UNITED STATES OF AMERICA

DEPARTMENT OF ENERGY

U.S. DEPARTMENT OF ENERGY
PUBLIC MEETING ON ENERGY CONSERVATION STANDARD
SUPPLEMENTARY ANALYSES FOR DISTRIBUTION TRANSFORMERS

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

Wednesday
June 20, 2012

Facilitator:

James Raba
U.S. Department of Energy

Participants Identified:

Tim Ballo
Earthjustice
1625 Massachusetts Avenue
Suite 702
Washington, DC 20036

Robert Berman
Berman Economics
1915 Grand Court
Vienna, VA 22182

Dr. Edwin Brush
BBF & Associates
154 West 2nd Street, No. 219
Boston, MA 02127

John Caskey
Electrical Manufacturers Association
1300 North 17TH Street, Suite 1752
Rosslyn, VA 22209

Greg Coulter
GE Prolec
2030 Yellowstone Drive
Fort Mill, SC 29707

Andrew deLaski
Appliance Standards Awareness Project
16 Cohasset Street
Boston, MA 02131

Chuck Foster
Edison Electric Institute
Foster & Jamison
410 Rosedale Court
Warrenton, VA 20187

Carlos Gaytan
Prolec GE International
S.de R.L. de C.V.
Blvd. Carlos Salinas de Gortari
Km. 9.25 Apodaca, N.L. 66600
Mexico

Steve Griffith
National Electrical Manufacturers Association
1300 North 17TH Street, Suite 1752
Rosslyn, VA 22209

Bruce Hirsch
Baltimore Gas and Electric
1068 North Front Street, Room 300
Baltimore, MD 21202

Alex Hoffman
American Public Power Association
1875 Connecticut Avenue, NW, Suite 1200
Washington, DC 20009

Gerald Hodge
Howard Industries, Inc.
PO Box 1588
Laurel, MS 39441

Richard Lyke
AK Steel Corporation
705 Curtis Street
Middletown, OH 45043

Aaron Meyers
Cooper Power Systems
1900 East North Street, M/S 1CC
Waukesha, WI 53188

Jerry Corkran
Cooper Power Systems
1900 East North Street
Waukesha, WI 53188

Steve Nadel
American Council for an Energy-Efficient Economy
529 14th Street N.W., Suite 600
Washington, DC 20045

Wes Patterson
Navigant Consultant
2705 Scottsdale Lane
Raleigh, NC 27613

Ray Polinski
ATI Allegheny Ludlum
585 Silicon Drive
Leechburg, PA 15656

Steven Rosenstock
Edison Electric Institute
701 Pennsylvania Avenue, NW
Washington, DC 20004

Bob Saint
National Rural Electric Cooperative Association
4301 Wilson Boulevard, SS9-204
Arlington, VA 22203

Mahesh P. Sampat
EMS International Consulting Inc.
1180 Brookview Drive
Athens, GA 30606

Bob Smith
Federal Pacific
601 Old Airport Road
Bristol, VA 24201

Meili Sohl
Edison Electric Institute
701 Pennsylvania Avenue, NW
Washington, DC 20004

Webinar Participants (Identified):

Alan Traut
Power Partners
200 Newton Bridge Road
Athens, GA 30607

Alan Wilkes
Wilks Consulting
1049 Valley Road
Dyersburg, TN 38024

Ali Ghaforian
ERMCO, Inc.

1040 Scott Terrace
Athens, GA 30606

Andrew Swisher
Engineering
7300 Fenwick Lane
Westminster, CA 92683

Antonio Trujillo
Cooper Power Systems
1900 North Street
Waukeshau, WI 53188

Bikash Basu
Distribution Apparatus
7300 Fenwick Lane, Room 169
Westminster, CA 92683

Brian Kaja
General Electric
7000 West Bert Kouns Industrial Loop
Shreveport, LA   71129

Carl Bush
PEMCO Corporation
P.O. Box 1319
Bluefield, VA 24605

Charles Drexler
Kentucky Association of Electric Cooperatives
4515 Bishop Lane
Louisville, KY 40220

Charles Simmons
Progress Energy
1418 Mechanical Boulevard
Garner, NC 27529

Craig DeRouen
ERMCO
2225 Industrial Road
Dyersburg, TN 38024

Daniel Peterson
Central Moloney, Inc.

P.O. Box 6608
Pine Bluff, AR 71611

David Lis
Northeast Energy Efficiency Partnerships
91 Hartwell Avenue
Lexington, MA 02421

Makoto Shinohara
Hitachi
46-1 Tomioka
Tainai-shi, Japan 9592608

Dave Millure
Metglas Inc.
440 Allied Drive
Conway, SC 29526

Demetrios Thanasoulis
National Grid
175 Hicksville, NY 11801

Dong Kim
Engineering
1 Innovation Way
Pomona, CA 91768

Ebrima Cham
Consolidated Edison
1601 Bronxdale Avenue
Bronx, NY 10462

Eduardo Robles
Engineering
4100 Rio Bravo Suite 211
El Paso, TX 79902

Edward Varnado
IID Energy
333 East Barioni Boulevard
Imperial, CA 92251

Eric Petersen
AK Steel Corporation
705 Curtis Street

Middletown, OH 45053

Ishmael Leon
Prolec GE
Carlos Salinas de Gortari
Mexico 66600

James Rakowski
ATI Allegheny Ludlum
1300 Pacific Avenue
Natrona Heights, PA 15065

Jerry Allen
Metglas, Inc.
440 Allied Drive
Conway, SC 29526

Jerry Schoen
AK Steel Corporation
705 Curtis Street
Middletown, OH 45043

John Oates
LIPA
175 East Old Country Road
Hicksville, NY 11801

Joseph Rempe
Tacoma Power
3628 South 35th Street
Tacoma, WA 98409

Justin Rush
Westar Energy
4001 NE 14th
Topeka, KS 66612

Katie
Katie Coughlin
Lawrence Berkeley National Laboratory
MS 90-4000
Berkeley, CA 94729

Kenneth Winder
Moon Lake Electric Association, Inc.

800 West U.S. Highway 40
Roosevelt, UT 84066

Kevin Oehlmann
Consolidated Edison
4 Irving Place
New York City, New York 10003

Linda Wilson
NYS Office of the Attorney General
120 Broadway
New York, NY 10271

Paul Ryan
HMA-Metglas
800 Grand Avenue
Carlsbad, CA 92008

Paul Sturgiou
Consolidated Edison
1601 Bronxdale Avenue
Bronx, NY 10462

Philip Hopkinson
HVOLT, Inc.
3704 High Ridge Road
Charlotte, NC 28270

Ray Harlow
Young & Company
530 South Marengo Avenue
Pasadena, CA 91101

Richard Lyke
AK Steel Corporation
705 Curtis Street
Middletown, OH 45043

Rob Carmichael
Navigant Consulting
1900 M Street
Washington, DC 20036

Robert Van Buskirk
U.S. Department of Energy

1000 Independence Avenue, SW
Washington, DC 20585

Robin Roy
Natural Resources Defense Council
1152 15th Street
Washington, DC 20005

Seth Blumen
SRP
P.O. Box 52025
Phoenix, AZ 85072

Susmitha Tarlapally
ABB
500W Highway 94
Jefferson City, MO 65109

Tamara Johnson
Springfield Utility Board
P.O. Box 300
Springfield, OR 97477

Tom Petrosino
TRP Consulting
1917 Park Road
Charlotte, NC 28203

Wilton Cedeno
Consolidated Edison
4 Irving Place
New York, NY 10003

ConEd

Participants from DOE:

John Cymbalsky
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Alan Strasser
U.S. Department of Energy
1000 Independence Avenue, SW

Washington, DC 20585
James Raba
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Participants from Navigant Consulting and Lawrence Berkeley National Laboratory:

Brian Coffey
Navigant Consulting
1900 M Street
Washington, DC 20036

Mike Rivest
Navigant Consulting
1900 M Street
Washington, DC 20036

Matthew Nardotti
Navigant Consulting
1900 M Street
Washington, DC 20036

Chris Bolduc
Lawrence Berkley National Laboratory
1 Cyclotron Rd
M/S 90-4000
Berkeley, CA 94720

Greg Rosenquist
Lawrence Berkley National Laboratory
1 Cyclotron Rd
M/S 90-4000
Berkeley, CA 94720

Pamela Costello
Navigant Consulting
1900 M Street
Washington, DC 20036

Presenters:

Brian Coffey
Navigant Consulting

Chris Bolduc
Lawrence Berkley National Laboratory

AGENDA

9:13 a.m.

P R O C E E D I N G S

MR. RABA: Let's get started. Please take your seats. Good morning everyone. Welcome to the Department of Energy's Public Meeting, whether you're in person or via the Webinar. This is the U.S. Department of Energy's Public Meeting about the Supplementary Analysis for Liquid Immersed Distribution Transformers. Today is Wednesday, June 20th, the first day of summer, here in the Forrestal Building, Washington, D.C.

My name is Jim Raba, Department of Energy. I will be the facilitator for today. So good to see you this morning. I'm glad you could make it here on time for an early start in the day. We have some opening remarks from our presiding officer, John Cymbalsky.

MR. CYMBALSKY: Thanks, Jim. Welcome everybody to the liquid immersed distribution transformer meeting. The title is very important here because that is the only focus of today's meeting. Today we are not here to talk about any other topics relating to transformers. We have not revised analysis into the final rule. This is just supplementary work that we undertook based on comment, and based on what we talked about during the negotiated rulemaking back last fall. We wanted to separate out some product classes and just take a look at the numbers, so that is our focus today. I appreciate the fact that people in the room might have other things to say about transformers and they submitted comments to our proposal. We are currently reviewing those comments so please don't feel the need that you need to repeat comments that are not pertaining to this exact topic. We'd like to keep on point here, keep the meeting focused and, you know, we have several hours for this, but we'd like to keep it on focus.

Also I'd like to help with the Webinar, I think we finally figured out our technical issues, and what that came to be is that we were leaving microphones turned on when we're not using them, and so when a voice on the phone came off the speakers it went into the microphone and caused feedback for the people on the phone, on the Webinar. So I would ask everybody, if you're not speaking into your microphone, please switch it off, including the stand mics in the back. There's an on/off switch. If you come up to speak in the mics on the stands, you switch it up to speak and then please when you're done, switch it off and then this way everyone on the phone can hear without feedback. At the last couple meetings it worked very well when we all adhered to this policy.

With that, back to Jim, and again, thank you all for coming.

MR. RABA: I may be repeating some of what John said, but very helpful of course to keep us all on the same methodology, the same process. But today we're going to focus on whether certain types of liquid immersed distribution transformers that are currently part of the same equipment classes warrant separation, to be separate into separate, distinct equipment classes. For example, where pole and pad mounted distribution transformers from the same equipment class, would they be more appropriately evaluated as separate equipment classes? And similarly, we'll address the appropriateness of evaluating network and vault-based liquid immersed distribution transformers as separate equipment classes.

I recall on February 10, 2012, Notice of Proposed Rulemaking, and during the February 23rd public meeting, DOE asked for comments and whether certain types of liquid immersed distribution transformers should be separate, distinct equipment classes. A number of interested parties submitted comments to support such an approach for pole and pad-mounted liquid immersed distribution transformers. In addition, they urged DOE to separate the equipment classes for network and vault-based distribution transformers with basic impulse rating levels of 200 kilovolts or more.

And since that time, our experts at Lawrence Berkeley National Laboratory, Navigant Consulting have prepared a supplemental analysis of trial efficiency standard levels that include life cycle cost and payback period analysis for each separate class of liquid immersed distribution transformers.]

So today's discussion, as John pointed out, will focus on that analysis. There's been no modifications or analysis for dry type distribution transformers because of the purpose and the focus of today's public meeting. So we want to hear from you, your comments, recommendations, data, and information.

So, we traditionally start off with introductions around the room, and then followed by introductions from those who are joining us via the Webinar. I'm going to start to my left. Turn your microphone on before speaking, state your name and organization. Speak loud and clear and turn your microphone off when you finish speaking.

Self-introductions

MR. LYKE: I'm Richard Lyke, I'm representing AK Steel Corporation.

MR. BERMAN: Robert Berman, Berman Economics.

MR. GAYTAN: I'm Carlos Gaytan, Prolec GE.

MR. COULTER: Greg Coulter, GE Prolec.

MR. POLINSKI: Ray Polinski, ATI Allegheny Ludlum.

MR. SAINT: Bob Saint, representing the National Rural Electric Cooperative Association, NRECA.

MR. HIRSCH: Bruce Hirsch, Baltimore Gas and Electric, representing the Edison Electric Institute

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

MR. HODGE: Gerry Hodge from Howard Industry.

MR. deLASKI: Andrew deLaski, Appliance Standards Awareness Project.

MR. CASKEY: John Caskey, National

Electrical Manufacturers Association.
MR. STRASSER: Alan Strasser, Department of Energy.
MR. CYMBALSKY: John Cymbalsky, DOE.
MR. SAMPAT: Mahesh Sampat, EMS Consulting.
MR. GRIFFITH: Steve Griffith, National Electrical Manufacturers Association.
MR. BRUSH: Ned Brush, consultant to the Copper Development Association.
MR. PATTERSON: Wes Patterson, consultant for Navigant.
MR. FOSTER: John Foster representing Edison Electric Institute.
MS. SOHL: Meili Sohl, representing Edison Electric Institute.
MR. RABA: Check to see if that microphone is on, please. Thank you.
MR. ROSENQUIST: Greg Rosenquist, Lawrence Berkeley National Laboratory.
MR. BALLO: Tim Ballo with Earth Justice.
MR. RABA: In the back here.
MR. BOLDUC: Chris Bolduc, Lawrence Berkeley National Laboratory.
MR. RIVEST: Mike Rivest, Navigant

Consulting.

MR. COFFEY: Brian Coffey, Navigant Consulting.

MR. NARDOTTI: Matt Nardotti, Navigant Consulting.

MR. RABA: Over here, yes.

MR. MEYERS: Aaron Meyers, Cooper Power.

MR. RABA: Welcome. Welcome. We welcome everyone now -- now for those who are on the webinar, there are a couple ways to provide questions and comment, but first of all, if you would raise your hands to introduce yourselves. Okay, nothing? Is there anybody on the phone at this time? Okay. No one on the phone now. There are a couple ways to do this --

PARTICIPANT: Jim, I think we have a technical difficulty. I know there are people that are on the phone that couldn't maybe respond.

MR. RABA: Right. Via the phone, indicate you'd like to provide a question or comment by raising your hand in the "Go to Meeting" software. The moderator will be notified that your hand is raised. Once called upon, say your name and organization, and speak loud and clear. Does that help? Also you could gain access via the "Go to

Meeting." Use the question window and go to meeting and submit a question that will be related to the moderator. If you're providing a lengthy question, you're asked by the organizer to ask your question via the phone, if we can get it to work. The function is best reserved for long, technical issues.

We're writing things down now, those who can't see the room. This again -- those who are participating on the phone via the webinar, welcome. We have quite a lot of people here. I'll go top to bottom. Alan Traut, Alan Wilkes, Antonio Trujillo, Carl Bush, Charles Drexler, Charles Simmons, Daniel Peterson, Dave Millure, Demetrios Thanasoulis, Dong Kim, Ebrima Cham , Eric Peterson, Ishmael Leon, James Rakowski, Jerry Allen, Katie Coughlin, Kevin Oehlmann, Linda Wilson, Paul Sturgiou, Phil Hopkinson, Rob Carmichael, Robert Van Buskirk, Robin Roy, Tom Petrosino, and Wilton Cedeno .

Hands raised, first hand I see raised is Antonio Trujillo. The phone should work.

MR. TRUJILLO: I just wanted to make sure that you can hear us.

MR. RABA: Oh, good. That's great. Good, you were right on cue, sir, thank you. Okay. Other hands raised, Linda Wilson.

MS. WILSON: You just asked if anyone was on the phone, so I said yes.

MR. RABA: Thank you. Perfect. And James Rakowski's hand is raised. Are you there sir?

MR. RAKOWSKI: Okay. I'm just trying to make sure.

MR. RABA: Okay. We can hear you. Thank you. I think we've got it worked out. So okay, I think we've solved the phone logistics. Thank you very much for your patience there in webinar land. It may be a good idea, when you do speak, turn your phone on, not speaking, turn your phone on mute to drown any other feedback that might get in the system.

Agenda Review

So, you all received a packet of information as you came in the door. I'll refer to that packet. There's an agenda. There is also a copy of the proposed rulemaking, or the Notice of Public Meeting for this, and also the slides for today's presentation.

I'll start by briefly going over the agenda. From this agenda, after this, we'll have our experts from Lawrence Berkeley National

Laboratory and Navigant Consulting give presentations on the supplemental analysis -- it's in your packet of information -- after which we'll entertain comments and discussion. Somewhere in here we'll take a break around 10:30 or so this morning for a coffee break. There's lots of opportunity for discussion about the trial standard levels, life cycle cost and payback period analysis and more.

We're scheduled to finish up today about one o'clock, so I think, not wanting to truncate the opportunity for comment and discussion, so we'll go efficiently and rapidly forward. We'll just see how long it takes for us to do this, otherwise if about twelve o'clock or so, or 12:30, we still have a fair piece to go, we'll pause for lunch, return and go back at it.

But so far, this is our agenda lineup, you can see it on your screen also at home. Are there any questions about the agenda, or comments? I see none at this point, hear none also. Okay.

So, I'd ask for your consideration. Many of you are familiar with this process. Please speak one at a time. You have to turn the microphone on to speak. Each time, please say your name for the record, and I'll be cuing individuals by name as best I can so you know who's in the queue. We'll also encourage any follow-on comments. The back and forth between individuals is sometimes very helpful to the Department as it's sorting through what to do with all this commentary. So please keep the focus here, turn you cell phones to silent mode if you would, please. Limit sidebar conversations. If you can, try to be concise, there's a lot to be said.

Having read the PowerPoint slides last night, a lot of content here, so let's see if we can keep it focused on the analysis today. I must say if we're as disciplined in the discussion today as you were in introductions, then it bodes well for us, I think.

So I'd like to proceed with the presentation slides. Brian, would you start us off, please. Brian Coffey, Navigant Consulting.

Regulatory History

MR. COFFEY: Can everybody hear me okay? I think some yes's and some no's. Yes's? Great. So good morning. Brian Coffey with Navigant Consulting. First, let's take a quick review of the rulemaking history. EPCA 2005 set standards for low voltage dry type transformers at the NEMA TP1 2002 level. In October of 2007, DOE issued a final rule establishing standards for both liquid immersed and medium voltage dry type transformers. DOE was sued on that rule relating to issues of environmental compliance, and that suit was settled. As a result of that settlement agreement, compliance was required in 2010 on the original schedule with standards established in that 2007 rule.

However, DOE agreed to an expedited timeline to determine whether or not to amend standards for liquid immersed and medium voltage dry type transformers. So along those lines, DOE publishes a Notice of Proposed Rulemaking in February of this year, which I'm sure everybody has seen, and then the final rule after that must be published by October 1, 2012 according to that settlement agreement.

So here's a timeline of the major rulemaking events. We had our first look at the analysis in 2011, and a NOPR in February of this year. The final rule publishes on October 1st with compliance required in January 2016.

So what brings us here today? In response to the NOPR, several parties submitted written comments supporting new equipment classes for liquid immersed distribution transformers. So this would include, potentially, pole mounted transformers, network and vault-based transformers, and those with BIL ratings of 200 kV. In response to that, DOE is providing supplementary analysis -- has provided supplementary analysis with several new trial standard levels and new equipment classes relating to those TSLs. And this is for liquid immersed transformers only.

The new TSLs which are lettered A through D. The original TSLs had numbers and the new ones have letters, just so everyone can distinguish. The new ones provide separate standards for pole mounted, network and vault-based, and 200 kV BIL-rated transformers.

I want to be clear that this supplementary analysis was conducted with the NOPR data and tools, so it's not any kind of pre-final rule work, it's an extension of what was done before. And just to reiterate, no modifications have been made to any of the dry type classes, low voltage dry or medium voltage dry are the same.

Added Liquid-Immersed Equipment Classes

So now let me take you through those additional equipment classes and TSLs. There's some judgment involved in dividing a covered product scope into equipment classes, and DOE does it to maximize energy savings, maintain equipment utility, and minimize regulatory complexity. In this case, DOE saw strong stakeholder support for new liquid immersed equipment classes, including those for pole mounted transformers, network and vault-based transformers, and those with BIL ratings of 200 kV. So let me discuss those last two first.

Network and vault-based transformers are generally located in underground concrete vaults in dense urban areas where construction work can be done only at great cost. These units are generally built in the stacked core configuration, where H0 is really the best grade of steel that's used. DOE understands that a very large fraction of these units are already being built with H0, and so manufacturers simply can't use the next grade up of steel to avoid size increases. You know, if you're not at the top grade and you really can't get bigger or to do so would be of great cost, then you can hop up to a new steel grade and it's expensive, but you've saved yourself the hassle of digging up the vault and replacing the whole thing. But if everybody is already at the top grade of steel, then that trick can't be played any more. So, depending on how much wiggle room there is in the vault, higher standards could mean very expensive vault replacements that would far outweigh the benefit of any energy savings obtained.

DOE believes that the market size by KVA for network and vault transformers is more or less five percent, but that's something that DOE would like comment on.

Moving to 200 kV BIL-rated transformers == yes, question?

MR. COULTER: This is Greg Coulter with GE Prolec. Can we ask or make comments as you talk, or are we going to wait to the end?

MR. COFFEY: No, as we go is great.

MR. COULTER: When you talk about network and vaults, we noticed that there was only a three-phase category for them. There are network and vault single phase transformers, and we thought there ought to be a similar single phase category.

MR. COFFEY: So I'll go through the equipment class structure. There is a single phase category.

MR. COULTER: For network and vaults?

MR. COFFEY: Yes.

MR. COULTER: We just didn’t see that in the thing that came out. Okay.

MR. COFFEY: I’ll go through the details of that in a second. But to continue with 200 kV BIL-rated transformers. So basic impulse level is a measure of transformers’ resistance to very high voltage transients, which would often come from, say, a lightning strike. The more protection a transformer has, the more difficult it is, difficult and costly, to pursue higher efficiency. Although in the past DOE has kept all liquid immersed BIL ratings together in a single equipment class, further increases will push the highest protection levels, the highest BIL ratings up into the steep portion of the cost curve, where the energy savings are less justifiable.

There is some precedence in doing this. DOE already does so with medium voltage dry type transformers. And DOE believes that the market size for these 200 kV BIL-rated units is about one percent by kV, but again, comment would be appreciated. Yes, please.

MR. COULTER: This is Greg Coulter again. 200 BIL represents almost nothing in the marketplace for these size transformers. Maybe a quarter of one percent is more than generous. Maybe less than 200 total transformers a year might be generous. We think that break is at 150 kV BIL. 200 BIL is meaningless in this size transformer. You need -- a big change happens when we have to go to 150 BIL, and we think that's where the big changeover comes, where it makes it very different for us to meet some of these efficiency ratings. It's not 200 BIL. We could care less. I think the majority of people in the room would care less about it. If it was 200 BIL you might as well not have it. You've either got to make it meaningful or take it out entirely.

MR. COFFEY: That's helpful. Thank you. Do you have a sense, offhand -- I'm putting you on the spot here -- but do you have a sense offhand of what the market size would be by KVA if the line were drawn at 150? Do you have a gut instinct?

MR. COULTER: Yeah, my guess is it's around three to four percent.

MR. COFFEY: Okay. Thank you.

MR. deLASKI: This is Andrew deLaski from the Appliance Standards Awareness Project, as a follow on for Greg. So Greg, just to help us understand, is there a bright line -- do you have products at 150 and products at 200? Is there a space in between or is that -- you sell 150 or you sell 200, but you don't sell 175s?

MR. COULTER: Simple answer is you're exactly right. The breaks are 95, 125, 150, and 200.

MR. deLASKI: Okay. So there is no in-between?

MR. COULTER: There is no in-between. And there's essentially no 200, so, you know, we're big -- 150 at least you get some volume, and 200 there's essentially no volume. In a good year, going back ten years ago, we might have sold 200 units as an industry of 200 BIL. That was a very good year.

MR. deLASKI: Right. Another follow on. We, in our comments, and in our response to the NOPR, and I guess you're aware, you know, we suggested that the levels that were proposed by the Department didn't really merit any separation of product classes for lower BIL -- for higher BIL products for poles or vaults. We thought that the proposal was of such modest improvement that the changes didn't need special treatment. So I guess my question for you is, at what level does it become apparent to you that you would -- that it becomes challenging to built a high -- to even build a high

BIL over 150? In the levels that have been evaluated by the Department, is it at level one, level two, level three? Please use efficiency level because the TSLs, you know, we'll get all lost in that.

MR. COULTER: There isn't an easy answer to that. But what we definitely see is a major shift, a major shift in the way we make product and the price of product, and the ability to meet the efficiency levels, when you get to the 150 BIL level. Certainly, at some of these efficiency levels we have talked about here, you're out of where you can really compete with a silicon steel. You've really pushed it into an amorphous category. I mean, can we make them? Yeah. We make amorphous. We do it all the time, and we can handle it. The point is, you're not competitive with silicon steel. And that's -- that's the criteria we were going by.

MR. deLASKI: Okay. For this three to four percent of the market that is 150 or greater.

MR. COULTER: Right.

MR. deLASKI: Okay. Great. Thanks.

MR. COFFEY: So thank you, that's helpful. This is precisely what this meeting is for, is to get feedback on the equipment classes, how they're defined and the TSLs that accompany them. Yes, please.

MR. MEYERS: Aaron Meyers, Cooper Power. Andrew, to answer your question more specifically, it's less than five percent that are greater than 150 and above, from essentially last year's shipment data for Cooper, and for 200 kV it's like a tenth of a percent.

MR. deLASKI: Your numbers are pretty similar to Greg's.

MR. MEYERS: Supporting Greg's comment earlier, 200 kV is essentially nothing, and it's less than five percent for 150 and above. And that's on a per unit basis.

MR. COFFEY: Okay. Well, great. Let me take you through the new equipment class structure. Here you can see -- here we're showing how the new equipment class structure relates to the old. You have the old on the left. In the past, it was simple. There is equipment class one for single phase, and equipment class two for three phase. And now on the right, each of these equipment classes is subdivided into the letters A, B, C, and D. One thing to note is that 1A and 2A are the classes for anything that doesn't meet the definition of something else, so it’s a catch-all. It’s not -- in the analysis that was published on line, we initially had gotten into the habit of referring to them as pad-mounted transformers, but we realize that there could be other units here and there that maybe aren’t thought of as traditional pad-mount units, per se. So this is sort of the -- 1A and 2A is the default class.

1B and 2B are specifically for pole mounted units, overhead poles. And 1C and 2C are for network and vaults, one and three phase. And then 1D and 2D are for the 200 kV units.

MR. ROSENSTOCK: Steve Rosenstock, EEI. But based on the testimony, you might -- these could change, correct?

MR. COFFEY: They could.

MR. ROSENSTOCK: Thank you.

MR. COFFEY: That’s what today is for, is to receive feedback on that.

MR. RABA: Brian, we have a hand raised from Alan Wilkes. Alan, go ahead, please.

MR. WILKES: I would like to be unmuted on my internet.

MR. RABA: You’re on, sir.

MR. WILKES: Yes, I’d like to be unmuted.

MR. RABA: You're on.

MR. WILKES: Thank you.

MR. CYMBALSKY: No, no. Only if he has a question will he be unmated. Do you have a question?

MR. RABA: Do you have a question, Mr. Wilkes?

MR. WILKES: No, not at this present time.

MR. CYMBALSKY: So, Mr. Wilkes, you will be unmuted only if you have a question, otherwise, all the phones will be muted until there is a question. So if you have a question, raise your hand and we'll unmute you, okay?

MR. WILKES: Thank you.

MR. COFFEY: So now let's take a look at what we have for representative units. Two tables. Left hand table is single phase, and the right hand, three. Equipment classes 1B and 2A, so that's the right column in the left table and the left column in the right table, those each have two design lines which makes the scaling simple, because one can simply choose ELs for each design line independently, and then fit the line in logarithmic space for a smooth, straightforward, and self-consistent standard.

Equipment class 1A, that's on the far left, only has a single representative unit, so there are a few more decisions to be made there, which I'll talk through. And then finally, equipment class 2B. So these are the three-phase pole mounts, and it's DOE's understanding that the vast majority of three-phase pole mounted transformers are constructed by triplexing three single phase cores. So, really it's like three single phase units in one housing. And if that's true, then it follows that the transformers should be as efficient as each of its constituent cores, only at three times the power level.

And so DOE, in equipment class 2B, DOE shows here that the equipment class 2B standards begin scaling from the single phase pole mounts in 1B, where there are two design lines and a little bit more robust analysis. Yes, please.

MR. ROSENSTOCK: Steve Rosenstock, Edison Electric Institute. In terms of the three-phase pole mount, 750 to 2500, it says scaled -- it says scaled from this slide, and then the following slide. I guess one -- and again, I appreciate this information, but it seems like at least in the information that we've received so far we have no way of knowing kind of where that falls in terms of the various ELs. So we’re kind of -- it’s kind of opaque. It says it’s scaled, but we have no idea, does that really kind of correspond to an EL1, or an EL2 or an EL3, or what numbers are we talking about there? I couldn’t find any information about where those numbers actually lie in the information that was sent out by DOE. It just says scaled, and then there’s an overall analysis, but I couldn’t -- I couldn’t find it, maybe I wasn’t looking in the right place. Where do those numbers fall, I say in terms of the ELs?

MR. COFFEY: Sure. I have some tables that I’m going to present that may answer that question, but I can say, just for your own intuition, the three phase poles are going to have the same efficiency standard as the one phase pole with the same -- I’m sorry, one-third the KVA rating. So a single phase pole at 100 KVA, would receive the same standard as a three phase pole at 300 KVA, and that’s because the way that they’re most commonly built is to just put three single phase 100 KVA cores in one housing. But we’ll look at the TSL charts.

MR. RABA: Brian, one more thing too, we

have a hand raised from Mr. Antonio Trujillo on the phone. Mr. Trujillo, you're live, go ahead please.

MR. TRUJILLO: My questions is, just the example that you described, is that only for poles? Is it going to be different for pads?

MR. COFFEY: That's right.

MR. TRUJILLO: Okay. Thank you.

MR. CASKEY: John Caskey, NEMA. And looking at the original NOPR from February 10th I think it is, and in there you had various design lines, like, for example, design line one was liquid immersed single phase rectangular tank, ten to 167 KVA range, and then you have a representative sample there. Do those DLs relate at all to the DLs in the most recent additional analysis?

MR. COFFEY: They do. That's a good point. So the ELs are the same for all the design lines. Again, this is an extension of the NOPR analysis, and so all of the ELs and TSLs that existed in the NOPR exist in this analysis, they haven't changed. The only thing that DOE has done is added new TSLs using the existing ELs and gave them letters A through D.

MR. CASKEY: I'm not sure I asked the question correctly. What I'm looking up here where you have the DL1 for 1A which goes from 10 KVA up to 833 KVA, how does that definition of that DL1 relate to the definition of DL1 that's in the NOPR published February 10th.

MR. COFFEY: So the design line itself is exactly the same. What's different is how it's being scaled to derive standards for equipment classes. And previously, that table that you're looking at on the left, all three of those rep units were in a single class because we didn't have poles and pads and networks and vaults. But now, we've got two design lines in the 1B equipment class for pole mounts, and only one rep unit in the 1A class for everything else. And so as you'll see, I'll describe that you need to make some decisions about how you're going to scale that unit. How can we use the information for all three design lines to construct an appropriate standard.

MR. CASKEY: Okay. So just to make sure I understand. So basically the DLs from the February 10th NOPR and the DLs in this additional analysis are the same, and the definition of the ELs and the efficiency levels are the same but the scaling may throw them off in some areas?

MR. COFFEY: That's right.

MR. CASKEY: Okay. Thanks.

Trial Standard Levels

MR. COFFEY: So now let's talk about TSLs. DOE has added four new trial standard levels to cover these equipment classes, and they're lettered A through D. And just to refresh everybody's memory, TSLs are sets of standards that DOE chooses from when proposing a standard and when actually setting one. And what it does is, for each equipment class, chooses ELs, packages them up, and then that becomes a TSL. So some of the TSLs, you can see in the chart here, which ELs go with which equipment class and design line. And so there will be some overlap, right, so a single EL can exist in multiple TSLs. Yes, please.

MR. ROSENSTOCK: Steve Rosenstock, Edison Electric Institute. In the Notice of Proposed Rulemaking there were seven TSLs and now there's four more, so basically since it is a final rule stage, basically all 11 are in play, correct?

MR. COFFEY: That's correct.

MR. ROSENSTOCK: And there could be other TSLs if you do any other analysis, correct?

MR. COFFEY: There's -- that's theoretically possible, but --

MR. ROSENSTOCK: We could suggest alternative TSLs in our comments, correct?

MR. COFFEY: Sure, yes.

MR. ROSENSTOCK: Would they be considered?

MR. COFFEY: Yes.

MR. ROSENSTOCK: Thank you.

MR. deLASKI: As a follow on to that --

MR. RABA: Andrew deLaski.

MR. deLASKI: Thank you. My recollection, and I think the Department's been pretty clear in both this NOPR and other NOPRs for other products that the TSLs are options that are considered. They are at the level of the analyses, but as we saw with the transformer rule in 2007, they sometimes can define a rule that might be in between those levels, so that is a -- the levels are, depending on the input from stakeholders in large part, and how the analysis comes out -- so that's my recollection of how things work. Brian's nodding so I think that was --

MR. COFFEY: It's a fair summary, thank you.

MR. ROSENSTOCK: And again, as another summary -- Steve Rosenstock, EEI -- there were levels in the 2007 rule, I'll say levels one through five, I think one through five, one through six, and when you did the final rule, you kind of mixed and matched based on the one phase, three phase and it turned out to be levels two, three, or four, four and a half, depending on the type of transformer and whether it was pad or pole mounted, single or three phase. So, you know, you mixed and matched last time, so it’s kind of -- again, just for a reference, that’s what happened last time, that you mixed and matched between different levels, basically.

MR. deLASKI: And that four and a half was an in-between level. Thank you.

MR. COFFEY: Okay. And so of course to make a cluttered slide even more cluttered here is, for each design line and TSL, the corresponding EL efficiency value, losses in watts, and then implied percentage loss reduction from the baseline. So in the rightmost column you see sort of what that block corresponds to, ELs, efficiencies, losses, and then percentage reductions depending on how you find it most intuitive to think about.

MR. RABA: Steve Rosenstock, go ahead please.

MR. ROSENSTOCK: Steve Rosenstock, EEI.

On the losses, is that the total losses at the specified testing level? I guess it was -- liquid filled I guess it was 50 percent -- is that the estimated losses at the 50 percent loading?

MR. COFFEY: That’s right.

MR. ROSENSTOCK: Thank you.

MR. BERMAN: Robert Berman, Berman Economics. Just a request, at the end of the presentation, can you make these types of tables available on the web at much higher resolution so those of us with glasses --

MR. RABA: Yes, we will do that, definitely.

PARTICIPANT: Speak into the mic please.

MR. BERMAN: So those of us with glasses can read them.

MR. COFFEY: Yes, absolutely. Thank you. We’ll try to make sure that everything is legible and in the event that something isn’t, I can absolutely provide a higher res table.

(Comment off microphone)

MR. COFFEY: So there’s a lot of information here, but I think it should be in your handouts if you’d like to spend some more time with it, and next we’ll discuss how these ELs are scaled from each design line to become a fully fledged set of standards.

Scaling

Just to review, trial standard levels or TSLs include efficiency levels only for DOE's representative units. To derive standards for the rest of the scope of coverage, DOE does what is called scaling analysis. Most of our equipment classes have at least two representative units for which, as I noted, a standard is constructed by fitting a straight line along a logarithmic space. So you pick an EL for each one and two points give you a line, and then that's a standard.

But in the cases of equipment classes having only a single point, there are a couple of options. Just to recap. DOE uses two scaling points for classes 1B, 2A and 2B. Those each have two points, so it's easy to derive a line. Class 1A, which is the single phase catch all class, has only one scaling point, and that's at design line one. And so now we'll look at where the different options for deriving a standard for that equipment class.

PARTICIPANT: Brian, just to clarify, the handouts have it --

MR. COFFEY: The handouts, I should say, I think 1A and 2A may be switched.

PARTICIPANT: Okay. So the presentation is correct, but the handout has a typo, just to be clear.

MR. COFFEY: Thank you. And a copy of this presentation will be posted on DOE's website, so don't worry about making all the annotations or anything like that. This will be sent out in its current form.

I think all of this is best discussed using an example. What we're looking at here is a plot of loss versus KVA, and they're both logarithmic for equipment classes 1A and 1B. Again, so that's single phase catch-all and single phase pole mounted. We have pole mount design lines at both 25 and 500 KVA, that's for 1B, and a pad mount design line at 50 KVA for 1A. At each of those KVAs you'll see a string of dots for each efficiency level, or EL, and because they're a little bit packed together, we also have zoom-ins at the end of each line in the corners. So it looks like there are kind of three plots on here, but actually the top left corner and the bottom right corner are just zoomed in versions of the ELs, so you can more accurately see where the crossing happens.

So how does the scaling work? Well, if we choose ELs at 25 and 500 KVA for equipment class 1B, that gives us a straight line. We can divide the line for equipment class 1A, so that's the 50 KVA class by taking an EL at 50 KVA for that design line and assuming similar physics, or a similar slope. If we assume that losses grow with KVA at the same rate, we get a line parallel to the first, that's the blue line. So again, because this is a loss plot, lower is more efficient. Fewer losses means a more efficient transformer.

So this is just TSL B which is an example, and we can see that it gives sort of a high standard at 500 KVA, maybe, just an eyeball test, maybe it's EL-2.5, so that's one outcome of this, right. And so now let's look at, well, if you found that would be high, what would be another possibility?

So now we're looking at the same plot, again equipment classes 1A and 1B, TSL B still, and the red line is identical to what we just saw, it's identical here. It runs through the same -- but the blue line that you can see, instead of being parallel, is converging with the red line at the end of DOE's scope of coverage. So at 833 KVA, these two lines meet. So it's a little bit less stringent at the higher KVAs, you can see it's running through maybe that orange circle which is about 1.5, so it's comparatively less stringent at the higher KVAs, but then if you look down at the lower KVAs, it's gotten more stringent. And DOE's understanding is that in this particular market segment, there are very, very few sales at the high KVAs. The single phase KVAs are really a very, very -- you know, let's say 250 and above, I think are a pretty small portion of the market.

So for purposes of this analysis and this discussion, we've shown all of our tables using the parallel scaling technique.

MR. RABA: Go ahead Steve.

MR. ROSENSTOCK: Steve Rosenstock, EEI. Just trying to interpret the scaling. It looks like you're trying to have the same delta in terms of loss reductions, again at 50 percent loading with your scaling, is that correct? You're attempting to do that for all of the equipment classes? You're trying to do parallel scales in terms of possible ranges of ELs?

MR. COFFEY: So I'm not sure I understand your question.

MR. ROSENSTOCK: Well, you show the parallel lines and then you show the converging ones, in terms of some of the new, I'll say the new TSLs or maybe the old ones, were you trying to keep looking at parallel numbers for all of the ELs, that you tried to prevent converging?

MR. COFFEY: Not necessarily prevent. These are just two options. You know, I framed the -- what is the task at hand here? And the task at hand is to create a standard for an equipment class that has only a single point. So if you choose an El for that point, you've defined a standard right there, but then you have a line running through it and the slope of that line can vary. And what that does is makes it comparatively more or less stringent at higher or lower KVAs.

So what I'm trying to overview here is the different ways that one might go about doing this, and one of the options is to assume similar physics as were present in the pole mounted transformers, and you have a parallel line, and another option is to have those two standards converge as you go up in KVA.

MR. ROSENSTOCK: Okay. Steve Rosenstock, EEI. So the Y axis scale -- it's a regular scale, it's not logarithmic, it's a regular scaling on the Y axis side. It says, you know, it goes from minus 2.3 to positive point three, and it says loss -- I guess I'm a little confused by that. I'm not sure what that Y axis really means at the different KVAs. One way to read it is, you know, some of the things actually increase losses, if it's above zero?

MR. COFFEY: So the axis is in the log of loss, so both axes are actually logarithmic, and that's the way that you get a straight line.

MR. ROSENSTOCK: That's a logarithmic scale on the left?

MR. COFFEY: Both of them. So the numbers are actually the result of the log themselves. So not a lot of intuitive meaning, but just to, I guess, have it there. The -- yes.

MR. RIVEST: So I struggled with this graph myself quite a bit.

MR. RABA: Mike, this is the first time.

MR. RIVEST: Oh, and I fully appreciate that. You may recall from previous conversations and from the previous rulemaking that when we analyze a specific KVA rating, like 25 KVA, and we all debate and talk about if EL1 is the right one, or EL2, or EL3. But we never had LCC results at larger KVA ratings versus smaller KVA ratings. So what we're trying to do is say, okay, what we've done a 25 KVA. If we extend it to the other KVA ratings to get the equivalent stringency, which for a manufacturer might mean the same steel, or the same construction, typical construction. So what we did in the last rulemaking is we used the .75 scaling rule, and the .75 scaling rule looks like a straight line with a slope of .75 in this one viewed this way.

The problem we got into in the last rulemaking is that we picked an EL for one KVA rating, another EL for another KVA rating and then had to fit a line through it and try to come up with a smooth curve. So here we're defining the standards right away to be a straight line so we don't get this mismatch at the end. And the way we're doing that is we're defining -- we've got EL1 for the 500 KVA. We have EL1 or point five, whatever the TSLs defines for the 25 KVA, and we're right away drawing a straight line through, and we're saying that's what the standard would look like. And it comes very close to .75, but it's not always .75. Sometimes it goes as high as .79 and we've seen .76.

So where we have those two dots at 25 and 500, we draw the line and we know we've got a nice uniform standard. Where we only have that one dot, we need to extend that dot to the other KVA ratings. We could do like in the last rule and just use .75, and that's certainly one option. Another option is to take the same slope as for the other product class, the poles having the same slope as the pads is what we're talking about. And that would give us .76, which is pretty close. And that's all this is.

It's not very intuitive, but the end result, I think Brian is going to show, is that it creates a nice smooth curve. When we look at this standard now as efficiency versus KVA.

MR. COFFEY: So yes, I can pull that up. This is equipment class 1A, so this is just one of those lines, and now we've --

MR. RIVEST: So -- Mike Rivest again. If you look at the light blue, which is the lowest line here, and now we've got on one axis efficiency, and on the other axis, KVA. So higher is more efficient. Our baseline is that light blue. And by looking at that you would make the observation that the current standard seems to be more stringent on the low KVA ratings than it is on the high. I think that's what we're hearing also, that we heard during these workshops. So our proposed standard, TSL1, you'll notice that, compared to the baseline, it can be a significant improvement in efficiency or it can be a minimal, depending on the area between those two lines.

And you'll notice that TSL A and TSL 1 -- this is for pads, I imagine, so TSL A is more stringent than the proposed level for pads. TSL B is more stringent than TSL A, et cetera. If you look at this for the product class for poles now, you'll see that TSL A is equal in stringency to what has already been proposed. So TSL A as far as poles is concerned, is the same as the proposal, because those lines are on top of each other.

MR. RIVEST: Very close.

MR. COFFEY: Very close. So although earlier in the table you saw one, zero, one for TSL 1, and 1.5, one for TSL A, that's actually a gross simplification of what that TSL looks like because in the previous instance we had to fit a line through three curves -- through three points rather than two, so there was like an averaging there. We were a little higher, a little less than one in some cases, a little higher than zero in other KVA ratings, because we couldn't have done a smooth standard by having a zero, one, zero.

MR. RABA: Question over there. Go ahead.

MR. CASKEY: Yeah, John Caskey, NEMA. If you can go back to the other slide for just a second, just to make sure -- one more earlier. Okay. So on this X axis it looks like it's KVA, and it's starting at 25, and you said that's log, so what is the right hand end of that axis?

MR. COFFEY: (off microphone`) … … [the limit of DOE's] scope of coverage …

MR. CASKEY: Okay.

MR. COFFEY: If you didn't hear that, the farthest right for which we have ELs is 500 KVA, that's our design line 3 unit. The scope of coverage extends all the way to 833 for single phase.

MR. CASKEY: Okay. Then on the Y axis is the loss. Are there units that go with those numbers?

MR. COFFEY: So it's the logarithm of watts, you could say. Logarithm of power.

MR. CASKEY: Okay.

MR. RIVEST: Mike Rivest again. What Brian -- the issue that we're trying to get your feedback on that Brian's been discussing is that we need to go with our blue line through this dot. And we want to have a straight line go through that dot. If we -- and this is a point -- we can go parallel; we can pivot upwards or downwards, but it's a zero net gain if you will in terms of the overall standard. Now if we pivot up like this, then we're making this more stringent. And the thought is that the impact is really down here, for the poles. So it's more important that we get this close as possible to getting through this dot at EL point five? Is that what -- we're depending on the standard -- so it's more important to get this dot right, go through this dot and get this dot right, than to go through this dot and get this dot.

MR. RABA: Greg.

MR. COULTER: This is Greg Coulter with GE Prolec. This is kind of a key issue in this point. As I used to have a professor say, one point is a dot, two points is a straight line, three points is a curve. So you're trying to take one point and essentially all you have -- even when you say you have two points there, you really only have one point -- so you're trying to make it work. I think I've been clear in my comments before. It isn't

.75. The scaling factor is not .75. It's only close across short distances -- it's only close across short distances of KVA. The point is, as manufacturers, our construction changes. We use a different construction for a 25 KVA than we do for a 50, and we don't build any 500s, so I never cared what you did at that point anyway. But when you get up to 167, where you do have volume, from ten to 167, we did care. But we have different construction. Our low KVAs are constructed completely different, strip versus wire -- I don't want to go into all the differences with competitors sitting in the room, but, you know, that's a simple one, and I think most people do that. So, this kind of becomes important.

It's less important when the efficiencies aren't so tough, but as we're getting close to where any of us can do things, and it's now becoming very important on this particular point. It is always easier to do these efficiencies a little bit more at higher KVAs. KVA just tends to be more efficient and that's why it's on that curve. It's the slope of the curve that makes a big difference. So even the difference between a converging and a straight line makes a big difference at this point. I don't believe it’s that important to get a straight line through 25 and 50. Your 25 is a pole, your 50 is a pad. There are different points. And so it’s kind of important to pick a point, and then I don’t know how else you can do it. It’s too late to come with more design lines, so you’ve got to use some kind of scaling, but you’ve got to be a little bit conservative in the scaling because of where we are. And at 25 KVA and at 50 KVA, which is the heart of the volume, you can scale off of it, but you’ve got to get those points pretty close to right and scale. I’m more on a converging side than the straight line side. If I understand the converging -- I mean this is the first time I’ve seen it, but it looks to me like that has a little more generous -- it’s a little more generous at the low KVAs. I’m wrong? You’re shaking your head. I misread that chart?

MR. COFFEY: Let me -- I think you are for converging if converging means converging at low levels as opposed to what we have here is converging at high KVAs. So you’re for converging, but not our -- a different kind of converging. So of these two, you’re for the parallel, but you would prefer that we consider converging at low KVA.

MR. COULTER: Where all the volume is,

yes.

MR. COFFEY: But of course, if we have total convergence, then we haven't separated pads from poles. So the question is at what KVA would we converge, if it was on the small side. Is it 25, is it ten?

MR. COULTER: Well, first, it may not be the same slope. You have a slope through those KVAs, but it's a different slope when you go up, which is truly what happens, by the way. This is not -- so .75 just doesn't work across the --

MR. COFFEY: So what's important to get is the range between what KVA and what KVA. Where's the -- where's 80 percent of the volume right now?

MR. COULTER: KVA 50 and below.

MR. COFFEY: Fifty and below, but not zero, not one KVA>

MR. COULTER: Ten.

MR. COFFEY: Ten --

MR. COULTER: Tens, 15s and 25s is probably -- on a pole line, that's going to be 80 percent of your volume. Tens, 15s and 25s. On pad line, now, it's going to be --

MR. RABA: Would you like to make a comment --

MR. COULTER: That 500 KVA point has no meaning. It's not even very good. The 500 KVA is not very good. But my point is, we never cared because we don't make 500 KVAs --

PARTICIPANT: Some people do.

MR. COULTER: But some people do and some people buy them. But they don't buy many. The point is, get the low points --

MR. COFFEY: I see what you're saying.

MR. RABA: Steve.

MR. ROSENSTOCK: Steve Rosenstock, EEI. Just as a follow up, there are customers that buy the 500 KVAs. I'm a little concerned about, well, put it high, who cares? Well, still the customers care because they're the ones who are going to be paying and it will be totally uneconomical for them.

MR. COULTER: Steve, that was not my point. My point is it's not as important as getting the low ones right, that's it.

MR. ROSENSTOCK: Steve Rosenstock, EEI. I appreciate that but it could be very important to those people who buy them, if they're facing huge up front costs for minimal efficiency gains. And if you look forward to TSL 1B, yeah that one right there, just a quick one -- this is for the pole mount and under TSL 1, doesn't TSL 1 equal the base for that one? But you show it as a different value, so I got a little confused when I was looking at that one.

MR. COFFEY: TSL zero is the base. TSL 1 is the proposed level.

MR. ROSENSTOCK: TSL 1 is base.

MR. COFFEY: Excuse me?

MR. ROSENSTOCK: For pole mount.

(comments off microphone)

MR. ROSENSTOCK: I'm looking at the chart here, design line two, yes. And --

MR. COFFEY: I'm sorry. I think what you're remembering, Steve, is in the NOPR proposal, the nominal proposal for design line 2 was EL-0.

MR. ROSENSTOCK: Right.

MR. COFFEY: But because of the scaling Mike mentioned before, there were three points in that single equipment class, and so to derive a standard, you know, you can't hit three points with a single line unless you happen to be really lucky with the points. So what wound up happening is this curve ended up being roughly EL point five for design line two, roughly EL point four for design line one, and roughly EL-1.1 for design line three.

Because to run through each of the points would have created this physically inconsistent disjoint standard that wouldn’t have made sense. So with the three points in one class, the best fit line was really the best that DOE could do.

MR. ROSENSTOCK: Steve Rosenstock, EEI. I respect that and I understand what they’re doing, but there are many other standards where there’s, quote, “disjointed curves,” just based on analysis of the market, analysis of the economics, analysis of everything that’s in there. I understand.

MR. RIVEST: I think the difference here Steve is here we were getting reversals in direction. So a curve -- it’s okay if it’s on a line if it’s a curve where it’s, you know, but if it looks like a camel’s back, a two humped camel is what we were getting.

MR. ROSENSTOCK: Steve Rosenstock, EEI. There are other efficiency standards where I believe you get very interesting results where there is high efficiency gains for some products and lower efficiency gains for other products, and it would not be a smooth curve. I haven’t seen them. I haven’t seen the logarithmic curves, but just based on other -- just from the results of other standards for other products, you know, it’s, you know, -- especially the ones with multiple product classes, I’ve seen situations where --

MR. RIVEST: So this is the same product class. It would be as if we took a water heater standard, which is an equation by gallons, and then we had reversals in the stringency. We would say the 40 gallon is one level and then you go down to 50 and then back up to 60. That’s just not --

MR. ROSENSTOCK: But in that case -- well, Steve Rosenstock, EEI -- the water heater curve it’s a few percent up to 55 gallons and then it’s 120 percent for over 55 gallons on the electric side --

MR. RIVEST: But it doesn’t do this.

MR. ROSENSTOCK: Okay, so it does this and then this. It still might not be a smooth curve like --

MR. RIVEST: I wish I hadn’t brought up water heaters.

MR. RABA: Okay. We have a hand raised from Aaron Meyers, please.

MR. MEYERS: Aaron Meyers, Cooper Power. I do appreciate the effort to smooth the curve because we feel that it does represent more reality, but all of the analysis that we’ve done so far has been using the previous scaling factor. So we really haven't assessed what the impact will be when you raise the efficiency. For instance, for 1500 KVAs for three phase, you see 2B, that's a pretty substantial increase in efficiency, and I don't know how or if that's reflected in the economic analysis.

MR. COFFEY: It should be reflected since that's one of the design lines, right, five.

MR. MEYERS: Yes.

MR. COFFEY: So five is the three phase pad at 1500 KVA.

MR. MEYERS: That's a significant increase in efficiency.

MR. COFFEY: We have later in this presentation, the actual -- we're showing graphically here what - how the different TSLs relate. We also have in tabular form the actual numbers for each KVA. The efficiency values themselves.

MR. RABA: In the back, please step to the microphone. Please, your name.

MR. PATTERSON: Wes Patterson. Brian, go back to that chart. Yeah, if I remember right, design line five is a 1500 KVA, three phase, which is those dots on the 1500 scale. I mean you have actual design lines on those, it's not extrapolation.

MR. COFFEY: That's right, so it would be on this equipment class 2A analysis. Because it's a pad mount.

MR. PATTERSON: Thank you for that clarification.

MR. RABA: Greg.

MR. COULTER: This is Greg Coulter. Here's another case where there comes a major change in design. 500 KVA and below are pretty much free-form for three phase pads. You go above there, you have to meet the 5.75 percent impedance, which puts a major restriction on what we can do, and that's one of the reasons why we always thought there was a major shift in the efficiencies when you get to that. You know, meeting that impedance forces us to put, I'll call it blank space in the design, but we've got to add space between the coil just to drive the impedance up to meet standards, which is space is not available to make these things more efficient. Matter of fact, by standards they almost become less efficient at high KVAs. It's almost a force of the 5.75 set impedance requirement.

MR. RABA: Wes, you're up.

MR. PATTERSON: Wes Patterson again. Greg, on this chart, the two design lines, one's a 150, the other one is a 1500. So the entire analysis of those dots is done on a physical design which should accommodate this change in the impedance. In those dots that are on those curves. Those two curves represent the situation that you're describing.

MR. COULTER: Well, I'm not sure I agree with that, Wes, because, you know, you would only have two points on a curve.

MR. PATTERSON: We only have --

MR. COULTER: You have 150 and you have 1500. And everything else is a curve fit.

MR. PATTERSON: And everything else is trying to make some kind of fit.

MR. COULTER: And all I'm saying is, I don't think the 1500 is the same curve as the 150 because of this impedance issue.

MR. PATTERSON: It may not be. It may not be, but then neither is the curve for 500.

MR. COULTER: That was the point I was making earlier.

MR. PATTERSON: So if we look at the existing standard, which is the baseline, as a result of how the existing standard was written, you can see that hook that took place right there -- it's what, 700 KVA or something.

MR. COULTER: It happens to be 500 -- between 500 and 750.

MR. PATTERSON: Right, it was 500.

MR. COULTER: Because there was a major design shift between 500 and 750. That's why -- that's the reason we always thought it was there, made perfect sense. But now it's being taken out because looks like you're trying to fit a curve between all those points that aren't the same points. Here you truly have a major --

MR. PATTERSON: The end result was that the 500 efficiency was the same efficiency as the 750.

MR. COULTER: Yes. Yes.

MR. PATTERSON: Okay. But that -- in some cases, naturally, that is not the case. And not across all manufacturers is that the case.

MR. COULTER: Well, we didn't say it was perfect. We just said it had more sense to it than it does not.

MR. PATTERSON: But not across all manufacturers.

MR. COULTER: We have other manufacturers in the room. Let them speak.

MR. RABA: We had three hands left to right, go ahead please.

MR. POLINSKI: Ray Polinski, ATI Allegheny. Just a comment, feeding on what Greg says. Why would we change the scaling that practically has worked. It's proven, it's practical. It's how it's been done. And to arbitrarily change it --

MR. RIVEST: Mike Rivest. This is nothing arbitrary here, okay. This was proposed -- we got comments on this, there is nothing arbitrary. We're not in this situation here, look at TSL 1 and TSL A, and they're the same, so --

MR. RABA: Do you have follow on, Ray?

MR. POLINSKI: Again, I'm not a transformer engineer so I'll stand back and let the transformer engineers speak, but what I heard Greg say is just that in practice he feels that the existing scaling, although it's not smooth, and that may cause some people to have heartburn, it is, in fact, it works. And so why in the world we would change that. Mike you can explain.

MR. RABA: We saw Steve and then Andrew

after that.

MR. ROSENSTOCK: Steve Rosenstock, EEI. Looking at all these curves, there's some sort of inflection point, whether it's at 100 KVA or at 500 KVA, it appears to be -- if I'm doing the bottom notes right, it's 100, 250, 500, is that -- or is that 333? I'm not sure exactly where they, you know, it just goes from 100 to 1000, so I don't know where the vertical lines are, but just looking at these, there's no perfect curves that they have now, but I think part of the reason was when DOE did their last analysis was that they were matching the single phase to the three phase efficiencies for different transformers as a way to lower manufacturing costs, as I recall. That was a way to assist them, so you didn't get the perfect curves, but if it lowered the cost of higher efficiency units, it's kind of a win-win situation.

So, I'm not personally, you know, I know we're going to get the economics later, if standards come up where it's not a perfectly smooth curve, that might be okay because that's where the economics are better for both the manufacturers and the steel makers as well as the utilities, just because you raise -- if you raise it too high and it just distorts the market, and the prices skyrocket, and then it’s not economical.

MR. RIVEST: Let’s think about what we’re talking about here. We have a dot at 1500, which is already EL1. That one’s not going anywhere. That’s where it is. We have one at 150, which is at EL1, that’s not going anywhere. So we’re talking about creating a standard across from that 150 dot to that 1500 dot. We have it now, which is a straight line fit in log-log space. Okay. It creates this smooth, function, one seen as efficiency times KVA. What is it I’m hearing that you -- what -- we can do a .75 scale across both of those and then we have a discontinuity, and we end up with something like that.

Now, that’s not going to lower the standard necessarily. That’s going to make it -- probably make the 150 more stringent because -- and make the 15 -- I don’t know, I can’t anticipate. But I don’t think the area under is going to really change.

MR. RABA: Andrew.

MR. deLASKI: Andrew deLaski, Appliance Standards Awareness Project. So just to be clear, Brian, the levels, TSL1 you show on your graph here, these are levels that were proposed. People have commented on these levels.

MR. COFFEY: That's right.

MR. deLASKI: People have taken positions on this. This has been pretty clearly noticed and comment. This is not something new.

MR. COFFEY: No, exactly.

MR. deLASKI: So you guys have been doing this now, as you said, you've been doing this for quite a while. This isn't new. The thing I wanted to ask Greg, just to follow on to your comment about -- I don't understand, again, some of the engineering constraints you're describing, which is that you add blank space -- I know you're describing it in simple terms so people like me, and I appreciate that, and that -- but why does that make it harder to be efficient?

MR. COULTER: In simple terms, we have to make -- the way we make stuff more efficient is we try to put it in more compact space, that's the best way you can do it. If you take out insulation, take out blank space in the design, you can get the winding in the core smaller. Here, we are forced to put space in between the winding and the core just to force impedance into the design. So we're not able to fill that space up with winding. It’s more compact, so we’re essentially adding losses, mostly winding losses to the design.

You know, how big it is, I don’t know. But it’s certainly a design change. It’s one of those reasons why the .75 scaling factor doesn’t work across, especially three phase pads. It’s probably the most prime example I could give. It works better for all the 750 KVA and above to be at that, but for the 599 KVA and below, on a .75 scaling factor, but it doesn’t scale across the whole curve.

If I look at that line, what you’re really seeing is the lower KVAs are really moving up, they’re having to be more efficient versus what they used to be. That’s essentially what it’s showing. You start getting where the heart -- where the meat of the KVA is for three phase, it’s actually not as big a change. It’s a little bit arguing against what we might like. But the point is, I don’t think -- I think there’s a point where the curves are -- the curves ought to have a slightly different shape. In other words, a discontinuance in the curve. It was there before. I think this one here is an obvious place for it -- it ought to be there. Now how big an issue that is on total losses, I don't know, in total, I don't know.

You know, in all our analysis, you know, if this was there and it was in all the data we saw back in February, we missed it. We were probably just looking, ourselves, at the 150 and the 1500 and that was it, and making all our analysis off of those changes, versus all the KVAs in between. We didn't pick up that this had changed like this.

MR. RABA: Wes Patterson.

MR. PATTERSON: The first thing I want to point out is that the -- what they show with the orange dot, TSL1, that was in the NOPR in February, that was in the proposal in the NOPR in February. What this chart is showing is that with the new equipment classes for poles, there is no change between the February NOPR and today on that chart. So the TSL A and the TSL1 are identical lines. That's what that chart is showing.

Now, coming back to the discussion about was the NOPR in February correct or incorrect? The assumption, Greg, that you're making is that because I've got to go to five percent impedance, I have to add space in the high-low in order to jack the impedance. But I can also modify the turns to jack the impedance, and not add any space whatsoever.

MR. COULTER: (comment off microphone)

MR. PATTERSON: But the efficiency balance can still be maintained and follow that .75 slope. In an optimization system, yes it can. I can balance those two elements at any time. So it doesn't really change the physical relation. This is a characteristic of a manufacturing practice, not a physics of the design of the transformer. I can change the turns ratio and still accomplish that curve.

MR. RIVEST: In any case, Greg -- Mike Rivest -- we're here to get your comments and to the extent that you can document and maybe if we had even market data that shows on the high end, not the baseline, because all the baselines are going to be hovering on that blue line anyway, but if there was some empirical way that we can justify another scaling, that's why we're here.

MR. RABA: Carlos.

MR. GAYTAN: Carlos Gaytan, Prolec GE. One comment about the equipment classes 1B and 2B which are for pole mounts, is really with a KVA score -- according to the IEEE standards, the pole mount transformers have a limit of up to 500 KVA for both single phase and three phase, and there might be a confusion when we interpret the tables and these charts for, especially for equipment class 2B for three phase, because beyond -- even at the 500 KVA level, probably the majority of the pole mounted transformers are not mounted on a pole, but rather on a platform above the ground level. But above 500 KVA, we consider them to be distribution substation transformers, and there might be a confusion whether those probably which have a singular construction with pole mounted transformers that are mounted on the floor level, if they should be considered as part of that equipment class, or because they are within that KVA range, or if they have to be in equipment classes 1A and 2A. That's my comment.

MR. COFFEY: Thank you.

MR. RABA: Additional comments? Good exchange so far, very lively. Go ahead, Brian.

MR. COFFEY: So we show the graphical representation of what's going on, which is intuitive, to see certain trends. We also have some tables for each TSL. This is TSL A, we've got all four equipment classes, TSL B, TSL C, TSL D. So I can linger on one of these if someone would like to make a point, but otherwise they'll be in your handouts to be reviewed at your leisure. And if there aren't any questions, I will invite up Chris Bolduc to talk about some of the economic results.

MR. RABA: Before we do that, Steve you had something?

MR. ROSENSTOCK: Steve Rosenstock, EEI. Just trying to look over all of the tables, and just in terms of the scaling, I'm just trying to -- you said the, on this equipment class 2B scaling, just double checking -- they're scaled with the 1B at the higher KVA levels, correct?

MR. COFFEY: Higher KVA? What do you mean by that?

MR. ROSENSTOCK: Well, equipment class 2B is the three phase pole above a certain KVA level, correct? I'm looking at the representative unit.

MR. COFFEY: 2B is for all three phase units.

MR. ROSENSTOCK: All three phase pole mounts, okay.

MR. COFFEY: And so the way that we've done the scaling is to give 2B the efficiency standard of the 1B product of one-third the KVA. So, for example, if you look at a 50 KVA in 1B, it's 99.11 at TSL B, that's the page I'm on right now, so the 150 for the three phase has that same efficiency value.

MR. ROSENSTOCK: Thank you. I hadn't seen the numbers before, so I just wanted to verify that, thank you.

MR. RABA: Any additional comments on Brian's presentation? Thank you very much. This is a good time to take a break. We've got a lot of content yet to go ahead on the economic analysis, so we're going to take a break at this time.

Looking ahead at the rest of the day, I think we're pretty much on schedule, so if we took a break now we return here at say, quarter to 11 by that clock. Those of you who are not familiar with the Forrestal Building, you need to wear your visitor's badge up high and visible …

(Whereupon, at 10:30 a.m., the meeting was recessed for a 23 minute period, and reconvened at 10:53 a.m.)

MR. RABA: This afternoon -- late this morning -- we'll begin with Chris Bolduc, Navigant Consulting, who will be doing the economic analyses, and we've received the photocopies of your business cards you turned in. Did everybody get one? If you didn't I can give them to you here right now, or

Brenda's got them at the front desk. Pass them along, please. So if you haven't given Brenda your business card, the Department keeps track of who's here so they can keep you informed later on.

A couple folks have joined us in the course of the meeting. Would you care to introduce yourselves.

MR. NADEL: Steve Nadel, ACEEE.

MR. RABA: Thank you, Steve. Anybody else join us more recently? Okay. Great. Let's continue. Start now again, resume, with Chris Bolduc.

Economic Analysis

MR. BOLDUC: Good morning, my name is Chris Bolduc from Lawrence Berkeley National Lab. I'm here to present the economic analysis. So I'd like to start by saying that for the economic results that were presented in the documents that were sent out, and in today's presentation, we did our utmost to use the same spreadsheet tools that were shared for the NOPR analysis. What we can say is that in the LCC spreadsheets we added a custom efficiency field for the NOPR during the reg neg sessions, which we exercised to analyze the new ELs. The only exception in this case is for design line 3 which we've cast for today and what we're talking about is a pole mounted transformer, and so we added the pole replacement algorithms or methodology that was used in design line 2 to design line 3, and I'll talk about that in more detail when we get there.

Again, the new -- with the NIA we used -- we just remixed the TSLs and the NIA to produce the impact results.

So, it's a bit of a convention for these slides I'm about to show, is that we have the proposed rule in green and any new analysis highlighted in orange. Here we have design line 1 which we're casting as a single phase, 50 KVA, for lack of a better term, a pad mount or other transformer. You can see that the new EL at 1.5 follows the trend that we would expect it to. There's really -- there's really nothing new to see here. I'd be happy to take your questions if anybody has anything to ask. Ray.

MR. POLINSKI: Ray Polinski, ATI Allegheny Ludlum. One thing, Chris, if it's somewhere in the report, if you can just direct me to where the data's at, but again, as we get to the 1.5 level, what percentage of the transformers -- how much are amorphous and what percentage of them, you know, are

M3 transformers? The question is the availability, how much amorphous is used versus M3 at the 1.5 level?

MR. BOLDUC: Okay. I hear you. I don't have the exact numbers in front of me, but I do have the larger steel components for these results. And in this case for design line 1, this is 49 percent SA1 and it's 46 percent M2 -- was the mix that produced these results.

MR. POLINSKI: Ray Polinski, ATI Allegheny. Thanks, Chris.   And the tonnage or weight that you have, do you have any -- one thing I think that's been communicated here repeatedly is that, you know, M2 -- M3, very readily available; M2 much more limited availability from a supply standpoint.

MR. BOLDUC: So your question is do I have for the meeting today, a projection of steel tonnage that would be required to meet the standard?

MR. POLINSKI: I think I've seen those in past reports, you know, in the past analyses, hey we need 250,000 tons or so many pounds, and that just, you know, the question is, is there the available capacity today or potential in 2016, to meet the standard, the materials available to meet the standard? That's always been my understanding from day one of the committee meeting was, hey, we want to make sure we've got standards in which we have adequate material supply to promote a robust competition and to ensure that we can supply and make the standard. So that was my question.

MR. BOLDUC: Thanks, Ray. Regrettably, no, we do not have projections of the volume of steel that would be required to meet each of the new ELs today. Moving on --

MR. POLINSKI: One last question. That's something you would have before you would propose a standard?

MR. BOLDUC: That would be part of the final rule package,

PARTICIPANT: Greg Coulter wants to go on the record -- that was a no.

MR. RABA: Aaron.

MR. BOLDUC: Yes.

MR. MEYERS: Aaron Meyers, Cooper Power Systems. This is really the crux of the issue here, is, you know, you can look at these numbers and appreciate the work that went into the economic analysis, but without robust competition between M3 and amorphous, I mean you're putting all your eggs in one basket, and we felt that that was probably the driving factor behind the original Notice of Proposed Rulemaking, and all the new trial standard levels that we're evaluating here, essentially are considering an amorphous only world. And we don't believe that that's the direction, the right direction for the country to move in, much less for manufacturers of transformers or core steel.

MR. BOLDUC: If I may rebut, Aaron. At the end, there's some summary slides and the new TSLs are not 100 percent amorphous for all the new TSLs.

MR. RABA: Jerry, then Andrew.

MR. CORKRAN: Back when we had our last meeting and we ended up at EL-1, the reason we went along with that was to try to end the process because that was the highest that we, as manufacturers, could make using M3 core steel. And we try to make higher loss levels, we're not competitive with amorphous, so you're saying 100 percent amorphous -- the DOE data agrees with that -- anything over one, your own data, says 100 percent amorphous, want to go back and look at your studies. And so now when you're talking about these higher levels it's kind of -- it's kind of like we're starting over and I'd really hate to see it. I thought we had an agreement and now looks like we don't.

MR. CYMBALSKY: John Cymbalsky, DOE. So, an agreement, I'm not -- the only agreement that the Reg Neg committee produced was not relating to this topic at all. And this is additional analysis. We didn't have 1.5 analyzed in the NOPR. That's what this is for, so you're seeing new numbers and I don't think you can draw the conclusion you just drew, because this was never shown before. You haven't seen this, so if we can go through the deck and we can see what shakes out here. Thank you.

MR. RABA: Question from Dave Millure on the phone. Then to you Andrew. David, you're live. Go ahead.

MR. MILLURE: Thank you. Dave Millure of Metglas. I believe to say 100 amorphous at EL-1.5 is not at all accurate. We are talking about things that are not the subject of this meeting, first of all, but there are some major manufacturers that will tell you that silicon steel and amorphous are competitive at 1.5. So I suggest we just move on.

MR. RABA: Andrew, thank you for your patience. Go ahead. This is Jim. Thanks, David.

MR. deLASKI: I want to come back to a point that you made, Chris, a few minutes ago. Can you tell me again what the percent -- what the steel mix is at EL-1 on this slide?

MR. BOLDUC: EL-1, one moment please.

MR. deLASKI: I think you just said it, but I'm not sure I caught it.

MR. BOLDUC: At EL-1 it's 88 percent M3. At EL-1.5, the LCC picks the lowest first cost units, and from that sample it's 49 percent amorphous, 46 percent M2.

MR. RABA: Bob Saint.

MR. SAINT: This is Bob Saint from NRECA and I'm still wondering if this whole analysis is credible, because it doesn't appear that you have addressed the power cost issues that we've raised before. And I was wondering if you were going to address those later, or --

MR. BOLDUC: Bob, that was a comment directed at the NOPR analysis. The presentation today is an extension of the NOPR analysis. We did receive your comment. That's all I can say, we received your comment, thank you.

MR. RABA: Again, let's keep the focus of the meeting. Please. Aaron, back to you, then

Steve.

MR. MEYERS: Aaron Meyers, Cooper Power. Again, I appreciate the analysis that was generated. When we talked before we were concerned about the crossover point between amorphous and M3, and we went back and used our actual design program to identify the crossover point, and for -- we looked at 25 KVA poles, 50 KVA poles, 25 KVA pads, 50 KVA pads, 500 KVA pads, 1500 KVA pad, and in no case was it at the EL-1. The closest to EL-0.5. So I'll make that point and would like to go on the record by saying that is the point of maximum competitiveness from Cooper's point of view, and the slope of the grain-oriented curve is so steep that once you go beyond that it very quickly becomes one material choice only, and that's amorphous.

MR. deLASKI: Just to follow up on that, this is Andrew deLaski, if I could. Again, as we discussed last fall, of course, that analysis is very sensitive to the relative price of the materials, that's what drives it, right. So, --

MR. MEYERS: That's why I said it was steep. That's why I said the steepness of the grain-oriented curve runs away from the amorphous curve very quickly, and so I wouldn't want to go beyond that point because the M3 curve can't compete.

MR. RABA: First Steve Rosenstock, then Robert Berman.

MR. ROSENSTOCK: Steve Rosenstock, EEI. Again, getting back to the economic analysis, the spreadsheet that was sent out with the announcement, it was --

MR. BOLDUC: Design line 3?

MR. ROSENSTOCK: -- design line 3, yes, and I was looking at a couple of tabs. I just want to kind of ask about the numbers in there. First of all, on the summary tab, it had information about average no load energy price, average load loss energy price, average no load demand price, average load loss demand price. And as I was --

MR. BOLDUC: Steve, again, this sounds like a continuation of Bob Saint's comment, which is regard to the no load energy price, is that right?

MR. ROSENSTOCK: Well, and a load energy price that was used for this A, B, C, and D. Weren't these used for the A, B, C, and D?

MR. BOLDUC: They were. They were also used in the NOPR, as I stated before. This is the same economic analysis. The only change for design line 3 was the inclusion of the pole replacement algorithm or methodology.

MR. ROSENSTOCK: Okay. And just a very quick follow up. In the spreadsheet there was a tab for sensitivity analysis, and that tab was blank.

MR. BOLDUC: That's right. That's not implemented yet.

MR. ROSENSTOCK: Will part of the sensitivity be using the power prices that were suggested by the utilities?

MR. BOLDUC: Can't say.

MR. ROSENSTOCK: Thank you.

MR. CYMBALSKY: Again, that's not part of the meeting, Steve.

MR. RABA: Robert Berman, you're up first.

MR. BERMAN: Robert Berman, Berman Economics. One point that we should keep in mind in terms of reading the results and crossover points and so forth, is if we expect -- if we find at the crossover, whatever the crossover point is, we would expect to find 50 percent sales of one material and 50 percent sales of the other. That is, the likelihood is 50:50 at that point. If we find that at EL-0, for example, that that's the crossover point and we find that amorphous -- that's the crossover point that would suggest that 50 percent market share for amorphous and that doesn't exist. There's no data that suggests that that's the case, so you've got some real data, then, to check your crossover point calculations.

MR. RABA: Thank you. The other Steve.

MR. NADEL: Steve Nadel, ACEEE. A process suggestion. Looks like everybody's ready to pounce, making points before we even barely begun this discussion. Perhaps we should let them present the results and then everybody can pounce based on this presentation, rather than based on any preconceived notion before the presentation.

MR. CYMBALSKY: I'd prefer a different word than pounce. But that's just me.

MR. RABA: Jerry, no pouncing, but go ahead.

MR. CORKRAN: I'll pounce -- regarding Mr. Berman's crossover points, I totally disagree on the 50 percent, and based on -- it's not based on any designs, I don't believe we have the ability to make transformer designs. But anyhow, my other point you guys are considering M2, but M2 is only available in a very limited quantity along with making M3. So you should not be considering M2. When you get past

M3, you're leaving the market behind. You guys were thinking M2, but M2 is, I think, something like 18 percent of the market is all it can be M2, so it just doesn't come out any different than that. The steel manufacturers, I'm hopeful, will confirm that.

PARTICIPANT: Yeah.

MR. CORKRAN: So I think it's very important you guys do not lock in on saying well, we've got M2 available, because it's not available.

MR. LYKE: This is Rick Lyke, AK Steel. I can confirm that we can't make 100 percent M2. We have to have a good market for M3 because the targets in terms of chemistry and processing are much tighter to make that product.

PARTICIPANT: But we've got to jump on that.

MR. LYKE: So we need, yeah, M3 is the volume product we can put out. We can put out some M2, but 15 to 20 percent, probably.

MR. RABA: Okay. Thank you. Go ahead, Chris, we'll proceed. Again, good comments back, good exchange. Go ahead, please.

MR. BOLDUC: Thank you. Right now on this slide here we have a DL-2 where we analyzed at half an EL. I think the one thing I'd like to point out here in the appendix 1A, the median LCC savings was -- this was presented as minus $533 dollars. That was incorrect. We have it corrected here as a positive $20 dollars, in bold.

Overall, what we do see on this design line, which is you can see in the actual -- the payback period is illustrated very well, is that when we move from below EL-1 to El-1 and higher, we see a full transition that the LCC is picking amorphous steel from the design sample. In this case, the mix of steel that is used to produce these results was 90 percent M2.

MR. RABA: Ray.

PARTICIPANT: At 0.5.

MR. BOLDUC: At 0.5, that's correct.

MR. POLINSKI: Ray Polinski, ATI Allegheny. Again, I started off by saying early on that I disagreed the way -- the same comment as was made before. We can't make 100 percent M2, either M2 is a very select processing parameter, its chemistry, et cetera. And so the one comment here for design line 2 was my understanding when the initial NOPR came out, just again, when the initial NOPR came out, there was a scaling issue and so EL-0 was for design line 2, but it ended up being like point four because of scaling issues. We not only made separate categories, and the fact that at point five you need 90 percent M2, again, I just go on the record that design line 2 should be a true EL-0. At zero. There's no need to scale it to point four because we're not scaling, we've mixed up the categories, so I just want to make that comment.

MR. BOLDUC: Okay. I'd like to counter just a little bit here. So I just really want to be clear that the steel percentages that I'm stating are the steels that -- they're from the units that were selected from the design sample by the LCC spreadsheet. It's just an artifact of the modeling.

MR. deLASKI: Andrew deLaski, if I can follow on, because -- so Ray, I guess I'm a little confused because at the NOPR hearing you supported the Department's proposal, and the proposal's levels were clear, they're laid out in the NOPR, and it was essentially the levels -- it was the levels that you read, as you said, they had the scale because of the pads and the poles were in a single class. And so at the time, when you read that analysis, did you think that it would require you to have 90 percent M2 for the poles?

MR. POLINSKI: Ray Polinski, ATI

Allegheny. Andrew, yeah, we had the initial meeting and generally, as I say, the NOPR was 1, 0, 1, 1, 1. There was some issues with one -- we were in favor, you know, of maybe going a little higher on the pads, but by the comment period which was due by April 10th I believe, we were very clear in the comment period that, you know, for design line 2, the point four level or point five level would really make the M3 not competitive. And so that's the facts. I mean, you can look at the crossover charts that were prepared for the DOE by Navigant and you can see where M3's slightly not competitive at the base case for design line 2. That's the facts.

MR. deLASKI: That's the Navigant analysis, and it's one analysis. I think we've heard each manufacturer has run analysis, and we've heard different information from manufacturers over the course of the docket and the negotiation. I mean this point of the crossover, we've been talking about it for a long time now, and I don't think that the Navigant analysis is dispositive. And I think that the reaction of the manufacturers to the NOPR indicates to us that it's not. Because folks thought, the manufacturers and the steel industry, supported the NOPR. So to me that's a pretty strong indication that the NOPR didn't put us into all M2 frame of design lines.

MR. POLINSKI: Ray Polinski, ATI Allegheny. Again, Andrew, to your point, as I say, we realize that there's no perfect analysis, but the analysis we were told we were supposed to comment on was the analysis that was presented by the DOE. And to your point, if the NEMA members, they feel that they can survive at a design line 2 average EL-0, which is really a point four, well, we respect that, they make the transformers. But the data that we have, based on the data that we're making these decisions on, it's -- the crossover point is where M3 is not competitive at zero, that's just the facts.

MR. deLASKI: And what do people use to build baseline transformers today by and large?

MR. POLINSKI: You're asking me?

MR. deLASKI: Yeah.

MR. POLINSKI: You'd have to ask the transformer guys, I think it's --

MR. deLASKI: Wes, what are you guys using for baseline transformers?

MR. PATTERSON: M3.

MR. deLASKI: And it's competitive --

(comments off mic)

MR. deLASKI: People are voting M3 as the baseline transformer, that's what's being used today. If it's not competitive, again, it speaks to the flaws in the Navigant analysis, that it's not truly telling us where this crossover is, and I think that's the point that we want to make is that if the crossover continues to be a problem with the crossover, it's not the purpose of the meeting today, John, so I'll keep it brief, but we continue to have this problem. It is a critical issue -- it is the critical issue in the docket, absolutely it's the critical issue in the docket, where we have the competition so we have robust competition amongst suppliers. We've all agreed on this from, I think, our first meeting.

MR. CYMBALSKY: I agree, so maybe I can just step in and say the Department understands that, appreciates that, gets that, and we will look very, very strongly at that. So maybe we can just -- we all get it, let's just --

MR. POLINSKI: Can I make one last comment, John, please. You know, because Andrew made a lot of comments directly at me, and the only thing is -- and I would ask the transformer guys to comment. I'm not a transformer engineer as I said before, and I just don't know, to your point, if M3 is used at today's baseline standards, and meets the standard, but is that due to availability of amorphous? If there was more amorphous available, would it be still a lower cost transformer? I don't know the answer to that question. You say M3 is being used, but is it being used at a slight cost disadvantage? That's what the charts suggest.

MR. RABA: Aaron.

MR. MEYERS: Aaron Meyers, Cooper Power Systems. A couple points here. First of all, regarding the 50 percent breakdown that Mr. Berman brought up, I mean, a little bit of that has to do with manufacturing capacity. So if a manufacturer has the capacity to build twenty times more conventional steel transformers than amorphous, obviously there's not going to be a 50:50 split. And that also somewhat addresses the point as to what transformer manufacturers are building baseline transformers with today. It's hinging somewhat on equipment capacity.

The other point here is regarding the life cycle cost analysis and the fact that it's free to use 90 percent M2 in certain cases, rather than being limited by the supply. And I'm curious to know what the outcome would be in terms of life cycle costs if M3 were substituted for M2 in this analysis, would it still be positive?

And my final comment/question is that there was information provided to the DOE regarding loading factors and whether or not that will play into the sensitivity analysis or new life cycle cost analysis, because when combined with the energy cost and the loading, I don't really -- I guess I don't believe this, this life cycle cost. I don't believe that there is a big benefit for the nation to even advance beyond where we're at today.

MR. RABA: John.

MR. CASKEY: I don't want to go back and hash everything either, but okay, so when we did -- when the NOPR was released and we provided comments on the NOPR, we had an opportunity to see those scatter diagrams and to try and figure out what the mix of steels were in those design lines and efficiency levels. Is there -- and I don't know if this is the same as what Greg had asked earlier, but can we get the percentages that you're rattling off up there now for the different -- for particularly the new efficiency levels, can we get those percentages like within the next couple of days so that we can factor that into our final comments that we submit relative to this new analysis?

And I realize before he says anything, that certainly the model is the model and we’ve all argued with the pros and cons of it, and you guys are doing the best job you can to get in the right ballpark, but where there are radical shifts, it would be nice to know that it’s being produced by the model because that drives everything else.

MR. RIVEST: So -- this is Mike Rivest. Since everyone is bringing this up, I’m going to have to say something. Remember, we are modeling one KVA. We have modeled one specific voltage primary, one specific secondary, one specific BIL. I caution you to make radical predictions on steel mix based on that, I mean, and dismissing experience and what the knowledge of the people in this room is. So to say that these are the facts and these are the only facts, is incorrect. There are other facts that weigh in this decision. We did not model every voltage, every KVA, every BIL rating, and that’s just the truth.

MR. deLASKI: So Mike, to follow on, that implies that you can’t estimate steel tonnage based on your model.

MR. RIVEST: You know, I think that with the precision we’re trying to have here that you should rely on other information than just what’s coming out of that. And that’s why when I hear, well, what’s the mix coming out at EL-1.5, M2 versus M3, we didn’t even model every kind of steel there is. We didn’t model every design -- every way these things can be designed. There’s a much more variety in the market than what we can model.

MR. RABA: Steve R and then Steve N afterwards.

MR. ROSENSTOCK: Steve Rosenstock, EEI. Mr. Rivest I appreciate that but don’t you have to rely on the information from the models to make the ultimate decision?

MR. RIVEST: We have to rely on the information in the docket.

MR. ROSENSTOCK: And the information that you receive from stakeholders, yes, both?

MR. RIVEST: Yes.

MR. ROSENSTOCK: Thank you.

MR. NADEL: And actually my point -- Steve Nadel from ACEEE -- and my point is picking up on that, basically we have one snapshot from this Navigant analysis. We have lots of other information in the docket. What I heard John say is he's going to look at all that information. Everybody recognizes crossover point is key, and we look at that whole set of information and he decides is it level zero, is it level 2.5 or where in between is that crossover point.

MR. RABA: Deep breath. Should we proceed, Chris.

MR. BOLDUC: Yes, thank you. So these are the results for DL-3, and this is where we added the pole replacement algorithm. So we used the same methodology that we used in DL-2. We went back to RS-means 2011, the same source for our pole replacement estimates that we used in the NOPR. We increased the pole replacement cost by the -- adding an additional crew, I believe it's called a heavier crane, to increase the overall pole replacement cost. This pushed the distribution from around $5800 up to close to $8000 per pole replacement.

We also scaled the weight change out thresholds. So we took the 150 pounds that was used for DL-2, we scaled it with the .75 scaling rule up to 1418 pounds. Now I'm going to be very honest here, perhaps a bad thing, but we found that the actual number of pole replacements with this configuration was negligible, less than two percent. The factor that came down to it was the minimum weight threshold of 1418 pounds.

Now also in this meeting, Carlos maintained that for these larger KVA transformers, they're usually mounted on platform type installations. That was not clear to me when we were doing the analysis. Looking through product catalogs, we did find many mounting brackets that would hold up to 6000 pounds of transformer for each arm, so that's based on -- this is not based on using a platform, it's based on poles. Steve.

MR. ROSENSTOCK: Steve Rosenstock, EEI. In the new appendix 1A that you put out, you show, in table 1-A.3.4 you talk about summary of weight for pole mounted design lines by efficiency level. And it looks -- and again, you show minimum, average, and maximum, and the average -- I'll just use the average values for now -- that was 22,812 pounds, and you do the scaling and it says, well, it won't be until 1400 pounds, that's 4200 pounds and based on the data that you have in this appendix, it says you don't get to that until efficiency level 7.

MR. BOLDUC: As I said, it’s a shortcoming that we would like comment on.

MR. ROSENSTOCK: Okay. And again, I think you received some comment that the delta -- sometimes the delta of the transformer isn’t as important as a certain weight limit on the pole. That even if you only go up a couple hundred pounds, if that’s enough to get to the structural weight maximum of the pole because of the other utilities on the pole, for example, in utility areas, just that small delta based on everything else could lead to the change out. I know the modeling and you’re scaling it, but again I think we’ve sent you information, the fact that especially in urban areas with combined utilities on the same pole, that it’s not just the delta of the transformer, it’s the delta to certain structural maximums on the pole.

MR. BOLDUC: Thanks.

MR. ROSENSTOCK: Again, I have to be honest, I want to be fair. I’m not sure how you model that. You might want to say for a percentage of the poles, especially if you have a -- if there’s some way to analyze urban versus non-urban poles, that might be one way to do it in terms of some of your analysis. If there’s a way to find that data out.

MR. BOLDUC: Thanks, Steve. Moving on to DL-4. Again what we're seeing here is pretty much an extension of the NOPR analysis, what we would expect. At around EL-2 we do see the switchover in the LCC picking amorphous, that's why we see the decrease in payback periods.

And likewise in DL-5. Robert.

MR. BERMAN: Robert Berman, Berman Economics. Can we go back? I'm processing a little slowly today.

MR. BOLDUC: Sure thing.

MR. BERMAN: Why do the payback periods -- why is the chart U-shaped on efficiency levels?

MR. BOLDUC: The payback, yes. This is because we're seeing a transition to amorphous.

MR. BERMAN: That --

MR. BOLDUC: Around EL-2.

MR. BERMAN: That talks about a decline, and then the -- going back up again is?

MR. BOLDUC: That's the increase -- if you remember the engineering curves --

MR. BERMAN: Increased costs. Okay. All right, and that -- that's fairly flat, then. Okay.

MR. BOLDUC: Aaron?

MR. MEYERS: Aaron Meyers, Cooper. Looking at design line 5 here and the mean retail cost, in EL-1 it's $28,000 and change. EL-1.5 it's $25,000 and we generally see the cost of the transformer going up with the efficiency level. And so I'm wondering is that responsible for driving this payback period for the transformer of 1.1 years which kind of seems unbelievably good, I guess.

MR. BOLDUC: Yeah, that looks -- it does look --

PARTICIPANT: Suspicious.

MR. BOLDUC: -- suspicious, thank you. I don't have an explanation for that, Aaron, I'll have to take a look at the model just to make sure everything is reported correctly. Thanks.

National Level Impacts: NIA Results

MR. BOLDUC: So what we have here is we have the proposed standard in green, and we have additional TSLs A, B, C, and D off on the right. As you can imagine, what we're seeing here is we're actually across the proposed TSLs or the new TSLs, we are seeing an extension that we would expect from the LCC results that were fed in there. Do you have any questions? Jerry.

MR. CORKRAN: Jerry Corkran, Cooper Power.

Regarding your proposed TSL-1 what did your calculations show for the percentage of amorphous and percentage of grain-oriented core steel?

MR. BOLDUC: For TSL-1? I don’t have those numbers. I’m sorry. Steve.

MR. ROSENSTOCK: Steve Rosenstock, EEI. Just to clarify, on the second line of that, where it says equipment cost, that’s the change in equipment cost compared to the base, right?

MR. BOLDUC: That’s right.

MR. ROSENSTOCK: Thank you.

MR. BOLDUC: Yes. Okay. So disaggregating these national level impacts to give an illustrative overview of what the savings might be for pads and poles as separate equipment classes, the Department basically assumed a 70:30 split. It’s a very rough estimate for the impacts of the pole mounted or -- sorry, equipment class 1A, which is the all other equipment class, and 1B. A number of reasons for this: one, at the time, we did not have the disaggregated data that we needed to separate the shipments by pads and poles, and also we wanted to go forward with the NOPR tools. So these numbers are very soft. I’d just like everybody to keep that under consideration.

Likewise, for the three phase, we assume that 95 percent of the savings would be attributed to the pad or all other three phase transformers; only five percent would be attributed to three phase pole mounted.

So, in summary, for TSL A, which is very, very close to what the proposed standard was, we're looking at point four five (0.45) quads of savings, NPV of close to .93 billion at seven percent, and 4.66 at three percent discount rates. For most equipment classes we have a net benefit greater than 60 percent. These are based on the LCC numbers.

In terms of the physical changes in the transformers which I know people are very concerned about, we're showing a weight increase of between a four percent for DL-3 and a ten percent weight increase for DL-2. Aaron.

MR. MEYERS: I did look at 25 KVA poles and 50 KVA poles, only poles, because that's what we're primarily concerned with here, and to go to EL-2 and keeping with M3, there was a 40 percent increase in weight for both of them. So I just figured I'd throw that out as a piece of information as the DOE's looking for feedback.

MR. BOLDUC: Sure, can you include that in the written comment afterwards?

MR. MEYERS: Sure.

MR. BOLDUC: Thanks. Steve.

MR. ROSENSTOCK: Chris, again, thank you for this information, but I just want to double check. You said the volume increase of 14 percent. When you say footprint, that's length by width --

MR. BOLDUC: That's right.

MR. ROSENSTOCK: -- in terms of pad? Okay, I just wanted to double-check.

MR. BOLDUC: And likewise, moving on to TSL B. We're looking at point six (0.6) quads of savings, and 1.2 billion in NPV at seven percent, with 6.4 billion at three percent discount rates. And again, we don't see a large change in the pole mounted transformers, I believe. We do see a larger change in the single phase pad mounts in terms of weight. Volume increases are all quite small.

But we do see a change in the materials mix in the very bottom line. I can read this out, but everybody looks like they're reading it -- able to read it just fine. Robert.

MR. BERMAN: Robert Berman, Berman Economics. Could you say a few words about how those percentages are calculated on the results, the last line on the slide. I'm not sure -- I'm trying to do the -- I'm trying to visualize the calculation.

MR. BOLDUC: So this is the sampling -- sorry. These are the results from the LCC sample, the percentage of units selected by the LCC at each EL for each design line.

MR. BERMAN: Okay, so these are the percentage of units --

MR. BOLDUC: That make up the simulation.

MR. BERMAN: -- that make up the simulation?

MR. BOLDUC: Sorry, the simulated results.

MR. BERMAN: So that's what's included in the sample space, not what necessarily wins?

MR. BOLDUC: This was what was selected by the LCC. There are many more materials inside the sample space, but this is the percentage of core materials that was sampled by the LCC.

MR. BERMAN: Selected as least cost or?

MR. BOLDUC: Yes, lowest least cost or lowest TOC. These numbers are available on the summary results tab of all the LCC worksheets, workbooks. Greg.

MR. COULTER: This is Greg Coulter. I

have a question. If I just look at TSL A and B up there.

MR. BOLDUC: Yes.

MR. COULTER: The efficiency class 1A and 1B. 1B is poles. Between TSL A and TSL B, the efficiency levels are exactly the same.

MR. BOLDUC: That’s right.

MR. COULTER: But --

MR. BOLDUC: The savings are different.

MR. COULTER: The savings are different.

MR. BOLDUC: That’s right. That’s an artifact of the rough 70:30 split, or 95:5 split I mentioned earlier.

MR. COULTER: But you have that covered under equipment class B, right? I’m not too sure, you know, one’s poles. Poles didn’t change, only pads would change --

MR. BOLDUC: That’s right.

MR. COULTER: Why does a pad change affect a pole change?

MR. BOLDUC: We didn’t have the numbers to change the NIA -- we didn’t have the specific pole versus pad by KVA rating in terms of shipments to modify the NIA to give you a more accurate answer. Right now, these are illustrative numbers that we think this is what is possible. It's a long way of saying we took equipment class 1 and we split it 70:30 at each TSL for poles and pads.

MR. CYMBALSKY: And we'll take comment on what those percentages --

MR. BOLDUC: Oh, yeah, we'd love those numbers.

MR. CYMBALSKY: -- should be. If you think they're different, we'd love to know what they are.

MR. COULTER: My comment is simple. Once you know the percentage, it don't change whether you're an A, B, C, or D. So your pole class up there should not have changed whether I'm in A, B, C, or D. That's my point. So no change in efficiency should have been no change in the energy savings.

MR. BOLDUC: Well, I understand, Greg. I thought my -- I mean whether it's 60:40, I don't care, 70:30, 80:20, those numbers shouldn't have changed. That's all.

MR. COULTER: I don't see how those numbers could change with no change in efficiency. Same volume.

MR. BOLDUC: I don't have those volume

numbers, Greg. This is my point. Andrew, I understand you had a written comment. Does this answer your question?

MR. deLASKI: It doesn’t, but I’ll keep puzzling over it.

MR. BOLDUC: Okay. Thanks. TSL C, which we’d like to state was the advocates final position from the Reg Neg, which we finally have here today.

PARTICIPANT: (Comment off microphone)

MR. BOLDUC: I’m trying. That would save roughly 1.3 quads over the analysis period. NPV of 2.99 billion at seven percent, and 13.51 billion at three percent. And again, the physical characteristics. Do I have any questions?

MR. ROSENSTOCK: So, Chris, this is Steve again. At the bottom there, again, just based on the model it’s basically either 79 to 100 percent amorphous?

MR. BOLDUC: That’s right.

MR. ROSENSTOCK: Across all design lines, right?

MR. BOLDUC: That's correct.

MR. ROSENSTOCK: And then the other part is M2?

MR. BOLDUC: Yep.

MR. ROSENSTOCK: Thanks.

MR. BOLDUC: And again, TSL D, which is a modified version of TSL C, if you will. Where we're seeing 1.2 quads of energy over the analysis period, and 12.93 billion in savings at seven percent, and 3 billion at three percent. Thank you.

So moving on to the comments sought -- shall I keep going? So for this, you know, we'd really like to reiterate that we're -- after your comments on the new equipment classes, the new ELs, we also -- well, we're seeking comment on all aspects of this analysis for the final rule. In particular, comments on

- the new equipment classes, pole/pad, network/vault, 200 KVA, BIL, any new TSLs. Opportunity for other energy savings.
- The appropriateness of efficiency levels for each class
- The pole replacement costs, which I believe I've gone over
- And the shipments data of all types.

Robert.

MR. BERMAN: Robert Berman, Berman Economics. One thing I haven't seen in this that would seem to be pretty relevant to think about is potential for substitutability. That is to say, take the 200 KV BIL class for example. If I hold that, just for the sake of argument, if I hold that at EL-0 and increase 150 to El-2, am I better off buying -- is it cheaper for me to buy a 200 KV BIL when what I really need is a 150? Do I create distortions on that? Similarly, I guess I don't have any -- problem doesn't appear to come up with poles and pads, because I can't -- I can't use a pole transformer on a pad, I guess, even if I run the wires up and down. But for bulk transformers if I take a look at the minimum requirements for a vault, according to the specs, rather than the price of a typical vault transformer which likely includes lettuce, tomato, pickle, and onion, is it cost effective, is there a trade-off on cost or what is the tradeoff on cost for vault versus pads? Here we don't have a -- our current mix data doesn't help us because if we're going into a type of transformer that's technically substitutable, and start changing efficiencies and relative prices, we might get the market responding in ways we never thought of before. And I'm just interested in what opportunities there might be for that response.

MR. BOLDUC: Thank you. Tim.

MR. BALLO: Tim Ballo, Earth Justice. Just following on to Robert's comment. I think during the workgroup that developed the definition for the network and vault transformers, we had some data from ABB and from Progress Energy that suggested that there was a fairly significant price premium for vault units meeting the IEEE standard. However, as was pointed out on one of the earlier slides, something like 90 percent of vault transformers use a very high quality steel. And if I was a utility and wanted to buy a really low cost transformer, if I were to order one meeting the IEEE vault requirements but not having that high quality core, what would the cost differential be? And it seems like there's an awful lot of potential here for a submersible transformer meeting the IEEE requirements to be sold and installed on a pad. So I'm wondering, is there any analysis available for what that cost differential is for just meeting the submersible requirements?

MR. RABA: Wes.

MR. PATTERSON: Wes Patterson. My understanding was that the existing standard already applies to the networks, so they can't be made any lower than the existing standard. And to comply with the existing standard has already forced those products into the high grade steel.

MR. BALLO: So I guess my question is, are they using the high grade steel to meet the standard within the dimensional constraints of fitting into the vaults?

MR. PATTERSON: And the answer to that is, yes.

MR. BALLO: Okay, but if I'm producing a unit that while having to be submersible, wouldn't have to fit into the vault, do I then have to use the high grade steel? If I'm producing a unit with the purpose of, although it's name plated as a vault unit, it's nudge, nudge, going to be sold and installed on a pad. It seems like I wouldn't have to still use the high grade steel at that point.

MR. PATTERSON: There's a couple of dimensions to answer this question. One is you cannot install a unit designed as a network or a vault on a pad. If we're talking about pad mount transformers. Because those are in publicly accessible areas and these units are not designed to be safe for access to the general public. By compliance with that standard, they cannot be physically deployed in a pad installation. One could say, okay, you'd be crazy enough to put one in for a substation transformer in restricted access area, however the cost of these units run 80 percent more than a standard transformer, because of all the other requirements within the standard. Not just -- I mean, even before we went into the high grade steel, these things carried an 80 percent premium to them.

MR. HIRSCH: Let me interrupt?

MR. RABA: Go ahead. We have an answer here, perhaps? Thank you, Wes.

MR. HIRSCH: Bruce Hirsch, Baltimore Gas and Electric. I don't know if I have an answer, but from a utility standpoint, I can tell you that I'd much rather put a pad mounted transformer up than to put a submersible unit. Submersible transformers, I mean we talk about the weight of the steel and everything, quite honestly, the maintenance of anything that's underground is extremely high, so there's just a tremendous amount of cost. I just don't believe that any utility would take a vault design and put it on a pad somewhere, don't make any sense at all. Utilities would try to put a pad mount transformer in a vault, but it's bought by the pad mount standards, and quite honestly, wouldn't last very long because of the corrosion issues. So I think those are the things that you really need to take into account. There's a direct difference between a network or a vault type transformer than a pad mount transformer, from the utility's point.

The other thing I'd like to point out too is, from the utility's standpoint that has a big city, Baltimore, we don't have an option. We are told we will be putting things underground, so we're mandated to go with the networks and the vaults we buy, and we are not expanding that system at all. Very few units are bought for new installations. They all -- most of what we buy are replacement installations, that's the size limitations that we run into in the discussions that we've had.

So I think it's important to know. I think most of the utility business in networks and vaults is replacement type transformers, and using one for the other just -- it just doesn't make any sense financially to a utility to do that.

MR. RABA: Perhaps you had an answer. Thank you very much. It was very helpful, Bruce, thank you. We have a caller on the line waiting, Kevin Alman. You're live, go ahead, sir.

MR. OEHLMANN: Thanks. Kevin Oehlmann from Con Edison in New York. Just to kind of, I guess, tie into what -- hello, can you hear me?

MR. RABA: Yes, we can.

MR. OEHLMANN: Just to tie in to some of what the individual from Baltimore was saying. We have approximately 26,000 network transformers installed throughout New York City. We cannot install those on pads and we do not put pad mount transformers in vaults. The cost associated with expanding vaults, if we could do that, would be quite high in New York City, just because there is no real estate to do so, and it would have a significant financial impact to our rate payers, should we have to go in that direction.

MR. RABA: Thank you. Very helpful. Very helpful. Thank you, Kevin. Bob Berman.

MR. BERMAN: Robert Berman, Berman Economics. I understand it's not cost effective to put a pad in a vault, for exactly the reasons you say -- suggest. But if I were to make a pad vault transformer accessible or non-accessible, for example, if I put a hood on the only thing that's showing to the public, on the connectors on top, so that was basically locked down the same way as a pad transformer is locked, could I not put it on a pad if it was cheaper to do so? Again, Jerry's quite correct, I've never designed a transformer, but the question is, how is the market likely to respond if we start changing cost significantly. We've got a set of IEEE standards that were set up, that says nobody puts vault transformers on pads and nobody puts pad transformers in vaults, and this is what you've got to do to have the electronics correct, this is what the standard is. Those standards do not, nor should they try to conceive of what happens if, through regulation, we decide to distort relative prices dramatically. And my question is, what happens if, through regulation, we distort relative prices? And what is the amount of distortion in relative prices that we're talking about? So I think we need to calculate what that is, and that's not a question of what does a typical vault transformer sell for, or what does a typical network transformer sell for. That is, what do I have to do to qualify something as a vault under the standard?

MR. RABA: Thank you, Robert. We have several hands up. We have one caller who was first, David Millure, go ahead, we'll put you live.

MR. MILLURE: Thanks. Dave Millure, Metglas. We were talking earlier about the 200 BILs for the vaults and I think Greg Coulter said that we should move that down to 150. My question is, if we move it down to 150 and carve that out, then if you want to buy a 125 at some new higher efficiency standard, versus a 150 at the existing efficiency standard, would not the 125 BIL higher move to a 150? So you're talking market size. We heard about five percent for the 150 and above, maybe we should talk a 25 percent, whatever it is, for the 125 and above, would be the actual impact of that carve out. Thank you.

MR. RABA: Thank you. We've got more hands coming up. Let's take these in turn, please. I think you were next, Andrew.

MR. deLASKI: Go ahead.

MR. RABA: Okay, passing on. Jerry.

MR. CORKRAN: Regarding the different equipment classes that we discussed --

(comment off microphone)

MR. CORKRAN: Good point, any comments on the comment.

MR. COULTER: I would like to comment because he mentioned me.

MR. CORKRAN: Go ahead Greg. Greg Coulter.

MR. COULTER: This is Greg Coulter. I think Dave Millure has an excellent point, actually. It's a point we're concerned about. If you would suggest that 150 BIL was the new cutoff rather than 200, well, people would just start ordering everything as 150 BIL and get a lower efficiency. So we'd be concerned about that too. There's ways to cover that. The easiest way, it's really a voltage issue. BIL is a simple way of talking about this for purposes of meeting like this, but there's certain voltages have to be 150 BIL, and there's certain voltages do not, and we'd really make that a voltage cutoff, not a BIL cutoff. At least that would be my suggestion the way that's handled. These voltages are 150 BIL and above and they would be subject to different efficiency levels than these other voltages. And you cannot use the wrong voltage in these cases. Thank you.

MR. RABA: Thank you. And now are there

additional -- I think you were going to -- Bruce, you had something there?

MR. HIRSCH: Yes, Bruce Hirsch, Baltimore Gas and Electric. Just answering Bob's comments before. I think in one of these meetings earlier, somebody likened it to using a Sherman tank when a Chevy Cruiser would do. That's essentially what you'd be talking about if we were using a network transformer. Inherently they're more expensive because of the thickness of the steel, and it's built that way to withstand subsurface requirements. Certainly I'm not naïve enough to say that somebody wouldn't use a tank to drive back and forth to work once in a while. So it's possible. It certainly is possible that you can take a network transformer, make it safe enough and set it out in the open. It's hard to believe that anybody would do it.

And I think also that if that's ever done, what happens is it now doesn't meet the requirements of a network, it's got to meet the requirements of a pad mount, and it would fall under the auspice of the efficiency standards that were required. But anyway, I think you've just got to understand the differences there. Can somebody misuse equipment, certainly they can, but I think in this case it's a big if. It’s a big if.

MR. RABA: We saw over here. Go ahead, please.

MR. HOFFMAN: Alex Hoffman, American Public Power Association. I was just going to reiterate it based on conversations with various municipal utilities, especially since Wes just mentioned that we were talking about a transformer that’s 80 percent more expensive by design. So it’s not just price, and I hope -- presumably this standard is not intending to raise the cost of a transformer by 80 percent. But there’s also like was mentioned, safety issues, these are very serious, and they have legal ramifications. There’s good design issues, so it’s really not efficient to put these vault -- pad transformers in vaults, because the life cycle of your equipment receives a major impact there. As it is designed and installed -- or designed by an electrical engineer, there’s licensing implications. So the engineer has an ethical obligation not to do something like this and can -- there’s a ramification. There are sets after sets after sets of ramifications for mis-installing a vault -- a pad transformer in a vault. And so I just thought I would reiterate that because I think it’s really important point in this discussion.

MR. RABA: I saw Andrew first, or are you going to comment on these also, Andrew?

MR. deLASKI: Yes, I guess I would just try to summarize by saying, you know, we have expressed in the past that we are comfortable with, if DOE does go to standards that are significantly higher than what has been proposed with separating out classes. But I think the point’s been raised today suggest that there’ll need to be a hard look at the definitions to make sure that we’re not going to abuse it. I hear you Bruce. A network transformer -- we’re not that worried about that based on our review of IEEE. The vault definition, we’re not sure the IEEE definition is as tight -- certainly it’s not as tough as the network definition. So the vaults give us a little bit of pause, and we would like a hard look at that definition and urge the Department to do so as well. Is the vault definition tight enough.

And then to avoid someone -- the market changing in a way that we don’t anticipate, so it’s the unanticipated consequences that we’re trying to avoid here. And Greg, thank you for your suggestion of voltage. I think -- and we’re also very concerned that 150 that that just becomes not five percent, but the whole market. So there's going to have to be something tighter on that. So I think if we go with high BILs, 200 doesn't seem like much of a risk, or go to 150 then that's going to have to be controlled in some other way. And again, if we're talking about higher levels, I think it's totally appropriate to have those conversations.

MR. RABA: First Robert, then Bob, then Steve. Then I think we'll get back to cue you Jerry.

MR. BERMAN: It's really important to look at the costs on this, and the importance of cross-substitutability. We've already got a huge hole in the regs now on pad transformers in that step up transformers for wind aren't covered. If I buy a wind transformer, I can use it on a distribution network. The -- whether or not this is done or the extent to which it's being done, I don't know. But the -- in looking across, trying to see what the costs are, I was a little surprised to see in terms of selling price that the network transformers were just a little bit more expensive than non-network vaults, with a whole lot more electronics on them. And I'm wondering if a lot of these -- the question is, are a lot of these vault transformers being purchased with switchgear that would not be purchased on pad mount transformers necessarily, and that are not required to meet the IEEE definition of a switch.

In looking at that, it seemed to me that Yeah, the case has to be -- is a lot more expensive. I took a look at a copper bearing steel tank that was maybe much thicker, three times the cost of the existing tank. Everything that I can come up with, other than the electronics which, as Jerry points out, I don't design transformers so I don't know about. I can get up to a ten percent difference in cost by goosing some of those items. That tells me that there's a lot more in what's being sold as a vault transformer than is absolutely required to meet the specs. So the concern is, is it possible within the standard, to put a sign on something that says, this is a vault transformer because it meets this standard, and sell it in the market as a pad?

MR. RABA: Bob?

MR. SAINT: It seems to me that you're drawing at straws trying to come up with something that really has no validity. I don't think that electric utilities are going to misuse, misapply transformers. They're just not going to do that, because of the reasons stated in this room.

However, there is another thing that maybe should be concerned about, even more than this is the use of rebuilt transformers, to save money, and that may be -- to me, that's more of a -- that's more likely to occur than a utility misusing a new transformer. And certainly that is a valid concern that has been addressed in this room before because they're not under this rule. And as the prices go up, more and more utilities are going to be looking at rebuilt transformers rather than buying a new transformer, because of the size requirement that may occur, and the efficiency drives the cost up too much.

MR. CYMBALSKY: Thanks, Bob. We've been through that set of bushes, woods, and so I don't want to rehash that argument, please.

MR. SAINT: Thank you.

MR. RABA: That was helpful, Bob. First Steve, then Kevin Oehlmann on the phone. Steve.

MR. ROSENSTOCK: Steve Rosenstock, EEI. I hear the concern about possible substitution because one type of transformer might have a higher standard compared to the other, and involved would be the baseline, which by the way, is increased based on the 2007 standards. They all -- all their standards went up as a result of the final rule in 2007 that took effect in 2010. So the standards for networks and vaults actually have gone up as result of the 2010 standard. So they've already had an increase in efficiency because of the last rulemaking. That's one thing to consider.

The second thing, just to summarize, there's a lot of regulations where you're not allowed to build -- put a pad mount transformer in a city. It's just not allowed. Thou shalt put it underground. Baltimore, New York, other cities, even other new smaller cities, you know, a lot of them have plans where you're putting infrastructure underground for aesthetic reasons. So even if the economics said well, put in a pad or substitute it, the local regulations say, thou shalt not. Period. You would violate the law, and utilities don't like to violate laws. Trust me on that one. Thank you.

MR. RABA: We'll trust you, Steve. Thank you. That was helpful. Kevin on the phone, please. Go ahead. Your turn.

MR. OEHLMANN: Thank you. Once again, Kevin Alman in New York City. I guess I hear some discussions on, I guess in relation to the definition of the equipment classes. I do have a concern with the definition in the current language for a network transformers. As I mentioned earlier, we do have 26,000 network transformers installed here in New York City. That's kind of an onus to maintain. We are the single largest user of network transformers in the United States. I believe Pepco has between 4500 and 5000, same thing with PSE&G, and then the numbers go down from there.

The transformers that I specify do not meet all the requirements of IEEE 6740, so that seems to be discontinuity. And in some cases they achieve the standard, but we don't get a primary switch compartment here at ConEd, that's kind of beyond the scope of this presentation anyway. But certainly I would think that if there was going to be a separate equipment class for network transformers that the ones used here in New York City should fall into that category.

MR. RABA: Thank you, Kevin. Impressive. New York, of course. John.

MR. CASKEY: I'm not sure if we've beat up this issue enough, but I mean I'm looking at the slide there, and I'm prepared to give sort of a general statement about, you know, that we certainly -- if you'd like me to do that at this point.

MR. CYMBALSKY: Yes, that's great. I instructed Jim that we should close that topic down.

MR. CASKEY: Okay. So certainly we appreciate DOE and Navigant and the rest, and LBL, for all the work that they've done on looking at these new equipment classes. Certainly we support very strongly -- NEMA -- this is John Caskey from NEMA -- the idea of breaking out the poles and the pads. We haven't come to 100 percent consensus within NEMA because there are some manufacturers that produce the poles and pads cores that are, you know, basically the same, so if the efficiency between the poles and the pads are the same, for some of those manufacturers it makes it easier on the manufacturing process that they can use the same components as to whether you're using it as a pole, or whether you're using it as a pad. So there are some benefits there.

But beyond that, certainly there are weight and height restrictions associated with putting a transformer on a pole, and breaking out the efficiency standard different from between a pole and a pad makes some sense and allowing the pad efficiency standard to be higher than the pole makes some common sense from our perspective.

We'll provide more detailed comments before the deadline, which I think is the 26^{th} or 27^{th} on that issue.

MR. BOLDUC: The 29^{th}.

MR. CASKEY: the 29^{th}. On the issue of network and vault, we agree with Andrew when he said that there needs to be some additional work done on the definition, and we'll provide some additional help on that, dealing with wordsmithing, on the definition of network and vault as well as where it is submersible -- the terminology submersible fit into that, because from our perspective not all vaults are necessarily submersible transformers.

And also we were talking about the concerns of the vaults. And in my earlier life I actually worked for Pacific Gas and Electric Company as well as Virginia Power, and had been in quite a few vaults, and I think the real driving force is there, is that it is virtually impossible to modify the size of the transformer that's in there. I mean, you basically have to rip out the side of the building, or you have to do some major reconstruction in order to put in a larger vault transformer than what's already there. So I mean that's really the driving force in trying to leave them even though they have increased in 2010, but leaving that efficiency the same as what it is relative to 2010.

The 200 KVA BIL, we're still having some discussions about that. Certainly, as Greg says, the leaving it at the 200 KV BIL, there's a very small market out there to deal with that. Internally, to NEMA, we've talked about whether it just should be terminology of greater than 95 BIL, or whether it should be the 150 BIL that Greg has talked about, so we're trying to resolve that internally and look at some of the market shares and things like that relative to that. But certainly leaving it at the current 200 KV BIL doesn't make a whole lot of sense. So we will work on, you know, what Greg has recommended dealing with the voltage definitions and how they apply to the different BILs.

Certainly we've reviewed the new TSLs. We'll provide some comments on those.

Dealing with the utility pole replacement costs, you know, that's a utility issue, so NEMA is not going to report on that.

And the shipment data, we don't have the information as granular as you would like, so we really won't be able to provide the information for that. Hopefully you can get it from other sources, by working directly with the manufacturers.

So again, we appreciate the opportunity to participate in this and breaking out some of these different equipment classes, and we'll provide comments on all this stuff. Thank you.

MR. BOLDUC: Thank you, John.

MR. RABA: Chris, did you want to -- oh, did you want to say something, Jerry?

MR. CORKRAN: Jerry Corkran, Cooper Power. The DOE had a request that we supply the percentage pads and poles and the selling prices and all, and our managers discussed it and decided that was such confidential information that they didn't feel like disclosing that even though it might go to NEMA who we love very much, of course, but still we've got to keep it within the company. We won't share that.

But one thing I admire DOE for trying to get accurate information and would suggest, if we think back on the -- when I read through the DOE selection of 30 percent loading for single phase, and 35 percent for three phase, and I go through that, I really would suggest that the DOE go to Edison Electric, EEI and find out what loading -- I imagine they could get 100 utility companies to tell you exactly what their loading is. They've got the metering, they've got the -- and that's such critical to the calculations of your payback on the loading, that if that's incorrect and Wisconsin Electric sent you a memo where they said 42 percent for single phase and 55 percent for three phase, and that's with 1.2 million customers -- and that's just one company, but they're telling you that your loading is way off at 30 and 35 percent. And the 30 and 35 percent is like having an A to B factor of eleven to one. And I've never seen a utility -- and if you think about utilities, they've got lots of computers now, they know what they're doing, and why would they put a transformer in that's only to be loaded at 30 percent? They know what their loads are. Thirty years ago they might not have known what their loads are, but they do now.

And so I would request that you go back and look at those numbers. It would be easy to change calculations if you find out you don't have accurate numbers. I don't think you do have accurate numbers. But I request that you take a look at it. Get Steve to -- I think Steve could give you 100 utilities that would give them, couldn't you, Steve?

MR. ROSENSTOCK: No. By June 29th, no.

MR. RABA: Thank you, Jerry. Should we proceed on, Chris. Steve, let's move on.

MR. BOLDUC: Those numbers can come in past June 29th.

MR. ROSENSTOCK: Steve Rosenstock, EEI. We don't want to be blamed for DOE missing any deadlines. No, thank you.

MR. BOLDUC: I'll take the hit for you, pal. No more comment extensions for you.

I'd like to thank you all very much. In summary, it's all up there. Your feedback is requested by the 29th of June. Thank you.

MR. CYMBALSKY: Thanks everybody for coming, we really appreciate it.

MR. RABA: Okay, from our part here, it's tradition to distribute evaluation forms. We would like to hear from you about these proceedings and how we an improve them. So pass these this way.

PARTICIPANT: I thought it went great.

MR. RABA: Okay.

(Whereupon, at 12:13 p.m., the meeting in the above captioned matter was adjourned.)

REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before:

U.S. DEPARTMENT OF ENERGY

In the Matter of:

PUBLIC MEETING ON ENERGY CONSERVATION STANDARD SUPPLEMENTARY ANALYSES FOR DISTRIBUTION TRANSFORMERS

Were held as herein appears and that this is the original transcript thereof for the file of the Department, Commission, Board, Administrative Law Judge or the Agency.

Further, I am neither counsel for or related to any party to the above proceedings.

Wendy Greene

Official Reporter

Dated: June 25, 2012