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Case: The Energy Conservation Standards for Residential Furnaces

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U.S. DEPARTMENT OF ENERGY PUBLIC MEETING

THE ENERGY CONSERVATION STANDARDS FOR RESIDENTIAL FURNACES

U.S. Department of Energy

1000 Independence Ave. SW

Washington, DC 20585

Room No. 8E-089

April 13, 2015

9:00 A.M.

Appearances for Department of Energy Meeting

John Cymbalsky, DOE
Ashley Armstrong, DOE
Dan Cohen, DOE
Eric Stas, DOE
Francine Pinto, DOE
Johanna Hariharan, DOE
Doug Brookman, Public Solutions, -- Moderator
Donald M. Brundage, Southern Company
Adam Darlington, Navigant
Andrew deLaski, ASAP
S. Craig Drumheller, NAHB
Rachel Feinstein, HPBA
Victor Franco, Lawrence Berkeley National Laboratory
John Hodges, Wiley Rein
Daniel Lapato, American Public Gas Association
Michael J. McCabe
Samuel McClive, Navigant
Charles McCrudden, ACCA
Michael Rivest, Navigant
Steven J. Rosenstock, Edison Electric Institute

APPEARANCES (CONTINUED:)

Aniruddh Roy, Goodman
Dave Schryver, American Public Gas Association
Caroline Davidson-Hood, AHRI
Frank Stanonik, AHRI
Kathryn Clay, American Gas Association
Mark Krebs, LACLEDE Group
Jim Moore, LaClede Gas
Christopher Lau, Navigant
Everett Shorey, Shorey Consulting, Inc.
Gregory J. Stunder, Philadelphia Gas Works
Constantin Von Wentzel, Navigant
Dave Winningham, Allied Air Enterprises
Alex Lekov, Lawrence Berkeley National Laboratory
Larry Dale, Lawrence Berkeley National Laboratory

P R O C E E D I N G S

(9:30 a.m.)

MR. BROOKMAN: Good morning, everyone. Welcome. This is a continuation of the Energy Conservation Standards Notice of Proposed Rulemaking meeting for furnaces. Today is April 13, 2015, here in the Forrestal Building in Washington, D.C.

My name is Doug Brookman, Public Solutions Baltimore. We started this meeting on March 27th, 2015. We got through a great deal of material. We had a lot of very positive and useful commentary, so we didn't complete it all on that date, and that's the reason we're here today.

We're going to start with welcoming remarks and perhaps some overview from John Cymbalsky.

MR. CYMBALSKY: Welcome back everybody to finish our meeting here on non-weatherized and mobile home gas furnaces.

We are going to pick up -- you see the slide up there -- we are going to pick up back where we left off with the life-cycle cost subgroup

analysis, and we're going to take a little deeper dive into this as we start the meeting. But we're going to go around and do introductions.

MR. BROOKMAN: Yes.

MR. CYMBALSKY: So, I'm John Cymbalsky, program manager for Appliance Standards.

(Introductions were made.)

MR. BROOKMAN: Okay. Thank you. And thanks to all of you for being here this morning. Nice to see you. Apologies to those of you joining us online; there was a little bit of technical difficulty getting going here this morning.

Just to be clear, at our last meeting, we got through a lot of material. If you look at the agenda and your slides, we went through the overview. We talked about scope and the engineering analysis. We covered the life-cycle cost analysis. We were on subgroup analysis when we stopped, and that's where we will resume today.

Following the subgroup analysis, we will *go directly into shipments model, NIA National Impact Analysis, RIA Regulatory Impact Analysis, and then

discuss the MIA Manufacturer Impact Analysis, and then as we move towards the end of this meeting, environmental, employment and additional research/side research. An opportunity,again, at the end of this meeting for anybody that wishes to raise additional issues, supplemental issues, issues that you don't think have been covered sufficiently for this important meeting.

I'd ask for your consideration to please speak one at a time. If everyone can make sure their phones are muted right now, please take a peak and make sure the little green light is not illuminated so that we don't have any feedback in the room.

And those of you that are joining us via the web, welcome. We hope to have you participate in this meeting as best we can. If using the software provided, if you raise your hand to speak, we will unmute you in the room, and we should be able to hear you, and you can chime in.

I'd also ask, as there will be a complete record of this meeting and a transcript available, please say your name each time you speak, and you can get used to turning these microphones both on and

off.

And I think that's the bulk of the preliminary stuff. John Cymbalsky.

MR. CYMBALSKY: Thank you, Doug. And this is John Cymbalsky again from DOE.

So up here, we have the slide we kind of ended with last time which showed the subgroup analysis for this rulemaking. And as you can see here, what we presented a couple weeks back was that the low-income subgroup would relatively not win as much as the general population. So over the past few weeks, we've actually dug deeper into the theory behind the economic -- the economic theory behind say rental markets, things like that. How people pay for the equipment that are low income, how renters versus home owners pay for equipment and receive the benefit long-term over their energy bills. So, based on that, we're going to probably rethink the numbers that you see here because I think there's a competing theory that would suggest low-income people actually would do better than the general population. And so today what I've done, I've handed out some additional

slides we'll put in the docket later, but we're going to go through this. And I've asked Dr. Larry Dale from Lawrence Berkeley National Lab to kind of walk through the economic theory behind sort of the split incentive theory, the theory behind rental markets, and why actually we think low-income consumers could be made better off through this regulation.

So I'll ask Larry to come up to the podium, and Emily, if she could put the other slide deck up that we loaded this morning.

MR. BROOKMAN: Do you have a question/comment here, Mark?

MR. KREBS: Well, you had mentioned if anybody wanted to make opening statements and then we just got right into the meeting.

MR. BROOKMAN: We already made opening statements at our last meeting and there will be an opportunity at the end of this meeting to make any remarks that you wish to make.

So these are the new slides; correct?

DR. DALE: Yes.

MR. BROOKMAN: And Larry can advance them?

DR. DALE: Yes.

(Pause.)

DR. DALE: Can you all hear me?

Can you hear me?

So I want to talk about the impacts of efficiency standards on low-income households. And I spent the last week thinking about this issue, talking with experts at U.C. Berkeley and have put together these slides trying to illustrate what I think is the key part of the problem.

Currently, as you saw from the last slide, DOE treats low-income consumers pretty much like everyone else, discount rates differ a little bit. But the main point is, they're treated like a typical household, whereas most low-income households are living in apartments or they don't own their households, so they may pay the energy bills, but they don't buy the more-efficient equipment.

So right from the start, you can see there's a possibility that if they're not buying the equipment, nothing happens. Then they would get the advantage of lower energy bills, but they're not

having to pay the higher costs of more-efficient equipment. So that's really maybe the key point to keep in mind.

What economists like myself will tell you is that things will start changing from that point. There's a possibility that some households with lower energy bills will be more attractive to renters, so the demand for those households, for those apartments, would rise, and that could increase the rent. That would be one way that low-income households living in apartments might face a higher cost from standards. But in fact, anybody who has looked for apartments knows you almost never check energy bills when you're looking for apartments. All you really see as you're going from apartment to apartment, is what the rent is going to be.

Low-income households, high-income households that are renting, they all pretty much do the same thing; they're not aware of potential energy savings, and so it's not reflected in higher rents.

The other possibility is landlords who have to buy the more-efficient equipment that costs a

little more are going to try to raise the rents. And that is a real possibility. They will try to do that, but as I will try to show in these three slides, that's fairly difficult to do, or it's constrained at any rate by the slopes of the demand and supply curve.

So here from the slide you see, I'm saying renters are unaware of energy savings. And actually, a recent study by somebody funded by the Resources for the Future group and work under the direction of Severn Bornstein at U.C. Berkeley, they've done a very clever study and actually showed, in fact it's true, even though this seems like intuition, it is in fact backed up by the data. Renters are not aware of energy savings. So renters don't raise rents in apartments just because the apartments have lower energy bills.

Landlords are aware of higher energy costs. This is also apparently the case, and while they pay the higher cost of equipment, and they will attempt to raise rates, standard economic theory is going to suggest they're going to have a lot of

trouble doing this in the few apartments every year that are buying more-efficient equipment.

The implications from these findings are: tenants benefit from lower energy bills; rent increases may not, and I would say almost certainly do not, cover the higher equipment costs. So overall, tenants (meaning largely low-income households in this case, or rather the other way around, low-income households that are largely tenants) are probably better off than suggested by our LCC analysis.

Sorry to bore you early in the morning with the supply and demand curve, but this is from your ECON 101, you might remember. This is sort of a typical analysis showing what happens when, in this case, the supply curve costs go up because it's now more expensive to provide an apartment because you have to buy more-efficient equipment and that costs something more. You can see the supply curve dropping from the dash line S-1 to the solid line S-2 which is S-1 plus the higher equipment costs.

The intersection of demand and supply is giving you the price. This line is showing you the

higher cost of the equipment, but you can see between the two dotted lines the actual price. In this case, the rent for the apartment is going up much less than the increase in the apartment cost.

So the point of all this is that landlords are going to be constrained by how much they raise rents. And in general, they can't raise rents as much as the increase in equipment costs. They are particularly constrained in urban areas where the demand curve is going to be fairly elastic because we're talking about relatively few households at any one time, and the supply curve is relatively inelastic. Hence urban areas, even though rents may go down or the ability to capture rents may go down, it's very hard to take apartments off the market or increase apartments in the market. So the price is constrained that way. In that case, the increase in rents that would accompany a rise in costs would be much less than the rise in costs.

Here's a few statistics. Low-income households, about 60 percent of them, are in public housing or renting. Their incomes are lower than for

typical owners. And here's a summary of the impacts of what I've just been talking about. Impacts on energy bill, the tenants get the full savings of the lower-cost energy bills. The impact of the first cost, the increased cost of the equipment. It's going to be a partial increase for public housing and renters and a full increase for owners.

So in sum, for most of the low-income households, we think the LCC analysis is underestimating benefits of standards, whereas for owners, which is a smaller part of the low-income population, it's probably getting it about right. So those are the slides I have to describe. Do I stand up here for questions? I'm not quite sure.

MR. BROOKMAN: Stay right there.

Steve Rosenstock. Let me ask you, apparently the polygon system is working well, so every time you shuffle papers or click your pen, everybody on line can hear it. So if we can be as quiet as possible. Steve Rosenstock.

MR. ROSENSTOCK: Steve Rosenstock, Edison Institute. Quick question. On the first slide, you

talked about assumptions -- renters aware of energy savings. If they're paying their bill, they're paying their electric and gas bills, right?

DR. DALE: Yeah, that's right.

MR. ROSENSTOCK: So why wouldn't they be aware of their energy savings?

DR. DALE: Well, they will after they get the apartment, but the determination of rent is right when they get the apartment.

MR. ROSENSTOCK: It's also a year after. It's every year afterwards when there's a rent increase, correct?

DR. DALE: It can be. It's true.

MR. ROSENSTOCK: Right. And was that accounted for?

DR. DALE: It is. In the study I'm referencing at the bottom here, this Erica Meyers study --

MR. ROSENSTOCK: Right. Yeah, that none of us has seen until today.

DR. DALE: Yeah, I know, I'm sorry. It is

certainly accounted for, but it is also the case, and it's a much lower impact.

MR. ROSENSTOCK: Okay. And the question also I have is, in many areas, haven't rents been faster than the rate of inflation, rental increases in apartments?

DR. DALE: Where housing is tight, rents are going up. I actually can't tell you what's going on inside of inner-cities, but I don't think that's the case in much of the northeast, which is the reason we're talking about it.

MR. ROSENSTOCK: And I remember you saying you talked to experts at University of California Berkeley.

DR. DALE: Yes.

MR. ROSENSTOCK: Did you talk to experts at the Apartment Owners and Building Association or National Multi-Housing Council for this study?

DR. DALE: I have not.

MR. ROSENSTOCK: Okay. Thank you.

MR. BROOKMAN: Yes, please, Catherine?

MS. CLAY: Good morning, thanks for the

presentation. I did have a couple of questions. First of all, so in this new analysis, are you assuming that in every case that the landlord would actually put in the more-energy-efficient appliances, more-energy-efficient furnace?

So what I'm getting at is, in some cases, it's physically impossible or at least because of code restrictions or the like, to put in the more-efficient condensing furnace. So in those cases where the alternative would be to put in a less-efficient alternative, does that -- was that captured in this at all?

DR. DALE: Yeah, I should be a little clearer. This is not really a study of the situation at hand. This is a study of how of information available to tenants and landlords and what the impacts will be of changes in energy bills and energy costs on rents and how rapidly they're passed through.

The question you're asking is, I think, how -- is in fact the cost of equipment higher in apartments or the cost of maintenance higher in

apartments or in typical households?

MS. CLAY: No.

DR. DALE: So that that -- I'm sorry.

MS. CLAY: No. No, no, no. The problem is that with condensing furnaces, you may not be able to actually put in the more-energy-efficient option.

DR. DALE: Oh, I see, it may not happen at all?

MS. CLAY: It may not happen.

DR. DALE: As I said, I haven't -- this is not something that --

MS. CLAY: No, no. You could actually push people towards choices that are less energy efficient.

MR. CYMBALSKY: This is John from DOE. Let me jump in here. So what Catherine is asking about is more like a fuel switching scenario. So all this is saying here is that if a condensing furnace is installed in an apartment which will be required upon replacement sometime in the future if the standard goes into effect, what we're saying is we think the low-income people will possibly be made

better off based on this. Whether or not they switch to a pump or no an electric furnace is a different case.

MR. BROOKMAN: Dave.

MR. WOOD: This is Dave Wood, Allied. And maybe this is getting a little bit too far into the weeds, but was the cost to convert the venting systems and drains considered as part of this?

MR. CYMBALSKY: Yes, that's all in the life-cycle cost analysis that we presented at the last meeting.

MS. CLAY: I just want to --

MR. BROOKMAN: Catherine follow on, yes.

MS. CLAY: I just want to follow up. I guess I'm also just confused about the purpose of this that's being presented. Is this going to mean that DOE is going to amend its technical support document? Are you pointing out that some of the figures in the TSD are somewhat arbitrary?

MR. CYMBALSKY: That remains to be seen. But basically, we are presenting some information that we think is relevant to the low-income subgroup

analysis, and we're still looking at it. We're presenting ideas here for comment.

MR. BROOKMAN: Aniruddh.

MR. ROY: So to Catherine's point, when there is fuel switching, let's say that occurs, if a landlord chooses a fuel switching option that is less efficient compared to a furnace, that analysis then would impact adversely the low-income housing subgroup, right? Because the decision is ultimately the landlord's.

MR. BROOKMAN: Steve Rosenstock?

MR. ROSENSTOCK: Steve Rosenstock, EEI. The other option for the landlord is to keep repairing that thing as long as possible and never replace, correct?

And that's a lowest-cost option to the landlord and so --

MR. CYMBALSKY: So no impact to the consumer from the standard.

MR. ROSENSTOCK: Well --

MR. CYMBALSKY: Because they're using the same exact furnace they had.

MR. ROSENSTOCK: Yeah, but there might be an efficiency degradation with that same piece of equipment.

MR. CYMBALSKY: Well, how could that be?

MR. ROSENSTOCK: Some pieces of equipment, they start out at 80 percent of efficiency. Over time, for whatever reason, even though they're maintained, there might be a slight degradation --

MR. CYMBALSKY: They're repaired and that makes it less efficient, is that what you're saying?

MR. ROSENSTOCK: Yes. Just over time.

MR. CYMBALSKY: Okay.

MR. ROSENSTOCK: Sometimes that happens over pieces of equipment. So as a result of the standard, the landlord --

(Simultaneous conversation.)

MR. CYMBALSKY: We have a lot of manufacturers in the room that can talk to how their equipment degrades over time.

Okay.

MR. ROSENSTOCK: I'm saying, well past the normal life.

MR. KREBS: Mark Krebs, Laclede Group. For the speaker, this paper at the bottom --

MR. BROOKMAN: Is your microphone on?

MR. KREBS: This paper at the bottom, this is something that you relied on in coming up with the TSD?

PARTICIPANT: No.

MR. KREBS: Not at all. Okay. We have yet to -- you know, if it were, I guess I'd say we need a hyperlink and this needs to be vetted in order to discuss it further.

MR. BROOKMAN: Ashley Armstrong?

MS. ARMSTRONG: This is Ashley from DOE. I think what we're doing here is . . . for the last public meeting, we presented our analysis for the LCC subgroup, and there are several commenters that raised some questions or extra, I would say, considerations with regards to the LCC subgroup throughout the day. So one of the things we were trying to do, and the Department is trying to be pretty responsive in saying, well, here are some ideas. This is an economic theory that's out there. There are some

studies. It was not considered in our analysis, but what do you guys think about it. And if we were to consider it, this is what we think the impact would be on the LCC subgroup analysis. So it's just extra information. We're going to put it in the TSD. The link is going to be in the TSD, in case you want to review it, but that's the purpose.

MR. KREBS: And it makes it hard to discuss it, you know, when it's just been dropped on us.

DR. DALE: I'll just jump in for a second though. I think although that's true, you haven't seen the study, the study is really just supporting what I think has been sort of common assumptions in a lot of papers that have been written for a long time. This paper is just supporting some of those assumptions that have been made in the past.

MR. BROOKMAN: Hang on, Steve. Don Brundage, did you wish to comment?

MR. BRUNDAGE: Don Brundage, Southern Company. The Department has made similar studies like this in the past related to the impact of

renters, and they always choose these short-term impacts at the time of the implementation of the new standard. You're not going to permanently extract economic rent from landlords from now until the end of time. There will be a lag, but eventually rents will keep up. You will not be able to permanently reduce the rate of return for landlords, or there will be fewer landlords, and that will balance out.

My point is that these are short-term effects. Long-term effect: rents will balance, and the proper way to approach it is to not look at whose winners and losers of parties, but look at the societal impact as you do with other things.

In the end, long-term, the renters are going to be experiencing the same economics as non-renters.

Thank you.

MR. BROOKMAN: Thank you. Do you wish to comment? Maybe you could just get close.

MR. DRUMHELLER: Craig Drumheller, National Association of Home Builders. There's a couple problems that I have with this that Don kind of touched on a little bit. One is, you're saying that

the renters are going to save money, but it's going to be free to them, right? There's no impact to them. And so what happens is that, if they can't raise their rates, then the value of the rental properties go down because they don't get the return on investment that they expect to get.

And then to take that even further, now when they're going to do an analysis -- when you build apartments, it's a financial decision, it's a business decision, can I get return on this money? If I can't, I'm an investor. I'm not a rental person per se, I can go invest in the stock market. I can go do whatever. I don't necessarily have to be in the housing industry. So they're not going to build new units, and go back to your supply and demand. Now, they're not keeping up with supply. The demand is going to go up. Rents go up, and we haven't saved any energy, so you have to be really careful when you do this.

I'm not an economist, but I've been involved in these types of discussions in the past. So I think this is a very one-sided, very short-sighted

approach. So I'd be careful to try to play this up too much.

DR. DALE: Thanks.

MR. CYMBALSKY: Can I comment?

MR. BROOKMAN: Please do.

MR. CYMBALSKY: Well, there's a couple thoughts about that. One is, it's true, we're not talking about what happens to landlords, and it's reciprocal. The tenants are better off and the landlords are a little worse off, equally worse off. But these supply and demand curves that I've shown here, these are actually drawn reflecting long-term demand and supply elasticities in the literature. And it's very hard to come up with supply and demand curves that are relevant here that would suggest landlords are going to be able to raise the rent as much as the cost of the equipment. And then if most low-income renters are in inner cities, then the supply curves are even more elastic than usual, and so it would be yet harder than is suggested here with this set of supply and demand curves.

MR. BROOKMAN: Frank Stanonick.

MR. STANONICK: Frank Stanonick, AHRI. A couple things. First of all, we're talking about low-income consumers, and maybe I'm the only one that sees things so black and white here, but, this is an efficiency standard addressing furnaces, the manufacturing of furnaces, okay? And so the consumer is the purchaser of the product being regulated. And yet we're talking about a situation where the purchaser of the equipment -- we're doing a life-cycle analysis or life-cycle cost analysis where the purchaser of the equipment is potentially getting no benefit, and we're looking at the benefit to someone who didn't buy the equipment. I'm just a little concerned we've kind of distorted what life-cycle cost analysis is supposed to be in this TSD. I mean, I recognize that is an issue of the people who can least afford high energy bills end up having high energy bills. I don't want to be unsympathetic to that. But more to the point really is, okay, so what percentage -- we had an idea of what percentage of low-income consumers are renters, and then what's the numbers -- what percentage of those renters pay their

utility bill as opposed to having it included in the rent.

MR. BROOKMAN: John Cymbalsky.

MR. CYMBALSKY: So, John from DOE. Sorry, Victor can chime in with the numbers, but back to the original thought. I agree with that, but at the last meeting, as Ashley mentioned, there was a lot of concern, and we had a statement right at the beginning about the impact on low-income consumers. We all know, and you just stated so eloquently that low-income consumers' energy bills are a larger proportion of their monthly income than the general population. And so if we can connect the dot that these particular people will actually save money on a monthly basis, that has a multiplier effect on their monthly income relative to the general population because there percentage of their monthly income is bigger for energy bills than it is for the general population. So this is the theory we're putting out there for comment, and so before anyone else chimes in, Victor, please with the statistics.

MR. FRANCO: So let me give you a little

bit of statistics. So about 20 percent are in -- this is non-weatherized gas furnaces in RECS, people having non-weatherized gas furnaces where they're living at. 20 percent are in public housing; about 40 percent are in other rental situations, so that's about 60 percent are rental. Of those in the public housing fraction, 40 percent pay for their bills; 60 percent don't; and the rental is about 20 percent don't pay their bills, 80 percent pay their bills of the rental fraction.

MR. CYMBALSKY: So let me see if I can clear this up. So 80 percent of people in non-public housing which represents 40 percent pay for their energy bills; 20 percent do not. In public housing, which is 20 percent, 60 percent do not pay their energy bills.

MR. BROOKMAN: I didn't know that. Find a microphone and speak right into it.

MR. SHOREY: This may have been answered the last time. When you did the life-cycle costs, did you stratify the sample on installation costs relative to -- okay, I'm seeing an answer.

MR. BROOKMAN: And your name again?

MR. SHOREY: Everett Shorey.

MR. BROOKMAN: Thank you.

MR. ROSENSTOCK: Steve Rosenstock. Thank you for those numbers. So again, because you were reading really fast, okay, 20 percent are in public housing; 40 percent in other rentals, so they could be single-family homes or townhouses or something like that where they're renting a non-apartment and the other 40 percent are where?

MR. FRANCO: The other 40 percent are owners.

So owners of single-family mostly, but they could be multi-family situations.

MR. ROSENSTOCK: So in terms of the technical support document, and they all say "see slide" that was just up on slide 83, for those 40 percent that are owners, nothing should change, correct?

(No audible response.)

MR. ROSENSTOCK: Okay. So that's one thing in terms of the slides. So these numbers,

again, don't change, and you're seeing the 8.3 to 11.7 year payback depending on what you're assuming here. The ones that are paying -- okay, the ones that are other rental, if they're in single-family homes, as someone who was -- whoops, sorry. Yeah, okay, as a former renter in a single-family home, I do remember that we were responsible for all the energy bills, and we were responsible for maintenance, and for certain appliances. If something happened to that appliance, we were responsible for replacing the appliance.

Now, granted, it didn't cover heating or cooling, or water heating, but everything else. And in a lot of the cases, there might be situations where they're responsible for the maintenance. So if there's increased maintenance costs, the renter is going to be responsible for it too. Was that accounted for in this study?

MR. BROOKMAN: So we've had new material presented. I thought it was a good, pretty darn clear explanation there. We have additional questions and comments here. Andrew deLaski? Because we're about to move on.

MR. deLASKI: I just want to applaud the Department for doing this analysis. This is actually a point that we made repeatedly over the years that the analysis for renters has been incomplete. I think now is a fantastic time to raise it because it is coming up in this docket in a very -- it's been raised by many stakeholders. It was raised at the last meeting, so I applaud you for coming back today with a description. And what I hear is a commitment, what I take from this is an intention to do a more robust analysis of the impact on low-income consumers. And I think that makes sense, and you've gotten some good feedback today from different stakeholders. And I think that will lead to a more complete and robust analysis of how low-income families are affected by the standard. So thank you for doing that.

MR. BROOKMAN: Okay. Thank you. Kathryn?

MS. CLAY: Yeah, I want to underscore Andrew's remarks. We agree as well. This is a critical community that should be given due consideration in the analysis. And if this is a step

in that direction and this is not the end point, we fully support it.

I wonder if we could get that commitment from the Department that there is going to be a more robust analysis, not simply this small piece that we've been presented today?

MR. CYMBALSKY: So this is John from DOE. Absolutely. So I think that what you've seen here is our first set of thinking to try to really refresh and make more robust this analysis. I think your organization and others have brought it to our attention that this rule in particular could have some impacts positive or negative that we should really take a very careful look at. So this is the first step, and you'll see more as we go through.

And, of course, we would like lots of comments on this issue so we can build it into the record and go forward with the analysis based on your comments.

MR. KREBS: Mark Krebs. At this point, I just want to stress that it could indeed be positive or negative. You know, we don't know yet. I

understand this is your first blush attempt, and while that's appreciated, you know, this has to have time to be looked at and vetted completely.

MR. BROOKMAN: Okay. So then we're going to move on, and I presume we're going to pick up where we left off, which is slide 83. If we can -- how can we advance the slides to there?

Thank you, Emily. And we're going to hear from Victor Franco.

(Pause.)

MR. BROOKMAN: Frank Stanonik, before we get started here.

MR. STANONIK: Since we ended on slide 83, could I actually get you to go back to that slide? And if my memory has failed me, it's very possible, but at the end of the last meeting, I did ask the question that seemed to me to be an oddity that the life-cycle cost savings for senior-only category was in fact higher than just for all consumers. And looking at it further, I now see that for the better than minimum condensing furnace, the 92s and the 95s, in fact, the life-cycle cost savings for a senior in

the rest of the country is in fact better than in the north. And that seems very counterintuitive to me from just the idea that, first of all, the heating season is significantly less than the rest of the country, and I guess, again, I don't know the full -- let's say the full demographics of senior-only, but you tend to think of smaller residences, generally less use. Is there kind of a quick explanation to that, or did you give it to me already, and I forgot?

MR. FRANCO: No, not at all. This is Victor Franco. No, we didn't go over that last time. It mainly has to do with a combination of factors. So it is where the senior are living. They're mostly living in a little bit higher, places with higher heating loads, and also the energy prices. We can give more details to that in the next version of the TSD.

So, good morning. I'm Victor Franco again, from Lawrence Berkeley National Laboratory. Next, I'll be presenting the shipments model, national impact analysis, and regulatory impact analysis. The shipment analysis is an input to the national impact

analysis, and this is what I'll be focused on the next few slides.

The purpose of the shipments model is to forecast non-weatherized gas furnaces and mobile home gas furnaces that would be expected to be shipped between the analysis period, the 30-year period between 2021 and 2050, with and without energy conservation standards. The shipment model considers three market segments: new construction, existing furnace owners replacements, and new owners. I'll be talking in more detail about these in the next slide.

Similar to the LCC analysis, DOE also took into account product switching of owners of non-weatherized gas furnaces which may choose to replace an existing non-weatherized gas furnace with another type of space-heating product such as an electric furnace or heat pump. If the non-weatherized gas furnace efficiency standard is amended, the fraction of products decreases over the analysis period. I'll be talking in the subsequent slides in more detail.

The shipments model also disaggregates

shipments by different market segments including product classes and weatherized gas furnaces and mobile home gas furnaces, residential and commercial applications, and north and rest of country regions as defined in Chapter 9. You may recall that there's this 5,000 heating grade criteria. Chapter 9 includes details about that.

In addition, the shipments analysis helps develop the base-case and standard-case efficiency distributions.

So let me go into more details about the shipments model in this next slide. This flow chart shows the overall three market segments and the inputs to calculate those. The first one is the new construction which is here labeled new installations. The two main inputs are projected new housing starts, which come from AEO 2014 projections, and the historical new construction saturations. Then, there are the new owners.

New owners are defined as the existing buildings that acquired furnaces for the first time during the analysis period. The new owners primarily

consist of households that during a major remodel add or switch to non-weatherized gas furnaces. DOE assumed that there were no new owners for mobile home gas furnaces.

For non-weatherized gas furnaces, DOE assumed that new owners correspond or is equal to half of the new owners observed in the shipments model from 2009 to 2013. This represents about 7.5 percent of the overall projected shipments.

And I forgot to mention, new construction represents about 25 percent of non-weatherized gas furnaces, where it represents 50 percent of mobile home gas furnaces.

Replacements are defined as existing buildings with furnaces installed. They are calculated using historical shipments, as shown here, and the retirement function.

DOE also took into account demolitions, houses removed from the housing stock, by tracking year-by-year changes in the projected housing stock in the AEO 2014 projections.

Overall, 67.7 -- 67.5 percent of

non-weatherized gas furnaces are replacements, and 50 percent of mobile home gas furnaces are replacements.

MR. BROOKMAN: Steve Rosenstock?

MR. ROSENSTOCK: Steven Rosenstock, Edison Electric Institute. I'm going to ask a question about the first asterisk there. Because I'm looking at U.S. Department -- U.S. Census data that shows, especially in the northeast, oil was used for a significant amount of new home heating systems in the northeast for many years, as much as anywhere -- until 2005 when it started really dropping off. But from 1971 until 2005, the number of homes -- new homes with oil-fired equipment ranged from 11,000 up to 57,000. So especially new homes, especially in the northeast, now it's dropped off a lot over the last several years.

MR. FRANCO: Those are the yearly totals.

MR. ROSENSTOCK: Those are the yearly totals for new single-family homes completed from the U.S. Census Bureau. And my question, and I asked it last time, is, why weren't other types of competing

heating technology considered for the fuel switching analysis, especially with the long history of their use in new homes, especially in the northeast, in the heating-dominated climates?

MR. FRANCO: Thank you very much for that comment, and please submit that in your written comments more detail.

For this analysis, the shipments take into account a lot of these changes already. The projections do not take into account further market changes because the oil market seemed to be fairly low, but please submit your comment so we can potentially review that in more detail.

MR. ROSENSTOCK: Okay. I thank you very much, but, again, for this analysis, again, and we're going to go into it later on, it seems like it makes it like it's either gas or electric when other technologies are available and have been used, whether they're central systems, whether they're zone systems, there's a whole array of technologies that could be used to heat homes.

MR. FRANCO: Okay.

MR. ROSENSTOCK: Hold on, hold on. And I believe, again, I'm going to say this, is right now in my view the analysis is incomplete because you're only looking at one option when there's multiple options. I can't stress that enough. Thank you.

MR. CYMBALSKY: This is John from DOE. I think we went through this at the last meeting, but if you have data to support the switch from gas to oil or wood or whatever, other things you're thinking about --

MR. ROSENSTOCK: The chart is right here.

MR. CYMBALSKY: Okay. That has the fuel switching? Can I see that?

MR. ROSENSTOCK: Yeah, it shows the wide variety of installations by year based on gas, electricity, or oil.

MR. CYMBALSKY: And it shows switching?

MR. ROSENSTOCK: No, this is just for new homes. This is new homes, what they've chosen to install in new homes and the wide variety --

(Simultaneous conversation.)

MR. CYMBALSKY: Well, that's in the

baseline. The market shares are developed --

MR. ROSENSTOCK: But it shows there's been fuel switching back and forth based on multiple conditions in the marketplace.

MR. CYMBALSKY: That shows fuel switching? Can I see that, please?

(Pause.)

MR. ROSENSTOCK: It doesn't say "switching." It shows installation, but it shows the wide up and down of the different technologies used in new homes based on the decision of the home builders over the years.

MR. CYMBALSKY: It shows the market disposition in new construction of heating?

MR. ROSENSTOCK: Correct.

MR. CYMBALSKY: We're very aware of that data.

MR. ROSENSTOCK: And in the future these technologies are not going away. It's not just electric --

MR. CYMBALSKY: And they're in the baseline.

MR. BROOKMAN: Frank Stanonik.

MR. STANONIK: Frank Stanonik, AHRI. You went a little too quick. What was the percentage you estimate is replacement furnaces?

MR. FRANCO: Replacement furnaces is 67.5 percent of non-weatherized gas furnaces.

MR. STANONIK: Right. Okay. All right. That seems a little low, but be that as it may. And just the other point, I want to maybe take a little different way.

So the new owners as an existing structure, if you will, that for the first time has a gas furnace installed?

MR. FRANCO: That is correct.

MR. STANONIK: So that would include whatever number of conversions have occurred in recent years from oil to gas?

MR. FRANCO: That is correct. And that's what we try to model in that number. And just to clarify, we do use the data Edison Electric pointed to which is the Census data to come up with the saturations for the new construction. We'll go over

those numbers. What we used is the last five years average, and then we project that as being the future.

MR. BROOKMAN: Victor, thanks for that clarification.

Mark Krebs.

MR. KREBS: Mark Krebs, Laclede Group. First of all, Steve Rosenstock, could you give us the source of that document so we could check it out?

MR. ROSENSTOCK: Steve Rosenstock, yeah, U.S. Census Bureau Housing -- I got it, Housing Report, Annual Housing Report. It's online. I'm happy to send it to you.

MR. KREBS: Forward me the link.

MR. CYMBALSKY: It simply shows the share of heating fuel in new construction. It does not make any statements about fuel switching or anything like that.

MR. KREBS: I trust Steve that it's worth looking at.

(Laughter.)

MR. KREBS: Next question. Total shipments, I'm going to use this as an opportunity to

ask Frank Stanonik a question. I see where you're going with this, but I would really still like to compare what you -- you know, total shipments with AHRI data, you know, raw unadulterated data. I asked this at the last meeting. I want to ask it again. I need it to be able to make comparisons. And, Frank, please feel free to explain, you know, why you don't do this anymore. A couple of years ago, you pretty much stopped. I don't know why that is. I know AGA has been beating on you for it, and I'm going to continue. But, can you -- why is it so difficult to get that?

MR. STANONIK: Frank Stanonik, AHRI. I welcome the opportunity because in fact -- well, just because I do. There's no way around it. We do what our members tell us to do, and in this case, a decision was made that the shipment information on furnaces would no longer be -- or some of the detailed information would not be -- made publicly available. I can tell you right now that's being reevaluated, and granted, recognizing my initial statement, I still have a pretty high level of

confidence that we will be able to fill in the gap. Because if you notice up until 2009, it was our data, right? And so I think we will be able to fill that in.

But, you know, anybody who thinks I get to tell the members what they need to do, you're just wrong.

MR. BROOKMAN: Frank, thanks for those comments. And I'm certain everyone in this room would appreciate it if your members do agree for you to follow up and provide that data. That will provide a lot of clarity. I didn't get your name at the outset.

MR. MURPHY: Richard Murphy, AGA.

MR. BROOKMAN: Make sure you've got the microphone on. It's not on yet, I don't think.

MR. MURPHY: You had indicated that for the new market and the conversions from oil to gas, you used a period of five years, the last five years, and projected that going forward. The last five years has seen an aggressive number of conversions from oil to gas, so would you anticipate that continuing

at that same pace in this analysis?

MR. FRANCO: That's what we assumed in the analysis, and the market share is significantly less. The market share is constant, so it wouldn't vary from that. That's our assumption.

MR. BROOKMAN: Charlie.

MR. McCRUDDEN: Charlie McCrudden, ACCA. I'm still confused on the difference between a new owner and, I guess, a replacement. A new owner is -- this is going to sound like I'm thinking way too basic. You're not suggesting that that's a structure that has no heat, that has been existing without heat and you're putting something in, a furnace for the first time, are you?

MR. FRANCO: Not exactly. So it could be, for example, that they might have had like oil equipment. That's one possibility.

MR. McCRUDDEN: Okay.

MR. FRANCO: Another possibility and it was for a time, as they became part of the market, they probably didn't have a centralized heating system. They might have had direct heating, some

other type of heating system, and they did a major remodel.

MR. McCRUDDEN: And it looks at both condensing and non-condensing non-weatherized gas furnaces?

MR. FRANCO: This is correct. This is primarily for the base case which is the current standard, and it does look at both condensing and non-condensing furnaces.

MR. McCRUDDEN: Thanks.

MR. FRANCO: So moving on to the next slide, this presents the inputs, the actual references. And so this has some of the references that we discussed, and further details about these references are available in the TSD. The links and the full references are available there.

Let's first discuss the two main inputs for the retirement function for the retirement shipments, replacement shipments, which include the historical annual shipments, and the retirement function. Before going into too much more detail about that, because that was a question about the shipments, the

total shipments that we used in terms of doing our projections are based on AHRI up to the last year that we have data.

The disaggregated shipments between south/north and between condensing and non-condensing, we only have data up to 2009, and that's the latest data that we have that on.

First, we started looking at Appliance Magazine furnace shipments from 1961 to 2012. Those match, for the most part, AHRI numbers that we've gotten at various times from 1972 to 2005. The primary source for the shipments from Appliance Magazine was AHRI, so that makes sense that they would match. After that, AHRI did provide from 2005 to 2009 this aggregated north and south values for that time period.

After that, we're just using total values from Appliance Magazine and AHRI, which they match from 2009 to 2012.

It's important to clear up that the numbers that we got from AHRI are actually combined, non-weatherized gas furnace and mobile home gas

furnaces, so we have to disaggregate those, and we used this method of disaggregating them. Based on new construction data for mobile home gas furnaces, based on the lifetime that we assume for mobile home gas furnaces, and the saturation of mobile home gas furnaces from the American Housing Survey, we come up with what we think are the shipment -- historical shipments for mobile home gas furnaces which range between 2 to 3 percent, historically, maybe a little bit higher up to 4 percent of total shipments.

The last time we discussed the lifetime, based on the lifetime from the LCC analysis, we come up with a retirement function.

Now, let's talk about the other inputs to the new construction market. The new construction market uses the saturations for the characteristics of new housing data from the U.S. Census Bureau, which was the source that we've been discussing before. We also use data from RECS 2009 to come up with saturations.

In terms of projections, we use data that's available from AEO 2014 to project the actual

housing starts in the future.

Lastly, the product switching comes into play in terms of the standard cases, and that's based on the consumer choice model in the LCC analysis.

If there are any questions, we'll stop here.

This next slide shows both the historical and projected numbers. So, as you can see, the historical numbers are shown here. They match exactly the data that's been provided by AHRI. That's important in terms of total shipments, and also the Appliance Magazine numbers.

Further details about these numbers are available in Appendix 9B of the TSD with appropriate references.

The second part of this chart shows our projected numbers. Our projected numbers range from a little bit more than three million to almost about four million by 2050.

MR. BROOKMAN: Question real quick?

MR. ROSENSTOCK: Steve Rosenstock, EEI. For the projected, what is your -- for new homes,

what's your projected rate for new homes completed by, I'll say 2017? What's your -- because I see how it really jumps up quite dramatically, I'll say, in 2017 or so? I'm just kind of curious. Again, I was looking through -- what is the -- does that bump up because of the huge rise in new home construction?

MR. FRANCO: That is correct. AEO 2014 projects that new homes will rise to an average, more or less historical, level of about 1.5 to two million new homes per year. This is in single-family --

MR. ROSENSTOCK: Single-family new homes?

(Simultaneous conversation.)

MR. FRANCO: And it levels out, yes, and is constant over time, pretty much.

MR. ROSENSTOCK: You say 1.5 to two million because -- Steve Rosenstock -- I'm looking at, again, the Census Data in the American Housing Survey, and the only years when it was, at least for single-family homes, when it was 1.5 million were in the boom years of 2005 -- 2004 through 2006. All other years, it was around a million, and in 2013, it said 569,000. So they're assuming that the rate of

new construction is going to basically triple by 2017. Is that right?

MR. FRANCO: I actually misspoke. That's the total including multi-family and mobile homes.

MR. ROSENSTOCK: Oh, okay.

MR. FRANCO: Sorry.

MR. ROSENSTOCK: So that's including multi-family?

MR. FRANCO: Yeah.

MR. ROSENSTOCK: Okay. Got you. So you're saying 1.5 million including multi-family.

MR. FRANCO: Yes.

MR. ROSENSTOCK: Thank you.

MR. FRANCO: This chart shows the distribution in terms of the different market segments that I talked about. So this includes new owners, new construction replacements, and it also includes the north versus the rest of the country. So, again, this relates also to the fractions that I mentioned earlier in terms of fraction of new construction, fraction of the owners, and fraction of replacements.

MR. DRUMHELLER: So this is assuming that this goes through, right? That there's a 92-percent requirement north and south effective January 2021? Is that --

MR. FRANCO: Let me clarify. This is actually the base case which I forgot to mention. This is the base case. This is without amended standards.

MR. DRUMHELLER: All right.

MR. BROOKMAN: So that was Craig speaking there.

MR. DRUMHELLER: Craig Drumheller, National Association of Home Builders.

MR. BROOKMAN: Thank you. Frank Stanonik.

MR. STANONIK: Frank Stanonik. It's clearly not the major thing driving this chart. But I think it's the new owners, okay? It seems to me that the population of new owners is by definition an ever decreasing base, okay? And so I really question the fact that it looks to me like your new owner lines in this graph seem to be pretty much equal as we go forward. And, again, we're really talking about whether you want to look at it simply as let's

say being a little -- bad joke here -- being a little crude, but assuming every oil customer was a potential switchover, okay, and also the folks who don't have central heating, okay, both of those populations are kind of fixed. They're not going to be steady. So I think at least part of that, the assumption that those would be constant through the succeeding years, is, I think, a little bit of an overstatement.

Now, again, as I said, I realize that's a small piece here, but I think it's a little far.

MR. CYMBALSKY: This is John from DOE. But I guess, Frank, all the new construction that's going in place in the intervening years that have electric fall into that pool as well.

MR. FRANCO: Thank you.

So now we're going to be talking about the fuel switching aspect. So now we're talking about the standards case. In the standard cases, we're considering potential for fuel switching. This table presents the actual percentage of switching from potential for non-weatherized gas furnaces to other

equipment, for example, electric furnaces and heat pump. As you can see from this chart, these fractions are disaggregated between north, replacement and new construction, rest of country, replacement and new construction.

I'll give you a second to ask questions.

MR. ROSENSTOCK: Steve Rosenstock, EEI. Again, you heard what I said before, and I believe that this chart is incomplete without looking at other technologies that are available and on the market that are especially in the new construction area. I'm just looking at the Census Bureau data again, and I remember that in 2005, there were record wholesale gas prices. I believe it got up to $15 per million BTUs as a result of the hurricanes, and by December that year, it was staring to be a cold winter, the gas prices -- they were just record gas prices. Okay. That year and next year there were over one million homes built with gas heat, even in a time of record gas prices.

Okay. So I mean, even in a time of record prices when people aren't switching and now gas

prices are very, very steady, very low at about $2.70 cent per million BTUs the last time I looked on the Henry Hub, and if gas price projections are pretty much flat, or very, very steady, or very slow increasing, I think a lot of these numbers, as much as I would like to -- a lot of my members would like to see this, I don't see these numbers as happening. I'm sorry. Thank you.

MR. BROOKMAN: Okay. Thank you.

Keep going, Victor.

MR. CYMBALSKY: Can I ask a question. So thank you for that comment. That's the kind of comments we like to hear, like a definitive statement.

Do you have a sense? So we're saying here that, you know, switching is about, say 20 percent in the south and looks like 11 percent in the replacement markets, do you have a different percentage in mind if a 92 percent standard were to come into effect? Do you think it's half that, a quarter that?

MR. ROSENSTOCK: Steve Rosenstock. I wish

I had that data. I don't have that data. All I can say is I'm just looking at some of the historical data when the gas prices were very high, and there was an economic driver to even look at other new appliances, and it didn't seem to make a difference.

Now, 2008 was another year of record high gas prices, also right in the middle of the recession, so everything was going downhill everywhere. But all I can say is, in my view, of course, it's all about theories and everything. In my view, I wish I had a number. I don't have a number. I believe that, you know, all I can say is, the home builders would have a better idea of all the technologies that builders are looking at, not just the electric. It's not just the one or the other. And, you know, oil furnaces are an option for these builders. They exist. They are an option, especially in new construction, and if their prices are lower than the gas furnace or electric heating system, I'm guessing that a certain percentage of builders will look at that option because they're out there, and there might be other things like wood, you know, there might be wood

systems or solar systems they might look at because of tax incentives. They're out there. So I don't know how much less the fraction is, but this is a personal view. I don't have a study. I wish I had some data. I don't. But in my personal view, I believe the fraction is less. I can't tell you how much less.

Thank you.

MR. BROOKMAN: Yeah, Andrew deLaski.

MR. deLASKI: I was sorry I had to leave last time before we got to the fuel switching discussion, so I think you went through the methodology for that at the end of the last meeting that was discussed, so I don't want to bring us back to that discussion.

MR. BROOKMAN: Andrew, get close to that microphone, please.

MR. deLASKI: But I do want to pile on Frank a little bit.

So I was just thinking out loud here, and I'm wondering, Frank, to the extent the AHRI members are able to provide data on heat pump shipments as

well if that would help, if that would be instructive to the Department in helping us to understand the relative shipments of the two competing technologies in electric furnaces as well, because, again, these are the same manufacturers making these products by and large. To the extent that we had time series data on the shipments of all the competing technologies, that would be, I think, a big assist to the Department in helping to validate. I think you have a good methodology that you laid out last time. I think it predicts more switching than I would expect. I think the market is probably a lot more sticky than you have predicted, that people do what they've done before, and there's a lot of inertia in markets and that you've not captured inertia. And I would expect -- what I would look to, so thinking about data sources, is the AHRI shipping data seems to me would be a very valuable resource to you.

So, Frank, as you're talking to your members and you're optimistic about getting data for furnaces, I hope you would do the same for heat pumps and for electric furnaces as well.

MR. CYMBALSKY: This is John from DOE. So since there's some AGA folks in the room, back in my former profession, AGA used to do a fuel switching study actually mapping which fuel they switched from and to. It was mostly to gas at the time. So this was circa 2000, 2002. Unfortunately, when I switched jobs, I gave up my right to keep the survey, but, they did have a very nice survey about what fuel switching actually occurred in their member companies. I'm not sure they do that particular survey anymore, but it was very helpful in the development of the NEMS model for EIA that I did in my former position to actually try to project fuel switching. But what I can tell you, counter to what Steve is kind of thinking about, switching to oil or wood or whatever, that just didn't happen. You know, homes that are built in New England, in particular, they'll be built with oil because they don't have gas lines available. It is a more -- it's cheaper than propane per BTU, and they will do that.

Now, if the gas line is there, they're not going to bury an oil tank. I hate to tell you, it's

not going to happen. So I don't know if AGA does that study anymore, but that was a very valuable data source to look at in terms of fuel switching. Other than that, I can tell you, there's not too much out there in terms of real data.

You can make inferences from shipments, but it's very difficult.

MR. BROOKMAN: Yeah. So, Rick, can you comment here?

MR. MURPHY: Yes, John, I'm not familiar with that study back at the time that you're referring to. But I believe it had to do with the customers that converted from an alternative fuel to natural gas, not the other way.

As you know, we did try to improve the level of intelligence that we have on the switching going the other direction by going out and speaking with contractors and builders about a year and a half ago to give them -- the question is, how would you react to a national standard that required condensing equipment? And we have the results of that study that we share with yourself and other stakeholder

groups that actually showed that it was actually a higher percentage of switching than this indicates.

We realized that we did not get the level of response that we would have liked to across the country. However, we did get a significant amount of responses that indicated that because of their experience in the pricing associated with the condensing of equipment, that a certain percentage of the market and a certain percentage of new installs, they would actually move away from a natural gas furnace.

MR. BROOKMAN: Okay. Rachel, comment here?

MS. FEINSTEIN: Rachel Feinstein, Hearth Patio and Barbecue Association. With regard to wood-fueled furnaces, or wood, forced-air furnaces, usually there are two different sizes, a smaller size and a larger size, and they're usually used to -- they're connected to an existing gas or propane, or oil-fueled furnace to give an extra supplemental energy to the system to kind of what we say, turbo boost the home system. And it's usually in addition to the gas or oil or propane-fueled systems and not

a replacement. It's mostly very rural areas, northwest, Midwest. Wood, forced-air furnaces are sold in like the Midwest, northwest and not very urban areas.

MR. BROOKMAN: Do you all have data on that?

MS. FEINSTEIN: Not -- we do not because there are just not many sold. It's a very small market. It's also a newly regulated category by the EPA as well, wood, forced-air furnaces.

MR. BROOKMAN: John Cymbalsky?

MR. CYMBALSKY: I just want to say thanks to both Rick and HPBA for providing that information. It's helpful, and I know we looked at the study, and we used the study, and as we said in the last meeting, actually the results overall --

MR. ROSENSTOCK: What happened to those ground rules?

(Laughter.)

MR. CYMBALSKY: My, oh, my. But I think what we shared last time is that the AGA switching and the DOE switching, actually, percentage-wise, are

roughly the same. There are differences in where they switch and some of the other things we went through. We're not going to revisit it, but, we do thank you for that study and thank HPBA for that information as well.

MR. BROOKMAN: Yes, please, Jim.

MR. MOORE: Jim Moore with Laclede. One of our concerns is with this switching, and using the DOE data, we're seeing a huge switch to electric in particular places like Arizona. And yet we believe you're including the -- that's an economic decision. They would have switched without this rule. But, yet, all those savings are included in your LCC calculations, and that's a concern for us. We think you're overestimating the LCC savings in that case.

And then again to Frank, I understand the proprietary nature of your data and that you don't want to give up all that. What I would be interested in seeing is just the breakdown between condensing and non-condensing, because I firmly believe that we're already there. That DOE is required to look at whether or not we should -- what happens without this

rule. And I believe the market is doing its job, and we're already there, and I think your data can prove that.

Thank you.

MR. BROOKMAN: When you say "already there," be more specific.

MR. MOORE: I don't remember the exact data point, but if you look in the chart on 8I where there's a huge drop off, because we don't have AHRI data and we switched to EPA and then EPA switched the rules in the middle of the game, and so we have this huge drop. I believe the starting point of that curve is much higher than it is.

MR. BROOKMAN: Okay.

MR. MOORE: Did that answer your question?

MR. BROOKMAN: Yes.

MR. MOORE: Thank you.

MR. BROOKMAN: Steve Rosenstock?

MR. ROSENSTOCK: Again, Steve Rosenstock, EEI. I said this before, but again on the record, as I recall with the previous rulemakings for electric heat pumps, I don't remember any fuel switching

analysis being done by this Department. And now heat pumps are going up from 10 SEER to 13 SEER, to 14 SEER in the last nine years, so there might be some fuel switching the other way. To totally ignore that in the context of this analysis, I believe, is another way of -- it's just not complete because what about the impact of that technology going the other way? And I guess I'll ask from now on for any space heating system, for any space heating analysis, are you going to do a fuel switching for every product from now on? Because to do it for one product and not other products just seems inconsistent.

MR. BROOKMAN: So all your written comments on these points will be very, very helpful to the Department.

Frank Stanonik?

MR. STANONIK: Frank Stanonik, AHRI. And I'm glad you got this one because the slide we were looking at was just non-weatherized gas furnaces, and I was just curious if you've looked at the potential fuel switching impact on mobile homes from the perspective, particularly of new mobile homes?

Because that really is in the hands of the builder and I mean, not that I have direct contact with those manufacturers of the manufactured homes, my understanding, it is already a very price-driven kind of industry and who isn't, and on top of that, if you will, there's no way around it, it's a lot easier to cite a, if you will, all electric manufactured home than one that needs a secondary fuel whether it's gas, oil, or whatever. I just wonder if that's been looked at. What, you know, maybe just talking to those manufacturers or what happened if their only option was a condensing furnace.

MR. FRANCO: Thank you for that comment. We did approach experts, and we did approach people in that area, especially in the new construction. That was something that we were looking at.

One of the primary things to consider in the consideration of what things potentially would be switching is the installation costs, and, for this equipment, the installation costs between a non-condensing and condensing is not very significant for the mobile home. It's primarily due to the short

venting length. Usually if you look at a mobile home furnace, it sits in a kind of closet area, and it's primarily vented vertically, so it's only one story. It's very short, and so it's not a huge installation cost differential. It's mainly the equipment costs, so that was the primary concern. So please provide your comments so we can take a look at that further.

MR. BROOKMAN: Victor has cued the comment slide here. As I look at these three, and Victor, I invite you to call out ones for which you would like to receive additional comment. We've begun to address all of these three, I believe, but is there anything else you wish to seek or emphasize?

MR. FRANCO: The first one I haven't heard anything about specifically just the fraction of commercial applications. In our analysis, we assumed 3 percent of residential furnaces are used in commercial applications. Any additional feedback would be appreciated.

MR. BROOKMAN: Craig Drumheller?

MR. DRUMHELLER: Craig Drumheller, National Association of Home Builders. I just wanted

to kind of go a little bit further with the methodology. One, I know you have to determine what the difference is going to be in shipments both before and after this rule may or may not be in place. And when you do your cost analysis, your cost analysis includes the ones that were shipped that were switching anyway to the higher-efficiency equipment. So they're the ones that have already determined that it's cost-effective, and said, you know what, we're going to go ahead and do this because it makes sense for us.

I would be very interested in an analysis that goes after that delta, the people that are now forced to switch that would not have switched otherwise, because a lot of them are doing it and because it doesn't make economic sense. And it might be a retrofit. It might be a specific location. There might be other reasons why they're not doing the switch, and I think you're going to find a huge difference in the cost effectiveness when you parse it for that delta of the people that didn't intend to switch because it didn't make sense for them. And I

think that's a very important distinction to be able to do that because when you group them altogether, it pulls -- the people that it already made sense for overwhelm the ones that it doesn't make sense for. And I think we need to let the market kind of dictate the way that this needs to move forward.

MR. BROOKMAN: Thank you.

MR. CYMBALSKY: So that's already done in the analysis. Those are the no impacted people that already did it.

MR. BROOKMAN: Thank you, John. Dave.

MR. WINNINGHAM: This is Dave with Allied Air. In the NOPR, it says DOE has concluded that a repair option really wasn't considered in this. In other instances where we've seen increased product costs, we see an increase in repair versus replace. Can you elaborate on how you came to that conclusion?

MR. FRANCO: For this analysis, our primary focus was on the equipment switching. We saw that as the -- building that model. Once we built that model, it was inconsistent with how we presently do what you're referring to which is the repairing of the

equipment, which is based on the price elasticity. At this time, we haven't been able to reconcile both methods. We assume that a fraction of the people that we're assuming currently are doing the product switching, potentially would do the repair, and it would be a similar impact, or it might be slightly more advantageous potentially to do the repair. So we think that we're -- at this point we're conservative in that regard, but we would like your feedback to look at that in more detail.

MR. BROOKMAN: Is that in the TSD, Victor?

MR. FRANCO: That's in the TSD.

MR. BROOKMAN: Let me see, Rick?

MR. MURPHY: John, I'd just like to go back to something you just mentioned just so I understand it correctly. You said that the customers who do fuel switching, because it makes economic sense, are included in the no-impact section of the -- I need to understand that.

MR. CYMBALSKY: So the baseline shipments already include sort of the market of switching that happens naturally without any standards. So the

shipments forecast builds that in. Okay. That's baked in. What we're looking at is the marginal analysis to when you impose the standards, and so what I was addressing from the NAHB gentleman is that the people who switched to the higher-efficient furnace are the no-impacted people. He was saying, how many people think this is a good thing to do anyway, right? That's in the model.

MR. MURPHY: Thats in the model, but its included in the no-impact group?

MR. CYMBALSKY: Correct. Because they're doing it anyway without the standard. The people who switch fuels, naturally occurring switching, that's in the baseline shipment data. So that's baked into the baseline as well. So we're only looking at what happens, the delta above that level.

MR. MURPHY: And if that's the case, why does -- if you choose the selection for no fuel switching in the LCC that the life-cycle cost benefits actually go down?

MR. FRANCO: The life-cycle -- this if

Victor Franco. The life-cycle cost benefits in the switching situation or the non-switching situation?

MR. MURPHY: Non-switching.

MR. FRANCO: Non-switching situation. So, in the non-switching situation, you're assuming that these households that have very large installation costs don't switch. Those households when you do the switching do switch and capture those benefits of not having to have those large installation costs.

MR. CYMBALSKY: So this is the inertia that Andrew brought up. So they face high costs to go to the condensing, and they pay it. So they're impacted, they didn't switch. So those are the impacted set of people.

MR. BROOKMAN: Thank you, John. Mark Krebs.

MR. KREBS: Mark Krebs. I want to chime in with Allied Air's consideration that, you know, the market is a very innovative device, and I believe it is probable that as a result of this rule of banning non-condensing furnaces, that you will unwittingly develop a cottage industry of firms that

go around repairing non-condensing furnaces. And that should be -- that potential should probably be considered by DOE in this rule.

MR. BROOKMAN: Okay. Thank you. Frank Stanonik.

MR. STANONIK: Victor, the second box, the projection of future shipments, one of the earlier slides was, you know, clearly there was a -- I'll call it an artificial peak in the relationship of condensing versus non-condensing in slide 69 driven by -- I think driven primarily by tax credits, but other incentives probably. It was in the years like probably '09 to '12. So in terms of -- okay, so that's there. Those are now in the field, that, you know, huge jump there. And so, again, my simplistic view, let's say they were installed in 2010, okay. So I look at that, and I say, okay, in 2010, if I go out about 20 years, I'm going to have this huge blip that needs to be replaced, and I would argue that if the person has already bought a condensing furnace, they're going to replace it with a condensing furnace or whatevers equal to that in 20 years, and then in

another 20 years, you've got another blip. So my question is, is your straight line there factoring in that blip, or does it not? That's a technical term "blip" by the way.

(Laughter.)

MR. FRANCO: Thank you so much for that comment. So actually, when we did the furnace fan analysis, the actual shipments were decided between non-condensing and condensing, and there, we actually did two projections of shipments by non-condensing and condensing, and you could see kind of those more clear blips.

This is a little bit of simplification. It does match the overall shipments, but it does not include what we could call those blips. And we appreciate a comment in that regard, and we can look at that further.

MR. CYMBALSKY: I think the distribution of the way it retires actually will serve to flatten out the blip, right?

MR. STANONIK: No, no, no. Absolutely. Yeah, it would be spread out over the years, but I

guess I was trying to get a sense of to what extent it gets rolled into that.

MR. BROOKMAN: Yes, Charlie?

MR. McCRUDDEN: Charlie McCrudden, ACCA. Your first request for comment box references the number of furnaces used in commercial applications. This is sort of the first, I think, that that concept has been brought up in these slides. Can you sort of give us some sense of what you think perhaps it is for 3 percent? And that's in the TSD somewhere?

MR. FRANCO: That is correct. That's based on -- the methodology is based on looking at CBECS and RECS data in terms of what we think if they have a commercial or residential furnace, looking at those saturations, then we come up with 3 percent.

MR. McCRUDDEN: Thank you.

MR. BROOKMAN: Is it John?

MR. HERSE: Yes, John Herse with Lennox. Going back to the previous chart that shows the future projections, no, the other one. No, not that one.

MR. BROOKMAN: The one that --

MR. HERSE: The one that we were just on. The blip chart.

MR. BROOKMAN: Sixty-three or something.

PARTICIPANT: Sixty-nine.

MR. HERSE: So speaking as a manufacturer, and one of those entities that I have it on relatively good authority that the new information will be released for furnaces. But just an observation, our experience was that precipitous drop wasn't as steep as you show, and our belief, based on prior history, is that that curve is flatter than it should be. We see adoption through a tax incentive, but it doesn't drop below. There is actually -- it moves consumer adoption higher, and I think the data will show that. So it would be interesting to recast that with better input data.

MR. FRANCO: That would be really appreciated. Thank you so much for your comment.

MR. BROOKMAN: Everyone welcomes that. Thank you very much.

Okay. Final comments on these issue boxes. We're about due for a break.

Yes, Greg.

MR. MOORE: Jim Moore from Laclede Group. Just echoing what Frank said, if you go to the historical and projected case shipments, the blue slide, you have a big dip in the '08, '09, '10 timeframe, which is understandable, and likewise 20 years out, you're going to see another dip again. Now, it might not be as deep, but it's going to be out there as people go to replace those furnaces. Just an observation.

MR. BROOKMAN: Okay. Thank you.

Let's take a break. It's now 10:52. Let me see. Let's resume at 10 minutes after 11 here in this room. Please make sure to wear your badge. There are restrooms at both ends of the hall.

(Whereupon, at 10:52 a.m., a brief recess was taken.)

(Record resumes at 11:14 a.m.)

MR. BROOKMAN: I've received a note. We're starting back up folks, here we go.

Apparently Neal Leslie who is joining us on-line has a comment and a question. Neal, you

should be now unmuted, please speak.

(Pause.)

MR. BROOKMAN: Haven't heard you yet. Yeah, okay, Neal, you're not coming through here in the room. So maybe we can figure out what's going on, and we can try you back later.

We're going to resume where we left off, and we're going to hear from Victor Franco.

MR. FRANCO: Hi, this is Victor Franco again. We just finished the shipments analysis, the primary input to the national impact analysis, which will be the next topic. The national impact analysis estimates the national impacts of energy conservation standards for non-weatherized gas furnaces and mobile home gas furnaces shipped between 2021 and 2050, this 30-year analysis period. There's two primary outputs of this analysis. One is the national energy savings, or NES, which calculates the primary energy savings, and then net present value or NPV, which calculates the difference between the net present value of annual energy expenditures and the present value of annual equipment expenditures.

The method is to calculate for each product class in each of the standard cases, calculate the per-unit cost increase and per-unit energy savings. In addition, calculate the number of units in the stock used between 2021 and 2050 and combine to determine the NES and NPV. The next few flow charts will show this approach.

Let's start with the NES or national energy savings. So the shipments analysis is one of the primary inputs. Here on this chart, we have on the right side the base-case projections and on the left side, the standards-case projections. We combine the shipments analysis with the base-case annual energy consumption to come up with the base-case cumulative energy use. From the standards-case we do the same. We combine the standards-case annual energy consumption to come up with the standards-case cumulative energy use. Then, we use site to source energy conversion factors to come up with the final national energy savings.

In terms of the net present value, again, we start with the shipment analysis numbers. We

combine them with inputs -- with inputs for energy costs, maintenance and repair costs, and total installed costs for both the base-case projections and standards-case projections to come up with cumulative operating costs. We combine energy costs and maintenance and repair costs both for the base case and standards cases. To come up with the cumulative total consumer costs, we combine the total installed costs of both the base case and standards cases. We then use discount rates to come up with the net present value.

This table summarizes all the different inputs that go into the analysis. More details are available in Chapter 10 of the TSD.

A lot of these inputs come from the LCC analysis. One of the primary inputs is the annual unit energy consumption which is an average value that comes from the LCC analysis. It's both for the product class, but for this rulemaking it's actually also provided for different market segments that we discussed earlier. It's provided for new construction and replacements, and it's also provided

for commercial and residential and for the regions we are considering -- north and rest of country.

For the shipments we have discussed earlier, the product stock is determined as the yearly stock using the annual shipments and lifetime of each of the product classes. For this rulemaking, we consider the rebound effect. It's a 15 percent rebound effect for this rule.

Base-case efficiency distributions I'll discuss in further detail in the next slide.

The site-to-source conversion factors come from AEO 2014 data. We also add full-fuel-cycle conversion factors that actually also come up from AEO 2014 data.

The total unit cost -- the total installed cost per unit and total operating cost per unit come from the LCC analysis as well and are designated by the market segments.

Finally, we come up with -- we use two discount rates that are used by OMB -- 7 percent and 3 percent.

Let me discuss in more detail the base-

case projections and distributions. As we discussed earlier in the LCC analysis, we come up with base-case market shares for 2021 and project that into the future. The distributions are shown here at the national level, 55 percent in the baseline, 5 percent level one, 17 percent level two, and 23 percent level three. For each of the trial standard levels, we come up with different market shares as well depending on whether the standard will require condensing or not. For some of the trial standard levels, since it's a regional standard, there will be a mixture.

For example, for trial standard two, there is not applicable for -- up to the third, since it's the standard for the north will be condensing. For the other market shares, non-condensing is still applicable for the south.

The distribution over time is shown in the graph for all of the product classes in the base case. The standards-case distribution is available in Chapter 10 of the TSD.

MR. BROOKMAN: Andrew DeLaski?

MR. DeLASKI: I'm not sure when a good

time to raise this is. Maybe now is a good moment. Victor, in many dockets, the Department will also model what you typically call a shift scenario which would typically look at some shift. You know, for example in this scenario, if the market shifts to a 95-percent standard, for example, manufacturers have an incentive to be able to offer an approved product and to sell out, right. The markets typically exhibit a good, better, best kind of structure, and that would typically drive a distribution of efficiency above a new standard level.

So I'm curious . . . in this case, you elected not to model a shift scenario, and what was the thinking there?

MR. FRANCO: Thank you so much for that clarification. It's actually a mixture of -- this is not reflected in this. It's actually both a rollup and a shift depending on what was considered. One example is -- for example, if we're going for the standard at 90 percent, there is actually a shift to some of the market going instead of just rolling up to 90 percent, some of the market actually going to

92 percent. The consideration there and the details are in Chapter 10. The consideration there was that the equipment price differential between 90 and 92 is small enough that consumers -- that some fraction of consumers would elect to go directly to 92.

For other potential standards, there's a certain part of the market that because of this improved -- because manufacturers want to have a better/best scenario in terms of the product segmentations, there will be a slightly higher, for example, 98 percent efficiency because that will be the best model that they could potentially offer into the market.

So if you look at the TSD, you can actually see, instead of the market share of 98 percent in TSL three, four, or five -- three or four, sorry, you would actually, instead of being, pretty much flat around 0 to 1 percent, it actually would grow over time to say 5 percent or even higher depending on what TSL level. The details are in the TSD.

MR. deLASKI: Okay. Thank you. I'll

look for that. Chapter 10 you said?

MR. FRANCO: Yes. Thank you.

So I kind of jumped ahead of myself because I did talk about the trial standard levels without discussing how they were developed. So here's the development that DOE considered for -- the criteria that DOE considered for the trial standard levels. DOE considered five trial standard levels, two of them have a regional standard, and three of them have a national standard, TSL three, four, and five.

DOE is currently considering TSL three. TSL five has the max-tech efficiency levels. TSL four yields the maximum NPV at 7 percent for which the percentage of LCC winners is higher than the percent of LCC losers. That's the criteria.

TSL three is 92 percent AFUE for both non-weatherized and mobile home gas furnaces. And TSL two is a mixture. As I mentioned earlier, 95 percent for the north, and baseline or 80 percent for the rest of the country.

TSL one would provide a 90 percent for the

north, and 80 percent for the rest of the country.

MR. ROSENSTOCK: Steven Rosenstock. I guess a very quick question. Looking over these numbers again, for TSL one, why was it the choice to make different numbers for the north for mobile home versus non-weatherized? Why is the mobile home number higher compared to the other?

MR. FRANCO: Thank you so much for that question. That's a great question. I passed over that. The baseline condensing that was considered in terms of the efficiency levels for mobile homes, the baseline was 92 percent since there are currently no models at 90 percent.

MR. ROSENSTOCK: There's no models a 91% either?

MR. FRANCO: No.

MR. ROSENSTOCK: Just 92%, that's the first one? Okay.

MR. FRANCO: That's the first one.

MR. ROSENSTOCK: Okay.

MR. BROOKMAN: Okay. Thank you. Aniruddh?

MR. ROY: Aniruddh Roy, Goodman. Just a

question on the discount rate. So, the real discount rate used in this analysis is 6.4 percent, whereas in the 2011 direct final rule it was 8 percent. I'm just curious to know what caused that change from the 2011 analysis to now.

MR. FRANCO: Thank you for that question. We do use different discount rates in our analysis. I'm not sure which one you're referring to, so I'll just clarify first the different discount rates that we use. We do use a discount rate in the LCC analysis which we described in the previous meeting. That's around 4 to 5 percent, and that's used in the consumer model LCC analysis. For the NIA, as long as I can remember, we've been using 3 to 7 percent, two discount rates to kind of give the range, and that hasn't changed for many, many years. So those are the ones that are currently used -- 3 percent and 7 percent. The results are presented with those two discount rates. We'll look at those results in a little bit.

MR. BROOKMAN: Mark Krebs.

MR. KREBS: Mark Krebs. I am familiar

with OMB Circular A-4 that you cited, and there's a footnote in that that -- footnote 8 that says Circular A-94 also recommends using other discount rates to show the sensitivity of the estimates to the discount rate assumption.

From my understanding of discount rates, it is a number that you use to assume a risk factor in the lifecycle costs. You can't have a different number, you know, for one group than another, or for different years. It has to be one number. And considering that the economy is not rebounding or at least using that assumption that it could naturally get much worse, and, you know, considering all these groups, I would say that using much higher discount rates is appropriate. You know, and I know I talked about this during the last meeting, and I reiterate that the Georgetown University -- George Washington University weighed in with some very good comments by a woman there, Sophie Miller, for the furnace fan rule who ran a lot of different discount rates to look at that furnace fan rule. And it really changed the whole life-cycle savings, you know, in a major

way.

And so, again, I think that DOE, according to the OMB, is required to look at vastly different scenarios than just three and seven, three and seven, three and seven.

MR. BROOKMAN: Thanks, Mark. Aniruddh?

MR. ROY: Aniruddh Roy. So, Victor, thank you for pointing that out on the discount rates. Actually just to clarify, this discount rate pertains to the INPV analysis, or maybe Navigant can answer that question whenever we get to that section again.

MR. FRANCO: Oh, yes, that relates to the MIA which will be coming up later.

MR. ROY: Yes. So just to clarify, it was 8 percent in the 2011 rulemaking for the same product, but 6.4 for this analysis. So I'm just curious to understand what caused that change?

MR. FRANCO: Thank you, yeah. That will be coming up in a little bit.

So, now let's discuss the trial standards for standby mode and off mode. These are the different TSLs that were developed. Essentially, it

maps the efficiency levels. These are the power watts for each of them, and DOE is proposing TSL three for the proposed standard.

We . . . in the engineering analysis, we went over the technologies and the power for these. So now, let's go over the results. So this shows the national energy savings, the primary energy savings, and the fuel cycle energy savings for both of the prior classes, as well as the total. DOE is currently proposing TSL three. As you can see, the primary energy savings are 2.25 quads for primary, and for the full fuel-cycle energy savings, it's 2.78 quads.

Again, the net present value is presented with two different discount rates, one at 3 percent and another at 7 percent. At 3 percent at TSL three, the total NPV is $16 billion. At 7 percent, the total NPV is $ 3.1 billion.

MR. STANONIK: Frank Stanonik. Just -- you don't have to go back to the slide, but on your estimates of national energy savings, does the TSD have information on separating that out by north and the rest of the country?

MR. FRANCO: Yes, we do provide as much details as possible. Additional details are in the analysis tools.

MR. MOORE: Jim Moore from Laclede Group. You said that in that chart that you've converted source to site -- or site to source, I'm sorry, and I've been going through the NIA spreadsheet, and I'm just not seeing it. Can you tell me what number you used? You know, standard numbers like three on going from site to source. Or did you use some other kind of analysis? Because my analysis isn't jiving with yours, and I actually show CO2 going up, not down.

MR. FRANCO: Thank you so much for that question. This is a very important clarification question. The actual total and primary energy savings of full-fuel-cycle are provided in a different tool which is called the NIA plus. Those numbers are available in that spreadsheet.

MR. MOORE: That's what I'm looking at right now.

MR. FRANCO: Yes, and those numbers vary over time. The primary resource for that is AEO 2014,

which calculates those values. I don't exactly know, but at the beginning of the trend, it probably is close to three, but further over time it decreases over time.

MR. MOORE: Okay. Thank you for that. And a follow up on EIA's release of AEO 2015 tomorrow. Is DOE going to look at that and see if changes are in order?

MR. FRANCO: Yes. Thank you for that comment. Definitely are.

PARTICIPANT: You will?

MR. FRANCO: Yes.

MR. MOORE: Thank you.

MR. BROOKMAN: Steve?

MR. ROSENSTOCK: Steve Rosenstock. For this, you know, EPA is going to be coming out with their final rule, the Clean Power Plan by June or July, which will have a huge impact on the electric side. The Mercury Rule has already had impact. I'll talk about that later, but, you know, that estimated ratio is overstated for electricity significantly. And will DOE do some sort of sensitivity analysis to

adjust for the probability of the impacts of the Clean Power Plan?

MR. CYMBALSKY: This is John from DOE. So the analysis you see here is based on current laws and regulations. So if that becomes a current law and regulation, we will incorporate it. If it stays a proposed rule, it will not be incorporated.

MR. BROOKMAN: Aniruddh?

MR. ROY: Just a question on slide 99. The 8.5 watts, that's specific to off mode and standby, right?

MR. BROOKMAN: We can just barely hear you down here?

MR. ROY: So it's 8.5 watts each, correct?

MR. FRANCO: That is correct. That would be the maximum if that becomes a standard. That's standby and off mode.

MR. ROY: Okay. Thank you, it came across as just being a combined wattage for both, so I just wanted to clarify that.

MR. FRANCO: Oh, thank you. Thank you for that.

Oh, yeah, sorry about that. So these are the results for the standby.

MR. BROOKMAN: Before you move on, we have some questions or comments from an individual joining us online. The first is from Terry Small who says, Manufactured housing or motor home housing gas furnaces and their markets (new and replacement) is very different from non-weatherized gas furnaces. It does not appear to me you are really analyzing it fairly on its own, rather automatically assuming it is just like NWGF for your analysis ease. And following up, Terry continues, It appears there is not really solid justification for the MHGF to move to 92 percent.

Okay. Thank you.

MR. FRANCO: Thank you for those comments.

MR. ROSENSTOCK: Steve Rosenstock, EEI. Again, on the standby and off mode, as I'm looking through the technical support document in the NOPR, you're saying the baseline is 11 watts and the choices are 9.5 and 9.2 and 8.5 watts. And I asked this before and if it was in the TSD, I should have

brought that chapter, but what is the range in the baseline? I know you're showing 11 watts, but what's the range of what's out there right now?

MR. FRANCO: This would be in Chapter 8 which would have the base -- which would have the base-case efficiency distributions, and actually, there's an appendix related to that which would show a little bit of the details. It depends on what type of motor you're using because mobile home gas furnaces are -- the furnace fan center does not require going to higher technology such as X13 or ECM. A lot of them already meet the standard, so most of the market is already at that lower level.

In terms of non-weatherized gas furnaces, I believe it's about 50/50 that would be at the baseline versus the max --

MR. ROSENSTOCK: 60/40 is what -- Steven Rosenstock. I'm showing about 60/40, and I guess, you know, when you're getting down to .3 watts for some of these or .5 watts, it's like, you know, the variations in technologies, you know, there could be a technology that meets level one that is below

what's in level two. And so you're not really saving any energy. And, again, the reason I was asking about the range was within each product category, if the ranges are overlapping, are you always assuming electricity savings even though they might overlap, the technology choices overlap?

MR. FRANCO: So if the technology, for example, is already below, it's higher than the max step, there's no savings. So it's not impacted. If there is potential savings regarding, for example, from a baseline to higher efficiency, there would be savings.

MR. ROSENSTOCK: Well, I guess if there's a technology, let's say for a TSL one which you show, you know, in slide 99, you know, the max is 9.5 watts, but what if the better ones out there are actually at 9.0 watts, or 8.7 watts which are actually below TSL two, how are you accounting for that in the analysis?

MR. FRANCO: We account for the base-case efficiency distribution. We came up with those distributions based on a limited set of data that we

had in terms of models. We would request manufacturers, if they have a better set of data, to come up with those estimates.

MR. CYMBALSKY: The short answer is, the same way we do it with the AFUE. So we know that a percentage of the market is already there, similar in standby. So, again, if they're already beyond what the numbers indicate here, they don't -- you don't see savings.

MR. FRANCO: Thanks, John.

So the next couple of slides are the same results in terms of national energy savings and NPV for standby mode and off mode. DOE is currently proposing TSL three. The total energy savings for primary is .26 quads, for full fuel-cycle is .77 quads.

In terms of net present value, TSL three would yield at a 3-percent discount rate, $3.3 billion and $1 billion at a 7-percent discount rate.

MR. ROSENSTOCK: Over the 30-year period, correct?

MR. FRANCO: Over the 30-year period.

MR. ROSENSTOCK: Steve Rosenstock, EEI.

MR. BROOKMAN: Thank you.

MR. FRANCO: So moving on to the regulatory impact analysis. DOE investigated national impacts of regulatory alternatives to mandatory amended energy conservation standards. This is available in Chapter 17 of the TSD. To conduct . . . that is, the method is using a modified version of the NIA spreadsheet to evaluate different non-regulatory alternatives including no new regulatory action, consumer rebates, consumer tax credits, manufacturer tax credits, voluntary energy efficiency targets, and government purchases. DOE identified 155 programs from 65 organizations offering rebates ranging from $50 to $800 to purchase condensing furnaces.

No alternative was found to be as beneficial as the proposed energy conservation standards. Again, further details are provided in Chapter 17, as well as the results.

DOE requests comments on the reasonableness of the value that DOE used to characterize the rebound effect with

higher-efficiency non-weatherized gas furnaces and mobile home gas furnaces. DOE currently uses a 15 percent rebound.

MR. BROOKMAN: Andrew deLaski.

MR. deLASKI: So I'll reiterate the comments I made at the last public meeting, which is we think this number is too high. The TSD and the NOPR paper by Steve Nadel suggest that the range is -- that 15 percent is the very high end of the range and that the range, based on our examination of the literature, is 1 to 15 percent and that you've developed a very conservative estimate of this energy savings because you've used probably the outer limit of the rebound. And I'll refer you back to that paper.

MR. BROOKMAN: Okay. Thank you.

MR. FRANCO: Thank you.

That actually concludes that section, the NIA.

And if there are any comments regarding the shipment --

MR. STANONIK: Frank Stanonik, AHRI. I'm

back on slide 104. So you identified in the analysis several different, let's say, non-regulatory alternatives were identified. I'm trying to figure what the right question is here. How did you factor in these alternatives into the -- okay, so the concept is that the analysis is supposed to look at the effect of the standard, so the baseline versus the market driven by the standard. So how did you factor in these alternatives into your future shipment projections? As an example, how would you factor in -- okay, I mean, 155 programs -- let's take the discussion, let's say there are currently 30 active utility programs pushing incentives for high efficiency products. How does that get factored into the future shipments?

MR. FRANCO: That's a good question. In Chapter 17, the details will be provided there. You can actually see the different market penetrations that would be applied. So, for example, let's say that we currently assume that the base case is 40 percent, going to condensing. Some of these might increase it by a few percentage points and that would

be the impact of that program.

MR. CYMBALSKY: Well, the short answer is, it's in the baseline market efficiencies that we presented earlier. So we know that in all, as it states here, there's 155 programs that are actually rebating consumers. So the fact that 60 percent of the market is already at condensing reflects the fact that these programs are in fact helping to achieve that 60 percent. And so what the RIA does is it looks at side scenarios for the rest of these types of things and evaluates what the energy savings would be and compares them to our standards case.

MR. BROOKMAN: Mark Bays, there's a question. The question is, why so much weight is being given to 90 percent furnaces compared to 90 percent? Pardon me, 92 percent. And he continues, are these based on existing furnaces because the electrical requirements will require a 95-percent efficient furnace to meet?

MR. CYMBALSKY: So this is John from DOE. I think the question seems to either have been transcribed incorrectly or I'm not understanding.

But actually, there's not a lot of weight given to the 90-percent furnace because as our market share data indicated, the market has moved beyond -- if it's going to go condensing, it goes higher than 90%, and we've seen that in the market data. So actually, 92% and 95% get higher market shares than 90%, and I don't understand the other question about the electrical requirements.

MR. BROOKMAN: Okay.

Yes, Steve Rosenstock?

MR. ROSENSTOCK: Question real quick. You know, going back to that blip slide, it showed that condensing furnaces, you know, went up from like 40 to 60 percent primarily as a result of the tax credits during the stimulus, as a result of the stimulus bill. It's at slide 69. It took a huge bump up. There it is, right there. Both, you know, in the north and especially nationally, you see the huge run up, and the tax rate was very generous at that time. So for the RIA, again, I don't have it right in front of me, what kind of tax credit was considered in terms of that for that analysis? Was

it as generous as during the stimulus bill, or was it a lot less?

MR. FRANCO: Thank you for that question. It was actually a lot less. But the details are -- I don't know the exact numbers, the details are in Chapter 17.

MR. ROSENSTOCK: Again, Steve Rosenstock. Thank you. Again, because we have this history here of a generous tax credit, why wasn't that part of the analysis?

MR. FRANCO: The analysis considers the current kind of scenario of tax credits that are available. The tax credit I think you are referring to are the Federal tax credits?

MR. ROSENSTOCK: Yes.

MR. FRANCO: These are mainly utility programs.

MR. ROSENSTOCK: Okay.

MR. FRANCO: This is the range between $50 and $800.

MR. ROSENSTOCK: Okay. But, again, I guess there's a current Federal tax credit that

expires -- I'll say $200 Federal tax credit, but during the stimulus years, it was 1,000 or whatever, and it shows a significant market response to that tax credit as result of that. To not consider it, seems, again, partially incomplete.

MR. BROOKMAN: Yes, Charlie.

MR. KREBS: Got a quick one, go ahead.

Mark Krebs. Going back to that same slide that Steve was just talking about --

MR. BROOKMAN: The famous blip slide.

MR. KREBS: Yeah. Yeah. There you are. You know, you look up to about, oh, what is it, 2008 when President Obama went into office. Then you look for the next few years, and, you know, the slope changed, but really not totally. It wasn't night and day. The slope increased; it got steeper, but not that much steeper than it was from 2000 to 2008. So, again, the reason I bring this up is just let's get the raw data from AHRI, which as Frank said is forthcoming, and then we can debate this in depth if there's -- of course, there won't be any more meetings, so it's kind of a moot point.

The other point I'd like to make real quick is just another issue about discount rates. You know, what do you think 7 and 5 percent represent? Then I'll tell you what I think they represent. Do they represent average American -- what is it?

MR. CYMBALSKY: You mean 7 and 3 percent?

MR. KREBS: Seven and 3.

MR. CYMBALSKY: The OMB? These are social discount rates. So societal. But I think people are confusing what is known as hurdle rates versus discount rates.

MR. KREBS: No. No. That's not where I'm coming from. What part of society does 3 and 7 represent? The homeowners or something broader?

MR. CYMBALSKY: I think, you know, if we read the OMB Circular, we could read what they espouse about what those mean.

MR. KREBS: Well, it just so happens that I just did that.

MR. CYMBALSKY: Then you can read it for the group.

MR. KREBS: I'm not going to read the whole thing. It just goes back to that footnote 8 and that the Circular goes -- says that the DFR was based on 1992 numbers for corporate capital. You know, that was a long time ago, and we're not talking corporate capital here. We're talking average American consumers.

MR. BROOKMAN: Mark, what are you suggesting it should be?

MR. KREBS: You should run a robust range of discount rates. You know, and then we could pay a little more attention to what it really should be for this long period of time on the average for all consumers. You know, I would say 10% is probably still too low. It depends. You know, it really depends on the type of consumer. If you're up against the wall consumer, teetering on the edge of going on welfare, you know, it's infinitely higher. You know, it could be 100 percent.

MR. BROOKMAN: Jim Vershaw has a question which is, from joining us online, For RIA, does DOE include all other ongoing regulatory actions like

commercial furnaces, commercial rooftops, standby power on AC/HP's commercial fan and blowers as all affect most OEMs or a subset of those?

MR. CYMBALSKY: This is John from DOE. So that's more of an MIA question that --

MR. BROOKMAN: Which we're about to get to shortly.

MR. CYMBALSKY: That's our chief engineer fixing the light.

(Laughter.)

MR. BROOKMAN: Okay. We're going to move on.

Yes, Charlie, before we do.

MR. McCRUDDEN: So this is Charlie with ACCA. So back to slide 104 and the regulatory impact analysis. You looked at the consumer rebates and utility programs, and I think I'm guessing most of those utility programs are incenting the homeowner to go to a condensing furnace. So when we go to a condensing furnace, what happens to -- have you looked at what happens to those incentives, and then would they still essentially be effective? Or if

they're not effective, then what impact does that have on that sort of 2021 to 2050 regulatory analysis?

MR. FRANCO: Just to clarify that question, you mean after if it's kind of linear or if it decreases over time?

MR. CYMBALSKY: Let me take a stab at it. This is John from DOE. So I think what we do, and Victor will throw something at me if I'm wrong, you know, when we get to 2021, to keep that share of condensing market share that we see, we're saying that these programs still exist when we get to 2021. What happens after that clearly, we've seen it in other products like lighting, for example, when the Federal standard came in, the CFL compact fluorescent lamp rebates that were very widespread went away. What will happen here is that our standard that we're proposing keeps the good, better, best scenario for both manufacturers and people -- programs who would like to keep their rebate programs in place. They will just be rebating at the 98% maybe instead of the 90% or 92% where they may be doing it today.

MR. McCRUDDEN: Okay. I guess the assumption is the rebates will remain. In your sort of nonregulatory action --

MR. CYMBALSKY: To maintain that level of condensing.

MR. McCRUDDEN: Okay.

MR. BROOKMAN: Yes, Steve Rosenstock?

MR. ROSENSTOCK: Steve Rosenstock, Edison Electric Institute. I'll just take on speaking as somebody who's worked on a lot of DSN programs. Whenever Federal standards have gone up, utility level incentives change, and if they go up significantly, because the delta has gone down between the baseline and the higher-efficiency product, the incentives go down, and they can go down significantly because there's less energy to save. Therefore, that energy savings is less. It's worth less to the utility to save that small increment of energy.

MR. CYMBALSKY: This is John from DOE. So the utility -- since the States still have their standards in place for a lot of these regulated utilities, what they will often do is look for

opportunities to get a similar bang for the buck. Like, for example, they've switched from lighting to maybe air conditioning because now the rebate dollars that they were given for lighting, they're not getting that anymore. The standards actually took that opportunity away from them. But they still have requirements. Certain States have requirements to meet certain efficiency levels, and they have the dollars to spend to get to those levels, so they will explore new opportunities.

MR. BROOKMAN: We're about to move on to the manufacturing impact analysis. Before we do, Neal Leslie has a comment. Neal, let's try it again.

MR. LESLIE: Sorry I wasn't on before. Can you hear me now?

MR. BROOKMAN: You sound good.

MR. LESLIE: And my apologies for not being on when you called on me the first time. I was unavailable. Anyway, my question has to do with slide 80. Okay. So if slide 80 -- shows that the average LCC savings jumped from $238 without fuel switching up to $305 with fuel switching, which is

approximately 20 percent of the rule benefit accruing due to fuel switching, my first question is, is that statement a correct statement that I made?

MR. CYMBALSKY: That is correct, they are higher LCC savings. Yeah.

MR. LESLIE: So then the next thing, assuming that's true, is that I want to make sure I understand this as well, carefully, and that is, if we were to deal with what I'll call rational technology switching to the 92 percent premise, it's my understanding from your earlier discussion that those folks are deemed to be not affected by this rulemaking because that would have been considered as part of the shipment data. Am I interpreting that correctly?

MR. CYMBALSKY: In the baseline, there's a natural level of switching that occurs without any standard in place. Those are the unaffected -- those are not part of the table that you're reading here.

MR. LESLIE: Okay. And I guess we -- still an issue for me on that particular one -- I want to make very sure I'm correct on that -- that I'm

not far off in the corner here and that is that those folks who would have, without the rule, gone ahead and put in a 92-percent furnace anyway are not in the affected class --

MR. CYMBALSKY: That's correct. Correct, they're not affected.

MR. LESLIE: So, I'm sorry, I call those rational technology switches, that's what I'm categorizing them as. The other one that has given me pause was the statement about what I would call rational fuel switching and that is fuel switching that is done to avoid the higher costs of a gas furnace option and a fuel switch to, say, an electric heat pump. What I would deem to be another part of what a reasonable consumer would do absent the rule and that is to make a fuel choice away from natural gas technology toward electric technology absent the rule. And what I heard this morning was that, at least some of those are considered effective to avoid the high cost of a furnace -- I'm not sure I have that correctly.

MR. CYMBALSKY: The baseline shipments

reflect those people, so they're not part of this at all. They're choosing electricity. They're choosing electric in the baseline, so they're not part of this at all.

MR. LESLIE: Okay. So anything in which there would have been a really strong benefit to fuel switching to avoid that high cost is considered to be not affected?

MR. CYMBALSKY: Right. Because they're doing it now, and they'll continue to do that, if that in fact is true what you said. It's already reflected in the shipments.

MR. LESLIE: So then my question is, given that, how could there be positive benefits to fuel switching caused by the rule?

MR. CYMBALSKY: Because the people who --

(Simultaneous conversation.)

MR. LESLIE: A lot of people that would rationally fuel switch and a lot of those potential benefits that are not affected -- that's my --

MR. CYMBALSKY: So I guess we'll step back to let you consider these rational people who are

right now, currently today, how many people are replacing their gas furnaces with some other form of fuel in their house? What would you suggest that percentage is?

MR. LESLIE: I'd have to go back and lean on the fuel switching survey information that was provided in 2014 to get a number. I do not have it off the top of my head.

MR. CYMBALSKY: I would suggest that number is single digits if that at all frankly. So you're saying someone who . . . Let's say a household comes in, and they have, let's say, a 78%-AFUE furnace. It breaks tomorrow. Their choices are an 80%, a 90%, 92%, 95%, 98%. You're saying nationwide there's a large subset of people who will replace that gas furnace with some other form of fuel?

MR. LESLIE: So that is ultimately the question.

MR. CYMBALSKY: And I think if you look at the shipment data --

(Simultaneous conversation.)

MR. CYMBALSKY: Right. So we can look at

the shipment data and figure, you know, make some rules of thumb, but frankly that number is very, very small. Again, and people have mentioned it here today, the price of natural gas today is a how low can you go, kind of thing. But, we don't see a large level of shipments of switching. So if you have data, and, again, I pointed to that now 15-year-old AGA study that I remember seeing that talked about fuel switching. It was very helpful to look at. Switching away from gas to a different fuel currently, I don't think, is a big number. If you have information to say that it is, we'd love to have it.

And then my next point is, so we think the shipments reflect that. And what the table that you pointed to is showing, and the reason LCC gets positive is that those people who get into the situation where the venting costs are very high, if they switch to the electric, they do not lose -- you know, they are definitely cutting down whatever loss that may have been there with the high venting costs. So that's why you get that difference.

MR. LESLIE: I guess the only issue is

whether those people should be considered affected or not affected, and we'll just leave that for comments. I just wanted to make sure I understood the underlying logic and rationale for a positive LCC benefit associated with fuel switching.

MR. CYMBALSKY: Right.

MR. LESLIE: That's pretty much -- what we saw from the fuel switching survey that was done in the 2014 timeframe was that those respondents did not expect that to be a beneficial fuel switch. They expected that to be a fuel switch that was driven not in the consumer's best interest according to those that were surveyed.

From my perspective, it's probably as good as we have right now on the topic to determine whether or not you have a distinction between what people would do absent the rule and what people would do with the rule.

MR. CYMBALSKY: And so it's important what you said. So on your survey, you said that it was not in the consumers' best interest to switch. So if they're going to be worse off financially, why would

they switch? What is driving that switch then?

MR. LESLIE: There is a behavioral economics question in play here that I don't know that we want to get into here in the discussion today, but it essentially -- the behavioral economics theory allows that consumers make choices based on more than just their economic wellbeing.

The cost of becoming better off comes into play as well in their mind. You know, there are time costs. There are other perceived costs within behavior economics that drive consumers to behave in a certain way, and that is what the fuel switching survey information was intended to define. It is a very challenging issue to deal with, but it does not suggest that the end result of fuel switching was a positive thing. I'm not sure how far we want to go with this.

MR. BROOKMAN: Okay. Thank you for that.

Steve Rosenstock?

MR. ROSENSTOCK: Steve Rosenstock, Edison Electric Institute. And with all due respect, part of the reason that there's going to be positive

economic impact is number one, the installation costs or the equipment costs might be lower when they make that choice depending on their situation, depending on the contractor. Number two, it all really depends on the local rates, local gas rates versus the local electric rate. Typically electric rates are lower in the wintertime than the summertime. And if they're on a time use rate, you know, they're lower at night than during the day typically. So, therefore, the cost of heating during the coldest time period is going to be lower. And, again, and the technical support document just shows basically State by State all the different prices they were using to run the scenario. And third, you know, the heat pump technology has 8.2 HSPF or higher. If they were going not 8.5, 9 HSPF, very high efficiency technologies, then that's also lowering their costs of heating.

Thank you.

MR. BROOKMAN: Rick, do you have a comment here?

Okay. Yes, Kathryn?

MS. CLAY: Yes, I fear I'm missing

something, so I appreciate the opportunity to clarify. So if I understand correctly the discussion, a consumer who say has a non-condensing furnace today and then is able to fuel switch and so, therefore, can avoid the extra costs of reventing, et cetera, that they would otherwise have to pay by going to a condensing furnace. But that's counted as a benefit -- that their ability to avoid those venting costs is counted as a benefit. And what troubles me is, that is entirely a cost imposed by the rules. So I don't understand how avoiding a cost that is imposed by the rule can possibly be construed as a benefit?

MR. CYMBALSKY: So there's costs, but it's relative to what their other option is. So it's a lesser cost to switch the fuel than to do the venting, et cetera. So let's say the 80% furnace breaks, and I have to get a 95% furnace, and I have a difficult venting situation, and it's going to cost $7,000. Or I can do the heat pump, and it's only going to cost $5,000. There're still costs, but it's $2,000 less costs in

scenario B.

MS. CLAY: But that choice scenario is entirely caused by the rule. If it were not for the -- so the proper way to evaluate whether the consumer is better off or worse off is, what choices could they have made if not for the rule? And if it would be more economical to replace their furnace with a non-condensing furnace, that's the -- that's the number you should be comparing to, not the avoided costs because they didn't purchase a condensing.

MR. deLASKI: What if non-condensing is not available because the standard has made it not available?

MS. CLAY: But that's what I'm saying. We're counting a benefit here, but it's a circle. We're saying that because the rule is making it expensive for that person to replace -- making it expensive because they've got to replace a non-condensing with condensing. If they can fuel switch and not pay that higher cost that's been forced on them by the rule, it does -- you can't count that as a credit. You can't say, well, I

jacked the prices up, but then I gave you a discount, so you ended up with a net benefit.

MR. deLASKI: The question is, what this is, is an electrical cost analysis. Right. So the question is, is the electrical cost lower than it would have been in the base case?

MS. CLAY: No, that's right.

MR. deLASKI: That's what this analysis is evaluating.

MS. CLAY: It's what it should be evaluating, but I think I heard that's not what it's evaluating. It should be comparing the cost of that consumer who replaced their condensing with a non-condensing furnace to that consumer who then went to an electric heat pump or other choice and then had higher energy costs associated with that.

MR. BROOKMAN: John.

MR. CYMBALSKY: That's exactly what we do. So the base case is without the standard, and everything here is the cost differential relative to what you just described.

MS. CLAY: So, again, I think I must have

misunderstood because I thought that I heard that you were counting the benefits a consumer would receive, quote/unquote benefits of avoiding the costs of reventing.

MR. CYMBALSKY: It is cheaper in that scenario, and so, yes, there's less cost.

MS. CLAY: But you shouldn't be comparing it to the scenario that is artificially constructed by the rule. It should be what the consumer actually does versus what they would have done in absence of the rule.

MS. ARMSTRONG: This is Ashley from DOE. So that's the difference between the with switching and without switching scenarios, right? Because you will see a higher estimated impact for if they had to do these really hard installations with high cost of the venting versus if you compare the delta between those two, is what are you seeing it get cheaper for the consumer. Both are compared to the base case, the base case of them buying a new non-condensing furnace. So we're doing exactly what you said. We've done multiple scenarios though, one that takes into

account all these different venting situations and one that takes into account all these different venting situations as well as the fuel switching.

MS. CLAY: Again, I think I have to try to understand -- the way it's being presented, it sounds very illogical. It sounds like the argument is, because this could have imposed greater harm, we're going to count that as the lack of greater harm as a benefit which just defies logic.

MR. FRANCO: Hi, this is Victor Franco. I just wanted to point out a number that might clarify a little bit your questions. So, you see, the percentage or fraction of people impacted, it doesn't actually vary between the two scenarios. So people are still impacted. As John and Ashley have pointed out, they're impacted less compared to again purchasing that 80 percent AFUE, if the standard wasn't a higher efficiency. It's always compared to them choosing being able to do what they can do in the base case -- installing an 80 percent --

MR. BROOKMAN: Ashley.

MS. ARMSTRONG: So there is a cost. It's

not just calculating benefits without the cost. There is a cost. But what we're saying is, that cost is different if you consider fuel switching versus if you don't.

MR. BROOKMAN: Mark Krebs. I want to move on to MIA pretty quick here.

MR. KREBS: I'll make it quick. Actually, not that I understand where these numbers come from, but I am seeing, you know, an obvious economic benefit from switching in these numbers on the chart. And that might explain questions that we have had of DOE going back to the preliminary spreadsheets, you know, when I think it was a question 1A that had this complicated table that compared 2011 determinations with the present determinations. And, you know, so like in the case of a 90-percent furnace, national all installations average life-cycle savings went from $87 to $236. So maybe, and there it is $236. I don't know, it may be totally coincidental, but, you know, this just underscores some basic questions that we've been trying to get addressed and answered clearly so we understand, and we're still quite a ways

from that obviously.

But I did go to the trouble of updating the numbers from the preliminary spreadsheet values to the ones that are the most recent ones, and I brought copies to hand out. I'm going to hand them out at this time.

MR. BROOKMAN: Okay.

MR. KREBS: And if I can get it posted on regulation.gov. . . If youd pass them down that way, please.

MR. BROOKMAN: And, Mark, will you state what these are?

MR. KREBS: These compare the average life-cycle savings and various scenarios from the 2011 DFR to the present 2015 numbers that were put on the spread -- put in the spreadsheets on regulations.gov this year. So, we see in the case of a 90-percent furnace in 2011 an $87 savings and the same furnace in 2015 a $236 savings, a change of 171 percent that we'd like to understand how that happened.

MR. BROOKMAN: Okay. We're going to move on now to manufacturer impact analysis.

And we're going to hear from Chris Lau.

MR. LAU: Thank you, Doug.

My name is Christopher Lau, I'm with Navigant. I'll be presenting the manufacturer impact analysis today.

The prime purpose of the MIA is to assess the impact of amended standards on furnace manufacturers as an industry. The second purpose is to identify and qualify impacts on manufacturer subgroups such as small business manufacturers, and the final portion of the MIA involves the discussion of direct employment, potential capacity constraints, and other Federal regulations that go into effect around the compliance date of this rule.

In terms of methodology, the primary tool used is the government regulatory impact model, also known as the GRIM. It's a cash-flow model used to represent the industry as a whole. The major output of the model is the industry net present value or INPV, a metric used to quantify impacts of the standard on manufacturers.

We also conduct interviews to validate and

refine inputs to the GRIM and to better understand qualitative issues. In general, we do our analysis in three phases. In phase one, we build an industry profile from publicly-available information including Census data, SEC filings, manufacturer websites, and product listings data.

In phase two, we use public data and inputs from the engineering and shipments analyses to outline the industry in the GRIM. And in phase three, key inputs are validated with manufacturers and qualitative issues are discussed in interviews. We use this content to refine the GRIM.

I'll take a moment here to pause to address an earlier question from Goodman about the cost of capital. The discount rate used in the GRIM is based off of SEC filing data, and so in the 2011 DFR, the data would have been based off of probably data from roughly 2003 to 2008, whereas the data in this rulemaking would have been based off of data from 2007 to 2013.

That SEC filing -- from the SEC filing data, we estimate a discount rate of roughly 7 percent

which is, you know, cost of capital from manufacturers. And then through manufacturer interviews, we revise that estimate downward to the -- I think we said it was 6.4 percent in the model today.

In interviews, you know, we heard several common concerns raised across manufacturers. The key issues raised -- we identified four key issues raised by the industry. There was broad concern about installation costs in the replacement market which we've discussed at length, but in general, manufacturers want to be sure that DOE properly captured the potential range of installation costs in the replacement market. There was concern about product switching which we've just had a long discussion on. I will not rehash this right now.

There's concern about regional standards and enforcement of such, but that is not being proposed today. And there's concern about reduced product differentiation which we'll address through markups, as I'll describe shortly.

These are some of the qualitative issues

raised. There's also extensive quantitative feedback which would have been incorporated into the GRIM.

Let me talk about that model a little bit.

To model the industry, we rely on contact from several analyses we've already discussed today. That includes financial and product data from the MTA market/technology assessment, manufactured production costs from the engineering analysis, and shipments forecasts from the shipments analysis. These inputs are essentially locked-in before we run our model. To complete the model, we supplement manufacturer markups and conversion costs. For this rule, the Department modeled three different markup scenarios, and here they are.

The preservation of gross margin percentage markup scenario. Under this scenario, manufacturers maintain the same gross margin percentage before and after the standard goes into effect. This implies that the manufacturers pass through all cost compliance to their customers.

The preservation of operating profit scenario. In this scenario, manufacturers are only

able to maintain the same per-unit operating profit in absolute dollars after the standard goes into effect. This means the markup decreases after MPCs increase. In this scenario, manufacturers are not able to pass on all costs of compliance as the level of investments increase with the various trial standard levels.

The final markup strategy model was called the three tier. DOE models a good, better, best markup. As the standard level increases, we see less differentiation in the markets. Manufacturers are not able to maintain the same premium markups. As a result, premium markups erode with higher standards, and we see a drop in industry profitability.

When we run these three options, what we found was that the best case scenario or the upper bound is the first one, the gross margin scenario. And the lower bound is the three-tier market where we see this compression and loss of premium markups for the industry.

Here, we see the results. It's a fairly dense table. I suppose I could walk through it.

Here in the second row, what you see is the industry net present value both for the base case and for the five trial standard levels considered. For the standards case, you will see there's a range of values. That range is due to the markup scenarios. At the lower end, the smaller number is the INPV based on the three-tier. At the upper end, the higher number is the INPV based on the preservation of gross margin percentage scenario.

And the third row, you will see the percent change in INPV relative to the base-case value of roughly $1 billion. Also germane to the change in INPV are the change in conversion costs, both the R&D expenses, as well as the capital expenditures, and here are the total conversion costs required.

The total conversion costs come out to roughly $5 million per manufacturer. This was based on a top-down model where we took the feedback directly from manufacturer interviews. However, you know, I think this is probably the first time folks have seen both the industry value and that rough average of

$5 million per manufacturer. We would love to hear some feedback on whether that's appropriate.

MR. BROOKMAN: Frank Stanonik.

MR. STANONIK: Well, I've got a different question.

MR. BROOKMAN: Let's see if anybody -- this is just a comment on the question, manufacturers particularly reflecting on the figures that are up here that Chris was just describing.

MR. LAU: And understanding that exact figures may be hard to provide, I imagine manufacturers look to their own operations to provide a high/low, or at least a qualitative indicator.

MR. BROOKMAN: Yes, Aniruddh.

MR. ROY: Aniruddh Roy, Goodman. So this is based on the interviews also?

MR. LAU: That is correct.

MR. BROOKMAN: Yes, please, Everett. Get close to that microphone.

MR. SHOREY: Hi, this is Everett Shorey. So in the GRIM analysis that you've done, you're looking only at the furnace regulations?

MR. LAU: That is correct.

MR. SHOREY: So how do you handle the fact that manufacturers have had to redesign their furnaces for the furnace fan regulations and now have to redesign them again for the furnace regulation?

MR. LAU: Sure. So the analysis focuses on the impacts of this rule and not combined rules. However, there are two things I would like to point out. One, is in the years preceding 2019 which is the effective date of the furnace fan rule, we have a different MPC, a lower manufacturer production cost, and then the manufacturer production costs increase when the standard goes into effect. However, if you wanted to look at the combined impacts of the two rules, it would be possible to look at the drop in INPV on the furnace rule which was, and I can -- which was roughly $60 million and add that to the drop in INPV of this rule. So if we're proposing TSL three, it's roughly a drop of $80 million.

MR. SHOREY: Well, actually that's not technically correct because the drop in INPV for the furnace fan rule is based on the assumption that the

life of that rule of that change is essentially indefinite. And by turning the furnace fan rule into a rule that only lasts for about three years, you would have changed substantially the INPV in the furnace fan regulation so that you don't really have a question of looking back.

I will say that the person who first wrote the GRIM made an assumption that a regulation would last essentially forever because the next round would occur at a natural cycle. And that may have been short-sighted by the person who did that. People are laughing. The person who did that was actually me. (Laughter.)

MR. SHOREY: So the question is --

MR. LAU: To defend that person, it can be hard to forecast regulatory cycles.

MR. SHOREY: Oh, I'm well aware, but what's happened is that there's no particular way of looking back. Now to say what's the -- there's no really good way of recapturing the fact that people have made an investment and are now making an incremental investment that was not -- that didn't

particularly affect the furnace rulemaking but has changed substantially the economics of the furnace fan rulemaking. And we may get to the same thing as we go forward with the air conditioning rulemaking which may again change the indoor unit. So we may need to rethink that set of assumptions.

MR. BROOKMAN: Okay. Thank you.

MR. LAU: It's an interesting intro to the next slide, but I think there may be another comment or two out there.

MR. BROOKMAN: Yeah, let's go to John first.

MR. HURST: Yeah, John Hurst, with Lennox. Just a question. On the three scenarios, do you know what the blended markup would be for each scenario?

MR. LAU: Sure. So in the preservation of gross margin scenario, the flat markup was roughly -- it was 1.34 for non-weatherized gas furnaces and 1.27 for manufactured home furnaces.

In the preservation operating profit scenario, give me one moment.

MR. HURST: Sure.

MR. LAU: Yeah, I'll solve it over break. So for the three-tier, the good, better, best for non-weatherized gas furnaces was 1.29, 1.37, and 1.45.

MR. HURST: Yeah, just to comment. You know, you look at one of the concerns of the manufacturers would be commoditization, you look at the span of products that are out there today, the bottom end 80 percent, the top end 98, that's an 18 point AFUE spread. You compress that down to six. And so from a differentiation standpoint, yeah, you could say there's a good, better, best, but it's kind of a best, better, better-er option.

(Laughter.)

MR. HURST: There's not a lot of -- it doesn't give you a lot of marketing.

MR. LAU: Sure. Recognizing that there are a lot of factors that manufacturers use to justify premium products, among them is efficiency. What we do is we do this good, better, best. And where there are multiple levels, the lowest level was good, the top level is best and then everything in between was better.

(Simultaneous conversation.)

MR. HURST: What were the other ones, just out of curiosity?

MR. LAU: Say again?

MR. HURST: What are the other ones besides efficiency? What color of gray you can get it in?

MR. LAU: I mean, there's reputation, warranty.

MR. HURST: I understand. I'm being a little facetious.

(Laughter.)

MR. HURST: But it is very challenging because that's, unlike automobiles, these things arent sexy to drive. You can't put the top down and feel better. That's all.

Thank you.

MR. LAU: I guess where I was going, I think we tried very hard to capture that. And as the number of efficiency levels dropped, there was less and less ability to justify higher markups. In fact at 95 percent, for example, there was only room for a

good and better, there was no premium markup.

MR. BROOKMAN: Frank Stanonik?

MR. STANONIK: All right. So I'm going to get to my question. So standard level two was 90 something in the north and 80 rest of the country. And the change in INPV in that case potentially is very largely negatively, almost . . . What are those in millions of dollars, right? $22 million almost? Oh, percent. That's probably worse.

So yet when you go to trial standard level three, so potentially at that second standard level, again, looking at it somewhat simply, the manufacturer in a sense really only has to address, let's say, roughly half of his product line. Because it's 80 in the south, right?

And yet that appears to have a much larger potential negative effect on his value as opposed to trial standard level three where essentially he has certainly the potential to have to redo rough numbers, probably at last 75 percent of his line. How does that work?

MR. BROOKMAN: Mike Rivest?

MR. RIVEST: Frank, we've scratched our head, and we asked ourselves exactly that question. So really what's impacting, what's creating the impacts here are the good, better, best assumptions and the market shares of the various efficiencies after standards. Not so much the investment numbers because the investment numbers relative to the revenues are not that large compared to the other rules where I've seen investments of $400 million for a $1 billion industry. Here, we're seeing investments of $80 million for a 1.1 -- you know, for a $1 billion industry.

And if you think about the 92-percent AFUE level, a lot of the R&D has been done and given -- you know, we talked about earlier the cyclical, you know, the boom-bust nature of the production. You know, a lot of the production capacity is there. So that's why those investment numbers are not irrational. So what's driving this analysis right now is the shipments assumptions and the shipment distribution numbers. And what John was getting at earlier, you know, we're continuing to assume the

ability to do a good, better, best, and what I was hearing in this comment is, well, maybe we'll get a good, better, best, but the spread in margins won't be as good as it was. So under a different set of mark ups, for example, and looking under a different set of shipments which I think we'll be getting as well, you know, I think we'll be seeing more differentiation between a national standard and a regional standard for the impacts.

MR. BROOKMAN: Frank, keep going.

MR. STANONIK: Frank Stanonik. So, Mike, and things are clicking in. So I guess I was ignoring that standard level two in the north is 95%, which would require investment.

MR. RIVEST: There's actually not much difference on the manufacturing side from a 92% to a 95%. A lot of the incentives right now are at 95%, and if you look at the production costs, they're not much different than 92%. What's really driving investments is going to be 98% because that's a different product.

MR. LAU: But at 95%, you see that loss of

--

MR. RIVEST: But there you're losing margin.

MR. LAU: Yes.

MR. BROOKMAN: Thanks, Chris. Thanks a lot.

(Simultaneous conversation.)

MR. STANONIK: So in a sense, it is what it is, so the fact is that one of the levels that wasn't looked at was 92% in the north and 80% in the south. We would have probably seen -- just at least on this slide, we probably would have seen a change in net present value more like either one or three?

MR. RIVEST: More like the 92s, you know.

MR. STANONIK: Okay.

MR. RIVEST: But, you know, it's based on those stated assumptions and the shipments which, you know, we all need to look at.

MR. BROOKMAN: Okay. Mike, thanks, that was helpful.

Chris, keep going.

MR. LAU: Let's see. So here you can see DOE proposes TSL three. It did consider -- the

notice does say DOE strongly considered TSL four. Contributing to the selection of TSL three is cumulative regulatory burden and, in particular, the overlap of the furnace fans rule on the residential furnaces rule.

What's unique about such circumstance for this rulemaking is that both rules take effect at a similar timeframe, 2019 and 2021. The rules impact design and manufacture of essentially the same product, and as DOE understands it, the cost of the two rules are additive with little overlap. And so you're basically adding on -- you're combining the variable cost increase and variable costs, as well as increases in conversion costs.

Here, we see the impacts of the two rules. Impacts with TSL four, impacts with TSL three, and impacts from the furnace fan rule. What we see here is the effective year, the incremental MPC, and then the industry conversion costs. I guess Id like to start by asking the industry whether that's a good assumption, the costs are largely additive? I think I saw some heads nodding earlier, and I see them

again. So, DOE's assumption there was good.

MR. BROOKMAN: Just for the record, I only see one head nodding.

(Laughter.)

PARTICIPANT: I see two.

MR. BROOKMAN: Okay. Okay. Good. Thanks for that silent confirmation.

MR. STANONIK: Frank Stanonik. I mean, fan efficiency is clearly looking primarily at the efficiency of the blower fan combination, or motor blower combination which is primarily an electrical consumption, and this really doesn't have a huge effect on the AFUE. So, yeah, that's pretty separate.

MS. ARMSTRONG: This is Ashley from DOE. I think that's true. I think one of the issues that we teed up in the NOPR specifically that we asked for comment on was, is there any possible synergy? So would there be one round of testing? Would there be one round of marketing material changes? I mean, are there things that doing these things together or roughly at the same time would actually be helpful?

Well, some of the costs and some of the design differences may be separate in terms of the investments. Are there other things in terms of conversion costs that would actually be done together?

MR. BROOKMAN: John?

MR. HODGES: There are synergies, but don't accelerate the timing.

(Laughter.)

MR. BROOKMAN: Well, thanks for the comment though.

Helpful. Okay. Any additional comments on potential synergies or confirmations?

(No response.)

MR. BROOKMAN: Okay. We're going to move on.

MR. LAU: Sure. We also looked at the small business impact of the standard. DOE identified three domestic small business manufacturers of covered product, one of which was a manufacturer of non-weatherized gas furnaces, and two which were manufacturers of mobile home gas furnaces.

DOE notes that the small non-weatherized gas furnace manufacturer sells a condensing product today; however, it does not have the same number or proportion of offerings as large competitors. The small mobile home furnace manufacturers, both of them, neither offer -- do not offer a condensing product today and probably need to undertake a development effort to remain in the market.

We can invite comment on the number, potential impacts, and severity of impacts on these affected manufacturers.

MR. ROSENSTOCK: Steve Rosenstock, EEI, and again I'm looking through the NOPR. I was wondering, where was the estimated -- the impact on domestic employment? Which table was that in the NOPR?

MR. LAU: So it would be in section five, B(2), I believe.

MR. ROSENSTOCK: B(2)?

(Pause.)

MR. ROSENSTOCK: No, it's not there.

MR. BROOKMAN: We'll look it up.

MR. LAU: At the high level, roughly

there's some small increase in employment due to increased labor content at the high end. And then at the low end, there's -- what we've seen is a trend of production moving overseas from some manufacturers. We extend that trend out.

MR. ROSENSTOCK: So your impact is a negative domestic employment impact?

MR. LAU: Right. There's a range of very negative to slight gain.

MR. ROSENSTOCK: Okay. I just wanted to see what that range was. Thank you.

MR. HURST: A question to follow up on that. Is that -- yeah, John Hurst, with Lennox, I'm sorry. Is that assembly, or is that componentry as well?

MR. LAU: What we take into account is direct production labor of the folks with a compliance burden, so it's just the manufacturers.

MR. HURST: Okay.

MR. LAU: So it's basically everyone who touches a product.

MR. HURST: Thank you.

MR. BROOKMAN: Steve, go ahead.

MR. ROSENSTOCK: Steve Rosenstock, I found it. It's Table V-20, and it says, potential changes, domestic production workers in 2020 for TSL three, negative 2,692 to 210. So basically as many as 2,692 job losses in the U.S. in 2020.

MR. LAU: That would be the lower --

MR. ROSENSTOCK: The worst case.

MR. LAU: -- half --

(Simultaneous conversation.)

MR. ROSENSTOCK: And in the best case, there might be a 210 increase at the best case?

MR. LAU: That's correct.

MR. ROSENSTOCK: Thank you.

MR. LAU: Okay. Next is the results from the standby mode. And we looked at standby mode standards independent of the AFUE mode standard. On the whole, the standby impacts are small relative to the active mode standard, but we took into account the engineering costs adders, conversion costs, and changes in markups. However, we did not think that there would necessarily be shipment changes given

that the cost adders were $1 to $10 per unit. And so as you can see, the impacts are much, much smaller than for the active mode standard.

But we put that in here for completeness sake.

MR. BROOKMAN: Yes, Andrew deLaski?

MR. deLASKI: So I just want to confirm that for the manufactured impact analysis, the analysis is looking at the net present value of the furnace division of these companies?

MR. LAU: That's correct.

MR. deLASKI: Okay. Thank you.

MR. BROOKMAN: Dave, comment? Nope, Okay.

Okay. Yes. We're moving to the environmental employment and addition --

MR. LAU: We have one more question in the back.

MR. BROOKMAN: Yes, please, Rick.

MR. MURPHY: (Off microphone.)

MR. BROOKMAN: Start again, Rick.

MR. MURPHY: Rick Murphy, AGA. Chris, you had indicated you looked at a number of factors that

were previously raised, one of which was installed costs in the manufacturer impact analysis. How did that come into play?

MR. LAU: It actually comes into play through the shipments. So one of the things -- what it was, it was a key issue that manufacturers raised in interviews that they asked DOE to consider. And so as you may recall, Victor went through an extensive discussion of all the different venting types and installation costs that were considered. So those factors affected the shipments analysis and consumer choices of what they purchased, and that flows into our model in terms of what is bought and how that affects manufacturer revenue.

MR. MURPHY: Okay. So in the lifecycle cost analysis that Victor went through, we had a lot of discussion about costs of equipment at the retail level and costs of installation at the retail level. And we had a discussion as to how did that bottoms-up approach come up with a number? How is that reconciled, or is there reasonable test to see what's actually playing out in the market?

Did you look at that? Because I believe the answer to that back in the discussion was that there is nothing that is done right now to do a reasonableness test --

MR. LAU: Right. In order to make the analyses consistent, we used the exact same shipments forecast as is used in the NIA. So we don't do anything -- we do not use a different -- we don't use different factors or different installation costs than were considered previously.

MR. MURPHY: And I guess just one last question if I could. John and Ashley mentioned at the last meeting that we are trying to get more information from the field as to what we're seeing as far as equipment costs and installation costs. If we're able to provide that information to you, how will that actually be used in your work going forward?

MS. ARMSTRONG: We would welcome any data or information that you or any other stakeholder could provide to help inform our analysis. So we would take it and look at our analysis and revise if

necessary and as appropriate. So we would appreciate it.

MR. BROOKMAN: So that was Ashley, and we have a comment or a question from Terry Small online. We have found that a $6 cost increase going from PSC to improved PSC is ridiculous, especially where a BPM motor is required for a conditioned or a conditional MHGF for furnace fan compliance regarding slide 113.

MS. ARMSTRONG: All right. Thank you.

MR. BROOKMAN: Thanks for your comment, Terry.

MS. ARMSTRONG: Yeah, if he wants to comment in more detail, especially when he sends in his written comments and/or through a confidential nature since it has to do with specific costs, we would welcome feedback on those costs.

MR. BROOKMAN: Okay. And everybody, I think knows how to execute an NDA through Navigant.

Frank Stanonik?

MR. STANONIK: Frank Stanonik, pretty quick question for DOE. Particularly with the GRIM

model, and going back to the meeting we had about your analytical tools, and you mentioned certain things are locked, would it be possible for us to get a copy that would allow us and our consultants to perhaps put in some different values for some of the locked things?

MR. BROOKMAN: Ashley Armstrong?

MS. ARMSTRONG: So this is Ashley from DOE. We'll take the request under advisement and get back to you with a yes or a no. I think DOE's position has been in the past that currently while the GRIM has some locked cells, it doesn't have any hidden cells, so you can actually see the equations that are being implemented, you know. It's very transparent in nature. They are locked for a reason, because the model only works to calculate certain types of cash flow and different scenarios. And if you were to change things and put different shipments, then it wouldn't necessarily be the GRIM as DOE has created it and function in the same matter. It could confuse things. So that's one of the reasons we do lock certain cells, but we keep them -- we make sure

that they're unhidden so you can see everything and to provide transparency, and all of our equations are outlined in the TSD. So we'll take it under advisement and get back to you.

MR. CYMBALSKY: And to follow on, this is John from DOE. We'd be happy to do different scenarios for you, so if you would like to provide different numbers for those cells, we will run them for you. In fact, the locked cell prevents that from happening.

MR. BROOKMAN: Okay. Thank you. Thanks, John.

Then we're going to move on to the next segment. Victor Franco.

MR. CYMBALSKY: We're going to forego lunch for an early dismissal for cherry blossom viewing for those of you who are from out of town.

MR. BROOKMAN: At a peak right now.

MR. FRANCO: This is Victor Franco again. I'll be going through the environmental/employment analysis.

First we do the emissions analysis. This is in Chapter 13, the details. The purpose of the

emission analysis is to estimate the emissions reductions resulting from amended standards. It includes full-fuel-cycle emissions, including power plant and upstream emissions. It includes fugitive methane emissions.

The method for determining these emission factors is using the output from the AEO 2014 reference and standard cases to assess marginal emission factors. The results for this analysis you will find in further detail in Chapter 13, but here are the results for TSL three for both the AFUE and standby and off mode.

MR. BROOKMAN: Steve Rosenstock?

MR. ROSENSTOCK: Steve Rosenstock. Some people probably wish they had gone to lunch now when I'm about to start talking here. There's significant problems with this analysis, especially where it's showing increase in emissions. When I've looked at the impact, that's assuming that there's increase from emissions on electric generation side from the estimated electric increases from fuel switching. This just really just goes against everything that's

happened. On the institute side, emissions have been regulated since 1990 under the Clean Air Act.

And the data that I got from our environmental folks, electric use since 1990 to 2013 has gone up 35 percent. SO2 emissions absolute, not per kilowatt hour or megawatt hour, but the absolute SO2 emissions have gone down 80 percent. Even last year with the polar vortex and some utilities having to use oil rather than gas, emissions went down for SO2 NOX, and CO2 nationally last year even with the polar vortex.

Looking at mercury, the MATS rule goes into effect on Thursday. A lot of utilities have already put in controls on mercury. I've seen data, basically mercury emissions from an NRDC document. Mercury emissions for power plants decreased 51 percent since 2000, and according to the environmental folks I talked to, most of the plants have already been retrofitted. Some are going to be retrofitted as of April next year. Then there's a power plant retirement. The environmental people told me that by next year, mercury emissions from power

plants are going to go down another 80 percent from this year -- from last year's level.

So when I see these numbers about, quote, increasing in emissions, it's just -- I see what they're doing in the analysis, but it's totally ignoring the environmental regulations, the actual impacts.

Now, you might say, well, wait a minute, what if there is an increase? Well, when I look at the numbers in here, and I'm seeing the potential, they're saying that, well, there might be an increase in power plant capacity. That's in the utility impact analysis in Chapter 15. I'm seeing numbers like, you know, that there's going to be an increase of 50 megawatts in coal-fired power plant capacity by 2050, and that's just insane. That's not going to happen. Coal plants are closing right and left, and this analysis assumes there's going to be 50 megawatts of new coal-fired generation in the U.S. as relative to this standard. It's not going to happen.

MR. CYMBALSKY: So your point is well taken on what's trending. Those trends will be

picked up both in the baseline and the standards case. What we're trying to do here is just show that all else is equal. And I mean, polar vortexes and all that kind of good stuff, if you add -- and I'm going to make up a number here, two million electric heating devices versus not having those two million heating devices. And everything else is the same. Then you will have -- if you burn one lump of coal more in that case, you will have greater SO2 emissions. That's a fact regardless of what is going on in the trend in both of those cases. Your point is well taken, but what we're looking at here is just the difference in case A that has more electric heating devices than case B that doesn't. And so all else is equal. The trends that you see with coal plants closing et cetera, et cetera, are in both of those cases, so, that's just a fact. As for the number of coal plants being built, is that an artifact of the AEO or is that security --

PARTICIPANT: This comes from everything --

MR. CYMBALSKY: SO that's what they're

building in the 2014 baseline. I know someone mentioned at the break that the AEO will be released tomorrow, I believe, 2015, so we will pick up -- you know, to the extent that those trends change based on some other things that you've talked about, we will pick them up in the next round of analysis. But it still remains the fact that if you add two million electric heating devices, all else equal, there is going to be some coal generated at this point in time to meet that extra demand.

MR. ROSENSTOCK: Steve Rosenstock, EEI. Now it's getting in the weeds of . . . well, it depends on which region of the country you're in and what is the generation. And in terms of marginal generation, if you look at some of the FERC or EIA data, for example, in terms of "marginal," they put out something today in Energy a little while ago saying that about 13,000 megawatts of coal plants are going to be retired this year, and the increase is going to be 9,800 of wind, 2,200 of solar, 1122 in nuclear, 471 of other renewables, and 4318 of gas. I mean, it just --

MR. CYMBALSKY: Are you saying no baseline capacity will be used at all to service these extra furnaces that we have in our standards case?

MR. ROSENSTOCK: No, I'm saying that the base-load capacity is changing quite rapidly, and of that base load capacity, they all have controls to minimize their production of either SO2 or mercury.

MR. BROOKMAN: Steve, those details would be especially helpful on your written comments.

MR. ROSENSTOCK: Okay.

MR. BROOKMAN: Okay. Thank you.

MR. FRANCO: Thank you so much. So let's move on to the monetization of the emission reductions. So based on the emission results from Chapter 13 and Chapter 15, we provide the monetization of emissions. The purpose of this is to estimate the monetary benefits of reduced emissions resulting from a proposed energy conservation standard.

The method used is using the social cost of carbon values as determined by interagency reviews. The social cost of carbon is intended to be a

monetary measure of incremental damages resulting from greenhouse gas emissions including, but not limited to agriculture production losses, human health effects, property damage from rising sea levels, and changes in ecosystem.

The interagency estimates are provided as part of the TSD Chapter Appendices 14A and 14B. The values for the emissions are provided here, and they're calculated in those reports.

DOE also estimated NOX emission reductions resulting from the amended standards, and the values are provided here as well.

DOE is still evaluating appropriate values to use for monetized avoided SO2 and mercury emissions.

MR. BROOKMAN: Jim?

MR. MOORE: Jim Moore. We would like the last bullet point to consider actual cost from trading markets. If you look at the EUC, the REGI program, the California program, the voluntary programs, they are all way lower than those numbers there. They tend to be in the single digits. And

we'd encourage you to look to markets for pricing as opposed to the societal cost of carbon. Thank you.

MR. BROOKMAN: Thanks, Jim. Steve Rosenstock?

MR. ROSENSTOCK: On your slide for the NOX values, you say an OMB Report to Congress 2006, and as I remember in that report that was -- I looked in the technical support document that's on the emissions impact not the monetization, but I believe that report kind of looked at the studies from 1990 through like 2004 in terms of what the estimate was. So I was wondering, is DOE going to lock in with those numbers from 20 years ago, or is DOE ever going to try to look at maybe reanalyzing those numbers to update them for 2015 maybe?

MR. FRANCO: Definitely. If any input comes in that we could revise those values, definitely, DOE will definitely consider that.

These are the results for the monetized emission reductions. Again, DOE is proposing TSL three. The values presented here are for CO2 and NOX at 3 percent and 7 percent discount rates.

DOE seeks input on the approach of collecting emissions analysis. DOE seeks input on the approach for estimating the monetary benefits associated with the emission reductions.

MR. BROOKMAN: Comments on these two requests?

(No response.)

MR. BROOKMAN: Okay.

MR. FRANCO: In Chapter 15, DOE presents the utility impact analysis. The purpose is to assess the impacts on the electric installed capacity and generation resulting from the adoption of potential energy conservation standards.

The method is to model energy savings impacts for each TSL using AEO 2014 to generate the forecasts that deviate from the AEO referenced case.

The results are changes in total electricity generation, changes in the mix of electricity generation by fuel type, and changes in total installed capacity.

The full description of this is available in Chapter 15, as well as the results.

MR. BROOKMAN: Steve.

MR. ROSENSTOCK: Steve Rosenstock, Edison Electric Institute. It's a gas furnace standard, and I was wondering why Chapter 15 doesn't talk about the impact on gas utilities upstream?

MR. FRANCO: This is just looking in terms of the utility of electricity.

MR. ROSENSTOCK: What about the utility of the gas or the propane? That's a primary impact of this standard.

(Simultaneous conversation.)

MR. BROOKMAN: Mark. Mark, please.

MR. KREBS: You know, way back when at the table, you know, when they were setting up EPCA, you know, I don't think AGA was quite as vociferous as they could have been, you know, so maybe that explains why they still today when they do utility impact analysis don't consider gas utilities.

MR. BROOKMAN: Okay. Final comments on utility impact analysis?

Jim?

MR. MOORE: Yeah, Jim Moore, Laclede. We

believe there will be a substantial impact on gas -- (off microphone) --

MR. BROOKMAN: Jim, apparently it's not on.

MR. MOORE: Sorry, I thought I had turned it on. I apologize. It's Jim Moore from Laclede. And we believe that there will be a substantial impact, especially in the south due to electric switching on gas utilities in particular, and we would like to see that addressed.

Additionally, I've done a lot of looking at marginal rates, and we believe that the AEO data grossly overestimates the marginal price for gas and electric, and I'm hoping to see it fixed tomorrow in the AEO 2015, but I have my doubts. I look back to 1998, and they've consistently, almost every year, underestimated electric rates and overestimated gas rates for the past ten years. So I'm hoping they'll fix it, but I have my doubts, and I would like to see DOE consider true marginal prices when they do this rulemaking. Thank you.

MR. BROOKMAN: Okay. Thank you.

MR. FRANCO: Thank you. The last part of

the analysis is in Chapter 16, where we consider indirect employment impact analysis. The purpose of this is to assess the overall impact on indirect national employment from the proposed energy conservation standards, which results from shifting consumer expenditure among goods and services and changing product and energy costs.

To do this, DOE used the impact of sector energy technologies, ImSET model, for the valuation of indirect employment impacts. The results of this is that DOE anticipates net labor impacts from the small over time due to small magnitude of short-term effects. See Chapter 16 of the TSD for further details.

MR. BROOKMAN: Employment impact comments?

(No response.)

MR. CYMBALSKY: Okay. So the next two slides talk about some additional research DOE has funded in the area of venting. I know it's been a big topic of conversation about the potential costs of some tricky venting situations that might exist when requiring condensing furnaces. So this slide

points out, and we had put this in the TSD, some links to some research that we've done in the area of venting. I just want to point out that this is side research and shows what could be in the future. It is not incorporated into the baseline numbers in the analysis that we presented in the last two meetings.

If you go to the next slide, so this was just some pictures of some venting solutions from M&G DuraVent that have been also looking into different potential solutions to venting strategy. So you can see, the one on the left is certainly further up along. It is a solution that is for sale now. It has been UL listed, and so basically, it's a drop-in approach to the B vents. And I'm not going to go into detail. This is just to show you that sometime in the future, it is our hope that there is a bigger market for different retrofit technologies that could go for venting and to make the venting a little less costly than what we see in our analysis today. So I'd point everybody to the documents that are listed in the previous slide.

And then finally, that's really it on

that. If there are any comments on the venting strategy, we will take them now, and then we'll move to closing remarks.

MR. BROOKMAN: Thank you. Mark.

MR. KREBS: Mark Krebs, Laclede Gas. AGA is the secretariat for I think it's the NFGC and -- and I asked them to look into this, this DuraVent thing, you know, what the status is, and I'm not going to say you're wrong, but what I will try to do is get you his analysis.

MR. CYMBALSKY: That's helpful. That's exactly what we're looking for, and that's why we threw this out here.

MR. BROOKMAN: Okay. So now Andrew deLaski?

MR. deLASKI: Yeah, we did a little looking at manufacturing websites, and these parts in many cases are already approved by the manufacturers for use with their products. So it's not in the future; it's here today. So things that are here today should be in today's analysis. So I would certainly encourage the Department in revising its

analysis to include venting technologies that are approved by UL, recommended -- not recommended, but also approved by the manufacturers for individual products should be incorporated into the main analysis to reflect the actual costs that consumers are going to face. They're going to choose a low-cost option for installation, so I think that's an update that's needed for the analysis.

MR. BROOKMAN: Okay. Frank? Yes.

MR. STANONIK: Frank Stanonik, just maybe to complete the loop on this. The complete standards process that manufacturers have to deal with, yes, they have to deal with the fuel gas code. Yes, venting systems get approved as venting systems, but there also needs to be appropriate or corresponding requirements in the appliance equipment safety standard that will be used to evaluate or determine for which venting systems the equipment will be listed. As an example, today, furnaces would be listed for use with either type B vent or stainless steel vent or PVC or so on. And so the fact that this, at least on the one slide it's been UL Listed,

that's kind of half the equation. And as far as I know, we won't have the other part yet where the equipment standards would recognize this system and then also have that coverage that says, this appliance can be installed on a venTing system that looks like this. There's more to be done. It's not fully there.

MR. BROOKMAN: Mark?

MR. KREBS: One short comment on that. What that AGA briefing essentially concluded is, yeah, this new DuraVent stuff, you know, it can be installed, but it basically has to be done on a case-by-case approval basis. I think that's a fair summary of the status of it. And like I said, I'll try to get that to you for the record.

MR. BROOKMAN: Okay. Thanks for doing that.

So I think Andrew deLaski?

MR. deLASKI: I'll circle back with you, Frank, but my recollection of that, I've seen the DuraVent material approved by individual manufacturers, you know, in their literature. So I

need to understand what that means. So maybe you and I need to circle back off-line.

MR. BROOKMAN: Okay. Now, we wish to receive any final comments. Oh, Ashley has a comment before we go there.

MS. ARMSTRONG: So I just want to bring up one issue that was brought up at the last public meeting with regards to the engineering, just to let you know kind of what's coming.

We had some questions with regards to how the aggregated manufacturing production costs were generated -- specifically some additional questions about the cost model -- and we had previously described generally how we got the cost in terms of the aggregated MPCs in great detail, and obviously that's well documented in the TSD. You know, they're based generally at a high level on physical teardowns. Then we use the manufacturing cost model. We've aggregated MPCs, and we've gone through the manufacturing interview process to go through individual costs with the manufacturers themselves. We've gotten feedback on those costs, component

costs, material costs. We've incorporated that into our analysis. We've aggregated it up, so we do intend -- there was a request for some additional information and if DOE could provide some additional information underlying those aggregated MPCs. So DOE does intend to place in the docket specifically in response to those stakeholder requests some additional info regarding the major subassemblies and how they break down with regards to the manufacturing production costs. We're also going to place a couple of slides that kind of walk through that, so you'll see that in the docket as well as the key material prices. And obviously all that, as well as all the other aspects of our engineering analysis, is open for comment, and we would actually welcome your comment on it.

So I just wanted to highlight that so you can note to go to the docket. We'll send out an email blast to let you know it's available, and that will be there for you to look at.

MR. BROOKMAN: Okay. Thank you.

Closing remarks. Aniruddh?

MR. ROY: Aniruddh Roy, Goodman. So I have a question on the engineering analysis. If you can go back to slide 19.

MR. BROOKMAN: Nineteen?

MR. ROY: Yeah.

(Laughter.)

PARTICIPANT: What are you doing?

MR. ROY: I had to do some of my homework after the initial public meeting.

PARTICIPANT: I put all my stuff away.

(Laughter.)

(Pause.)

MR. ROY: So while they're pulling up the slide, I'll just brief everyone on what's going on. So the assumption here for non-weatherized gas furnace is that the combustion system type will be a two-stage as a baseline, whereas in Chapter 5, Table 5.4.3 specifies the baseline being a single-stage equipment. And then eventually, a cost adder of $34.72 is being added to move from a single-stage to two-stage. There is also a statement in the TSD which says, following the 2014 furnace fan rulemaking, in

2019, all non-weatherized gas furnace units will be required to include multistage operation in addition to higher-efficiency blower motors. For this reason, DOE included the $34.72 cost adder to change from a single-stage to a two-stage.

Now, the question I have is that when you did the test procedure NOPR, there was a statement made by Ingersoll Rand saying that the two-stage operation will be affected based on the test procedure improvements. So it looks to me in the engineering analysis, single-stage is the only one that has been tested, and then the $34.72 has been applied as a cost adder. So, I guess, has DOE evaluated the impact of the new test procedure on a two-stage? That's the first question.

The second question being -- is that we feel that the furnace fan rulemaking can be adhered to by manufacturers using single-stage equipment. So my question is, why was the assumption made that only multi-stage operation can meet the 2019 levels?

MS. ARMSTRONG: So this is Ashley from DOE. I'm going to address the first part, and then

Adam is going to address the second part. With regards to the test procedure, DOE did do some testing with regard to the potential impact on the proposed changes to the test procedure. DOE did talk about that at the test procedure public meeting, and I think, in an aggregate form, DOE found that the ratings would not change. We came to a conclusion or at least a tentative conclusion that the ratings -- the AFUE ratings if they still existed would still be valid under all of the proposed changes that we were making. Some manufacturers commented with respect to that, so obviously, we welcome your data. The data that we have shows in an aggregated fashion that those rating remain valid.

MR. BROOKMAN: Adam.

MR. DARLINGTON: This is Adam Darlington from Navigant. So as to your question about the assumptions in the engineering, basically what we started from was what was done in the furnace fan rule. So in the furnace fan rule, the assumptions there were that to meet that standard, manufacturer would have to implement two-stage designs and X-13 fan

motors, basically. So when we started out looking at the analysis, you know, we did teardowns of single-stage, two-stage, fully-modulating, ECMs, you know, full-modulating ECMs, X-13s, PSCs, and everything in between. And so we did all these combinations, and basically, what we had in our baseline initially was that single-stage PSC that's in the TSD. And then we looked at the cost differential for what was going to happen from the furnace fans rule and just sort of added on so it's considered in the analysis.

Now, if you're going to be able to meet the furnace fans rule with a single-stage, that would be excellent information to know. And certainly we would welcome those types of comments so we could revise the assumptions about what's going to happen, but we were just going off of what was done in the furnace fans rule for what they would assume would need to be done to meet that standard.

MR. BROOKMAN: Okay. Now, let's take closing remarks.

Summary remarks here as we move towards closure. Please Kathryn.

MS. CLAY: Thank you. This is Kathryn Clay with the American Gas Association. I wanted to take the opportunity as we conclude our many hours of discussion to thank the Department for taking the time to not only hold a public hearing but extend it for this amount of time to give adequate opportunity for all of our questions and to cover all of the material.

I have to say I'm in some ways very encouraged. I think we've made some very positive steps in our conversation. Some of the things in particular that I've heard as a response to some of the questions we put to you include major new topics on the table like the impact on low-income consumers, like better transparency on the manufacturer costs and the ability to get transparency there through greater aggregation to protect proprietary information, and also I've been encouraged, although this is not within the Department's purview, but the encouraging signs that we may be seeing better shipment data. That gives us a better sense of the condensing and non-condensing markets. So I think very, very

encouraging things have come out of these two days that we've all spent together.

And I think that we are moving towards that more open, transparent process that, you know, is so valuable. So just appreciation for that.

I have been -- I want to say though that I believe we're still in a dialogue. We've gotten those issues on the table, but they're big ones. They're complicated. We're going to need some time to iterate with you to understand how you put those forward and to give you some honest feedback on how things could be improved. I'll just touch briefly on the conversation we had earlier about the lifecycle cost benefits from fuel switching and the fact that in the analysis the Department has presented, those become positive.

I have a gut feeling that it's just a mismatch of -- that the kind of analysis, it's a valid analysis, but perhaps not in this context. I'm thinking of the way that, you know, in accounting you might enter your revenue and your liabilities and it turns out to be a wash. I feel like there might be

something there going on.

But if we take a step back and think about that one, at the moment if we leave that analysis as it stands, we end up with the perverse result that actually the more fuel switching that occurs under this rule, the more cost beneficial this rule becomes. And I think we all agree that that is not at all the intention of this rule -- to move people away from natural gas.

That says to me that there's a structural problem with the analysis, but I think that it's something that we can address together by finding the appropriate way to capture those fuel-cycle impacts. And given the responsiveness that you all have shown on these other major issues, I'm confident that we can keep working together in a positive way.

Having said all that, and I'm going to say this as an informal request and reiterate what I had said at the previous public hearing, I really think we're going to need more time on the comment period. And I will go back and check with my membership, but I believe that you will be receiving a more formal

request from AGA to extend the comment period given these new issues that we've identified together and the need to address them adequately.

Thank you very much.

MR. BROOKMAN: Thank you. Additional comments here in closing. Frank -- pardon me, Mark.

MR. KREBS: I urge everybody to review the Process Improvement Rule, particularly Part G, to use transparent and robust analytical methods. I'm going to read this real short part of it. "The Department seeks to use qualitative and quantitative analytical methods that are fully documented for the public and that produce results that can be explained and reproduced so that the analytical underpinnings for policy decisions on standards are as sound and well-accepted as possible." Well, that sets a really high bar for the Department, and it's a lofty goal. I'm not sure that we're exactly headed in that direction, however, you know, and I think there are some clear alternatives to all this that it would help us cut to the chase that ought to be seriously considered.

You know, when I talked about it last time, I talked about just going with that rough simple payback criteria, you know, and getting away from all this controversy of life-cycle costs, because, let's face it, it's hard to predict the future.

The other thing that I want to bring up in closing is that in every rule, every NOPR, there's a section in the back where DOE has to jump through all these different Executive Orders and things that you know, we really didn't touch on in this series of meetings. But one in particular, Executive Order 12866, tells Federal agencies to look at all these different alternatives and all -- you know, all these different impacts, and, you know, in there, I guess even, you know, you could probably -- the Secretary could read into that that it also includes looking at carbon emissions. But the last part of the last sentence, it says, "to include the alternative of not regulating." Okay. And that's why we want to look at the shipment data, you know, to see if the markets had merit in that trajectory, you know. Do we really need this rule? And, you know, you're required by

Executive Order 12866 subchapter 1A to do it and, you know, I realize it's pretty much anathema for a regulator to not regulate, but nevertheless, that's what this Executive Order calls for.

MR. BROOKMAN: Okay. Frank, do you have comments? Oh, I thought you did.

John Cymbalsky, please.

MR. CYMBALSKY: This isn't my closing remark, but I just wanted to address that we spent, I think, a good half hour talking about the regulatory impact analysis which included what you said. So, one of our favorite Executive Orders is 12866. I can tell you that flat out. But we did. However, your point is well taken. I think once the AHRI data come in, obviously, we will revise those analyses that are part of the 12866 mandate.

MR. BROOKMAN: Yes, Charlie?

MR. McCRUDDEN: This is Charlie with ACCA. One of my disappointments in looking at some of this stuff was that there was no outreach to contractors specifically. And I don't know if it's a PRA [Paperwork Reduction Act] issue. I don't know if it's an antitrust

issue, but to me, the fact is that there was no outreach to contractors specifically on a rule that does not only impact contractors, but also impacts how the products would be installed by those contractors. So maybe that's something that we can work on in the future, but to me, that's a real deficiency here.

MR. BROOKMAN: Okay. Final comments?

(No response.)

MR. BROOKMAN: So then I'm going to turn it back to John Cymbalsky, and for my part, I thank all of you. I think we really covered a lot of ground and very constructive comments across the board. John Cymbalsky.

MR. CYMBALSKY: Thanks, Doug. And thanks everyone for participating in these two days of public meetings on this topic. I think we've all learned that this rule is complicated, analytically and otherwise. But I think from what we've heard from stakeholders and what I do believe to be true, I think DOE has been very, very open and transparent about all of its analytical processes, and we continue to get as transparent as possible. I mean, that is

definitely a goal of ours. The more data we make available, and the more data we get in response to that, the better the rule. So we're going to continue down that path. But, again, the comment period I believe is June 10th currently, and I understand we'll get an extension request. So we'll consider that if and when that comes in, but let's all keep June 10th in mind until you hear otherwise, and please provide the data and comments as you see fit.

If you're traveling, travel safe. If not, you have the afternoon. It's nice out. Go out and see the cherry blossoms, full bloom. I believe I'll be strolling over there myself.

So thanks again.

MR. BROOKMAN: Thank you all.

(Whereupon, at 1:19 p.m., the meeting was adjourned.)

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