and the standby mode. I
15 am not going to go through these at all, in detail.
16 You could read them at your leisure. The basic
17 conclusion here is that the proposal itself is
18 technologically feasible and economically justified
19 with our analysis. And so, again, we're happy to
20 take comment on all aspects of what we've done here.

21 MR. BROOKMAN: Yes, John.

22 MR. RODA: John Roda of Burnham Holdings.

1 Just real quick, John, on page 17 to 25 of
2 the NOPR it talks about in the national impact
3 section that you know a significant amount of energy
4 will be saved and that's significant amount of energy
5 is further defined as six-tenths of 1 percent. Now,
6 how do you reconcile that, which seems almost like
7 statistically insignificant, with what you're trying
8 to show us here?

9 MR. CYMBALSKY: This goes back, I think,
10 to the P-Tax rule, right?

11 MR. RODA: To the what?

12 MR. CYMBALSKY: A rule we did on P-Tax and
13 I think a subject of a lawsuit. My lawyer is looking
14 at me funny, but it's before my time.

15 MR. STAS: I think somewhere mentioned in
16 the NOPR there should be a citation of a court case.
17 I think it was Harrington case. And the courts
18 helped us define what a significant amount of energy
19 is and it says any amount that's not genuinely
20 trivial. So, we grapple with that, but here you can
21 see instead of looking at it in terms of a
22 percentage, which sounds very, very small, look on

1 the charts here on say page 119, 120 you're seeing
2 almost two-tenths of a quad of energy, so that's an
3 absolute value, which is a good chunk of energy to be
4 savings. So, I wouldn't necessarily focus strictly
5 on percentages.

6 MR. ROSENSTOCK: Steve Rosenstock, EEI.
7 That's a cumulative value over 30 years.
8 Correct?

9 MR. CYMBALSKY: That's correct.

10 MR. STAS: Yes.

11 MR. ROSENSTOCK: Thank you.

12 MR. CYMBALSKY: Including the full field
13 cycle savings.

14 (Slide.)

15 MR. CYMBALSKY: Okay, again, a couple of
16 requests for comments here. And basically, we ask
17 for comment on any and all aspects of the analysis at
18 this point.

19 (Slide.)

20 MR. CYMBALSKY: Okay, the next slide is
21 the RIA, so the Regulatory Impact Analysis. So, an
22 Executive Order instructs DOE to look at other means

1 besides setting a standard that could be used in lieu
2 of a standard or minimum standards as a means to save
3 energy and could it save equal or more energy
4 relative to the standards.

5 So, we looked at six different things
6 here. And looking at these, we found that none of
7 these options provided the greater or equal amount of
8 energy savings. So, you could see more of that in
9 chapter 17 of the TSD.

10 Okay, so I know I went through that quick,
11 but it's really mostly just a lot of numbers to look
12 at. What's more important you got a real detailed
13 look at how we got to these numbers. And so, at this
14 point we're going to talk about the manufacturer
15 impact analysis, and we're going to pass it over to
16 Andrew.

17 MR. ALLEN: Thanks John. My name is
18 Andrew Allen. I work with Navigant, and I will try
19 to quickly take us through the manufacturer impact
20 analysis slides.

21 (Slide.)

22 MR. ALLEN: So, the primary purpose of the

1 MIA is to assess the impacts of amended standards on
2 residential boiler manufacturers, but we also try to
3 identify and estimate the impacts of amended
4 standards on any subgroups of manufacturers that may
5 be disproportionately impacted by standards, such as
6 small business. And we also try to examine the
7 impact of amended standards on direct employment,
8 manufacturer capacity, and the cumulative regulatory
9 burden faced by the industry.

10 And the primary tool used in the MIA is
11 the government regulatory impact model or GRIM, which
12 is a cash flow model that helps us quantitatively
13 assess amended standards potential impacts on the
14 industry, and the key output of this model is
15 industry net present value or INPV. And DOE also
16 conducts interviews with manufacturers to refine GRIM
17 inputs and try to better understand the industry.

18 So, the MIA is conducted in three phases.
19 In Phase 1, we try to build an industry profile from
20 publicly available information, such as Census data
21 and SEC filings, manufacturer websites, product
22 listing databases and we try to identify any

1 important issues that require additional
2 consideration throughout the analysis.

3 In Phase 2, we build the GRIM using
4 publicly available data and inputs from the
5 engineering and shipping analyses. And in Phase 3,
6 we try to verify our key inputs to the GRIM during
7 manufacturer interviews and evaluate any subgroups
8 that may be disproportionately impacted.

9 So, during the manufacturer interviews
10 conducted by DOE, manufacturers raised concern on
11 four broad topics. First, the standard necessitating
12 condensing technology could disrupt the replacement
13 market in which most boilers are sold. Manufacturers
14 argued this market is structured around legacy
15 venting and distribution systems that are not
16 designed for condensing products.

17 Second, a standard necessitating
18 condensing technology can impact the vertically
19 integrated structure of the industry, which could
20 impact manufacturers' profitability and manufacturing
21 jobs.

22 Third, manufacturers raised concern about

1 the ability of condensing units to perform as rated
2 in the field and meet the heat distribution
3 requirements of their installations.

4 And finally, manufacturers raised concern
5 about the durability and reliability of condensing
6 boilers relative to lower efficiency boilers.

7 And DOE considered these and other issues
8 throughout its analyses and all of these issues are
9 related to a standard with condensing efficiency
10 levels, which DOE is not proposing today; however, it
11 sounds like from some of the comments we heard the
12 legacy venting issues are still pertinent.

13 So, as I mentioned previously, the MIA
14 uses an industry capsule model to quantify the
15 impacts of amended standards on manufacturers. It's
16 a model the industry we rely on content from several
17 of the analyses that we've already discussed today,
18 including the MTA, manufacturer production costs from
19 engineering analysis, and the shipments forecast from
20 the shipments analysis.

21 And to complete the model, we supplement
22 our estimates of manufacturer markups and industry

1 conversion costs, so for the purposes of the GRIM,
2 DOE modeled two markup scenarios to capture a range
3 of potential impacts on the industry. The first is
4 the preservation of gross margins markup scenario.
5 And in this scenario, manufacturers are able to pass
6 through all additional costs due to compliance to
7 their consumers.

8 And the second markup scenario we modeled
9 is the preservation of operating profit scenario.
10 And in this scenario manufacturers are not able to
11 garner any additional operating profit from increased
12 cost due to compliance; however, to maintain the same
13 operating profit in the standards case as in the base
14 case.

15 In the preservation of gross margin
16 scenario represents the upper bound of INPV impacts,
17 while the preservation of operating profits
18 represents the lower bound of impacts.

19 So, for the purposes of the GRIM, DOE also
20 models industry conversion costs. DOE estimates two
21 types of conversions costs. Capital conversion costs
22 being one-time investments in property equipment

1 necessitated by standards, product conversion costs
2 being one-time investments in research and
3 development testing, marketing, and any other
4 non-capitalized costs. The efficiency levels
5 proposed in TSL DOE developed an average capital
6 conversion and product conversion estimate per
7 manufacturer for each product class based on market
8 share weighted feedback from manufacturers and
9 applied these averages to the entire industry.

10 And at TSL3, DOE estimated that the
11 industry would incur approximately .9 million dollars
12 in capital conversion costs and approximately \$3.38
13 million in production conversion costs.

14 (Slide.)

15 MR. ALLEN: So, now that we've discussed
16 the inputs to the MIA, here we display the INPV
17 results of the GRIM by TSL. The results are
18 displayed as ranges in the first two rows, and the
19 ranges represent the results from the lower and upper
20 bound markup scenarios. At TSL3, DOE estimates the
21 impacts on INPV will range from a decrease of
22 approximately 2.1 percent to an increase of .2

1 percent.

2

3 (Slide.)

4 MR. ALLEN: So, as I previously mentioned,
5 DOE conducts separate analyses on subgroups that
6 could be disproportionately impacted by standards.
7 DOE identified small businesses as a potential
8 subgroup and conducted a separate analysis.

9 And as part of this analysis, DOE
10 identified 13 companies meeting the Small Business
11 Administration's definition of a small business
12 covered by this rulemaking, nine of which are
13 manufacturers and four of which are private labelers.

14 In the table on this slide, we show DOE's
15 estimates of conversion costs for the average, large,
16 and small manufacturer as well conversion costs as a
17 percentage of EBIT and revenue for the average,
18 small, and large manufacturer over the conversion
19 period.

20 DOE estimates that the average, small, and
21 large manufacturer will experience similar conversion
22 costs and have to convert a similar percentage of

1 their products.

2 MR. BROOKMAN: Gary.

3 MR. HAINLEY: Gary Hainley, U.S. Boilers.

4 Could you explain the cutoff between large
5 and small manufacturers? Could you define them?

6 MR. ALLEN: Yes. So, the SBA lays out
7 their size standards based on NAECA's codes, so the
8 NAECA code for boilers the cutoff is 500 employees or
9 less. So, any entity with 500 employees or less,
10 including all -- you know including the parent
11 company, including any subsidiaries would qualify as
12 a small business.

13 MS. SHEPHARD: This is Amy Shephard at
14 AHRI.

15 And how many total manufacturers did you
16 determine were in the market?

17 MR. ALLEN: Total, we believe there are 36
18 that sell covered products in the U.S.

19 MS. SHEPHARD: Okay. Thanks.

20 MR. ALLEN: Sure.

21 MR. ROSENSTOCK: Question real quick. You
22 said there are 36. How many domestic and how many

1 are based overseas?

2 MR. ALLEN: I could get that number for
3 you. I don't have it off the top of my head, though.

4 MR. ROSENSTOCK: Steve Rosenstock, EEI.

5 Okay. And I'm just kind of curious, when
6 you discussed with the manufacturers what is the risk
7 of outsources as a result of the standards, different
8 levels?

9 MR. ALLEN: The general feedback we got
10 back was that you know at non-condensing levels there
11 wasn't much just because of shipping consideration.
12 The feedback we got back at condensing levels was you
13 know heat exchangers could probably be sourced from
14 overseas.

15 MR. ROSENSTOCK: Thank you.

16 MR. BROOKMAN: Yes, Paul.

17 MR. SOHLER: Just a comment, they are
18 sourced, by and large, from overseas. It's not a
19 matter of could today. That's where almost all of
20 them in the residential world come from.

21 MR. BROOKMAN: Thank you.

22 MR. ALLEN: So, DOE also analyzed the

1 proposed standby and off mode standards in the GRIM
2 and these standards were analyzed independently from
3 the AFUE standards we discussed previously.

4 And the GRIM incorporated incremental
5 additions to the manufacturer production costs
6 resulting from the technology options for reducing
7 electricity consumption discussed in the engineering
8 analysis. And DOE estimates that overall impacts on
9 INPV at the proposed TSL will be smaller than the
10 AFUE standards.

11 (Slide.)

12 MR. ALLEN: And so, we're requesting
13 comment on the number of small manufacturers and on
14 the potential impacts of the amended standards on
15 small manufacturers, also on our conversion costs
16 estimates and the key drivers of those conversion
17 costs, and any other aspects of the MIA.

18 MR. BROOKMAN: No additional comments
19 here?

20 (No response.)

21 MR. BROOKMAN: Okay.

22 MR. CYMBALSKY: Okay, this is John from

1 DOE. I'm going to bring us down the home stretch,
2 talk about the environmental impacts of emissions.

3 So, as I mentioned in the NIA, we look at
4 the full fuel cycle emissions reductions or increases
5 in some circumstances to the proposed standard. Full
6 fuel cycle includes all the upstream emissions that
7 could occur from extraction and transportation of the
8 fuels that are used in generation, for example. We
9 look at the marginal power plant emissions for CO₂,
10 nitrogen oxidize, sulfur dioxide, and mercury, and
11 that comes from the AEO. We will update it with AEO
12 2015, as appropriate.

13 We look at site combustion emissions for
14 CO₂, NOX, SO₂, methane, et cetera, and we use some
15 emissions factors developed by EPA and used in their
16 rulemaking. The FFC upstream emissions has been
17 developed out at the lab by Katie Coughlin and
18 there's a cite to the paper there, but basically you
19 know what the National Academy of Science has
20 directed DOE to do is to look at all the potential
21 upstream emissions savings from the standards.

22 (Slide.)

1 MR. CYMBALSKY: The next slide shows the
2 actual results here for emissions reductions or
3 increases in the case of mercury, and then on the
4 bottom chart you could see the estimates for the
5 standby and off mode.

6 MR. ROSENSTOCK: Steve Rosenstock, Edison
7 Electric Institute.

8 Just a quick comment based on these
9 slides, for mercury is that a thousand tons or just
10 tons? The reason I ask is when I look at AEO 2015,
11 Table A8 that in terms of electric power sector
12 emissions in 2013 for mercury the number was 27.94
13 tons. So, I mean you're saying .001 you're saying
14 that it's going to increase by one ton or a reduction
15 of three tons over 30 years when overall -- again, if
16 we're going from 11 to 8 watts, when overall for the
17 U.S. for you know like 3.8 trillion kilowatt hours
18 it's 27.9 tons. I believe that might be off by a
19 factor of a thousand in terms of the impacts. I'm
20 looking at this table.

21 MR. CYMBALSKY: So, you're comparing one
22 year versus 30 years of shipments, right?

1 MR. ROSENSTOCK: Right.

2 MR. CYMBALSKY: Okay.

3 MR. ROSENSTOCK: And also in that regard,
4 because of the mercury rule, looking at Table 8 of
5 the AEO, they basically by 2020 the mercury emissions
6 are going to down from 27.94 tons per year down to
7 6.58 tons per year, so that about a 21 ton reduction
8 per year, starting -- following 2016, but I'll just
9 say 2020.

10 So, over that 30-year period, that's a 600
11 ton reduction versus you know -- well, possibly this
12 one ton increase, which I don't believe, but again,
13 because the EPA rules and regulations that anything
14 showing an increase really just -- you know, again,
15 looking at national impacts, ignoring all these other
16 factors that are going on in the marketplace you're
17 showing as incremental, but I never see anything in
18 the reports, TSD, or the rules that say, well, here's
19 what's happening nationally with emissions.

20 They're going down significantly and it
21 never seems to come out in the reports. I believe
22 that it should -- some of these things should be

1 discussed because there is big national trends that
2 are totally overwhelming any incremental increases
3 estimated from these rules.

4 MR. CYMBALSKY: So, it is regular tons and
5 not thousands. So, thank you for that.

6 So, these are reductions relative to the
7 baseline, so I think regardless of what is going on
8 in the baseline what we're just trying capture is
9 relative to that declining baseline, as you say, we
10 think we can save a little bit more, so that's what
11 that number represents. It takes into account the
12 trends from the AEO.

13 MR. ROSENSTOCK: Steve Rosenstock, EEI.

14 But it's an 80 percent reduction within a
15 couple of years, so wouldn't that reduce this by 80
16 percent?

17 MR. CYMBALSKY: No, the baseline is the
18 baseline, so we're just looking at the change from
19 that baseline. So, if you're got two declining --
20 it's two lines that are declining, just one's lower
21 than the other.

22 MR. ROSENSTOCK: Okay, Steve Rosenstock,

1 EEI.

2 I appreciate that the ones incrementally
3 are different, but the overall trend is a huge
4 reduction so that, again, it's still -- this is
5 within the noise of the noise maybe, and so it's not
6 going to have any -- and in my mind you're talking
7 about -- you get to the monetization later, but in
8 terms of national impact it's so small that it's not
9 going to be really seen on a national basis, in my
10 view.

11 MR. CYMBALSKY: Right. What we're showing
12 is the impact from the proposed rule, and that's what
13 it is. The baseline's doing what it is without our
14 rule.

15 (Slide.)

16 MR. CYMBALSKY: Okay, so we just had some
17 comments from Steve. Anyone else has comments on
18 that up to this point; otherwise, we'll go towards
19 the monetization.

20 (Slide.)

21 MR. CYMBALSKY: So, there was an
22 interagency process that's been developed over the

1 past several years in an effort to capture the
2 monetary value of emissions, so you can see the
3 numbers here, but you know the big one here is CO2.
4 We just use the values that the interagency process
5 has directed us to us, so it's basic arithmetic. We
6 have our ton reductions and we multiply by these
7 numbers to get the total reduction in terms of
8 dollars. And so, on this next slide you could see
9 the monetization of that. So, the range for CO2 is
10 up to a billion, just over a billion in the proposed
11 level and then, of course, much smaller for the
12 standby and off mode.

13 And so that's it.

14 MS. SHEPHARD: This is Amy Shephard.

15 I actually have a comment on that. So,
16 could you clarify exactly how the monetization of the
17 social costs of carbon, other than the full fuel
18 cycle is used in the statutory analysis? So, is it
19 part of the seven factors of the economic
20 justification or is it considered as energy savings?
21 How was this actually used in the analysis?

22 MR. CYMBALSKY: So, in the NOPR you could

1 see the tables. We show the numbers with and without
2 the monetization.

3 MS. SHEPHARD: Which table are you talking
4 about?

5 MR. CYMBALSKY: It's right up in the
6 front.

7 MS. SHEPHARD: So, 1.6?

8 MR. CYMBALSKY: Yes.

9 MS. SHEPHARD: Okay, so I had a question
10 about that table because it says that this is the
11 national economic benefits, but as we know, this
12 number is not national, it's global. And then, it
13 has the consumer operating cost savings. It has the
14 consumer installed cost, but it doesn't have the
15 manufacturer costs or the decrease in the industry
16 net present value in it.

17 MR. CYMBALSKY: Right. So, the consumer
18 cost so we're reflecting the cost to the consumer, so
19 the way the cost recovery was flowed to the consumer
20 is how that's picked up.

21 MS. SHEPHARD: Right. But the table is
22 summary of national economic benefits and costs. So,

1 I think when you present this analysis it should have
2 the cost to manufacturers in it. I mean they're part
3 of the national economic benefits in costs.

4 MR. CYMBALSKY: Well, to the extent that
5 they recover those costs over the analysis period I
6 think you'd be double counting.

7 MR. ROSENSTOCK: Steve Rosenstock, EEI.

8 And again, she brings up a very good point
9 because, as you see, in terms of the total net
10 benefits that CO2 value at \$40.5 per ton is added in
11 as a total net benefit, including emissions
12 reductions to monetized value. So, if you look at
13 the monetized value at \$40.5 per ton, which is kind
14 of the -- I'll say the mid-case is kind of what they
15 used -- it's .37 billion dollars and that's used for
16 the 7 percent and the 3 percent overall net benefit.
17 So, they basically -- that monetized CO2 value that
18 consumers will never see is 50 percent of that 7
19 percent discount rate total net benefit.

20 As I recall, that because the discount
21 rate for CO2 is locked at 3 percent that's used in
22 both benefit totals there. Correct? For example, at

1 7 percent the operating costs is .64 billion dollars
2 and then you subtract the .29 billion dollars of
3 incremental and stolen costs. That's about .35
4 billion and you get a .74 by adding in the .37 from
5 the CO2 and the .01 from the NOX and there might be
6 some rounding in there as well.

7 So, based on that, the monetized value of
8 the emissions reductions is 50 percent of the total
9 net benefits shown at the 7 percent discount rate if
10 I'm doing my numbers correctly. Again, there might
11 be some rounding errors here or there because of you
12 know the last decimal place there after the -- like
13 before a decimal place there might be some rounding
14 issues, but that's how it's shown in the report and
15 that's how it's presented to the public; but that is
16 what's being shown.

17 And again, one of the issues that I raised
18 before is that in certain parts of the country, in
19 New England under the Regional Greenhouse Gas
20 Emissions of California, their AB32, there are market
21 prices for CO2 for electricity that are part of the
22 price and in the Reggie area I believe it was about

1 \$3.50 during the last auction, as I recall. And in
2 California, I believe the value was about \$11 per
3 ton. Those are market prices that are actually
4 included in the electric rates that people see that
5 will be -- that consumers will see if they reduce
6 some of their electricity rates, and this is added on
7 top of that when you get right down to it. Thank
8 you.

9 MR. CYMBALSKY: Thank you. Well, I'm just
10 looking at the table, and if we exclude all the
11 emissions for the moment, the consumer operating cost
12 savings at 7 percent is .64 and the incremental cost
13 is .92, okay.

14 MS. SHEPHARD: Well, then that's the chart
15 of consumer benefits. It's not a chart of the
16 national economic benefits and costs.

17 MR. CYMBALSKY: I'm just pointing out that
18 the rule to consumers without any emissions
19 monetization is still a positive economic benefit,
20 all I'm saying, but thank you for the other comments.

21 MR. BROOKMAN: Additional comments on the
22 emissions and the monetization.

1 MR. CYMBALSKY: So, our last two analyses
2 to discuss are the utility impact analysis and the
3 indirect employment. So, for this one the purpose
4 here is to look at the impacts of the installed
5 capacity and generation on electric utilities. We
6 used MEMS BT, which is out at the lab, and we look at
7 the AEO forecast. We look at the change in the total
8 generation, the primary fuel mix, and the installed
9 capacity. And so, chapter 15 of the TSD has more
10 information on that.

11 MR. ROSENSTOCK: Steve Rosenstock, Edison
12 Electric Institute.

13 Again, I will ask that -- you know you're
14 looking at an upstream analysis, but you're ignoring
15 any sort of upstream analysis on gas or fuel oil
16 production when that's going to be the primary impact
17 of the rulemaking. I find that rather -- I'm sorry.
18 To me, it's an incomplete analysis. And then when
19 I'm looking at chapter 15 showing that there's
20 actually going to be an increase in coal-fired power
21 plant -- that there's going to be an increase in
22 capacity of coal-fired power plants I just find that

1 kind of hard to believe based on current trends and
2 the EPA's rule that's going to be coming out in June
3 or July because that is going to have significant
4 impact on what's going to happen with power plant
5 installations and existing power plants in the U.S.

6 I understand why you're doing this, but
7 it's still -- it just seems to be ignoring what's
8 happening with EPA and some of these assumptions in
9 terms of increased, especially cold-fired power
10 plants just don't seem realistic to me. I'm sorry.

11 MR. CYMBALSKY: These were based on AEO
12 2013, so obviously the landscape's changed since then
13 and if and when EPA finalizes a power plant rule and
14 that become part of the AEO forecast we will pick it
15 up in all of our --

16 MR. ROSENSTOCK: Steve Rosenstock, EEI.

17 The only problem is AEO 2015 is out. The
18 rule comes out in July, so the next version of AEO
19 won't come out until either December -- the earlier
20 version might come out until December, but the next
21 official version of AEO won't come out until next
22 spring. And again, the proposed rule is a 30 percent

1 reduction in carbon based on 2012. That's going to
2 be a huge impact on what's happening with power
3 plants over the next several years, so I don't know
4 how you -- this affects all rules, obviously.

5 Again, it may be just another sensitivity
6 analysis, but obviously that rule is so huge and just
7 in terms of upstream electricity that all these other
8 projections have to be totally changed because
9 everything is going to change come June or July when
10 EPA comes out with that final rule.

11 MR. CYMBALSKY: Okay. Thank you for that
12 comment.

13 MR. BROOKMAN: Rick.

14 MR. MURPHY: Yes, I don't believe it would
15 be relative to this particular rule, but if there was
16 a standard that had an impact on the pressure
17 requirements for gas appliances that would be needed
18 would that be included in here? The delivered
19 pressure to the home or the business would have to be
20 upgraded in order to serve that new appliance. Would
21 that be part of this analysis?

22 MR. CYMBALSKY: So, maybe clarify what you

1 mean. So, some other government agency comes out
2 with a rule about a pressure requirement?

3 MR. MURPHY: No, no, no for an appliance,
4 a gas appliance under a new standard if it required a
5 certain level of pressure to the home that didn't
6 exist today and the system had to be upgraded, the
7 natural gas system would that be accounted for in
8 this section here?

9 MR. CYMBALSKY: We'd have to think about
10 that, I think

11 MR. BROOKMAN: Yes, Paul.

12 MR. SOHLER: As much as I would like to
13 throw that rock at this, I can't do it. I think, by
14 and large, you know the pressure requirements for
15 higher efficiency equipment have not gone up. If
16 anything, they've gone down.

17 MR. MURPHY: Rick Murphy, AGA.

18 I'm not suggesting that this rule would in
19 this analysis. I was just curious if something like
20 that would be considered in this part of the
21 analysis.

22 MR. SOHLER: Paul, thank you for the

1 clarity.

2 MR. BROOKMAN: Thanks. Are there
3 additional comments on utility impact analysis?

4 (No response.)

5 MR. BROOKMAN: Nothing there? Okay.

6 (Slide.)

7 MR. CYMBALSKY: Okay. And I think our
8 last technical slide talks about indirect employment
9 impact analysis. So, the idea here is that if
10 consumers have extra money in their pockets due to
11 saving monthly energy bills some of that money would
12 flow back through the economy in the form of other
13 purchases, and so this is the idea that the macro
14 economy could improve just because there's more goods
15 and services being purchased with that extra money
16 and so, you can read about that as well in the TSD,
17 but that's the general theory on that slide.

18 And so, with that, we've come to the end
19 and so we're --

20 MS. SHEPHARD: Actually, I had one
21 question on the employment. On the indirect impacts
22 to employment in the NOPR, it says that it limits it

1 to the year 2025 because of the uncertainties in it;
2 yet, when you look at the social cost of carbon
3 there's all kinds of statements about the
4 uncertainties of that and it goes out past the year
5 2100. So, why is it that in some areas of DOE's
6 analysis there are limitations on the measurements on
7 the costs and benefits and in other areas they're so
8 much broader?

9 And going back to the Tables 1.5 and 1.6,
10 it says the same thing. It says that some of the
11 benefits to the consumers go beyond 2049, but why? I
12 mean if they were going to measure the benefits to
13 them going beyond 2049, then we should also be
14 including the repair costs and other things that are
15 going to them.

16 MR. CYMBALSKY: We look at 30 years of
17 shipments in the analysis, and so it's everything
18 that purchased through that 30th year. I don't know
19 about the repair -- the repair cost goes out as well.
20 So, we stop the shipments after 30th years and
21 everything associated with those shipments is
22 captured in the cost, including the repair.

1 MS. SHEPHARD: I would suggest that that
2 one be clarified then in the rule because it
3 currently says only benefits are included.

4 MR. CYMBALSKY: Okay.

5 MR. BROOKMAN: Thank you. So, now we're
6 at the point where we are eliciting any final
7 remarks, any closing comments from members present
8 and we'll take those now.

9 MR. WEISS: Yes, this is Corey Weiss with
10 Field Controls. Thank you.

11 Obviously, a tremendous effort went into
12 producing the technical support document and it's
13 going to probably take an equal effort to have a
14 reasonable review and response, but I wanted to take
15 a step back from the numbers. Frankly, it got
16 numbing there towards the end. And I want to repeat
17 some things that I've heard today and have read and
18 then maybe add a few new things or just a new or
19 different perspective; but in listening to
20 everything, for me what my take aways the boiler is
21 part of a system. It's not like a stand-alone thing
22 that we just say you are now 85 and be gone. It's

1 part of a system.

2 You know it is covered to some extent in
3 the NOPR in the technical support document, but I
4 don't think it's received as much emphasis as it
5 really should. You know 90 percent of the boiler
6 sales are replacement. The new construction, new
7 owners I'm having a hard time conceiving of anyone
8 that's going to change their hot water distribution
9 unless it's old house and they're basically tearing
10 it down and building a new one, so you have that
11 finite, that constraint of the hot water distribution
12 system.

13 And the NOPR even indicates that you know
14 that really negates going condensing because you're
15 not going to see the efficiency that a condensing
16 boiler in a brand new installation designed for that
17 type of equipment is going to deliver, so I agree
18 with the Department in not going to that level.

19 As far as the 85 versus 82, and then one
20 of the other things I want to touch on is the
21 directory, because that's been kind of boon and a
22 bane throughout these rulemakings that I've

1 participated in. 85 percent there's a reason that
2 the industry is pushing back. They already have this
3 equipment, so this isn't like electric vehicles or
4 something where this mandate comes down and now
5 energy has to somehow pull a rabbit out of their hat.
6 They have these pieces of equipment already.

7 So, it's not like they don't want to sell
8 these boilers, but when you look at the installation,
9 these replacement installations they don't want to
10 sell these boilers in certain installations. That
11 doesn't mean that an 85 percent boiler is unsafe, but
12 there's a lot of installations where it starts to get
13 rather fuzzy and the industry doesn't want to go
14 there. So, I'm going to play the safety card because
15 that's really what we're talking about. And I
16 respected the numbers, the effort, everything that
17 went into it.

18 The averaging and annualizing the costs
19 I'd like to know where I can get my boiler repaired
20 and only pay \$46 over 20 years for that repair, but
21 that is what it is. It comes down to safety. And
22 you know I heard comments about contractors. We've

1 all had work done on our home. I assume you know we
2 all have a home or an apartment, wherever we live
3 we've had to have work done.

4 We've seen good contractors and we've seen
5 bad contractors. We've heard horror stories and
6 we've had people you know just swear that this is the
7 greatest guy. You got have him come out and do it
8 for you. So, I'm going to agree with the Department.
9 I'm going to assume that all contractors are
10 conscientious and they want to do a good just. So,
11 why can't we trust them to make the right decision
12 over this product offering that already exist as to
13 what is best for the customer? You know if that
14 customer has a short chimney and you know short run
15 to the chimney and they can put an 85 in and it's
16 good and they're out there, but if we now have a
17 boiler that was sitting in the middle, going up the
18 middle you know in a row house and now we got to
19 somehow get to the outside wall and go through all
20 the gyrations to do that you're increasing the odds
21 of that turn out well.

22 And I think you know this is the last

1 thing I'll say on it is that this is the thing with
2 the directory. It's kind of a two-edged sword. You
3 know the marketing departments at the various
4 manufacturers they just love to you know push stuff,
5 come up with stuff, then the engineers or the
6 technical people now have to live with that. And you
7 know I'm just -- it's hard to come up with numbers.
8 It's a sensitive subject, you know, liability,
9 safety.

10 You know no one's going to come out and
11 say you know 85 percent of the contractors are like
12 bozos and they're putting in like death machines. No
13 one's going to say that. And yet, at the same time
14 there's this you know reservation about saying you
15 know some of these things, but that's what's at the
16 root of this reservation on the industry to just go
17 to 85. Yes, there's 65 percent, 85 percent boilers
18 in the directory and all. You know clearly they make
19 them. They can sell them. There's a reason that
20 they want to in every case.

21 And the problem I have with the 85
22 percent, and then I'm going to stand down, is right

1 now the contractor can look at each installation,
2 each job and make a decision based on those set of
3 circumstances on what the best appliance is for that
4 customer and for that -- you know the best because
5 they want to put in the best job they can. If you're
6 now taking away that option where now they have to
7 put in 85 percent no matter what, they have no
8 leeway, they got to this. Now, I guess they could go
9 condensing, but again, you're painting yourself in a
10 corner because the distribution system is going to
11 undermine whatever you're trying to do for raising
12 the efficiency.

13 So, I wanted to say that after listening
14 to a lot of good comments and really a lot of work
15 that went into this document, but I really feel that
16 the industry is -- they're not digging in their
17 heels. They're really showing their concern for all
18 of us. You know certainly all of us that have a
19 boiler and wanting to not do something that could
20 negatively impact their customers. You know one
21 wants to get sued, but I'll tell you what, I'm in the
22 same as with Gary and Paul in this, and nobody wants

1 to be associated with a product or an install that
2 someone died. And I've been to enough death cases
3 you know where people have died and nobody wants
4 that.

5 So, I just wanted to bring that kind of
6 back in because after many hours of numbers this is
7 really about people and making sure that when all of
8 us go home what we go home to is something that our
9 families -- you know we're going to get up the next
10 day because I've been in installs where the Christmas
11 tree is still up and the presents are there and the
12 people died two days before and I don't want us to
13 lose sight of that you know as we look at these
14 numbers and the dollars and cents of the thing.

15 You know, ultimately, all of us have stuff
16 in our home that we're trusting is -- you know is
17 safe. So, I can't say what that number should be. I
18 defer to my industry colleagues on that, whether it
19 should be 83, whether it shouldn't change, but my
20 sense is is that 85 and 84 are -- you know they're
21 cause for concern and I think that that should really
22 be taken into account here, along with all the other

1 you know factors that go into this decision. Thank
2 you for your time.

3 MR. SOHLER: Paul Sohler, Crown Boiler.

4 I want to touch base real quick on one
5 thing and then ask a question. Number one, when we
6 went through the manufacturing impact analysis, it
7 kind of passed us by before we got our ducks in a row
8 to share our thoughts on that.

9 I think we are convinced that if the
10 minimum gas boiler, water boiler efficiency goes to
11 85 that it's going to have a significant negative
12 affect on our ability to keep our foundry running,
13 which you know relies -- for those to be economically
14 viable they need to be running at full capacity most
15 of the time. So, to the extent that going to 85 --
16 and again, tying back into what Corey said, you know
17 do, to a large extent, have a market that's
18 stratified right now in the 82/83 range and then
19 condensing.

20 So, to the extent that that 85 pushes
21 people up into the condensing range it will cost
22 American jobs and not only will it drive -- have a

1 negative impact on the foundry, but it also is going
2 to have the impact of driving up the costs of some of
3 the other classes that are made out of cast iron
4 where all those fixed costs need to be spread out
5 over the gas steam boilers and you know oil boilers
6 and other types. So, there's a very definite, major
7 economic impact and it's going to I think have an
8 impact, have a tendency to ship jobs out of the
9 country.

10 And the last question I have, and I'll
11 shut up, is that we had a discussion a little while
12 ago about kind of going back and reworking you know
13 this analysis, which by the way, I recognize a lot of
14 hard work went into it. And are you saying -- you
15 know we're going to try to you know provide some
16 quantitative data in places where we talked about --
17 you know there's a lot of moving parts here.

18 I think it's fair to say that the benefits
19 are very, very small. Your intention is to go back
20 through this again and re-calculate or re-do this
21 analysis with new data?

22 MR. CYMBALSKY: So, any new data we

1 receive as a result of comment to the NOPR in this
2 public meeting will be taken into consideration. We
3 already know we're going to update all the moderates
4 for the new AEO data, so yes.

5 MR. SOHLER: When you say take into
6 consideration, you're going to take the data, and
7 assuming that it's credible you will drop it in --
8 you know all of it that you get?

9 MR. CYMBALSKY: That's our standard
10 procedure.

11 MR. SOHLER: Okay. Thank you.

12 MR. CYMBALSKY: We went through this
13 really quickly, but this is the slide that kind of
14 addresses your concern about what will happen if this
15 is our presumed occurrence, so at TLS3 you can see
16 the market share basically takes everything from what
17 was below it, but you could see here we didn't assume
18 that the condensing market share would go up. So, if
19 you don't think that -- this is stuff we would take
20 comment on. Okay.

21 MR. MARRAN: Yes, Roger Marran with Energy
22 Kinetics.

1 Just very briefly, I agree with DOE with
2 respect to going to TSL3 is going to be primarily
3 focused on increasing heat exchanger area. And in
4 moving in that direction, there are two things, one
5 we mentioned earlier, the max tech for atmospheric
6 and natural draft vent puts a ceiling on those
7 products. 86 and 85 put a floor on those products
8 and that squeezes the range any given product can
9 serve.

10 In doing that, it's pretty clear for the
11 markets dominated by cast iron boilers and if they
12 have to move up they're going to add a section if
13 they have to get into that range, which adds mass.
14 And when you add mass, you're adding to what can be
15 correlated with the idle loss on the system, which
16 has a dramatic impact on the actual annual
17 efficiency, depending on what your re-gain assumption
18 is in the home.

19 I know there's a lot that went into it on
20 this as side of it as while. So, the thought,
21 though, there is it's possible you could have an
22 improvement in AFUE through the rule, but through

1 actual field performance with idle loss taken into
2 account you could reduce it by more than what you're
3 increasing the rule by and you could actually have a
4 backsliding effect in the industry, depending on how
5 that plays out with really the re-gain amount in that
6 mass.

7 And from a manufacturing perspective, I
8 know Paul mentioned some things with manufacturing
9 efficiencies on foundries. For other manufacturers
10 that don't have foundries, it means introduction of
11 new products because you can't serve as broad a range
12 with a single product, so you have to introduce new
13 products as well.

14 So, I think there's some impacts there
15 that are a little different than the costs that we're
16 looking at here too, but from the perspective,
17 overall, from an efficiency standpoint and a
18 manufacturing standpoint how that all come together
19 and play out can have a profound impact on how the
20 calculations worked to establish that.

21 MR. BROOKMAN: Additional thoughts? Yes,
22 Frank Stanonik.

1 MR. STANONIK: I'm Frank Stanonik, AHRI.

2 We touched on this I think very early in
3 this meeting, but one of the issues that -- I mean,
4 obviously, we recognize we need to just, to the
5 extend we can, provide some data and help better
6 inform the analysis, and we'll try to do that; but
7 one of the other issues that is very significant here
8 is that we're convinced that the revised test
9 procedure is going to change the AFUE for boilers.
10 And so, we have this little bit of this, if you will,
11 moving target situation that we're trying to look at
12 the analysis to review the standard and yet what
13 we're seeing is that when we looked at the revised --
14 proposed revised AFUE procedure for boilers we're
15 going to get a different number.

16 And so part of this we're trying to
17 develop some of that information to show why we're
18 concerned and where we think that happens or you know
19 in what parts of the procedures causes that, so
20 that's something we're working on at the same time
21 we're trying to deal with this analysis. And so,
22 John you'll see I mean that's part of why we're

1 asking for the time extension, but the only other
2 thing that I would say thanks to some of the slides
3 that were presented here now when I see SOB I'm going
4 to think of steam oil boiler.

5 (Laughter.)

6 MR. BROOKMAN: Rick.

7 MR. MURPHY: Yes, Rick Murphy, AGA.

8 I want to thank DOE for allowing us to be
9 here today. I found it very informative. The work
10 was very comprehensive and appreciate the ability to
11 go through that. I really appreciate the feedback
12 that the manufacturers provided. It was one of the
13 key reasons why I wanted to come and listen directly
14 from the people who are manufacturing this product.

15 An important take away for at least me is
16 the fact that -- and the gentleman at the end of the
17 table I think articulated this earlier is that
18 there's going to be a certain percentage of the
19 market that this 85 percent standard will actually
20 force it to become a condensing standard. And when
21 you look at the LCC spreadsheets and moving into
22 those condensing levels that's when you start to see

1 a greater percentage of the market have more of net
2 cost than a net benefit. So, that is of deep concern
3 from the industry that works directly with the end
4 users of this equipment and the customers. So, I
5 really appreciated the dialogue and the information
6 and the willingness for the manufacturers to share
7 their perspective.

8 MR. BROOKMAN: Final comments before we
9 move towards closure here. Gary.

10 MR. HAINLEY: Gary Hainley, U.S. Boilers.

11 Thanks again for taking our comments
12 today. We appreciate the presentations. Not to be
13 belabor the point, but just to confirm our support
14 for what Frank said with the conflict associated with
15 the test procedure and the new standard being run
16 nearly simultaneously. We certain support an
17 extension to the comment period.

18 It is our belief from initial testing that
19 using the new procedure, as best we know it, will be
20 a reduction of 1 to 2 percent in AFUE. So, as
21 somebody once told me, it's hard to begin the game
22 until you know how you're going to keep score, so I

1 think that's my comment there.

2 And we spent a lot of time on gas-fired
3 water boiler product class level, and I think
4 everything's been supported, our concerns with
5 venting. I don't have anything new there, but we
6 believe a better alternative is to set a minimum
7 efficiency level of 83 percent, which would allow
8 most existing chimneys to stay in effect.

9 It gives homeowners choices. It allows
10 them to decide if they can afford to go to a higher
11 level they will. They do it today. People are
12 buying condensing boilers today and it's not
13 regulated. They're doing it because they can afford
14 it and it's economically justified for them, not
15 because they're being forced to do it. I think the
16 same thing applies here, that in some cases 85 is
17 just not appropriate. We like to continue to give
18 our customers choices and we do think that it is a
19 safer and broader product offering.

20 The last comment that I have is on the
21 lifetime analysis, and we'll try to provide more
22 written data on this; but we do feel that the

1 assumptions that EPA used that DOE then continued
2 with for comparisons in the UK are inappropriate.
3 That condensing boilers have only been in the
4 marketplace in the U.S. since about 2000 and you just
5 can't make the assumption that they're going to have
6 a 25-year lifetime when none of them have been here
7 for 25 years, and the UK comparison are based on
8 different products. With that, thank you.

9 MR. BROOKMAN: Thank you. Final comments?
10 Okay, John Cymbalsky.

11 MR. CYMBALSKY: Actually, this question
12 came in earlier today and I put it in my pocket to
13 end the meeting with for good reason because it
14 really isn't relevant to this rulemaking. David Lis,
15 L-i-s, asked could DOE clarify whether or not
16 circulating pumps are considered a covered product
17 and thus, preempting states from implementing
18 state-level standards.

19 We do have an open rule on pumps and this
20 question will be delivered to the pumps docket and
21 dealt with in that rule.

22 And in conclusion, I would just like to

1 thank everybody. I think actually today was a very
2 productive meeting. I learned a lot and we really do
3 appreciate the openness of the manufacturers to share
4 the information that they have. This is, obviously,
5 information only you guys have. And to the extent
6 you can and will provide it will really help
7 strengthen the analysis and so thank you in advance
8 for anything you can provide there.

9 And then for you traveling get home safe
10 and currently the comment period closes June 1, 2015,
11 but I can safely say you know you'll have another
12 month at minimum at this point. So, you'll have 30
13 days. I can guarantee that much at this point.
14 Please submit your comments to the email here.

15 MR. STAS: We'll do an extension notice in
16 the Federal Register and probably do an email blast.
17 It'll be on website.

18 MR. CYMBALSKY: Yes, we will do a Federal
19 Register Notice. I'm still waiting for one of the
20 extension comments to come into my email box, so I
21 need to read them first. So, here's how you submit
22 your comments so that the docket's really important

1 there and we look forward to receiving your comments
2 and thanks again.

3 (Whereupon, the meeting was conclude at
4 4:41 p.m.)

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