U.S. DEPARTMENT OF ENERGY

+ + + + +

PUBLIC MEETING FOR TEST PROCEDURE GUIDANCE FOR ROOM AIR CONDITIONERS, RESIDENTIAL DISHWASHERS, AND RESIDENTIAL CLOTHES WASHERS

+ + + + +

FRIDAY

JUNE 1, 2012

+ + + + +

The meeting came to order, in room 8E-089 of 1000 Independence Avenue, SW, Washington, D.C. at 9:00 a.m., Ashley Armstrong presiding.

PRESENT
ASHLEY ARMSTRONG, Department of Energy
LAURA BARHYDT, Asst GC for Enforcement, Department of Energy
ELIZABETH KOHL, Atty Advisor Department of Energy
AMANDA STEVENS, Program Manager, Energy Star Appliances, EPA
KATHLEEN VOKES, Energy Star Product Development, EPA
PAUL RICHTER, AB Electrolux
JENNIFER CLEARY, AHAM
RALPH HUDNALL, AHAM
STEPHEN B. LEYBOURN, AHAM
WAYNE E. MORRIS, AHAM
PHILIP J. MANTHEI, Alliance Laundry Systems
JOANNA MAUER, ASAP
MIKE EDWARDS, BSH Home Appliances Corporation
DAVID J. LINGREY, Friedrich Air Conditioning Co.
BRICE BOWLEY, GE Consumer and Industrial
PHIL HOMBROEK, GE Consumer and Industrial
KELLEY KLINE, GE Consumer and Industrial
KEVIN CHURCHILL, Intertek
LINCOLN BILLINGS, Intertek
MARK MENZER, Intertek
JOHN I. TAYLOR, LG Electronics
JUDITH REICH, Navigant Consulting
ED OSANN, NRDC
RAVEENDRAN VAIDHYANATHAN, Samsung Electronics America, Inc.
DONALD BRUNDAGE, Southern Company
JULIA FARBER, UL, LLC
VINCENT P. ANDERSON, Whirlpool Corporation
WAYNE KLUG, Whirlpool Corporation
DANIEL E. TEICH, Whirlpool Corporation

ALSO PRESENT
MICHAEL WOODFORD, AHRI
KEVIN MESSNER, AHAM
WES ANDERSON, Appliance Standards
MIZANUR CHOWDHURY, CSA International
JOHN CYMBALSKY, DOE
TIMOTHY BALLO, EarthJustice
GEORGE HAWRANKO, Electrolux North America
AMANDA GONZALEZ, Energy Solutions
EDWARD WUESTOFF, Friedrich Air Conditioning Co.
CHRIS ROBERTS, GE
YOOLANDA WILLIAMS, GE Appliances and Lighting
ANGELO CACCIATORE, Haier America
DANIEL WOODCOCK, IAPMO R&T
SEAN SOUTHARD, ICF International
MAX WILBAND, LG Electronics
STEVE POLINSKI, Miele USA
JAVIER BURGOS, Navigant Consulting
JUSTIN SCHMIDT, Navigant Consulting
RICHARD SHANDROSS, Navigant Consulting
TIMOTHY SUTHERLAND, Navigant Consulting
DETLEF WESTPHALEN, Navigant Consulting
TROY WATSON, Navigant Consulting
MVUALA SUAMI, NRCan
SAI ARIDI, NSF International
WAYNE MYRICK, Sharp Electronics
EVA MILAKOWSKI, Ontario Ministry of Energy
MIKE SHOWS, UL
CURT TREMEL, UL Springboard Engineering
DEBRA BENGSTON, Viking Range Corporation

C-O-N-T-E-N-T-S

Call to Order and Opening Remarks 6
Ashley Armstrong
Department of Energy
Introductions 9
Opening Remarks 13
Jennifer Cleary 13
AHAM

General Cross-Cutting Test Procedure Discussion 22
Basic Model Definition and New Basic Model Requirements 22

Model Number 26

Industry Test Procedure Version and Revisions 29
Guidance Procedures and Policies 31
Rounding Policies 36
Other Issues/Open Forum 41
Room Air Conditioner Test Procedure Discussion 43

Installation of Test Unit in Wall Cavity of Test Chamber 44
Adding Water to Drip Pan Prior to Initiation of Test 55

Run-In Period 63

Air Sampler Placement 73
Other Issues/Open Forum 83

C-O-N-T-E-N-T-S (CONTINUED)

Dishwasher Test Procedure Discussion 85
2010 Test Procedure Guidance Regarding Cycle Selection 85

Detergent Volume Calculation 93

Substitutions 100

Preconditioning 108

Soiling and Loading Procedures 124

Rinse Agent Container 135

Water Pressure Measurement 138, 158

Drain Height 142

Upper Rack Position 143

Water Hardness 147

Ambient Temperature 152

Differences in Food Soils 156

Clothes Washers 160

Testing Anomalies 161

Drum Volume Measurement 180

Energy Test Cycle 200

Test Cloth Loading Method 202

Water Pressure 208

Recording of Ambient Conditions 211

Standby Measurement 216

P-R-O-C-E-E-D-I-N-G-S

9:05 a.m.

MS. ARMSTRONG: All right. Good morning, everyone.

For those who don't know me, my name is Ashley Armstrong. I work here at the Department in Buildings. I oversee the testing procedures, the certification, enforcement, and the Energy Star testing that we do in the Buildings Program for appliance standards.

I would like to welcome you today to our discussion, hopefully a productive one, about some of the testing questions and issues that have arisen with respect to dishwashers, clothes washers, and room air conditioners.

This is really a forum for you guys to speak, to bring your issues to the Department. We are really here to listen. You will notice that most of the times today we will not be issuing an opinion on most matters. We are going to be listening. We

will be taking all the different questions and clarifications and requests back and probably come out with some to-do's from this meeting.

But we really appreciate you coming. I encourage you to speak up. This is your opportunity.

Just a couple of ground rules. I think you guys know, when you come up to the microphone, either the ones on the side or this one, please push to talk. State your name clearly for the record. There will be a transcript of this posted on the website. Also, state your company affiliation each time you speak, so not just the first time, but each time.

Another thing we are going to do, for the participants on the webinar, I welcome you as well. We are going to try to incorporate a two-way dialog with you. So, if you want to talk on the webinar, there is a way you can raise your hand. I will know that, and we will try to integrate you into

1 the discussion by unmuting your line and
2 calling on you.
3 Just as with the participants in
4 the room, I ask you that you state your name
5 for the record as well as your company
6 affiliation before you talk, even if you are
7 speaking on the webinar.
8 This is a new webinar thing for the
9 Department as far as the two-way communication
10 goes. So, if it doesn't work too well, we
11 will go back to listening-only mode. But we
12 are hopeful. We tried it out yesterday. We
13 are moving in that direction at least.
14 So, for anyone else who wants to
15 come join the table, feel free to do so, now
16 that we are starting the meeting and it looks
17 like we have a couple of open spots.
18 Other than that, we are going to go
19 around the room and do introductions of
20 everyone. As soon as Kelley gets seated, we
21 will let her start. You could you just start
22 with introductions, with your name and your

company affiliation.

MS. KLINE: Hi. Kelley Kline, General Electric appliances.

MS. ARMSTRONG: Great.

MR. RICHTER: Hello. My name is Paul Richter, AB Electrolux.

MS. ARMSTRONG: Okay.

MR. LINGREY: David Lingrey from Friedrich Air Conditioning.

MR. EDWARDS: Mike Edwards with BSH Home Appliances.

MR. ANDERSON: Vince Anderson with Whirlpool.

MR. OSANN: Ed Osann, Natural Resources Defense Council.

MR. VAIDHYANATHAN: Ravee Vaidhyanathan, Samsung Electronics.

MS. CLEARY: Jen Cleary with AHAM.

MS. FARBER: Julia Farber with Underwriters Laboratories.

MR. MANTHEI: Phil Manthei, Alliance Laundry Systems.

1 MR. MENZER: Mark Menzer with
2 Intertek Labs.
3 MS. KOHL: Betsy Kohl, Department
4 of Energy General Counsel.
5 MS. ARMSTRONG: Ashley Armstrong,
6 Department of Energy, Buildings.
7 MS. BARHYDT: Laura Barhydt,
8 Department of Energy General Counsel.
9 MS. ARMSTRONG: If we could also
10 start on that end in the back, if you guys
11 could actually make your way to the
12 microphone, we are going to get for the record
13 everyone who is in the room.
14 MR. BOWLEY: Brice Bowley, General
15 Electric.
16 MS. CHINGOS: Abigail Chingos,
17 Office of General Counsel, and I work in
18 Enforcement with dishwashers and clothes
19 washers, among other things.
20 MR. CASE: Dave Case, DOE Office of
21 Enforcement as well, and I work with room air
22 conditioners.

1 MS. STEVENS: Amanda Stevens, EPA,
2 Energy Star.
3 MS. MAUER: Joanna Mauer, Appliance
4 Standards Awareness Project.
5 MS. SWOGGER: Denise Swogger,
6 Alliance Laundry Systems.
7 MR. BRUNDAGE: Don Brundage,
8 Southern Company.
9 MR. TAYLOR: John Taylor, LG
10 Electronics.
11 MR. TEICH: Dan Teich with
12 Whirlpool.
13 MR. KLUG: Wayne Klug, Whirlpool.
14 MR. CHURCHILL: Kevin Churchill,
15 Intertek.
16 MR. BILLINGS: Lincoln Billings,
17 Intertek.
18 MR. MORRIS: Wayne Morris with the
19 Association of Home Appliance Manufacturers.
20 MR. HUDNALL: Ralph Hudnall,
21 Association of Home Appliance Manufacturers.
22 MR. LEYBOURN: Steve Leybourn,

1 Association of Home Appliance Manufacturers.
2 MS. ARMSTRONG: Okay. Did we get
3 everybody in the room? If not, please
4 introduce yourself.
5 MS. VOKES: Hi. I'm Kathleen
6 Vokes. I am with the EPA.
7 MS. ARMSTRONG: Okay. Sorry.
8 MS. REICH: Judith Reich from
9 Navigant.
10 MS. BRUNK: Debra Brunk from
11 Navigant.
12 MS. ARMSTRONG: All right. Well,
13 right before we do opening remarks, I just
14 want to make one further comment. For
15 dishwashers, we have an open rule right now.
16 So, I just want to make clear that any of the
17 issues brought up today, the Department
18 doesn't plan to address those. Those will be
19 addressed through the rulemaking process. We
20 encourage you to submit comments to that
21 docket as they may relate to that. You can
22 certainly bring up issues, or if there are

1 issues that haven't been brought up as part of
2 that rulemaking, you can bring them up here,
3 but they will be addressed in that docket, in
4 that rulemaking. So, just to make that clear
5 before we start.
6 With that, I am going to open it
7 for opening remarks. I know there is someone
8 down there who wants to go first.
9 MS. CLEARY: I will volunteer.
10 (Laughter.)
11 I just wanted, first of all, to
12 start by thanking DOE, and Ashley in
13 particular, for holding this meeting today.
14 MS. ARMSTRONG: Can you do me a
15 favor and state your name?
16 MS. CLEARY: Oh, I'm sorry. Jen
17 Cleary with AHAM.
18 We think this is a very important
19 meeting, and we are grateful to have the
20 opportunity to discuss these issues today.
21 In particular, a combination of
22 factors is making correlation and common

1 understanding of DOE's test procedures more
2 critical than ever before.
3 One, standards are becoming more
4 and more stringent, which leaves less room for
5 error during testing.
6 Second, we have increased DOE
7 enforcement testing.
8 And third, third-party verification
9 testing by different laboratories for Energy
10 Star, also, through DOE and certification
11 bodies.
12 So, accordingly, like I started out
13 saying, we thank DOE for holding this meeting.
14 We see it as a very important opportunity for
15 an open dialog to discuss these issues, and we
16 look forward to future meetings like this.
17 Hopefully, today will be successful.
18 In particular, there are several
19 lab processes that I think we will discuss
20 today that are difficult to characterize in
21 the limited wording in the test procedures.
22 The result is that different labs, you know,

we have witnessed, are interpreting procedures different, certain procedures in the test procedure differently, which means different results. And the outcome could be false findings of compliance or non-compliance.

Some examples of these types of issues that cut across all products: significant digits and rounding. I think there is some significant confusion about DOE's procedure for that for each product. There are provisions in different areas of the rules. And so, we would be looking today if DOE is able to kind of walk us through that so everybody is clear.

And also, this is coming up now in Energy Star specifications. I think we would look for those to be the same as DOE, whatever the process is.

The approach to new basic models should be the same for DOE and for Energy Star. So, we would hope that there is only a need to report changes that result in a

measured energy that is less efficient than the reported value.

The approach for the change in model year also needs some clarification. If there is a placeholder for the model year in the model number, we don't think there should be a need for retesting or certification, once that placeholder value is changed for the year.

Also, there has been great improvement in the way that DOE has been posting and issuing its guidance, but we still look for a little bit of clarification around the significance of when DOE maybe posts guidance on its guidance website and then later pulls it down. What should we be doing as an industry in that type of situation?

Some just examples of why this meeting is necessary for each product. And we plan to go into these issues in depth today. But for dishwashers there are several questions around cycle selection and

identifying whether a cycle is soil-sensing. There is some interpretive confusion regarding the detergent volume calculation. There is a significant need for substitutes, both in the soils and the dishware. Flatware is being addressed, but dishware as well. And the need for these substitutions to be specified through a quick and clear procedure as they arise, because these issues will continue to arise. And also, the definition of preconditioning needs some clarification, among other issues.

For clothes washers, one main issue is how to address testing anomalies, like an unbalanced load during testing. Also, some further need for clarification on drum volume measurement. Particularly, I know J2 addresses many of them, but we are still under J1. And so, we need some more guidance in addition to what is already out there with regard to bad design, the weight used to determine volume, unique design features, and

1 shipping bolts. Also, there is a need for a
2 more detailed description of the test cloth
3 loading pattern and sequence.
4 With regard to room air
5 conditioners, there are some questions
6 regarding there is some variability in the
7 installation of the unit from lab to lab.
8 Also, some labs add water to the drip pan to
9 speed up the time to reach equilibrium, and we
10 would like to discuss that. The placement of
11 the air sampler and, also, the run-in period.
12 Again, just stressing the need for
13 the open dialog which this meeting addresses.
14 We think that we should continue to work
15 together on these test procedure issues. AHAM
16 is constantly working to improve our test
17 procedures, many of which DOE incorporates by
18 reference into its test procedures. And so,
19 correspondingly, we would hope that DOE would
20 revise its appendices to incorporate by
21 reference the most recent version of the AHAM
22 test procedure, where relevant. This will

1 greatly reduce the variation. Many of our
2 changes are to address variation that we see,
3 and there should be a quick process for doing
4 that and to evaluate the impact on measured
5 energy.
6 DOE should also consult
7 stakeholders before issuing final guidance.
8 We think this is the best way to have good,
9 clear guidance and, also, give industry some
10 lead-in time for that guidance, as if it was
11 unclear, there may be some who were not doing
12 it the way the guidance indicates.
13 Also, this guidance should be made
14 publicly available to all stakeholders, so
15 that the tests can be run by all labs in the
16 same way. That is critical.
17 Finally, we would ask, does the
18 Department have some clear criteria that we
19 could evaluate whether it is best to seek
20 clarification through a guidance request,
21 through maybe a petition for a test procedure
22 change. If there aren't such criteria, could

they be developed? And we just see this as important for us to help you make the test procedures as clear as possible.

So, thank you again for this meeting today, and we have several specific issues that I know our members wish to raise.

MS. ARMSTRONG: Great. This is Ashley from DOE. Thanks, Jen.

Does anyone else have opening remarks that they would like to make at this time before we get into the details of each of the issues?

(No response.)

No? Wow. This could be a really quick public meeting.

(Laughter.)

Okay. So, I will say, like I said at the outset, really I don't have anything but a simplified agenda because this really isn't a presentation of the Department that the Department is making for comment. This really is a forum for you guys to discuss the

1 details, especially examples of what you think
2 or how things are being conducted differently,
3 where the clarifications are needed, where the
4 ambiguities lie. The more details you can
5 provide to us, the more helpful it will be to
6 us, and, hopefully, the more helpful we can be
7 to you, once we get a chance to evaluate
8 things as they come through.
9 So, with that, I am going to move
10 on. Okay. So, the first thing we are going
11 to talk about today is some of the more
12 general items that have been brought up. And
13 granted, I have listed here on the agenda the
14 items that I am aware of today that have been
15 brought to my attention, but by no means does
16 this mean you need to limit your questions or
17 clarifications or requests to these items
18 alone. Feel free, when we get to the end
19 where there are open issues, to bring up any
20 other questions or concerns you may have. And
21 we encourage you to do so.
22 So, the first questions that we

have gotten surround the basic model definition and what actually constitutes a new basic model. I am actually going to open the floor for discussion first around what questions may lie or what concerns there are, just so that we can understand.

Anybody?

MS. CLEARY: This is Jen at AHAM.

I don't know if we so much have questions about the basic model definition, but we do think it is important that it be the same, you know, part of correlation I think is that it is the same for Energy Star, which certainly since we initially raised this issue that has definitely been incorporated into the specifications. I think AHAM would continue to believe it would be better if DOE's regs were cited instead of the language copied, so that they would always be the same. But I think that was maybe our main concern there.

And with regard to new basic model, as I mentioned in my opening statement, I

1 think we just want to make sure that it is
2 clear that there is only a need to report
3 changes to a product that would result in
4 less-efficient measured energy, that there is
5 no need to report certainly things like a
6 color change. Or more germane would be
7 changing like a part in the product that
8 either would not change the measured energy at
9 all or would change the measured energy to be
10 more efficient. Because the manufacturers
11 have the ability to conservatively rate, there
12 shouldn't be a requirement to report that type
13 of a change or to institute a new basic model.
14 MS. ARMSTRONG: Okay. So, this is
15 Ashley from the Department.
16 Jen, I think what you just said is
17 fairly consistent with the Department's
18 position as far as its regulatory program goes
19 with respect to basic model. And I think
20 Kathleen can confirm that DOE and EPA are both
21 working together on a regular basis. So, to
22 the extent there are differences there, I

1 think we are committed to working through
2 those. I think we think we are harmonized.
3 MS. VOKES: This is Kathleen Vokes
4 from EPA.
5 I am not aware of a requirement for
6 Energy Star to make people report. You know,
7 if it is a basic model, it is part of the
8 family. So, it is just treated the same way
9 in our specifications.
10 So, if you have any examples of
11 instances where you believe that we are not
12 harmonized and we are not doing it the same
13 way, please bring it to our attention.
14 MR. ANDERSON: This is Vince
15 Anderson at Whirlpool.
16 Just to be terribly clear on this
17 -- and, Jen, in your verbiage there, there is
18 a distinction that I want to make sure is
19 clear. Jen said that we would not have to
20 report the change as long as it was equal or
21 more efficient. Actually, what we have
22 proposed is that so long as it essentially

meets the rated value. So, there could be a design change that we make that makes the product less efficient; yet, it still meets its rated value. So, I just want to make sure I am terribly clear on that. The rated value is the key parameter to focus on.

MS. ARMSTRONG: Okay. This is Ashley Armstrong from DOE.

Once again, for the DOE regulatory program, that is correct. As long as your test data still supports your certified rating -- so, for example, if you rate conservatively, if you make changes, it might be slightly less efficient, but that certified rating is still supported; you are good to go.

Now I will say, with one caveat, that if you make changes to make a model more efficient and you want to claim that more efficient rating, you do need to recertify your product. But if you do not want to claim that more efficient rating and you still want to go with a conservative rating, you are good

to go.

MS. VOKES: And I would just add for that, for EPA for the Energy Star Program, we have a specific clause in our conditions and criteria for certification bodies that says they have to do a reevaluation in the event of significant changes. And the specific language says that they have to have procedures to reevaluate product performance in the event of changes that could affect the Energy Star qualification status of the product the CB has certified.

So, the example that you gave is not something that would impact the certification qualification status. And so, you would be fine.

MR. ANDERSON: Okay. Thank you.

MS. ARMSTRONG: Okay. Issue two, the next issue, we have gotten questions about model number changes and when a model number needs to be changed in terms of DOE's regulatory program.

So, do you guys want to speak to any issues regarding or questions regarding that specifically?

(No response.)

No? Okay.

MR. MANTHEI: Phil Manthei from Alliance Laundry Systems.

Okay. If the model efficiency were to go down, be less efficient, and we would like to change the certified rating, then does the model number actually have to change? Let's say we are not making any significant change to the model, but we have found through verification and audit testing that the model doesn't meet what we originally certified.

MS. BARHYDT: So, again, I can't speak to Energy Star or FTC's requirements. But with respect to DOE's regulatory program, the only time that we require a model number to change is when the product has been found to be non-compliant with the standards.

MS. VOKES: I can confirm that is

similar for Energy Star. So, if find that a model is disqualified from Energy Star, if you wanted to recertify that it is Energy Star, then we require a new model number. But, otherwise, we don't.

MR. MANTHEI: Okay. Thank you.

MS. KLINE: Kelley Kline with GE.

One question I have seen come in the past is the extent or any guidance around what needs to change in a model number when you are making a change. You know, sometimes it is a question of, can you change engineering digits or is a change in the model year sufficient. Or is there any thinking around how significant the change needs to be?

MS. BARHYDT: Okay. So, if DOE has found a product to be non-compliant, it needs to be a change that is going to be visible and noticeable to a consumer. The whole point of that requirement is to ensure that consumers don't get confused between a new model and an old model that was not compliant.

MS. KLINE: Okay. And I guess I wasn't thinking about that example in particular where DOE has the non-compliance. I was thinking more of a change in the normal course of things.

MS. BARHYDT: Since we don't have any regulatory requirements with regard to those, it is not impacted.

MS. KLINE: Okay. Thank you.

MS. ARMSTRONG: Okay. Moving right along, the next issue that has been brought up is industry test procedure versions as well revisions when they have been revised, either industry standards, ANSI standards, ASHRAE standards that may be applicable, but DOE has not yet gone through the rulemaking process, but they are available publicly.

There have been some questions as to what version should be used. So, for the DOE regulatory program, the version that should be used is always the version in the Code of Federal Regulations. It is that

specific version, that specific year. And even if there are more recent substitutes, they cannot be substituted unless we have gone through a rule to update the proceeding. So, I think that is fairly clear.

And to Jen's point and her presentation this morning as to DOE adopting the most recent version, we are trying to do that. We have a seven-year lookback provision in our statute to review each test procedure at least once every seven years. If we had a strong need to do so earlier, we could always have that discussion when it arrives. But we are committed to trying to review the test procedures on a regular basis.

So, I am going to open the floor if anyone has any questions.

MS. CLEARY: This is Jen with AHAM.

I think we are revising our test procedures much more than every seven years. So, what would be the best way for us to ask you to update the DOE test procedure?

1 MS. KOHL: You can always submit a
2 petition for rulemaking.
3 MS. ARMSTRONG: Okay? So, the next
4 issue is guidance procedures and policies.
5 When we issue guidance, as you are well aware,
6 our guidance system is relatively new. It is
7 on the website. It is by product. It spans a
8 variety of different categories, some of which
9 is applicability of standards, global
10 coverage, enforcement, certification, and some
11 of which is test-procedure-related, which is
12 probably more applicable to today's meeting.
13 That being said, some of them we do
14 put out for a draft; others we do not put out
15 for a draft because they are the Department's
16 interpretation. That being said, it is our
17 policy, if we put out as draft, to provide a
18 comment period, to send the blasts to
19 everyone. It will also be posted on our
20 website. So, that is basically the guidance
21 procedures more or less. As far as the policy
22 goes, I am turning it over to my lawyers.

1 MS. BARHYDT: We had received one
2 question about the binding effect of the
3 guidance. The guidance that we issue, when we
4 issue a final guidance document, obviously, it
5 is not a legal requirement. It is an
6 interpretation of our existing regulations.
7 But we do say exclusively on every single
8 final guidance that manufacturers may rely on
9 that guidance.
10 MS. KOHL: And that was Laura
11 Barhydt from DOE.
12 MS. ARMSTRONG: So, with that, does
13 anyone have any questions about guidance
14 specifically?
15 This is Ashley from DOE.
16 MS. CLEARY: This is Jen with AHAM.
17 I think lead-in time is
18 particularly important when there is guidance.
19 So, I mean, sometimes it seems like there is,
20 for example, like a 30-day lead-in time to the
21 guidance or there is a specific date that is
22 indicated on the guidance. Is that uniform

across all guidance? Or, I think, could it be?

MS. BARHYDT: Well, if you are interested in it being a standard amount of time, I would be interested in hearing about that. My expectation would actually be that manufacturers may want variable amounts of time, depending on what they believe the impact of the guidance is. If their interpretation has been radically different from how the Department reached the guidance, it seems to me manufacturers may actually want different amounts of time for the guidance.

But, in any case, whenever we put out a draft guidance document, anyone can always comment on what they believe is a necessary amount of time before it goes into effect, whether we specifically ask about that or not.

MS. CLEARY: This is Jen with AHAM.

Thank you. And certainly, I think when we know there is a certain amount of time

1 and there is an ability to comment, we will.
2 But when there isn't draft guidance and it
3 comes out just final, certainly, we would hope
4 that lead time is always considered. I think
5 there have been some cases where industry
6 would consider the guidance to be a change,
7 and there has been either very little lead
8 time or the lead time hasn't been expressly
9 stated. And so, then, there is confusion
10 about would it be like a standard 30 days or
11 is it today that the guidance was issued?
12 So, I have certainly noticed that
13 guidance has started to have like more of a
14 format. So, that is helpful. I think we
15 would agree that it shouldn't be like 30 days
16 across the board because in some cases that
17 may not be enough. But it is probably never
18 enough to have it be that day.
19 So, I think that would be a
20 situation we would say categorically we
21 wouldn't want to see. I think we would want
22 to have at least like maybe a standard minimum

time and more time could be allowed.

MS. BARHYDT: So, I know there have been some growing pains with the guidance, but our policy and practice now is that all test procedure guidance goes out for comment. And I might put one little caveat on that. There have been several test procedure rulemakings that have had in the body of the rulemaking guidance and in the preamble. And so, we may immediately just post that out in the guidance document, so that somebody doesn't have to go back and find The Federal Register. But since it was published in The Federal Register, that we wouldn't put out for comment.

But any new guidance is going to be put out for comment for test procedures. As Ashley said, we do send out blasts to all the people on our regular mailing list or people who have been interested in the rulemakings. And so, we are trying to make sure that everyone is aware whenever we put out a document for comment.

MS. CLEARY: Jen from AHAM.

And we thank you for that. That has been very helpful.

MS. ARMSTRONG: All right. Moving right along -- this is Ashley from DOE -- is the rounding policies. We have just gotten some questions generally about how is rounding conducted. It is in different places in the CFR.

So, as a general policy, before I open the floor, if there are specific rounding provisions in the appendices, in the test procedures themselves, they obviously are required to be followed. If there are specific rounding provisions in the industry standards that are incorporated by reference or the sections of the industry standards that are incorporated by reference, those are also required to be followed. So, that would be on a unit-by-unit basis. And then, if there are different additional provisions in the test procedures themselves about multiple units or

1 averages that they may apply, those are
2 required to be followed.
3 There are also rounding provisions
4 in 430.23. So, I would encourage you to check
5 those as well. That is the general section
6 that talks about the test procedures as well
7 as some of the requirements for the annualized
8 use for FTC labels. There are rounding
9 provisions there.
10 Now I realize that the rounding
11 provisions are not harmonized in our
12 regulations across the board as far as
13 location and whether they are or are not
14 there. So, where we do have rounding
15 provisions, they should be followed. Where we
16 don't have founding provisions at all, DOE, as
17 far as those certified ratings go in terms of
18 we look at the number of significant figures
19 in the actual standard, the energy
20 conservation standard -- that's all -- against
21 their certified rating. So, that is the
22 general matter of practice.

1 That issue is still ongoing, and we
2 will be grappling with it in a future
3 rulemaking to try to kind of standardize the
4 way that it is treated as well as the location
5 to make it a little bit easier.
6 So, I will open the floor at this
7 time. But that is pretty much for the DOE
8 regulatory program.
9 MR. OSANN: This is Ed Osann from
10 Natural Resource Defense Council.
11 Could you just restate the last
12 point you made about what you are intending to
13 do in the future?
14 MS. ARMSTRONG: Oh, just generally
15 that we are going to plan to address rounding
16 provisions where they either do not exist or
17 generally how they are applied to the
18 certified ratings in a future rulemaking.
19 This is Ashley from DOE.
20 MR. OSANN: This is Ed Osann again
21 from NRDC.
22 There would be a future rulemaking

specifically on rounding?

MS. ARMSTRONG: This is Ashley from DOE.

No, it would likely be part of a larger rulemaking. So, for example, if we do another certification and enforcement rulemaking, it may be part of that, yes.

MR. BOWLEY: Hello. This is Brice Bowley at GE.

I guess the one question I had, and you answered it somewhat, is that if the appendices or test procedures have a rounding, it should be followed. I guess my question is, if it is part of the test procedure, does it need to be applied on basically a unit-by-unit basis, that if a unit is tested four times for certification, it should be rounded each time that the value is calculated? And then, an average is calculated at the end with the rounded values?

MS. ARMSTRONG: This is Ashley from DOE.

1 And I caveat this with you should
2 read the specific language in the test
3 procedure just to make sure they don't have
4 additional rounding provisions for like the
5 sample as a whole. And I think you meant if
6 four units are tested, not one unit tested
7 four times?
8 But, okay, so if your sample,
9 though -- most of the test procedures are
10 written on a per-unit basis. If there are
11 rounding provisions in the test procedure,
12 they are applied per unit, each unit. And
13 now, if there is additional sampling or
14 rounding provisions applied to the sample,
15 they would be specified for like the averages
16 or the UCL/LCL, those types of things. Those
17 mostly do not exist right now, though.
18 All right. So, I think that is it
19 with rounding, unless anyone has any other
20 issues.
21 (No response.)
22 Okay. With that, I am going to

open the floor to just any other general questions you may have that are not specific just to room air conditioners, dishwashers, or clothes washers, or maybe across the board, before we move into our product-specific section.

MR. OSANN: This is Ed Osann with NRDC.

One more on rounding. This is actually on significant digits. I think the statement was made that significant digits are based on the metric that is in the standard.

Just to be clear, would that mean, for example, that if a standard were expressed as, say, an efficiency of 97.6 percent, that the significant digit would be one decimal place?

MS. ARMSTRONG: This is Ashley from DOE.

Unless there are specific rounding provisions that prevail, DOE would compare the certified rating to the tenth decimal place,

as expressed in the standard, correct.

MR. ANDERSON: This is Vince Anderson with Whirlpool.

I am just kind of curious. That is the first time I have heard at least that, in the absence of any guidance in the test procedures relative to rounding, we would go to the standards provision. I just wonder if that ought to be documented perhaps as a guidance, so that it is clear how that should be applied.

MS. ARMSTRONG: Thanks for your comment. We will consider it.

MR. ANDERSON: Okay.

MS. ARMSTRONG: Any other remaining questions or open, cross-cutting-type issues that may apply to all the products before we move on to room air conditioners?

(No response.)

Okay. Does anybody want to change seats? I know that we had a couple of requests at the beginning. So, before I move

1 right into room air conditioners, does anybody
2 want to move around? If anyone else wants to
3 join the table, there are three seats
4 available. I promise I am not that bad.
5 All right. We are moving ahead.
6 We are ahead of schedule here.
7 So, with this, I am going to
8 strongly encourage that everyone speak up and
9 talk because the more details we have about
10 where the variances may lie between different
11 labs, the more it will help us. So, the more
12 details that you can explain, unlike the first
13 section, we really don't have a lot of
14 opinions on the next three at this point. It
15 is really we need to hear from you guys what
16 is happening, where the ambiguities exist,
17 what is going on. So, I strongly encourage
18 you to please come up and please speak up
19 freely as you may wish.
20 So, the first issue that was
21 brought to our attention has to do with the
22 actual installation of the room air

1 conditioner and the test chamber itself.
2 So, with that, I am going to open
3 the floor. I don't know whowants to speak
4 first. Hopefully, a lot of you want to speak,
5 as well as I will be monitoring the phone or
6 the webinar in case anybody else wants to
7 speak on that. Feel free to raise your hand,
8 and we will call on you as we cycle through.
9 But, yes, open the floor.
10 MS. CLEARY: This is Jen with AHAM.
11 We have a handout that we brought
12 which goes through some of these issues that
13 are on the agenda. Would it be helpful to put
14 it on the screen? We have it there as well.
15 MS. ARMSTRONG: Do you want to
16 describe what the general issue is, or
17 somebody? And then, maybe different people
18 can speak to different potential
19 interpretations or that type of thing with
20 additional details other than what is in the
21 box, just to help us understand.
22 MS. CLEARY: Sure. I mean, maybe

1 some of the companies want to speak, too.
2 MR. LINGREY: Yes, this is David
3 Lingrey from Friedrich Air Conditioning.
4 There are basic types of room air
5 conditioners with regard to chassis design.
6 There are fixed chassis designs where the unit
7 is contained as one fixed unit. You can't
8 pull out the internal parts of the unit. It
9 just gets mounted in the wall.
10 Then, there are slideout chassis
11 designs where you would mount the shell into
12 the window, and then you could slide in the
13 internals. When that is slid in, there are
14 some sealing gaskets that normally need to be
15 put in place.
16 The standard, of course, says that
17 no effort shall be made to seal internal
18 construction of the air conditioners. I think
19 that is meant for where there are bulkheads or
20 passthroughs where we seal for piping and
21 electricals and that sort of thing. I can see
22 that that makes sense not to do that because

1 that would be, in effect, probably a
2 manufacturing deficiency if those weren't
3 sealed properly between the indoor and outdoor
4 cavities.
5 But when there is a slideout
6 chassis, the gaskets need to be applied
7 properly obviously. Otherwise, there can be
8 some air changes or exchanges from indoor to
9 outdoor, and vice versa, which would affect
10 the efficiencies. And obviously, those need
11 to be put in place with regard to the
12 manufacturer's instructions and that sort of
13 thing.
14 I think there have just been some
15 cases where, because of placements, optimum
16 placement, it is not necessarily conveyed or
17 understood by the testing lab. In some cases,
18 there have been noticed errors. Okay?
19 And then, for example, an air
20 conditioner may be able to be slid right or
21 left inside the chassis and it tests in
22 performance better when it is on, say, the

left side than the right side. That is where things are optimized.

Now, in the general public installation instructions, those testing optimization points are not necessarily conveyed because of marketing language simplicities, if you will. So, it is the matter of having a separate document or appendices that could be used by the testing lab to understand that better.

Do you follow me?

MS. ARMSTRONG: Oh, I follow. Do you know what's coming?

This is Ashley from DOE.

I guess I want to understand why you feel it is necessary to have additional testing instructions that an actual consumer wouldn't follow when it is installed in the field. In other words, you are not going to get that performance if you don't tell them to install it, as your example, on the left or on the right. If there is an optimal performance

1 location in a window, why should that be used
2 for testing?
3 MR. LINGREY: It is just an example
4 of some of the things that could happen
5 because the consumer doesn't test the product.
6 They install it and they operate it. Okay?
7 And it is just the way it goes.
8 MS. CLEARY: This is Jen Cleary
9 with AHAM.
10 I think what we would be suggesting
11 is that, if the manufacturer's instructions
12 indicate sealing around the unit, for example,
13 then that should be done during the testing.
14 So, that would be something that the consumer
15 would be seeing. I don't think that AHAM
16 would be suggesting anything -- I don't know;
17 I don't think David was suggesting, either --
18 that the unit should be tested on the right or
19 on the left. I think what we are looking for
20 here is that there should be consistency from
21 lab to lab in how the units are installed. If
22 the consumer would be installing it, sealed

around the edges, then that should be done during testing as well. That is how the consumer will see the product.

MS. ARMSTRONG: Okay. So, this is Ashley from DOE.

And I don't know; we have several labs in the room. And so, I encourage you guys to also speak freely.

But I think, from the Department's position, in most cases in our test procedures we follow the installation instructions that are shipped with the unit. And so, that being said, if there are additional specifications that are not shipped with the unit, those are outside the bounds. So, if there are specific instructions you want DOE to follow, they need to be in the installation manual available to the consumer as well as anyone who may buy the unit.

Yes?

MS. CLEARY: This is Jen at AHAM.

I think another issue we have here

in this first issue is that some labs may add thermocouples to be able to get some extra information about performance, and some labs may not do that. And so, what we would propose, I think, is that that should be permitted so long as it is not interfering with the airflow or the test results, that there shouldn't be anything to stop a lab from gaining that extra information about performance.

MS. ARMSTRONG: This is Ashley from DOE.

And, Ed, hang on one second on the line, and I will open it up as soon as I ask Jen a question.

Can you just explain to me, I mean, I have an assumption, but can you explain to me what you would use the data from those thermocouples for?

MS. CLEARY: I will open that up to companies to share.

MR. LINGREY: You know, the issue

with regard to thermocouples, I don't know where that originated. I wasn't in all those original discussions. But, from a unit-under-test aspect -- this is David Lingrey, again, by the way -- we would monitor beyond what is done or entered into the ASHRAE 16 standard. For example, we monitor suction pressures and temperatures and discharge pressures and temperatures and some other things.

So, we understand how the unit is operating beyond what can be measured in a calorimeter room just by measuring input watts into the space. And so, those are just some things, I think that that is why that was added there.

But if that was the case, it should be done in every instance and it should be added in through ASHRAE 16 testing or SPC process.

MR. CHURCHILL: Hello. This is Kevin Churchill from Intertek.

As far as the thermocouples go,

they can be installed on units, and we generally do. They are used just an indication-only purposes. They are not installed internally as far as pressures go. Not all the units come with the availability of hooking on gauge lines or have ports for gauge lines.

Also, I would like to speak on the insulation of the units. As far as we go, we can only follow what we are given by manufacturers for the insulation instructions, which those insulation instructions that we follow, we follow them just as the consumer would, step-by-step. So, if they have a right- or left-orientation, if they have a foam-orientation or a sealing-orientation, that is what we follow, which is directly what the consumer would follow.

As far as the taping goes, when we do tape, there is a pressure that we must maintain constant between indoor and outdoor. So, the taping is just for a barrier wall

purpose, making sure that there is no air infiltration from indoor to outdoor.

We do have to make sure to ensure that the taping is not over any sealing of the unit from the chassis itself to the cabinet. I think that is a major point to make there on that, of the insulation and the use of the taping.

Thank you.

MS. ARMSTRONG: Okay. Emily, do you mind unmuting Ed?

MR. WUESTHOFF: Yes, this is Ed Wuesthoff at Friedrich.

MS. ARMSTRONG: Go ahead.

MR. WUESTHOFF: The only point I wanted to make had to do with listening to, reading the manufacturing instructions, and then reviewing some of the pictures after the test. Sometimes it takes like where you can see that maybe a sleeve was used that had been used repeatedly with the test facility, and it does not represent what is actually

manufactured, from what the customer would get.

So, sometimes maybe the opportunity to balance the way a unit has been tested may be something that we want to consider because there are cases that you witness the test setup for certain products that we build when being tested for AHRI, for example.

MS. ARMSTRONG: Okay. Thank you, Ed.

MR. WUESTHOFF: You're welcome.

MS. ARMSTRONG: Does anybody else have any comments or questions or details about specifics regarding installation and thermocouple placement or the addition of thermocouples, before we move forward?

(No response.)

Okay. This is Ashley from DOE.

The next issue -- and, Jen, I don't know if my agenda follows yours exactly, but I tried to do it this morning when I got in. But, anyway, the next issue on my agenda is

the addition of water to the drip pan -- it should say "drip," not "drop"; sorry -- prior to the initiation of the test. And that does follow No. 2. So, we are good to go there.

So, I am going to open the floor about that, discussion of that issue.

MR. BOWLEY: This is Brice Bowley at GE.

Yes, I think looking at this, and trying to understand why someone would want to add the water, partly comes into the run-in and operation. A lot of times when the units are being run-in as far as for the unit to come to equilibrium, they are not being run-in under standard conditions. They are being run-in in any room that is available to allow the compressor components to wear and to basically come to a stable efficiency.

So, even though the units run for, let's say, 24 hours, it may not have generated any moisture and accumulated in the drip pan. So, that being said, when it is put in the

room, it is not at a stable condition that represents it running for 24 hours. So, adding water to it allows it to come to a stabilized operation quickly.

MS. ARMSTRONG: Thanks. This is Ashley from DOE.

Just a question to you. If you were to add water to the drip pan before you start the run-in in a condition, would then you still not have to use the conditioned space or you would still have to use the conditioned space? Then, how long would that decrease the potential run-in? Does that make sense?

MR. BOWLEY: Well, the run-in -- this is Brice Bowley at GE again -- the run-in and the effect from the water are different effects. The run-in, as far as if you added the water before the run-in and you run in a non-conditioned space and the humidity is low, you are going to remove the water.

MS. ARMSTRONG: So, I guess the ask

here, then, if I understand you correctly, is run-in is down on my list, but to add water for what period of time? Just when the test is being initiated or for a certain period of time after run-in, before the test, to allow for stabilization? What exactly are you asking?

MR. BOWLEY: Yes, to be added prior to the equilibrium, you start the hour equilibrium. So, there is an hour-long equilibrium. You add the water before the equilibrium, let it run, and spray water. If there is too much water, it will spray off on the condenser and it will evaporate away, and would, hopefully, come to a stabilized condition.

And I know Jen's also comment is there may need to be additional work done as far as unit equilibrium, because right now the equilibrium is room equilibrium, but there is no definition around is the unit running at equilibrium.

MS. ARMSTRONG: This is Ashley from DOE.

So, do you have information as to what you would suggest what a unit equilibrium is as compared to a room equilibrium? I mean not for GE, but generally that would be applicable across the board?

MR. BOWLEY: Yes, I don't have one today, but we talked about that at our last meeting, that we need to basically develop a method of determining unit equilibrium.

MS. CLEARY: This is Jen at AHAM.

So, I think we would probably be talking about this within AHAM and be glad to submit a suggested definition to DOE, if we are able to find one.

MR. LINGREY: This is David Lingrey.

Yes, I agree with that as well.

MR. OSANN: This is Ed Osann with NRDC.

Just to be clear, is the addition

of the water to reduce the time to prepare the unit for testing or to reduce the running time of the test?

MR. LINGREY: It is to reduce the running time of the test, because it takes "X" number of minutes or hours to condense the water out of the air and direct it from the condensate pan into the water slinging area in the condenser, where it is used to help optimize efficiency. Because we pull out "X" pints per hour or grams per minute, or however you want to measure it. So, we are just trying to short-cycle that by adding some volume of water. Whether that water has the right volume or the right temperature, and that sort of thing, needs to be addressed to keep being stable.

MR. OSANN: Just to follow up -- this is Ed Osann from NRDC again -- are there any characteristics of the water that affect that at all, either the chemistry or the temperature?

MR. LINGREY: The water that is condensed, it is condensed water. So, it doesn't have a lot of any mineral content or anything of that nature as well. So, it needs to be distilled-type water you are adding. But it is so minor, I would imagine, unless you have really terrible water -- as far as temperature goes, you don't want to add in 100-degree water, and you don't want to add in 40-degree water. It needs to be something in the middle, and wherever that is, I guess the unit would reach equilibrium with the water temperature and with the environment. So, that you would need to interpret as part of that definition of equilibrium.

MR. OSANN: One last question. Ed Osann with NRDC.

What is the potential reduction of running time of the test? Is this a matter of reducing the time by a few percentage points or is this reducing it by a third? Or what is the sense of how much value this adds in terms

of reducing testing time?

MR. LINGREY: This is David Lingrey at Friedrich again.

I think it varies with unit type and size. I mean, I guess maybe the lab testing people can convey that as well.

MR. CHURCHILL: Kevin Churchill with Intertek.

As far as adding the water, we talked a little about hours up to days of what the unit would actually have to condense out of the air to actually fill up the drip pan enough to actually get the slinger working up to the conditions that they had it at design. So, adding the water to the beginning of the test would certainly decrease the time that you would have to wait for the condensate to actually be produced from the actual unit. And thus, that would help the unit to actually get itself into the equilibrium point of the unit and stabilizing out the room. So, addition of the water would help just to get

the room to the point quicker and the unit running properly quicker, rather than waiting for it to actually produce the water itself.

MR. LINGREY: Thank you.

MS. ARMSTRONG: Okay. Anything else on water?

(No response.)

I am actually going to skip one and just go ahead. This seems like a good segue into run-in time before we actually talk about air sampler placement, my favorite topic.

So, run-in time, I am going to open the floor. As you know, DOE does not have a run-in time right now specifically in its test procedure for room AC. So, open the floor for a discussion of run-in time, including any specifics. And I am going to ask you to submit data over what that should be.

MR. BOWLEY: Brice Bowley, GE.

Our past experience has shown that, obviously, the first 24 hours you get the most reduction in energy usage as the compressor

components wear, but it continues to drop off up to like 72 hours. But it is an exponential curve, so you are dropping dramatically from zero hours to 72 hours.

I think what it is similar to is the EPA measurement for automobiles, which has a 5,000-mile run-in. So, when you look at the two, they are very similar as far as the amount of hours under operation. So, 72 hours for an AC or 5,000 miles for an automobile.

MS. ARMSTRONG: So, one question back to you. This is Ashley from DOE.

There are a couple of variations, 24 all the way up to 72. Are you advocating that 24 is sufficient because most of the benefit is gained in that 24 hours?

MR. BOWLEY: I think 24 is sufficient, yes.

MS. ARMSTRONG: Does anyone else in the room have thoughts on that or anyone else on the phone?

MR. LINGREY: This is David

Lingrey, Friedrich.

Yes, run-in times do vary by compressor size and manufacturer. But, again, it is important to loosen-up and wear-in those components. So, in 24 hours, we have found that is a good run-in period with a brand-new product.

MR. OSANN: Ed Osann with NRDC.

Perhaps either AHAM or any of the manufacturers can answer. Is it standard practice for room AC units to be shipped without any running time on them at all?

MR. LINGREY: This is David at Friedrich.

In most manufacturing -- and I don't know of everybody's manufacturing facilities -- but there is a run test that is performed, but it is certainly isn't of that duration, obviously, because of trying to get the product out.

So, we run units for "X" minutes and that's it. But it is really not anything

that would be that long.

MR. BOWLEY: This is Brice Bowley at GE.

The operation time would be five or ten minutes. So, it certainly wouldn't wear-in the compressor components.

MS. ARMSTRONG: Okay. Does anyone else have anything they would like to say on run-in before we move on?

All right, Detlef, you are on the phone.

MR. WESTPHALEN: Hi. This is Navigant Consulting.

The only question I have in regard to the run-in is I am aware -- I haven't really looked this up myself -- but I have been told that (phone cuts out) for run-in up to not more than --

MS. ARMSTRONG: We can kind of hear you. I don't know if you are on speaker on your phone, but if you could take it off? You are kind of cutting in and out.

1 MR. WESTPHALEN: Okay. I took it
2 off speaker.
3 MS. ARMSTRONG: Everybody in the
4 room can mute their microphones, if possible.
5 MR. WESTPHALEN: Okay. Is this
6 better?
7 MS. ARMSTRONG: Much better.
8 MR. WESTPHALEN: Okay. The
9 question is in regard to the AHRI standards
10 for some air conditioning products, commercial
11 products, where they talk about a run-in of up
12 to 24 hours and not more. And I guess I am
13 just wondering about the inconsistency of 24-
14 hours-plus versus up to 20.
15 I know that there is a rulemaking
16 getting started on packaged terminal air
17 conditioners, which are very similar,
18 obviously, to the room AC. They use the same
19 ASHRAE 16 standard for the testing.
20 So, the question comes up, what is
21 the appropriate run-in time and why would the
22 AHRI recommendation be up to 20? Back to

Ashley's comment about whether there is any test data that would be used to really demonstrate what the right amount of time is.

MR. BOWLEY: This is Brice Bowley at GE.

I am not sure why AHRI posed a maximum. I mean, again, the units are going to reach a maximum efficiency and continue that maximum efficiency for what would be the equivalent of years after the initial run-in.

My suspicion would be that they put a maximum on it to limit test time in the labs.

MS. ARMSTRONG: So, this is from Ashley from DOE.

I can't speak to AHRI's program and how they run it themselves. I can tell you that DOE just adopted for commercial air conditioning units an up-to limit of 20 hours. An up-to limit, we say we will at least just for commercial, and we did it through a rulemaking, not through guidance, we said that

we would do whatever the manufacturer did to certify their products up to 20 hours.

So, in other words, if you guys, when you came up with your certified rating, put in the lab time to do 20 hours, we would match that for any DOE-initiated testing that we did. And that is only for commercial, and that was dealt with through the rulemaking.

And like Detlef said, I would encourage you to submit test data for room air conditioners or for certain types of compressors that shows over time what the appropriate run-in period may be. Because, as you have heard today, there are a variety of different numbers that are being tossed around. What the appropriate one would be would be something the Department would have to consider.

MR. MENZER: This is Mark Menzer from Intertek.

I cannot speak for AHRI, certainly on the program, although we do some of them.

I don't know of which program you speak. AHRI has about close to 40 programs with 40 different sets of rules. But they also do about 2500 tests a year, and the problem just becomes when every unit, 2500 units are being looked at doing run-in. You just run out of time and you run out of space. So, they sometimes put some limits on it, but certainly 24 hours or much more than that is not unusual for certain product classes for AHRI programs.

MR. ANDERSON: This is Vince Anderson, Whirlpool.

I am just curious, when you have a maximum run-in time, then how do you conduct comparison tests between labs? And how was that addressed for those commercial products? In other words, test the product in Lab A and then send it to Lab B and test that same product again to make sure they correlate.

MS. ARMSTRONG: Yes. So, this is Ashley at DOE.

If we were to do a DOE-initiated

round robin for commercial, we would uniformly specify that across the board. So, say, for example, we might use 20 across the board for that unit or those units that we were testing. Does that make sense? So, the same unit will get the same run-in or we would specify the provisions.

If it is DOE-initiated testing for verification or enforcement purposes, we are testing at one third-party lab, and that would follow whatever the duration was that was certified with the unit when it was submitted to the Department.

MR. ANDERSON: I still didn't understand how you would address that in the round robin. Because when it goes to the second lab, it is going to have 40 hours of runtime on it then.

MS. ARMSTRONG: Oh, yes. It is like how are you going to --

MR. BOWLEY: So, this is Brice at GE.

I think, normally, a round robin is run, like in air conditioners, it is run for an extended period of time and then sent from lab to lab. So, it is at stabilized operating conditions.

MS. ARMSTRONG: So, you would advocate running it in first and then starting the round robin extensively, apparently? Okay.

Anybody else. Sorry, this is Ashley. Anybody else or anybody else on the phone for a run-in period?

(No response.)

If not, we are moving to our last issue for room ACs perhaps.

Okay. The placement of the air sampler. I am going to open the floor for that one.

(No response.)

Okay. Well, quietness means everything is being done right. Because, then, we can take it off the issues list. And

uniformly across from lab to lab, manufacturers alike.

MR. MORRIS: This is Wayne Morris. Jen had to step out.

This is an issue that has come up on a few occasions where the air sampler is placed near the unit. The ASHRAE standard actually specifies a different circumstance, but our question is making sure that the labs are all doing it the same way. Our intention is to make sure that the air sampler is placed in a sequence or in a location where it does not interfere with the movement of the air, but which you actually get a good sampling of the air near the unit.

There are units that are, of course, different sizes. And so, specifying one particular distance away may not work in all cases.

So, we would just like to know if the Department has any guidance in terms of this or if we could use language as is

suggested there on the screen with the request that we have made.

MS. ARMSTRONG: This is Ashley from DOE.

I am actually going to turn that around to other people in the room. What do you currently do, both the labs and the manufacturer labs?

(No response.)

I could start calling you by name. You have name cards.

(Laughter.)

MR. CHURCHILL: Kevin Churchill from Intertek.

Obviously, right now, the way we have it is with the sampler trees, every unit, it is taken from a unit basis. Some units do have one inlet; some have two. Some have different placements, depending on the unit style, whether it be a built-in unit or a regular unit.

Obviously, the main intent is to

1 try to get the sampling of the air going to
2 the inlet of the unit without restricting any
3 of the airflow to it. So, with that said, we
4 try to get it as close as possible without
5 restricting the air.
6 We use one air sampling tree on the
7 single inlets, two on the dual. We try to
8 place them far enough away from the unit. We
9 have it about three to five feet, is in our
10 procedure. In that comes a point where you
11 need to try to keep it away from the
12 condensing air as well, so you are not
13 recirculating the air.
14 Currently, in the standard I
15 believe they are in the process of updating
16 the picture that they have in there of the
17 actual placement of the unit. Obviously, for
18 manufacturers, they can always step in on that
19 guidance as well on placement of the air
20 sampler tree.
21 Thank you.
22 MS. FARBER: This is Julia Farber

1 from UL.

2 We actually completely agree with

3 what Intertek just said, and we are also

4 running our tests in a similar fashion.

5 MR. LINGREY: This is David Lingrey

6 at Friedrich.

7 Obviously, the sampling tree is a

8 device that can impede airflow. And we feel

9 that there is a location minimum, so to speak,

10 that you don't want to impede on. If there

11 would be something placed in the certification

12 document perhaps that would indicate a stay-

13 away zone or to prevent recirc or prevent

14 impediments there, that might be appropriate.

15 MS. ARMSTRONG: So, this is Ashley.

16 Does anybody do it a lot

17 differently than what Intertek or UL

18 described?

19 (No response.)

20 I guess I am trying to understand

21 what the actual issue is. It seems to be just

22 general agreement with the description.

1 MR. MENZER: Yes, this is Mark
2 Menzer from Intertek.
3 I think it is just one of these, it
4 is an engineering judgment call. In these
5 standards, for consistency, you want to
6 minimize engineering judgments and maximize
7 specificity.
8 MS. ARMSTRONG: Okay. So, thank
9 you.
10 This is Ashley.
11 So, with that in mind, I can
12 appreciate that. To the extent that you all
13 can work together to articulate what that
14 engineering judgment is in a fashion, whether
15 it be through the ASHRAE process, through the
16 AHAM process, through a voluntary consensus
17 process, and submit those to the Department, I
18 think that is something that we would need
19 those details to be able to flesh out some of
20 these issues that you are asking for.
21 Otherwise, I just put my engineering judgment
22 in there. And, well, that might not be a good

idea.

MR. MORRIS: Ashley, it is Wayne again, Wayne Morris with AHAM.

We appreciate that and understand. I think part of the concern has come that the AHAM standard doesn't specify, shall we call it, a minimum or a setback, as David said. The ASHRAE really was not intended for this kind of circumstance. And so, it doesn't do a very good job of specifying.

I think that it is not something that we have found that it makes an enormous difference, but it is one of those where it could affect, as we narrow down the amount of deviation or differences that occur, the significant digits of the actual values, this becomes a potential area. So, as we get differences in laboratories that laboratories are testing, we want to try to reduce it.

So, I think that your suggestion is probably a good one, that AHAM would take on as a responsibility to make a suggestion of

1 what we believe is the right way to organize
2 this. Whether it be a range or whether it be
3 a minimum distance, we will look at that.
4 I think that you are dealing, also,
5 as Kevin said, with a 3-dimensional kind of
6 situation. It is that optimization where you
7 want to make sure you don't interfere with the
8 airflow, but you also need to get it close
9 enough that you don't have outside influences
10 on this. So, we will look at this and see if
11 we can come back with a suggestion on this.
12 MS. ARMSTRONG: Thank you.
13 MR. MORRIS: Good. Thanks.
14 MS. ARMSTRONG: Okay. So, this is
15 Ashley.
16 We have a question from the table
17 to ask. So, the issue of recirc has come up.
18 So, I am going to ask the labs in the room,
19 all those, as well as anyone else that would
20 like to chime in on this, how do you check for
21 recirc? What do you do now?
22 MR. LINGREY: David Lingrey,

1 Friedrich.

2 There are several ways to do

3 recirculation assessments. One of them is use

4 smoke traces and some different things. Of

5 course, that would be something that would be

6 done in development.

7 Another is computational fluid

8 dynamics and things of that nature. But,

9 again, that wouldn't be something that would

10 be done through --

11 MS. ARMSTRONG: I haven't done that

12 since grad school.

13 (Laughter.)

14 MR. LINGREY: Yes. But just from a

15 research standpoint, there are some methods

16 that are used to come at it. From a design

17 perspective, we add some things to prevent it.

18 MS. ARMSTRONG: So, I am going to

19 come back and say, research aside, when we get

20 into audit checking, or whatever you do in

21 terms of testing, just to check to make sure

22 parts off the line are performing the way they

1 are supposed to; there has been no variation.
2 Do you do any recirc checks then?
3 And if you do, how do you do it?
4 MR. LINGREY: It is David from
5 Friedrich again.
6 We do add instrumentation on units
7 under test that is outside the scope of the
8 test protocols, you know, some thermocouples
9 and some different things that are generally
10 placed to understand if we are getting some
11 recirc. But that is something that I am not
12 sure that the labs are doing.
13 MS. ARMSTRONG: Would you be
14 willing to describe that general placement for
15 me? Like what exactly is it? Where do you
16 put them? What do you do?
17 MS. FARBER: Can I interrupt for
18 just one second. I'm sorry.
19 One of our folks on the phone, he
20 keeps saying that your microphone is going in
21 and out. So, he can't hear what you are
22 saying on the phone.

MR. ANDERSON: I think when the light is on --

MS. ARMSTRONG: Yes, so just come close to it. Light on means it is on.

MS. FARBER: I am sorry. They are really interested. He is like it sounds like it is active there; I just can't hear.

(Laughter.)

MR. LINGREY: I don't know what I cut off on.

MS. ARMSTRONG: Whatever she asked about.

MR. LINGREY: Well, the guy on the back-end.

Well, thermocouple placement can be placed on the inlet and discharge areas of the unit, and maybe even in a grid array, to sample over the aspect, the cross-sectional area of that inlet, to see if there are temperature differential that is caused by recirc.

MS. ARMSTRONG: This is Ashley.

1 And that wouldn't impact the
2 airflow?
3 MR. LINGREY: Well, thermocouples
4 are just a wire with a small thing.
5 MS. ARMSTRONG: I understand.
6 MR. LINGREY: They are very small,
7 and they probably in most cases will not have
8 any sort of impact.
9 MS. ARMSTRONG: Okay. Thank you.
10 Anybody else?
11 (No response.)
12 So, I am going to open the floor to
13 other issues, if anybody has any, with regard
14 to room air conditioners testing. For those
15 that they want to do an open floor, we are
16 probably going to take a break before we move
17 on to the next product of the day.
18 MR. MORRIS: Ashley, I don't know
19 whether there was a fourth one on that sheet.
20 MS. ARMSTRONG: Yes. I popped that
21 one in front. Yes, that is all the ones I
22 have, I think. Yes, sorry. I could have

stood it up. Okay.

Yes, run-in we got.

So, anybody else have any other issues with regard to room air conditioners that they would like to discuss?

(No response.)

Okay. At this time, I am going to propose a 15-minute break. There is a coffee shop all the way on the ground floor or, for anyone interested, bathrooms are to the left, elevators to the right.

For the room air conditioner manufacturers that are leaving, I thank you for your participation. Should you have additional questions or think of additional things, feel free to email me after the meeting or subsequently.

And we will see you back in about 15 minutes.

(Whereupon, the foregoing matter went off the record at 10:24 a.m. and went back on the record at 10:47 a.m.)

MS. ARMSTRONG: Okay. All right. We are going to start back now. We have almost everyone.

So, we are going to move right along to dishwashers.

Like I said before -- this is Ashley from DOE -- but, like I said before, I strongly encourage everyone in the room to stand up and provide us details. It is hard for the Department to take action items away, at least to further understand and investigate here with what we need to do, without additional details of what is actually being done different and how things are being done different.

So, I am once again going to reiterate the strong importance to stand up and, if you all do it the same way, that is great. If it is just that you all do it the same way and that way is not detailed enough in the procedure, that is great, too. I mean, any details, anything that you can provide is

helpful.

So, with that, moving right into dishwashers, the first question we had was regarding the 2010 Test Procedure Guidance regarding cycle selection.

And, Jen, you are going to have to help me out with these, if you don't mind, just walking through. I will put your actual dishwasher one up there, and if you could walk through at least the introductory issue, and then if everyone else could chime in as appropriate, that would be great.

MS. CLEARY: Sure. This is Jen with AHAM.

While you are putting that up, actually, I can just start with the first issue, which is there was some guidance issued in response to a question from a company in 2010 on cycle selection. It stated that a soil-sensing cycle is to be used, even if the normal cycle is fixed. And to some, this guidance changed the interpretation of the

1 test procedure.
2 And so, I think one issue that we
3 had at the time, which with passage of time
4 may be less relevant at this time, although we
5 wouldn't want to see it in the future, is that
6 it would have been better prior to finalizing
7 that guidance if you had sought input, which
8 they are now doing. You are now doing it.
9 So, we appreciate that.
10 This issue, DOE is proposing to
11 address this in the SNOPR that was issued this
12 month. So, we are still reviewing that
13 proposal. We appreciate that DOE is taking
14 the initiative to address it. And we will
15 certainly provide written comments on the
16 issue.
17 But a major concern here is how
18 different labs will do this testing. And so,
19 we do think that there should probably be an
20 interim solution of some kind while the
21 rulemaking is ongoing.
22 This is really a complex matter.

So, what AHAM would propose is that, if it is possible for DOE to require or permit manufacturers to indicate on their certification statement the cycles and options that were used during the energy test, that might be a way to address this and to ensure that DOE and other third-party labs that might be doing verification testing would be using the same cycles and options that were selected.

It might also be useful to identify in the certification report whether or not the unit is soil-sensing, whether the cycle is soil-sensing. That goes into kind of our next issue as well, but I think that issues 1 and 2 on our sheet are connected and stem from the same guidance.

So, issue 2 is, how does a lab identify if the cycle is soil-sensing? Again, this is complicated. I am sure companies have more details to share, but that is the general issue.

1 MS. ARMSTRONG: Go ahead. Like I
2 said, I do encourage you -- this is an open
3 rule. I will remind you DOE will not probably
4 at this point, because it is an open rule,
5 make comments. We have proposed stuff. To
6 the extent you have comments on our proposal
7 or further clarification, I strongly encourage
8 you to submit them to this docket. You are
9 welcome to speak in this forum as well, but,
10 also, please submit them to that docket as
11 well.
12 MR. KLUG: Well, good morning.
13 Wayne Klug at Whirlpool.
14 Certainly, the SNOPR content is
15 very helpful in regard to this topic. As I
16 look at the definition of the normal cycle in
17 the SNOPR, and I don't think that has changed
18 very much from the original language of the
19 current procedure. It talks about the cycle
20 type that includes wash-and-dry options
21 recommended by the manufacturer for completely
22 washing a full load of normally-soiled dishes,

1 including the power dry option.
2 As I look at the SNOPR content that
3 is being proposed -- and this is 2.6.3.2;
4 sorry about the chapter-and-verse reference
5 here, but I think it is helpful to have that
6 context -- it looks like that if a normal
7 cycle does not contain a soil-sensing
8 capability, then another cycle that may
9 contain that soil-sensing capability is used
10 or would be used for the testing.
11 And so, really, more for
12 clarification, it sounds like a manufacturer
13 may be able to recommend or identify a normal
14 cycle, but you could have a non-normal cycle
15 of, say, pots and pans on a more heavy-load
16 end of the spectrum or a cycle on the other
17 end of the spectrum that is not as heavy in
18 terms of cycle behavior that could be used for
19 the actual soil-sensing load and not the
20 normal, everyday cycle that would be
21 specified.
22 So, really, I was just looking for

more clarification around that topic. Sorry about the long wording and description.

MS. REICH: Judith Reich from Navigant.

Yes, you are correct, the SNOPR does address that particular topic, and it does, indeed, follow the approach in the guidance that was provided to the manufacturer. And you are also correct in that, if the normal cycle does not have soil-sensing capability, it is the proposal that the alternate cycle that does have soil-sensing capability be tested because the provisions in the test procedure for testing under varying soil conditions are intended to be used for soil-sensing dishwashers.

MR. KLUG: All right. Thank you.

So, really, just probably more of a footnote would be that the normal cycle may be an everyday use sort of cycle. But one of these other cycles may be less common, less commonly used by customers, but that could end

1 up being used for the actual test procedure.
2 MS. ARMSTRONG: Good. Thank you.
3 MR. EDWARDS: Mike Edwards, BSH.
4 So, how would the verification labs
5 determine if it is a soil-sensing cycle unless
6 we tell them something?
7 MR. BILLINGS: Lincoln Billings
8 from Intertek.
9 The only methods we have to
10 determine whether or not a unit has soil-
11 sensing capabilities is through what is
12 provided via the use-and-care manual of the
13 unit.
14 MS. ARMSTRONG: So, this is Ashley
15 from the Department.
16 So, you are advocating Jen's
17 position of perhaps writing more information
18 upon the certification of the products, about
19 its features?
20 MR. EDWARDS: Mike Edwards from the
21 BSH team.
22 Yes, that is correct, either in the

1 certification report or the manual.
2 MS. ARMSTRONG: Okay.
3 MR. EDWARDS: I think we have to
4 include additional information.
5 MS. ARMSTRONG: So, a question
6 about what you do currently, because,
7 obviously, open rule, but do you all, if it
8 has a soil sensor, is that clearly indicated
9 in the manual shipped with the unit now?
10 MR. EDWARDS: For BSH, it is now.
11 MS. ARMSTRONG: Okay.
12 MR. EDWARDS: But it hasn't always
13 been.
14 MS. ARMSTRONG: Okay.
15 MR. KLUG: I believe that is the
16 case for Whirlpool as well.
17 MS. ARMSTRONG: Okay. All right.
18 Any other issues with the first couple?
19 (No response.)
20 Okay. The next issue I think we
21 are going to go to is the detergent volume
22 calculation.

1 MS. CLEARY: Hi. This is Jen with
2 AHAM.
3 Some interpretative confusion
4 exists regarding the detergent volume
5 calculation. I think there maybe has been
6 some guidance around this. In any case, it is
7 now addressed; DOE is proposing a solution to
8 this in a SNOPR. So, we will certainly submit
9 some written comments. We are reviewing that
10 proposal.
11 We had also raised an issue about
12 the actual detergent itself, and that has also
13 been addressed in the SNOPR, the Cascade with
14 the Grease Fighting Power of Dawn. So, we
15 certainly support that.
16 Upon first review of the proposal
17 with regard to the calculation, though, we
18 think there may still be some room for
19 interpretation that would make verification
20 testing challenging. So, we will detail that
21 in our written comments.
22 Kind of a connected issue here,

recently, phosphates are no longer allowed in the detergent and, also, we believe that consumers may be using the tablet form of detergent that could have rinse aid in it as well. And it is a dosage that is the same every time. So, we think consumers are using those more and more, and it may be necessary to do some kind of consumer use study on how those different detergent types should be incorporated into the test procedure as well. That is, obviously, a longer-term thing, and we can provide some more detail on that in written comments as well, but wanted to raise that here today.

MS. ARMSTRONG: All right. Thank you.

MR. EDWARDS: Mike Edwards, BSH.

I think one point of confusion is that, if you run the preconditioning cycles and determine your detergent calculation, and then when you run the actual test, if the water usage comes out differently, what do you

1 do in those cases?
2 And one other one would be that, if
3 you determine from the precondition cycles to
4 use detergent in the pre-wash and the main
5 wash, and then the sensors take out the drain
6 so that they become one and the same, how
7 would you interpret that detergent usage? So,
8 just a couple of things to keep in the back of
9 your mind.
10 MS. ARMSTRONG: Do you have a
11 suggestion?
12 MR. EDWARDS: No, not at this
13 point, but I think it is something we could
14 try to work on.
15 MS. REICH: Judith Reich from
16 Navigant.
17 I just wanted to point out that in
18 the SNOPR one of the proposals would be to
19 require that the preconditioning cycle be run
20 with the same cycle setting as for the energy
21 test to try to ensure that the water
22 consumption that is measured to determine

1 detergent dosing is as close as possible to
2 what is used during the energy test.
3 MR. EDWARDS: Mike Edwards, BSH.
4 So, you do the preconditioning
5 cycles with food soil? Is that what I am
6 understanding?
7 MS. REICH: The proposal right now
8 is for no load during preconditioning.
9 MR. EDWARDS: Mike Edwards again.
10 The sensors and the food soil will
11 impact each other.
12 MS. REICH: I recognize that, and
13 it was an issue of test burden to do the
14 preconditioning without the soil load.
15 MR. KLUG: Wayne Klug at Whirlpool.
16 I think, on that topic, Jen's
17 earlier point and Mike's point, as we look at
18 potentially the use of tablets, which are more
19 commonly-used today perhaps as we migrate in
20 that direction, or look at migration in that
21 direction, that may allow us to move away from
22 that percent concentration approach/concern

1 and use really what the customers are doing
2 when they are putting a tablet or a uni-dose
3 or a set amount of detergent in their machines
4 more and more. It is just an option for us to
5 look at.
6 MS. ARMSTRONG: Okay. Chris
7 Roberts on the phone, I think your line should
8 off mute now. And I am going to ask everyone
9 in the room to mute their lines, if they don't
10 mind.
11 Chris?
12 MR. ROBERTS: Yes, ma'am.
13 MS. ARMSTRONG: There you go.
14 MR. ROBERTS: I just wanted to send
15 in a comment. We were talking about the use-
16 and-care books. And our use-and-care books do
17 not indicate if a cycle (phone cuts out).
18 MS. ARMSTRONG: So, can you get
19 closer by chance to the phone? Or take me off
20 speaker and then speak? Because you are
21 cutting in and out when you are on speaker,
22 please.

MR. ROBERTS: How about now? Can you hear me now?

MS. ARMSTRONG: Much better.

MR. ROBERTS: All right. Yes, there were the comments going about the sensor cycles versus the fixed cycles, and I was trying to just comment that our use-and-care books do not necessarily indicate which cycles are sensor-based and which are fixed. And that is why I shot you that note on the webinar notes through the questions. I think everybody else was commenting that they typically did indicate that.

MS. ARMSTRONG: Okay. Thank you.

MR. ROBERTS: Thank you.

MR. OSANN: This is Ed Osann from NRDC.

What company was the speaker with?

MS. ARMSTRONG: GE.

Okay. Anything else on detergent volume? Go ahead.

MR. EDWARDS: I was just going to

1 make a comment. The detergent can influence
2 the sensor decision. So, it is a
3 fairlycritical subject.
4 MS. ARMSTRONG: Okay. Thank you.
5 Like I said, to the extent in your
6 comments in response to the SNOPR, if you have
7 a specific proposal -- I realize the SNOPR
8 recently came out. So, you may not have time
9 to fully have read it, et cetera. But to the
10 extent you have any specific proposals or
11 definitely proposals other than the ones we
12 have, I encourage you to submit those in
13 addition to your comments.
14 Okay. The next one is
15 substitutions. I think there is a variety of
16 questions regarding this, whether it be
17 flatware substitutions, soil substitutions, as
18 well as table, for lack of a better term,
19 tableware substitutions.
20 So, Jen, I will turn it over to
21 you.
22 Some of this is also addressed in

1 the SNOPR as well. To the extent there are
2 other things that need to be addressed, please
3 let us know.
4 MS. CLEARY: Jen with AHAM.
5 Yes, flatware I know is being
6 addressed in the SNOPR. We appreciate that.
7 We made a recommendation to DOE, and we
8 appreciate that the proposal is to adopt that
9 recommendation.
10 Then, there are, though, some other
11 substitutions that we can see right now need
12 to be made. And also, we anticipate that,
13 because like the food soils and the dishware
14 and the flatware are all specified, you know,
15 exactly, that as those things change and they
16 are outside of our control, this is an ongoing
17 issue that things become obsolete.
18 And so, I would think the broad
19 issue with substitutions is that there needs
20 to be some kind of quick and clear process for
21 getting substitutions.
22 Rulemaking, probably while it was

very handy that this time around there was an open rulemaking to address flatware, and, hopefully, we can get some of these other issues that we have to raise today taken care of through that rulemaking as well, that is not always the case. If it is no longer available, it is hard or impossible to do testing until there is something uniform in terms of the substitution. So, I think that is the overarching comment.

Specifically, for soils that are not available now exactly as DOE has specified, I think one example would be the margarine. I think we have seen some guidance to use the Fleischmann's Original margarine, but would look to see if DOE has guidance on that.

AHAM's Task Force will certainly be evaluating substitute food soils and would be glad to make recommendations to DOE, but we would request those substitutions be made clearly and quickly.

1 Also, the dishware -- this is No.
2 5 -- the dishware that is currently --
3 MS. ARMSTRONG: Can I jump in real
4 quick before we move on for margarine?
5 MS. CLEARY: Yes, yes.
6 MS. ARMSTRONG: So, obviously, any
7 guidance DOE issued will be posted on our
8 website and is only applicable for the
9 regulatory program or is the guidance
10 applicable for the regulatory program.
11 What are manufacturers, third-party
12 labs, doing now if there is unavailability of
13 this margarine? Are you not testing?
14 MR. EDWARDS: Mike Edwards, BSH.
15 We have dishwasher dishes that are
16 in specification. But if we have to get new
17 ones, we could --
18 MS. ARMSTRONG: Margarine?
19 MR. EDWARDS: Not margarine, no.
20 We are using the margarine that we agreed to
21 in the AHAM group. What is it, Wayne? Do you
22 remember?

1 MR. KLUG: Well, I think that, for
2 example, the margarine, there is a stick
3 original Fleischmann's original that is called
4 or available that is kind of the closest
5 representation of that margarine. So, we
6 really kind of go out, whether it is the
7 detergent or the margarine, we try to find
8 that substitution that is really the closest
9 match, and we talk about it within industry.
10 Go ahead.
11 MR. EDWARDS: We discuss it within
12 AHAM and try to do the same thing.
13 MS. ARMSTRONG: Right. Jen, or
14 whoever, is this an AHAM thing that you guys
15 discuss it and say, okay, we all agree to do
16 this? At what point could you come to the
17 Department? I mean, could you tell us
18 upfront, "Hey, either this is almost obsolete
19 or at least some of our members are having
20 trouble finding it right when it happens."?
21 And then, "Oh, we are working on a solution or
22 an agreement internally."

1 Because the earlier we know about
2 it, the better. Obviously, I don't know how
3 this affects -- we can talk about this
4 internally as far as what pathway might get us
5 to an answer the quickest.
6 But, like I said, to the extent you
7 are using something other than what is in DOE
8 guidance and/or CFR that hasn't been approved
9 specifically by the Department, that would be
10 at your --
11 MS. CLEARY: Yes, so I think that
12 is why we are raising these issues today,
13 certainly. I think in the future, yes, we
14 probably should notify you when we become
15 aware of the issue, let you know we are
16 working on it, as we did with flatware. I
17 think that would be what we would continue to
18 do.
19 This is Jen from AHAM.
20 MS. ARMSTRONG: And I would also
21 encourage for anyone on the phone or any
22 third-party labs in the room, if you have

similar issues, whatever lab it is, that you come to the Department and ask the question when it has to do with a DOE regulatory test procedure. That way, we can issue regulatory guidance and it will apply across the board.

MR. KLUG: I think just to underscore Jen's comments, and I think she stated this very well, in that from time to time these items do show up. And a lot of times, there are surprises, like, "Oh, crud, we can't order this fork anymore." And so, we work to try to identify those substitutes and work diligently with AHAM, with the stakeholders, to try to find the right substitution.

I think the point to underscore is just that process for substitution, whether it is a guidance approach or an industry-wide waiver. Because, really, the rulemaking is a great process, but it takes time to go through that process. And so, really looking for something that can expedite this, because it

is going to come up over and over.

Even though we work with the suppliers of, let's say, cutlery and we ask them, "How long will you have the cutlery available," and they say, "Forever," or at least for a fairly long period of time, but, in reality, these things are going to come up over and over for us.

MS. ARMSTRONG: Okay. We understand, to the extent we need to talk internally here, but we understand the issue.

MS. CLEARY: Jen from AHAM.

I think the only other detailed one that we would share today would be the dishware. This would be an example where we are giving you an early heads-up that it is not obsolete yet, what is referenced in Appendix C, but it is getting very difficult to source. So, we will be working on suggesting some substitutes and we will share that with the Department once we have a suggestion.

MR. EDWARDS: Mike Edwards, BSH, again.

More of a general comment, we need to try to make sure as best we can that we work with Canada and try to get consensus on the interpretations. We are seeing that Canada has a couple of different interpretations in some cases than DOE. That would be very burdensome.

MR. KLUG: Yes, just to extend that, that is a good thought, Mike. To extend that a step further is there is a test procedure that Canada uses for energy testing as well. I know there are efforts to have those procedures be common and similar. But it does come up for really both countries.

MS. ARMSTRONG: Okay. Moving along, preconditioning is the next issue.

MS. CLEARY: This is Jen with AHAM.

The issue that we have identified is that the definition of preconditioning is kind of vague, and it is not adequate for the

way some products operate today. The SNOPR published this month does make a proposal to address this issue, and Judy was discussing this earlier, which is that the preconditioning cycle would be the same as the one, the cycle or cycles used for the energy test.

AHAM does agree with that. That was what our suggestion would have been. However, our first glance at the SNOPR, we think that the language in there may be a little too confusing, and it could just be more simply stated that the cycle used for preconditioning shall be the same as the cycles used for the test. So, we will certainly provide some more detail on that in our written comments.

MS. ARMSTRONG: Okay. Thank you.

Any other comments or specific concerns regarding preconditioning at this time?

MR. KLUG: Wayne Klug at Whirlpool.

1 Probably the only thought that
2 comes to mind is the previous language
3 associated with or in the existing DOE
4 procedure seems to allow for a partial cycle
5 to be used. The language, as I read it, in
6 the SNOPR, 1.1.5, reads, "Preconditioning
7 cycle means the cycle that includes a fill,
8 circulation, and drain to ensure that the
9 water lines and sump area of the pump are
10 primed." And certainly, that is a very
11 important aspect of the preconditioning cycle.
12 But, as I think about this, we
13 really want to ensure that there is an
14 allowance for a complete cycle to be
15 performed, so that sensors can be calibrated,
16 so that the water usage can be established for
17 the amount of detergent used. And so, perhaps
18 as we look at the wording here, we can adjust
19 it to reflect that a complete cycle or cycles
20 be used/allowed for preconditioning. Because
21 I am aware of some laboratories that actually
22 perform more than one preconditioning cycle

just to be sure that the machine is cleaned out and they have understood the amount of water usage.

MS. ARMSTRONG: Thank you.

I actually just have a general question regarding soil sensors for you all. At what point are you sure that the soil sensor has actually been engaged? So, is it clear that, if it runs once in the preconditioning cycle -- and this may just be my lack of knowledge -- but is it clear that, if it runs once, that the soil sensors are engaged or does it actually need to run multiple times when it is first plugged in to make sure that soil sensor is working properly as it was intended?

MR. KLUG: I can speak for the Whirlpool product, and the design intent is that one cycle is sufficient to establish the sensor behavior. Now we do have repetitions built in. If, for some reason, that first cycle doesn't calibrate, then it takes another

look at the next cycle as well.

MS. ARMSTRONG: So, if that one cycle is used for preconditioning, how would you know, in other words? You can chime in here.

MS. REICH: Judith Reich from Navigant.

I wanted to add to that question. Does that first cycle require a soiled load in order to properly calibrate the sensor?

MR. KLUG: For Whirlpool, no, we are really looking at the clear-water base.

MR. EDWARDS: Mike Edwards, BSH.

I agree with Whirlpool's comments, but in our lab we run two preconditioning cycles, one to clean out anything that may be in the machine, the oils or things like that were used in the manufacturing process, and then the second to actually get the calibration with the clean water. So, we are trying not to use the energy test calibration from something that may be influenced by

external stuff.

MR. OSANN: This is Ed Osann with NRDC.

Just an observation. It is not clear whether this calibration is something that is required, is a self-calibration of the sensor or this requires a tech to actually do something to the machine.

MR. KLUG: For Whirlpool, it is a self-calibration.

MS. ARMSTRONG: This is Ashley from DOE.

I will say the Department has seen instances where the first cycle doesn't engage the sensor, for whatever reason. So, there are at least some products out there the Department has come across in testing where we have not been able to engage the soil sensor on the first run.

That being said, if there is variation in the industry or even within a given manufacturer's model offerings, I would

ask, how do we ensure that the soil sensor is engaged?

(No response.)

Everyone is staring at me, for those on the phone who don't have the benefit of seeing the room.

MR. EDWARDS: This is Mike Edwards, BSH.

We have equipment in our labs, and we can tell that very easily in our internal tests. But I don't know how to describe it for you to tell that.

MS. ARMSTRONG: So, how would DOE figure that out if it was running a verification test at a third-party lab? How would a third-party lab figure that out?

MR. KLUG: Wayne at Whirlpool.

I think my answer is the same as BSH, as Mike's. With our internal equipment, monitoring some connection to the controls, and so forth, we can get varying levels of that detail. But, for an outside lab, I am

1 not sure there is a clear way of determining
2 that.
3 MS. ARMSTRONG: So, then, our
4 question would be, if there is variation -- I
5 realize there may not be variation between
6 those in the room here -- but if there is
7 variation within the industry, is it
8 worthwhile running multiple preconditioning
9 cycles or a number of them, or maybe the
10 manufacturer specifies that certification
11 represents how many cycles that may take for
12 you to ensure that the soil sensor actually is
13 engaged, or whether or not it needs soils
14 versus clean water, or the characteristics
15 that would perhaps, maybe not ensure 100
16 percent of the time, but for the most part it
17 would be engaged?
18 MR. KLUG: I think there is benefit
19 to the additional cycles. For example, if the
20 machine is taken out of the box, and maybe
21 there is some sort of residual dirt in a
22 factory process, something, that first clean-

1 out cycle or first cycle could be used to
2 clean the machine, if you will.
3 So, additional cycles, at least the
4 way our machines are set up, if it doesn't
5 calibrate on the first cycle, an additional
6 cycle would give it that opportunity to
7 calibrate. So, more is better, although we
8 try to make sure it functions as intended
9 within that first cycle.
10 MR. EDWARDS: Mike Edwards.
11 I will just add to that some.
12 Depending on how the manufacturers write in
13 their program logic, it could receive a
14 calibration error. And what they do after
15 that could depend on whether you are getting a
16 sensor response or not. So, if it gives a
17 calibration error and they just stop the
18 process, then it will have a default path that
19 it would go to. So, it kind of depends on
20 what the manufacturers are doing and their
21 philosophy. So, you can't really answer for
22 all the manufacturers.

MS. BARHYDT: This is Laura Barhydt at DOE.

If there is some kind of a calibration problem, is there a light or a readout or something on the unit that would indicate that?

MR. EDWARDS: No. Again, it depends on what the manufacturer decides to do. It doesn't mean that they can't ask for another calibration within that same run. So, there could be multiple calibration requests in that same cycle.

MS. ARMSTRONG: Okay. So, it would just keep trying to calibrate, even though you are running the same first preconditioning?

MR. EDWARDS: I know what we do, but I don't know what everyone else --

MS. ARMSTRONG: Right. That could be the case, though? I got it. Okay.

MR. KLUG: Yes, similar with Whirlpool, it will work to calibrate on the subsequent cycle.

MS. ARMSTRONG: Okay.

MS. BARHYDT: This is Laura Barhydt at DOE.

One other thing that we have encountered is that some units don't run the selected cycle, depending on what feedback it is getting through its sensors. Is there any way for a test lab to know whether it is really running the cycle that has been selected or not? Does that not make any sense to you?

(Laughter.)

So, my understanding --

MS. ARMSTRONG: Like an override --

MS. BARHYDT: Yes.

MS. ARMSTRONG: -- is the best way to say it.

MS. BARHYDT: Something didn't calibrate or some issue was detected. And so, the unit defaults to some kind of set cycle that it knows to run in order to remedy the issue.

MR. EDWARDS: Mike Edwards, BSH.

It is obviously difficult to comment because I don't know exactly which one you are talking about. But the complexity of cycles is increasing, and there are multiple sensor decisions and there are multiple things the sensors are doing now. They are speeding up motors. They are changing temperatures. It is not just about water fills.

I think it would be, again, very difficult for labs outside the manufacturer to know exactly what is happening within the cycle. We watch it very carefully when we run tests, and we know what paths we wanted to take when we do certain things.

That didn't answer your question, but maybe it helped.

MS. BARHYDT: This is Laura Barhydt at DOE again.

I think what I am wondering is, is there some kind of information you could provide that would be something that the lab

could see and say, I don't know, "It ran for 20 minutes. Clearly, it didn't do what it was supposed to do."? Or "It ran for 45 minutes. Clearly, that was not the normal cycle that was supposed to be the energy test cycle."?

So, is there some kind of characteristic that you could convey possibly in a certification report or through some mechanism that the lab would know whether or not it is getting what it thinks it is getting?

MR. KLUG: Wayne at Whirlpool.

For example, if you were to watch the cycle behavior, there are indicators that are in, for example, the wattage chart and the water usage results of that product that would be indicators of how that machine is operating or behaving. But that would be dishwasher-specific, and I know within our various products we build, that there is a lot of different approaches. And so, the one-size-fits-all would probably be difficult. You

1 would have to look at it product-by-product.
2 MS. BARHYDT: Okay. Thank you.
3 MS. ARMSTRONG: We have somebody on
4 the line who would like to speak. So, Debra,
5 can you --
6 MS. BENGSTON: Sure.
7 MS. ARMSTRONG: Make sure you are
8 off speaker and you should be ready to go.
9 MS. BENGSTON: I will try to speak.
10 One of the things I can recommend is that
11 usually if the lab will read the use-and-care,
12 I believe there are charts that have an
13 overview of the cycle which talk about how
14 cycles should be, approximate (phone cuts
15 out). That would give the lab a clue to the
16 sensor may have run. And if it did not meet
17 the energy cycle, if it was listed in the
18 manual, the temperature, the main wash, then
19 they would know most likely that the
20 calibrating sensor did not happen.
21 MS. ARMSTRONG: Okay. So, you
22 broke up just slightly during that. So, I am

1 going to repeat what I think I heard, just so
2 you can confirm.
3 Basically, I thought you said that
4 within the manuals there are various
5 descriptions/characteristics of the different
6 cycles that would be run, that the labs could
7 compare what actually happened to ensure or
8 give some indication whether the actual
9 correct cycle was actually run or if there was
10 some overriding function that took place and
11 something needed to be rerun. Is that fair?
12 MS. BENGSTON: That is fair.
13 MS. ARMSTRONG: Okay. And can you
14 just remind us who you are with?
15 MS. BENGSTON: Viking Range
16 Corporation.
17 MS. ARMSTRONG: Thank you so much.
18 Anybody else?
19 MR. EDWARDS: This is Mike Edwards.
20 We do put water usages in our
21 manual, but we normally do not include a
22 chart. So, I mean, you give the min and the

max water usages. If it is between those two figures, then most likely --

MS. ARMSTRONG: Well, one could argue, though, I mean, obviously, most people, everyone in the room gets those numbers right. But if it happens to be a maximum water usage that exceeds that table, it is not necessarily indicative of the wrong cycle, correct?

MR. EDWARDS: Correct. That is correct.

MS. ARMSTRONG: Okay. So, we would like some indicator maybe other than one that would also potentially indicate that there is an issue with compliance, if possible.

MS. FARBER: This is Julia Farber from UL.

I just wanted to go back to the preconditioning question about how laboratories are running. At the moment, our laboratories are running one conditioning run, and that is because of DW-1, your recommendation.

1 MS. ARMSTRONG: All right. Anybody
2 else?
3 (No response.)
4 We are going to move on to drain
5 height. And I am going to quickly pass this
6 one to Jen. Or do you want to do yours, soil-
7 loading procedures? That is fine, too. Do
8 you want to move -- MS. CLEARY: Yes,
9 if you don't mind, I think we tried to
10 prioritize.
11 MS. ARMSTRONG: Yes, that's fine.
12 MS. CLEARY: Okay.
13 MS. ARMSTRONG: Please do.
14 MS. CLEARY: So, there are a number
15 of these issues with the soiling details and
16 loading procedures. I think the overall
17 comment we would have is that anytime there is
18 soiling involved or loading being done of
19 soiled and non-soiled dishes, it is really
20 helpful for labs to have like a visual of what
21 other labs are doing. So, some of these
22 issues, the best way to solve them may be for

DOE to allow other labs, including manufacturing labs, to view how DOE's labs are doing the testing because that would be the best way for everyone to know if they are doing it the same way.

That could be done through like a YouTube video or something or to actually go to the lab. This is something, the YouTube video is something we are sort of starting to use in AHAM to know if everybody is doing things the same way, because we may actually be using the same words to describe something, but in actual practice, when you see it being done, it is different.

So, that is a tool that we are finding to be useful, and we might suggest that DOE do the same thing as well. I know we have also made this recommendation with regard to the Energy Star test procedure development right now for dishwashers. So, that is sort of an overarching comment.

Then, we have some very detailed

soiling questions I think here, as well as some recommendations. So, No. 8 on our issue list here --

MS. ARMSTRONG: Let's go back for a second.

MS. CLEARY: Yes.

MS. ARMSTRONG: This is Ashley from DOE.

So, for the most part, I will say, as of now, we are using the same third-party labs that everyone in this room has access to. So, to the extent you know there are differences between the way the soils are being applied, the way the loading is being done, I ask that you, rather than -- well, the YouTube video site, I actually ask that you point it out.

Obviously, we would like to articulate something to the extent we could or to the extent that it is necessary. What specific instructions are needed in addition to what already may be provided, either in the

1 AHAM method or outside of that? What is
2 actually being done different from lab to lab
3 in terms of soiling or how they are being
4 applied or how they are being loaded?
5 Because, like I said, for third-
6 party replication, we are using third-party
7 labs, and at that point we want the test
8 procedure to be fairly standalone -- to be
9 standalone.
10 MS. CLEARY: This is Jen with AHAM.
11 We want the same thing.
12 Unfortunately, I think we are suggesting the
13 video because there are some times where we
14 may think everyone is doing it the same way,
15 and that isn't the case. That is where the
16 actual witnessing can be very helpful, to know
17 that information.
18 But to address your other issues
19 about instances we do know about, we have some
20 of those today to share.
21 MS. ARMSTRONG: Who wants to share
22 those instances?

1 MS. CLEARY: This is Jen from AHAM.
2 I would be glad to share those instances.
3 (Laughter.)
4 So, the first would be there have
5 been some questions about the use of a brush
6 versus a spatula for soiling the dishes.
7 DW-1-1992 actually makes some reference to the
8 utensils, but it doesn't provide specific
9 details beyond like the order of the
10 application of the soil. So, this is one
11 where certainly things should be discussed.
12 We will work to develop some
13 uniformity there and suggest them to AHAM. I
14 am not sure if companies want to give any more
15 detail on this point today.
16 MR. KLUG: I think that, first of
17 all, I like the idea of a video. I like the
18 idea of lab-to-lab visits. As we look at
19 procedures such as this, repeatability and
20 reproducibility become very significant. And
21 many of those sources of variation are subtle,
22 and many of them have no significance, but

1 some may or some do have some significance.
2 Just to select one, oatmeal, for
3 example, how well it is spread out on the
4 plate, the clumps of oatmeal, how long the
5 oatmeal may sit before it is used, all of
6 those may or may not have some significance.
7 And you can really go through all of the
8 soils, all of the instruments set up, and find
9 a number of things that can bring variation to
10 the procedure.
11 Really, the challenge is, which of
12 those are the most significant? We are aware
13 of some that are of no significance. There
14 are some we are currently exploring that we
15 think have some significance.
16 So, the challenge is how to
17 communicate those, and often doing that in
18 words is very difficult to do. And so, the
19 picture is worth a thousand words. The video
20 is worth, well, maybe a few more than that.
21 And so, that sort of approach will help us
22 move, I think, in the direction of less

variation.

And some of the things we have also talked about here today, and some of the callouts of the margarine, for example, may introduce some differences if an alternate soil is selected that may not match the original callout. And so, there is really a lot of places where that variation can creep in.

So, I don't think a simple explanation or even in a list necessarily gets us to that solution. It certainly helps. It certainly is helpful, but I like the idea of something that photo-video-documents the procedure, the application method of soils, how that takes place.

MR. EDWARDS: This is Mike Edwards, BSH.

I also agree with the comments from Whirlpool. I just wanted to give a couple of examples.

I have been to labs that had the

refrigeration equipment to keep the food soils in located three floors away. So, every time when they are working to prepare the food soils, they would have to stop, go get something, come back. The same labs, the kitchen facilities were not where the dishwashers were tested. So, things were being transported.

This all adds time to the process. It takes longer for the techs to do the process, and then it increases the drying time of the food soils, actually. So, things like that are hard to capture in a written test procedure. And I agree again, that the video would be a helpful tool.

It can be subtle as well. Just soiler-to-soiler variation, you can have two people -- and we see this frequently within our labs -- two people that are following the exact same procedure, have different applications of the soils. I know we call it a measurement system evaluation within our lab

where we have multiple people do the same task at the same time over and over, so we work to commonize a method that is consistent. And certainly, that becomes more challenging as you look at interlaboratory, across-laboratory type procedures and protocols.

MS. ARMSTRONG: So, two questions. One, I think we would be interested in what exactly you are identifying that is different in your lab? I mean, what are the details? What is being put on differently?

I assume you are using the same materials in the same kitchen with the same drying times, but what is being done differently really than what is in our test procedures? That is (a), maybe an ask for you guys.

And then, to your point, I am not clear how drying time, temperature of the food applications, whether it comes from the third floor or around the corner, or whatever, how really that would be solved by a video,

because the video would just show you grabbing the food. In other words, I am not understanding how it would solve that issue.

Temperature of the food being put on, a specific drying time, something like that, maybe, but I am not sure how a video would show me grabbing something out of the refrigerator right next door, should I be lucky enough to be in the so-called video. No, I am just saying --

(Laughter.)

But, you know, I guess I am trying to understand exactly. Maybe it is pictures. Maybe it is additional specificity with the actual conditions. What it actually is that is needed?

So, I don't know if anybody else needs to say anything. I know we have someone on the phone. Debra, again, wants to say something.

So, Debra, we are going to try this one more time because I heard there is a lot

of feedback on the line. So, I do ask that everyone has their microphones off in the room, and that you not use speaker, and speak as loudly as you can into the phone so that you don't cut out this time.

MS. BENGSTON: Okay, I will try.

Ashley, one of the main things that when I have visited outside labs, the differences I have seen in soiling, soiling mixture, one was (phone cuts out) or the lack of knowledge of what reconstituted milk actually was. I have seen and witnessed outside labs not put the water back into the milk directly (phone cuts out) or measure dry milk into the oatmeal mixture. That is one (phone cuts out).

No. 2, when a lab has measurement, the actual leveling of the food soil spoons (phone cuts out) because it affects the amount of soil that is placed on the dish. I have also witnessed like (phone cuts out), the time factor.

1 And I also was in labs that I have
2 worked in myself. I have seen individuals
3 interpret the soil methodologies differently.
4 I am (phone cuts out) the video to
5 try to eliminate (phone cuts out) the
6 discrepancies within the soiling procedure.
7 MS. ARMSTRONG: Okay. Thank you.
8 MS. BENGSTON: You're welcome.
9 MS. ARMSTRONG: Anyone else on
10 soiling or loading procedures?
11 (No response.)
12 No? All right. Moving along, Jen,
13 I assume you wanted to go ahead and discuss
14 other issues. It seems like we are moving
15 fairly quickly.
16 MS. CLEARY: Yes. So, I mean, it
17 seems like maybe we didn't need -- you know,
18 we gave very detailed explanation I think of
19 the specific soiling issues up above in the
20 chart. So, maybe we don't need to read
21 through them today --
22 MS. ARMSTRONG: Sure.

MS. CLEARY: -- is the sense I am getting. It sounds like no one else thinks we need to verbally go through them.

Okay. So, the other issues, I think these just we couldn't group them together. But the first one would be rinse aid. I think some labs have been observed to fill their rinse aid container with water before starting the test cycle to prevent the indicator light from turning on. But the test procedure does not address this practice. AHAM would suggest that the rinse agent container should not be filled with water at the start of the test run.

MS. ARMSTRONG: Okay. So, this is Ashley.

Can you explain why, why or why not?

MS. CLEARY: So, I will leave that, I think, a little more detail to the companies.

MR. EDWARDS: I think the reason

that this was done is to get the LED light to go off, so it would not be included in the power consumption evaluation, is how it was explained to me.

I guess I would just say that, to me, if it says don't use rinse aid, you shouldn't use rinse aid. You shouldn't put anything else in there.

MS. CLEARY: So, I think that is why AHAM's suggestion is what it is, you know, for an anti-circumvention type of measure.

MS. ARMSTRONG: Okay. The next one?

MS. CLEARY: Okay. The next one, No. 14 on our list deals with water pressure and where it is measured. This is partly addressed in the May SNOPR where AHAM had suggested that the pressure should be measured as the water is flowing, and that is the proposal in the SNOPR as well. We support that and will indicate such in our written comments.

1 But there is also an issue -- and I
2 definitely would leave this to better be
3 described by technical experts here -- but
4 that the pressure is expected to drop when the
5 valve opens, and the length of time where the
6 pressure would be different than what is
7 required in the test procedures should be
8 limited. And the test procedure right now
9 does not have a required amount of time for
10 that limit. So, AHAM would suggest a two-
11 second limit for that transient pressure drop.
12 MS. ARMSTRONG: Do you know what I
13 am going to ask?
14 MS. CLEARY: You want to know why
15 two seconds instead of any other time?
16 (Laughter.)
17 We will address that in our written
18 comments.
19 MS. ARMSTRONG: Thank you.
20 MR. KLUG: Wayne, Whirlpool.
21 Maybe one other thing we may want
22 to think about, just to plant the thought, is

1 the height at which the pressure measurement
2 is made. I have seen some measurements made
3 at a height further above the dishwasher. And
4 so, really, your pressure per foot of height,
5 it is approximately .4 or .5 psi. And so, we
6 may want to look at just prescribing where
7 that measurement takes place. I don't think
8 it introduces a lot of significance, but it
9 may allow us to tie down where that pressure
10 is actually measured.
11 MS. CLEARY: This is Jen with AHAM.
12 Oh, I'm sorry, did someone else
13 raise their hand? Yes, they should go first.
14 MR. OSANN: Yes, I had a question.
15 This is Ed Osann with NRDC.
16 I had a question on the AHAM
17 handout with regard to pressure. It indicates
18 that the length of this drop should be limited
19 to assure that water flowing into the unit is
20 at the proper pressure. I am not sure why --
21 I don't know how that relates to the two
22 seconds, and if it were five seconds or twenty

seconds, how would that affect the water flowing into the unit at the proper pressure?

And either it is flowing pressure or it is static pressure. If you are measuring flowing pressure, does that matter whether it is seconds after the valve is opened or twenty seconds after the valve is opened?

MR. KVAIDHYANATHAN: The question here is flowing pressure needs to be measured. But what really happens is, if you look at, monitor the pressure, the flowing pressure, you know, it changes when the valve opens. It drops down and then gets back to the normal level. If it drops down for a longer time, what it really means is the valve float is going to change, too. So, you don't want to have a longer drop.

So, what we are saying is, I would say the stable condition should happen sooner than later. I think that is what is behind this comment. If it does happen after a long

time, that may impact how much it fills as well.

Yes, generally, now the fill time can be like one minute.

MR. OSANN: Right.

MR. KVAIDHYANATHAN: So, if it is one minute, and if they are losing twenty seconds of one minute, that can be quite significant. You are not maintaining the pressure at the right level during that time.

MS. ARMSTRONG: Okay. Thanks, everyone.

Anything else on water pressure before we move on to rack position?

(No response.)

Okay. Moving along --

MS. CLEARY: This is Jen with AHAM.

Actually, before we get to rack position, if it is okay, I think I had something on the drain height, which is not currently specified in the DOE test procedure.

AHAM would propose that this should

be specified and that it could be indicated that the installation shall be per the manufacturer's installation instructions. If there are no such instructions, then AHAM would suggest that the height shall be a standard level of 20 inches, which is what we have observed to be the standard.

MS. ARMSTRONG: Okay. Keep going.

MS. CLEARY: Okay. No. 16, the rack position, this is the upper rack. The position of that can -- and I will leave this to experts in the room to further describe, but to just give a brief description -- it can impact the water pressure and the consumption during the test. But the test procedure does not indicate what position that rack should be in. And some dishwashers do have multiple positions that it could be in.

So, we think this is a complex area that needs to be resolved. AHAM would be glad to work with the Department to do so. In the interim, what we would suggest is that this

1 could be indicated as part of the
2 certification statement, like which position
3 the rack was in during the test. And then, we
4 could work as a longer-term solution to
5 identify what the best position would be in
6 the test procedure.
7 MS. ARMSTRONG: Two questions. One
8 would be, is there a reason that it should be
9 different than the as-shipped position? And
10 No. 2 would be, if it is a big issue that
11 shows high variation, and you allow
12 manufacturers the discretion to choose what
13 that position is, what is to say that they are
14 doing it uniformly or at least equitably?
15 MS. CLEARY: I would definitely --
16 this is Jen with AHAM -- open this up. I
17 think individual companies may be able to give
18 you more information. But my understanding is
19 that the as-shipped position may not always be
20 the same and/or how the consumer is getting it
21 may not always be in the same position. There
22 may not be a way to make that uniform. Now

that may not be the case for all companies, but for some that may be the case. So, that, I think, is part of the difficulty.

MS. ARMSTRONG: And then, one other just before your time ends, you can address this, too. If it is not the as-shipped position, are there actually instructions in the installation manual telling the consumer that this is the default position that the rack should be in?

MR. EDWARDS: Mike Edwards, BSH.

It is true that the varying positions of the rack may impact the pressure slightly. That could influence the rate the food soil falls off the dishes and the sensor decisions.

I don't consider it a critical issue, but it could cause testing problems when a verification lab runs a test. So, it could show up.

Yes, it is in our manual, but it has been recently added.

MS. ARMSTRONG: And is it different than the way you ship?

MR. EDWARDS: That one I cannot answer.

MS. ARMSTRONG: Okay.

MR. EDWARDS: And it varies from product to product. We have several platforms. So, they are not all the same. So, my suspicion would be they are all shipped the same, but the manual is telling you to do different things with it when you run the energy test.

MS. ARMSTRONG: The manual actually has a position for the energy test and --

MR. EDWARDS: It is now in our manuals, yes.

MS. ARMSTRONG: Wow.

MR. KLUG: Wayne at Whirlpool.

I am not sure what is in our manuals. So, I have got to go look. And I have to check on what our shipped position is.

I would share Mike's comments that

there might be a slight difference in water pressure, again, due to height, and how that feeds the upper spray arm.

The consumption piece, I am kind of scratching my head because I am not sure there is an impact there. And so, I think we probably want to look at that, that word, and see if that needs to be pulled out of here. I think it is more of a water pressure, soils coming off the dishes topic.

MS. ARMSTRONG: Anybody else have anything else with this?

(No response.)

Do any of the labs want to say what you currently do when you set up a dishwasher? Do you follow the installation instructions? Do you do as-shipped?

MR. BILLINGS: Lincoln Billings at Intertek.

We currently typically test under as-shipped conditions.

MS. ARMSTRONG: Thank you.

MR. KLUG: I have to check what we do.

MS. ARMSTRONG: Okay. Jen, do you want to move on to water hardness?

MS. CLEARY: Jen with AHAM.

As I know everyone is aware, Appendix E does not have a water hardness requirement. As part of the Energy Star test procedure, DOE did propose to adopt a water hardness requirement. And I believe the proposal was to adopt the requirement in DW-1-1992.

And then, there was a question about whether the 2009 should be cited instead. And I believe in AHAM's comments on that we indicated that that proceeding was not the time to change the DOE test procedure. But, now that there is an open rulemaking, perhaps this would be an opportunity to address this.

AHAM would propose that DOE adopt the DW-1-2009 water hardness specification,

which is similar to 1992 but more detailed. And there was a study to support those specifications, and we would be glad to share the details in some written comments and feedback.

MR. OSANN: This is Ed Osann from NRDC.

What is the objective of the AHAM standard, either the 1992 version or the 2009 version? Is it to provide not just standardization, but standardization around what? Is this chemistry supposed to be representative broadly or is it supposed to be challenging? Or what is the point of the specification?

MR. KLUG: Lab consistency.

MR. OSANN: Consistency?

MR. KLUG: From lab-to-lab, yes.

MR. ANDERSON: Are you talking about for water hardness in particular?

MR. OSANN: Yes.

MR. KLUG: Yes.

1 MR. OSANN: And is the
2 specification that is in the AHAM standard, is
3 it consistently hard or consistently soft, or
4 where does it land on that spectrum?
5 MR. KLUG: The current callout in
6 both 1992 and 2009 versions of DW-1 call out
7 zero to 85 ppm of water hardness, which is
8 about zero to five grains.
9 The clarification or the detail
10 that Jennifer was referring to for the 2009
11 version is that it also calls out that that
12 PPM level is based on the calcium carbonate
13 content.
14 MR. OSANN: Just a follow-up
15 question. I was wondering whether AHAM has
16 any data as to how representative that level
17 of hardness is.
18 MS. CLEARY: Yes, as I mentioned,
19 we did have a study to support selecting that.
20 Maybe Wayne can indicate exactly who did the
21 study. I can't remember off the top of my
22 head.

1 MR. MORRIS: This is Wayne Morris
2 with AHAM.
3 The work that the DW-1 Task Force
4 did prior to 2009 was in contact with the
5 American Water Works Association to try to get
6 the most general range of water hardness that
7 they felt was in municipal supplies.
8 Obviously, if you are dealing with well water
9 or something like that, the consumer may vary
10 considerably. But this was their way of
11 detailing it, and their suggestion was not
12 only to detail the grains, in this case the
13 PPM, but also to do it based on calcium
14 carbonate, since there are some other methods
15 of specifying it, in addition to that. They
16 felt this would tie down more specifically and
17 leave less lab-to-lab variation.
18 MR. OSANN: This is Ed Osann again.
19 This was felt to be representative
20 of publicly-supplied water?
21 MR. MORRIS: Yes. The range that
22 they had asked for us to do, which is, as

1 Vince indicated, zero to 85 PPM is considered
2 to be, shall we call it, the normal range that
3 occurs in municipal-supplied water.
4 MS. ARMSTRONG: Okay. Any last
5 comments or questions regarding water
6 hardness?
7 (No response.)
8 If not, we are going to move on to
9 ambient temperatures.
10 MS. FARBER: This is Julia Farber
11 from UL.
12 I just have a note here that in our
13 experience as well, the difference between
14 varying soft and hard water could potentially
15 impact your results. And that is dictated
16 based on the hardness of the water.
17 And also, similar to Intertek, we
18 are performing all of our testing standards
19 based on the manufacturer instructions.
20 MS. ARMSTRONG: Moving on to
21 ambient temperature.
22 MS. CLEARY: This is Jen with AHAM.

1 Ambient temperature in Appendix C
2 is expressed as a range, 75 plus or minus five
3 degrees Fahrenheit. And we think that that is
4 fine, but it would be better if the test
5 procedure or guidance could expressly state
6 that the intent of the procedure is actually
7 to maintain the 75 degrees, not to go anywhere
8 in that range. So, you shouldn't be aiming to
9 run the test at 70 or 80, and that, in fact,
10 the test is intended to be run at 75 degrees
11 Fahrenheit.
12 MS. ARMSTRONG: Okay. I mean,
13 technically, then, would you be in favor of
14 tightening the range, tightening the
15 tolerance? Even if you shoot for the
16 midpoint, I mean, it is a valid test in that
17 range.
18 MS. CLEARY: Right. So, this is
19 Jen with AHAM.
20 I think that tightening the range
21 maybe could be a possibility. The difficulty
22 would be every lab is going to have a

1 different test chamber, and there may be
2 varying abilities to have a tighter range than
3 five. So, I think that might be something
4 that you might need to find out.
5 I know we did submit comments with
6 regard to DOE's proposal to widen the range,
7 and we would oppose that. We think at least
8 it needs to be this tight.
9 So, we could look at if a tighter
10 range would be possible, but right now I think
11 our sense is that, because labs are different,
12 maybe the plus or minus five, that this is
13 kind of the best that we can think of to do
14 with those variabilities.
15 MS. ARMSTRONG: Yes. So, I may
16 request that if you could think of some
17 specific language that would achieve your goal
18 of shooting for 75 but allowing dips above and
19 below that, we would welcome that. Because 75
20 plus or minus five, I mean I read that and I
21 think it is fairly clear you shoot for 75, but
22 if you go above or beyond, there is a

1 tolerance there for that reason.
2 MS. CLEARY: Jen from AHAM.
3 Yes, we will work on some language.
4 MS. ARMSTRONG: Thanks.
5 MR. KLUG: Wayne at Whirlpool.
6 I think that the lab impact that
7 Jen spoke of is probably the key challenge to
8 overcome on the value of the temperature.
9 Certainly, centering is very important, and we
10 would support language around centering those
11 values.
12 I think, from our perspective, even
13 tightening those values does have a lot of
14 benefit. But, again, that comes up against
15 what the lab equipment might be capable of.
16 But certainly, tighter is better. Centering
17 is better. And language to make sure that you
18 are actually targeting 75 and not some other
19 within the range would be beneficial.
20 MS. REICH: Judith Reich from
21 Navigant.
22 It would be helpful if you could

provide information on this issue, whether the key issue is the capability of the lab or really how much the temperature affects the performance, whether if you are operating it at 70 or 80 degrees really has a difference on the performance of the unit.

MR. BILLINGS: Lincoln Billings from Intertek.

We do understand fully that the intent is to target 75 and do aim to maintain that condition. Also, I think it is important that that condition is met prior to the test for the soil drying as well.

MS. ARMSTRONG: Okay. Any other dishwasher issue, whether it be those on the sheet, other issues? Any other comments as they relate to dishwashers before we break for lunch? We are about an hour ahead here.

MS. CLEARY: This is Jen Cleary with AHAM.

I hate to get in the way of lunch, but just the last issue on our sheet.

1 MS. ARMSTRONG: Okay.
2 MS. CLEARY: I think we have
3 addressed this in a general way already, but
4 this would be one specific instance where
5 there is a more recent version of DW-1, which
6 is incorporated by reference in Appendix C.
7 We would recommend DOE incorporate by
8 reference the 2009 version of DW-1. There are
9 some differences in the food soils there. So,
10 clearly, in order to do that, DOE would need
11 to determine whether there would be an impact
12 in measured energy from those changes. And
13 AHAM, we don't know for sure right now, but we
14 would be glad to work with DOE on figuring
15 that out.
16 MS. ARMSTRONG: Thank you.
17 MR. KLUG: Yes, Whirlpool would
18 support that as well. The differences are
19 fairly subtle, soiling order, how the egg is
20 prepared, a couple of other minor items. But
21 it would be beneficial to cite the most recent
22 reference, primarily because some labs perform

both the 1992 and 2009 procedures, and it would be certainly convenient to be able to have one size fit all.

MR. EDWARDS: Mike Edwards, BSH.

We also support it, but we would want to go in and check to make sure it didn't influence sensor decisions.

MS. ARMSTRONG: Okay. I think we would welcome any data that you would be willing to share with us, once you did that comparison.

MR. EDWARDS: If you guys are serious about accepting the proposal, then we will go in and test.

MS. ARMSTRONG: We are always serious here at the Department.

Okay. So, I take it there are no other dishwasher issues. I have had a request to at least -- oh, one more? Oh, go ahead. Go.

MR. BILLINGS: Lincoln Billings from Intertek again.

I hate to jump around, but going back to item 14, referring to the pressure drop issue, it seems that, judging by the suggested two-second limits indicates that there may or may not be, I will say, an industry-accepted allowance for transient conditions. If that is the case, I would just like to ask where that is aligned or specified, because we run into the same issue and generally throw any transient condition test.

MS. ARMSTRONG: They ask for industry-accepted positions.

MR. EDWARDS: I can tell you where the two seconds came from. It is what we all felt our labs were capable of.

MS. ARMSTRONG: Okay. So, any other dishwasher? Free feel.

(No response.)

I have been asked to ask everyone in the room, if you want to move straight to clothes washers to get out of here early or if

you want to break for lunch. I don't know how long the clothes washer one -- I will take a vote. I mean, majority rules here. I will sit here with you if we want to keep going.

Anybody?

So, how about this, 10-minute break? Or a 15-minute break is fine, whatever. Reconvene at 25 after or so, 20 after. Is that okay? So, 20 after, and we will go right to clothes washers.

(Whereupon, the foregoing matter went off the record at 12:08 p.m. and went back on the record at 12:33 p.m.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

1:33 p.m.

MS. ARMSTRONG: Okay. I would like to welcome everyone back from that quick lunch break we just had.

(Laughter.)

We are going to move through to clothes washers. We are running quite a bit ahead of schedule, and it may be perhaps that we can end quite early and get everyone home to enjoy their weekend, even if they have to travel by air.

So, with that, we are going to segue into clothes washers. I am going to go ahead and turn the first issue over to Jen to introduce.

Like I said, I am going to keep saying the same thing. I encourage you to provide detailed data, ask each other questions, so that we can really identify where there might be differences of interpretations that the Department really

needs to consider what action it can take.

MS. CLEARY: Okay. Jen, AHAM, again.

I know that the manufacturers in the room will have more details to share, particularly on this first issue. So, I will just tee it up a little bit.

Essentially, what we are dealing with here is how to handle testing anomalies. One example would be an unbalanced load. You know, DOE's test procedure doesn't address exactly how to handle those situations, if there is like a certain threshold of acceptability, for example, or when a test might need to be disregarded and a new test run.

We believe that labs probably are making different determinations as to when to invalidate a test run and restart it. Both third-party labs and manufacturer labs may have different processes that they follow there.

1 So, this is a pretty complicated
2 issue because the anomalies could be
3 different. But what AHAM is suggesting is
4 that, in the case of an obvious unbalanced
5 load, the test should be invalidated and
6 restarted because the test results should not
7 be based on a run that the consumer would
8 notice as abnormal.
9 We also think that a more general
10 way to handle this in a uniform way would be
11 something similar to -- I have the wrong IEC
12 number there, but it should be 60456, similar
13 to that approach which we have included in
14 this handout.
15 Now the exact wording in the IEC
16 version, it can't just be cut and pasted into
17 DOE's procedures. So, AHAM certainly would
18 like to continue to work on this and make some
19 suggestions in more detail to DOE. But we
20 wanted to put out there today that this could
21 be one way of handling it. So, I would
22 certainly ask the experts in the room to give

some more detail around exactly what the issue is and what different labs have been seen to do, and what our suggestion is here as well.

MS. ARMSTRONG: Everyone is looking at me.

So, I just have a question before we jump into this. Perhaps some of the manufacturers and/or the labs can say what they do.

If it is an unbalanced load, will the cycle automatically prematurely terminate in all cases or is it possible that it will actually finish?

MR. HOMBROEK: This is Phil Hombroek from GE.

It really depends on the machine and the complexity in the machine. Some will completely terminate and others will have other unbalanced algorithms to try to regain balance and try to restore the machine to normal operation.

MS. ARMSTRONG: So, to Jen's point

earlier, how would a consumer and the Department know that it is unbalanced if it doesn't prematurely terminate?

MR. BILLINGS: Lincoln Billings from Intertek.

We have seen units that actually have an indicator light where we will give the user instructions as per the use-and-care manual.

MS. ARMSTRONG: And if it doesn't?

MR. HOMBROEK: Then, you're right, in most cases it would terminate. But it depends on the complexity of the machine. We have some that certainly have out-of-balance algorithms that will take additional action, and they will inform the consumer that it is rebalancing or stop the machine and redistribute your cloths.

So, this is something that kind of needs to be considered, contrary to probably your thoughts. But the DOE cloth load is a complicated load to wash. It is in some cases

more difficult than a mixed load. When you lay those DOE cloths completely flat, one on top of another, and you pour water right over the top of it, especially in some of the newer machines, what you do is create a solid, concrete pancake, if you will, of DOE cloth, and your machine needs to be able to agitate it enough and to have the right kind of routine to mix it up and not create any kind of out of balance.

And this is coupled with the fact that, obviously, we are trying to reduce the amount of water over and over again as much as possible. So, we use these routines on a lot of higher-end machines to try to regain the balance.

But in the case of some machines, we may stop the machine and go through an entire new fill. Okay? And filling the machine again in that kind of condition, the consumer is not like the DOE and causes probably more use of water than we would like.

1 In the case where everything is
2 working properly and we load the cloth just
3 the way that we would like to, obviously, more
4 often than not, we don't have these types of
5 conditions, but there are occasions that we
6 do. And we just ask that the DOE consider it.
7 MR. MANTHEI: Phil Manthei from
8 Alliance Laundry Systems.
9 With the front-loading washers
10 predominantly, of course, gravity prevails.
11 And so, the load will tend to always be on one
12 side. So, the machine has routines, you know,
13 software, to try to balance that load out. Of
14 course, the test procedure, one of the things
15 that we did years and years ago was to make
16 sure that the test procedure tested the
17 maximum load size to allow for less unbalance
18 to occur during the test.
19 What can happen is in some units
20 the software will say, okay, I cannot take
21 this load; it is unbalanced; I cannot take it
22 up to high-speed spin. And therefore, it will

drop down to a lower-speed spin.

What could be done, I suppose, is I don't know that everybody puts in their user instructions what the actual spin speeds are of high, medium, and low speeds, et cetera. Oftentimes, that is only in the promotional material, the sales spec material. But knowing what the intended maximum spin speed is for the energy test cycle certainly could be one thing that would help the test labs to know whether it was an appropriate cycle run.

MS. ARMSTRONG: Anybody else? Any other characteristics that would help determine unbalanced load outside of just an indicator light or a premature termination?

MR. KVAIDHYANATHAN: This is Ravee from Samsung.

Unbalanced is one of the special-cause type of issues. You know, it can happen. And there are other types of situations, too, where a single test run may not represent the system behavior. So,

unbalanced is definitely one of the issues in the examples that we wanted to cite. It is both on horizontal and top-load and front-load washers. It can change the cycle.

And how the machine reacts depends on the system. Some machines, you know, they can continue the cycle at lower spin speed. Some add water. I think the MEF and Water Factor numbers, for example, are going to be different for the specific run where it went through an off-balance or other type of special-cause issues.

So, given that fact, how do we identify that? And how do we separate it from one of the runs which are special-cause runs and take it out of the calculation?

MS. ARMSTRONG: Right. That is kind of the question I just asked you, too.

(Laughter.)

You know, we are trying to understand how will we differentiate between what one would call an anomaly for which you

wouldn't have a light, you wouldn't have a premature termination. The consumer may not know it would finish its cycle, but it would use more energy or water, or whatever it is. It would use the different cycle than it normally did or it would use a different spin speed, or whatever it may be. How do we determine that without going through this whole process, getting the test results, saying, hey, DOE has these test results that show that your unit uses 50 percent more energy? And you say, "Oh, no, it had an unbalanced load." I mean, how do we get to the point where we can recognize that at the forefront rather than after we have finished verification testing or enforcement testing?

Where do you draw the line between something that is using more energy and water consistently versus something that was tested with what you guys are calling an anomaly? Are there any characteristics specifically that we could look at in the test or the test

data that would give an indication of that, other than just the lights are the easy ones, but it won't finish the cycle is an easier one. We don't just necessarily throw test data out per se.

So, I am asking you guys. How do you determine what to do when you come up with your ratings?

MR. MANTHEI: This is Phil from Alliance Laundry Systems.

With the spin speed, that one is fairly obvious. You can measure the spin speeds and compare them to what the product literature or specification is for that model, and know if you are at the right one.

MR. OSANN: This is Ed Osann with NRDC.

I think there is a concern here about, or we would raise a concern about to what extent these conditions really are anomalous. As the control logic of these machines becomes more sophisticated over time,

1 you could envision sort of a gradation of what
2 you might consider intervention in rectifying
3 non-standard conditions. And it might be
4 that, for marketing purposes, a machine, a
5 design would intentionally intervene more
6 often.
7 I think, as presented, it is hard
8 to argue against the ability to throw out
9 truly anomalous results. But it seems like
10 there ought to be more on the record here
11 about how often this occurs and how to
12 distinguish this occurrence from what
13 consumers are likely to encounter more
14 frequently.
15 MR. KVAIDHYANATHAN: This is Ravee
16 from Samsung.
17 There are potential ways of
18 addressing and understanding the special-cause
19 situations. In the test tunnel, for example,
20 for the water factor, multiple units are
21 tested and multiple runs are done at different
22 load sizes, too.

So, when we look at the data, it is probably we can do some types of statistical validation or analysis to see which runs are out of the norm. When we have multiple data points, it is easy to find the special-cause runs from the normal test runs. So, that is one way of addressing that in terms of taking it out.

Again, if all the runs seem to be like special-cause runs, that is the typical behavior of the system. So, we can't take anything out. But if a few runs are out of spec in terms of what the other runs are, it may be easy to use statistical means to separate the data out.

MR. TEICH: This is Dan from Whirlpool.

So, Ravee, are you suggesting that a limit, some kind of a statistical level be set, that if special-cause runs occur, if we hit this level, then we would be allowed to take those out of the equations, out of the

calculations? Or are you talking about addressing the question of gathering data to determine statistically how many times that happens? I am not sure.

MR. KVAIDHYANATHAN: I was just imagining the washing machine testing. You know, we test multiple units and multiple load sizes, multiple temperatures. So, we do have a good dataset in terms of what each of those test runs resulted in, you know, water volumes, energy consumption, recycle time. All this information is out there, and if we want to identify those specific runs which are anomalies, there is the possibility to treat this, you know, look at the data to understand which one is out of the norm. We can maybe define some limits, some statistical limits, to determine which one might be out of the norm.

MR. HOMBROEK: I was just going to state that GE would certainly be in favor of setting some type of limit to the number of

anomalies that is described in the IEC example that has been provided.

We also would like to state that different labs are interpreting this in different ways. You may go to one third-party lab and they may throw out information giving a certain set of criteria versus another lab may do it differently. And this is an area where I believe that harmonization needs to be in place.

MS. ARMSTRONG: Okay. So, I am actually going to turn to AHAM and the labs. So, I want to know if you would be willing to share how AHAM in their verification program is going to determine an anomaly like this. What set of criteria do you plan to use? And then, for the labs, if you could speak to that as well in terms of what you do now?

MS. CLEARY: This is Jen with AHAM.

I think we could provide that information to you later.

MS. ARMSTRONG: Thank you.

MS. FARBER: So, this is Julia with UL.

We have noticed that there is definitely a difference between the top-loading and the front-loading washing machines. We tend to see that unbalanced loads in front-loading machines are often just redistributing the loads. We usually will keep those in the test run, and we have a tendency not to see anomalies in that situation.

But in the top-loaders, we will say that there are a couple of different situations where we do see either an indicator light or we notice that the cycle is changing or we will see an additional amount of water entering the machine. That will give us an indicator that there is something amiss, and that leads us to possibly question whether or not it is an anomaly.

We do want to ask, though, if there is a possibility to get a little bit of

1 additional clarification from the DOE and/or
2 from AHAM on what situations you would prefer
3 us to keep those test data and when you would
4 like us to throw it out. We are totally open
5 to hearing your thoughts on that. Of course,
6 we are a test laboratory that is here to serve
7 our clients and you guys as well. So,
8 whatever guidance you offer to us is going to
9 be the one that we use.
10 Thank you.
11 MS. ARMSTRONG: Anybody want to
12 speak to the specific sets of criteria that
13 they know are different?
14 (No response.)
15 We can't consider a uniform
16 specification without knowing some ideas of
17 what that should look like or what is actually
18 being done differently. It is pretty hard.
19 So, if you want to think about it
20 and suggest things later, that would be fine.
21 But it is hard to understand.
22 MR. TEICH: This is Dan from

1 Whirlpool.

2 I am just struggling right now, and

3 I think we need to work as an industry to

4 define what is the definition of an anomaly,

5 the level at which one type of an anomaly may

6 become enough that we throw out that cycle.

7 And so, sitting here today, I don't

8 think we can list each one of those, give any

9 specifics. But I am not opposed at all to

10 doing that as an industry and coming together

11 and agreeing on some different levels. I

12 think it would be a great idea because we do

13 have quite a bit of interpretation among all

14 the manufacturers, I think, Whirlpool

15 included. When do we include that cycle; when

16 don't we?

17 And we have different ways of

18 informing our consumers, whether we tell them

19 in owners' manuals go ahead and re-adjust, do

20 something, or we indicate via lights. So, I

21 think it is way too broad to try to address

22 right now.

1 MS. ARMSTRONG: Okay. I am going
2 to make -- this is Ashley from DOE -- I wanted
3 to make one request that you keep in mind when
4 you do this.
5 For assessment testing, when we
6 test one unit, we don't have the luxury of a
7 large dataset to see where an anomaly may lie.
8 Just because the ratings are off by a certain
9 percentage, doesn't necessarily indicate an
10 unbalanced load. We have had a unit
11 consistently fail by 200 percent, I mean over
12 many units tested.
13 So, just because there is a
14 threshold -- so I ask you to consider that. I
15 think, from the Department's point of view, we
16 are sensitive to the fact that there are
17 testing anomalies and we would like to be able
18 to articulate better. But, on a single test
19 deviation from the ratings is not a unique
20 indication that it is a test anomaly or a
21 defective unit. So, when you think about
22 that, that is the challenge from our

perspective.

Okay?

MR. MANTHEI: This is Phil Manthei from Alliance Laundry Systems.

On the unbalanced load situation, when you are testing one unit, right now the test procedure for the RMC only requires recording the RMC for the maximum test load at the cold cycle. I think it has the same cycle, and wash and rinse have the same temperature.

If you did that for the other cycles that you are testing, because you are testing like at the maximum load size, the average load size, minimum -- so, you have got three, and then you have got three temperatures. You could actually have like nine cycles. If you recorded the spin speed and RMCs from those other ones, you would have the kind of statistical information, I think, even on just testing one unit, to know that that one that is critical that you are using

1 right now is the one test at maximum load and
2 cold wash is an anomaly.
3 MR. TEICH: This is Dan from
4 Whirlpool.
5 I think that is somewhat, Ravee,
6 what you were getting at. We run enough
7 cycles in one test to determine just from
8 those if there is an anomaly that stands out.
9 MR. KVAIDHYANATHAN: We need to
10 prepare a good proposal and communicate to you
11 as the industry.
12 MS. ARMSTRONG: I think that would
13 be very helpful.
14 Okay.
15 MS. CLEARY: This is Jen from AHAM.
16 I think the next several issues
17 have to do with the drum volume measurement.
18 We know that this has been a topic that we
19 have sought guidance on in the past. There is
20 existing guidance on drum volume measurement
21 for Appendix J-1, and Appendix J-2 also gives
22 some more detail. So, many of the issues have

been addressed.

However, there are still some questions that we would seek further guidance on from DOE. That is what these questions are intended to do.

Issue No. 2 has to do with the bag design, that the test procedure specifies use of a poly sheet, but it doesn't go into more detail than that. A flat sheet is going to result in some folds in the material, which can lead to an inaccurate measurement.

So, what AHAM would suggest is that a bag be used to reduce folds in the material, and we would ask that this be clarified in the procedure, maybe as a recommendation of best practices or whatever the Department, if you agree, find the best for doing that, if there is any more detail.

MR. MANTHEI: This is Phil Manthei from Alliance Laundry Systems.

I think most of the manufacturers have been using bags for years and years and

1 years. But we are aware that at least one lab
2 attempted to do it using plastic sheets, and
3 it was a disaster.
4 MS. ARMSTRONG: Here is where the
5 fun part starts. DOE used sheets -- look at
6 the faces -- when we did testing. I ask, have
7 you done any round robin or activities within
8 each lab to show that there is a significant
9 difference between sheets and a bag? We did
10 our round robin. The results yet are not
11 public. They will be at some point. But I
12 think we didn't see a whole lot of difference
13 attributable to that issue.
14 MR. TEICH: This is Dan from
15 Whirlpool.
16 To my knowledge, I have never seen
17 a round robin done. I am anxious to see the
18 results of what you are talking about.
19 But I think for the manufacturers,
20 when we attended the verification visits, it
21 just stood to us -- since most of us, and I
22 think all of us, have used bags for years,

1 like Phil said -- it just stood out as a huge
2 area of variability.
3 MS. ARMSTRONG: Potential? Or you
4 have data that shows it is?
5 MR. TEICH: We do not have data.
6 MS. ARMSTRONG: So, potential?
7 MR. TEICH: Potential, yes.
8 MS. ARMSTRONG: Okay.
9 MR. TEICH: And that is why I said
10 I am anxious to see your results on the round
11 robin, if it was done.
12 MS. ARMSTRONG: I mean, to the
13 extent -- well, just one second -- to the
14 extent we have done any verification testing
15 and used sheets, I mean, we haven't come
16 knocking on your doors. The ratings are
17 coming out pretty similar.
18 (Laughter.)
19 Not to say that that doesn't mean
20 we shouldn't look into it, but I am just
21 saying --
22 MR. TEICH: Right. Okay.

1 MS. CLEARY: This is Jen from AHAM.
2 I think, as I mentioned in my
3 opening remarks, as the standards get more
4 stringent, this could become an issue. So, I
5 think that that would be our concern as well,
6 that as the requirements are tighter and
7 tighter and there is less room maybe even for
8 conservative ratings, which may be helping
9 variability right now, this may become a more
10 important issue at that time.
11 So, the results of the current
12 round robin may not show that as much. I
13 don't know. We will need to look at the data
14 and evaluate that as well.
15 MR. HOMBROEK: This is Phil from GE
16 again.
17 When this came up, it was during
18 our AHAM round-robin testing, finding out
19 which lab we wanted to choose for verification
20 testing. As I recall, in this particular
21 incident the lab in question, when they
22 measured it, ended up putting that particular

washing machine in a new category. So, it did even have an impact in that result.

I will have to look through some material, but I can look back, I guess it was about a year ago, at the data that we took at each individual third party. But it certainly did change the load size for this one third party.

MR. TEICH: And this is Dan from Whirlpool.

I guess I would ask, since the industry has used bags for many years, is there a particular reason why a bag wouldn't be considered as something to be standard?

MS. ARMSTRONG: I am just trying to understand. So, if we go through a uniform requirement, we are going to have to have a rationale for doing such things. So, I am trying to understand why is it the bag. And if there are large differences, obviously, that indicates that there should be. But if there are little to no impacts on the energy

1 used, as long as you are implementing it the
2 correct way, then it seems like having choices
3 is not necessarily a bad thing.
4 MR. TEICH: Right. Yes, and I
5 think the gap is we just need to support that
6 with data. And so, the round robin, from what
7 you said a few minutes ago, it sounds like one
8 is completed, has been completed, or is in
9 process.
10 MS. ARMSTRONG: We did a limited
11 one, right, before?
12 MR. TEICH: Okay.
13 MS. ARMSTRONG: And I am not sure
14 that you can draw 100 percent conclusion bags
15 versus sheets. So, that being said, I think
16 there is a common understanding that labs may
17 have used different mechanisms. We didn't see
18 a large variation in results, but we will see.
19 MR. TEICH: Well, I would
20 offer -- you know, maybe I am going way out of
21 the box -- but I don't think we would be
22 opposed to participating in a round robin to

confirm or gather data.

MS. ARMSTRONG: Okay. Other manufacturers that agree to do that as well?

I appreciate that offer. I will ask.

MR. MANTHEI: This is Phil Manthei from Alliance Laundry Systems.

I think it is just makes common sense. I mean, you have a cylinder, and trying to put a flat sheet into a cylinder makes no sense.

MS. ARMSTRONG: All right. Moving along -- oh, anybody?

MR. TEICH: I was just going to say, again, going along with what Phil said, it opens up much more areas for variability/interpretation. How do you wrap the flat sheet around it? That is where we saw the issues.

MS. ARMSTRONG: Okay. Moving along to energy test cycle, or I might have them out of order on my agenda.

MS. CLEARY: Yes, I think we still had some other drum volume measurement issues.

MS. ARMSTRONG: Okay. Keep going.

MS. CLEARY: Yes. And I think, just to expand on the last point real quickly, it is that this could be down to like hundredths of a point in terms of the categories of the washers. So, that is what Phil, I think, was indicating. That is why we do see the potential here.

MS. ARMSTRONG: I mean, just to clarify, the Department is not opposed to clarifying, where needed, but we will need some rationale.

MS. CLEARY: Yes. Understood.

I think that issue No. 3 on our sheet -- that is Jen at AHAM -- we probably don't need a lot of discussion on. It is something we just wanted to make sure to put on the record maybe, so that maybe labs are aware of this, that DOE procedure requires the weight of the water to be used to determine

the volume. NRCan may have a different procedure. We just think it is worthwhile to verify that all the labs are using the proper volume-measuring procedure, as required by DOE.

MR. KVAIDHYANATHAN: Yes, this is Ravee, Samsung.

The measurement of water volumes and weight, you know, the accuracy depends on the standard. So, what it really means is that, by using different approaches, the accuracy of measurement can be different. So, the weight measurement is done with more accuracy compared to the volume measurement, as per the standard. But the result will also be different if you use a different method in terms of accuracy.

MS. ARMSTRONG: I don't know that you want me to say anything other than you have what our test procedure requires. I don't have it in front of you, but I assume that you have articulated it correctly.

MS. CLEARY: Yes, I think we see part of this --

MS. ARMSTRONG: Sure. That's fine. Fair enough.

MS. CLEARY: -- open forum as putting it out there in the open, yes. Okay.

The fourth issue that we have identified -- and this is also with regard to drum volume measurement -- deals with unique design features. So, this is sort of a broad category. We have identified one such situation could be the seal and the gasket in a horizontal-access machine, that labs could be interpreting this differently as how to measure the volume when there are different designs up in the drum.

We would suggest specifically with regard to this gasket and this seal issue that the measurement of volume should not include the volume of the corrugations in the gasket, that bags should just be draped over the gasket, not extending into it. That would be

1 the specific language I think AHAM would
2 suggest and shouldn't be seeing like the bag
3 or the sheet being like stuffed into the
4 gasket.
5 There may also be other unique
6 designs that either exist now for some
7 manufacturers and not others or may be coming
8 onto the marketplace that DOE should also be
9 evaluating. We certainly recognize that it
10 would be the manufacturer's, the individual
11 manufacturer's own to come to DOE with those
12 designs, but, overall, what we would be
13 requesting today is that there should be a
14 method to quickly and uniformly address these
15 designs, so that all labs could be and would
16 be testing in the same way.
17 MS. ARMSTRONG: Okay. I mean, I
18 would encourage you to come to DOE if you have
19 a design for which you think the guidance does
20 not specifically or clearly articulate how to
21 do something before you do your certification
22 testing and before any subsequent verification

1 testing may be done. That is going to be the
2 easiest way to deal with this.
3 And to Jen's point, we will think
4 of ways that we can expedite a response with
5 whatever regulatory mechanisms we have
6 available to us.
7 MR. MANTHEI: Do you mean that each
8 manufacturer should come to you?
9 MS. ARMSTRONG: So, to the extent
10 you want to work with AHAM, because you all
11 have a common design that needs to be
12 addressed, that is fine. If each manufacturer
13 has a different issue, you may also come to us
14 individually. That is kind of at your
15 discretion, depending on the potential designs
16 that may need further clarification which you
17 do not feel is adequately addressed by our
18 test procedure or guidance.
19 This is Ashley from DOE.
20 MR. OSANN: This is Ed Osann.
21 I have got a question about the
22 AHAM position. In this case, seeking to

clarify that the volume of the corrugations in the gasket basically are not measured. Is this out of concern for the repeatability of the measurement or is this because -- why should this volume be excluded?

MR. TEICH: I think it is repeatability of the measurements, but, then, more importantly, getting at the consumer facing issue, cloths are not meant to reside in that area.

As you go through the wash process, we specifically try to keep cloths out of that area. So, how could it be included in a usable capacity.

MR. OSANN: So, this goes back -- this is Ed Osann again -- so, this goes back to the notion that the drum volume is supposed to be the extent to which the --

MR. TEICH: The usable capacity.

MR. OSANN: -- the volume that is used for washing clothes?

MR. TEICH: Correct.

1 This is Dan Teich at Whirlpool.
2 I'm sorry.
3 MS. FARBER: This Julia from UL.
4 I may have some comments related to
5 this issue, but not necessarily specific to
6 the gaskets. So, I am wondering if you want
7 us to wait on that until the end or if you
8 want us to share those comments now.
9 MS. ARMSTRONG: Please share them
10 now.
11 MS. FARBER: Okay. All right. So,
12 we have some clarity questions about the
13 capacity measurement of clothes washers.
14 According to our engineers, the latest
15 guidance is showing examples of where the
16 capacity of clothes washers should be
17 measured, and that has helped to consistently
18 measuring the volume across many models. But
19 the concern is for top-loading models, this
20 capacity measurement does not represent the
21 useful space of loading clothes by the
22 consumer. And when the guidance came out, it

1 represents a much closer -- it was much closer
2 to the usable space than previous
3 interpretations. Now that that has been out
4 for several months after the guidance, there
5 are some models in the market that are getting
6 further from the consumer useful space while
7 still being within the guidelines of the
8 latest guidance.
9 So, it is our suggestion that, if
10 you could at DOE, that guidance documents and
11 schematics get updated periodically to ensure
12 that the measured capacity reflects the usable
13 space, per the intent of the standard.
14 MS. ARMSTRONG: This is Ashley.
15 So, I think, as a general practice,
16 we do not have an issue updating guidance
17 documents where they may necessitate revision.
18 However, we are going to have to know the
19 details about why and what needs to be
20 considered for reopening.
21 MS. FARBER: Thank you.
22 MR. HOMBROEK: This is Phil

1 Hombroek from GE.
2 A question, actually, to UL. Were
3 you talking about the difference between the
4 J-1 and J-2 documents?
5 MS. FARBER: That is referenced in
6 here, yes.
7 And I have another question about
8 the transition of declared capacity from J-1
9 to J-2 and when that might be taking place.
10 Sorry. This is Julia from UL.
11 MS. KOHL: This is Betsy Kohl from
12 DOE GC.
13 The new J-2 is required for use on
14 the compliance date, those new standards that
15 were published in The Federal Register
16 yesterday, I guess.
17 PARTICIPANT: We can't hear you.
18 MS. KOHL: Oh, sorry.
19 Betsy Kohl, DOE GC.
20 Use of J-2 is required on the
21 compliance date of the new standards that were
22 just published in the DFR a day or two ago,

1 assuming that we don't get adverse comments
2 that would lead us to withdraw the rule.
3 MR. HOMBROEK: This is Phil
4 Hombroek from GE.
5 You made reference to a new rule
6 that came out in the last day or something?
7 Okay. And you are backing out more of the
8 standards in J-2 versus what is in the J-1?
9 Is that what I understand?
10 MR. TEICH: This is Dan Teich from
11 Whirlpool.
12 I hope you are referring to the
13 direct final rule that came out --
14 MS. ARMSTRONG: We are.
15 MR. TEICH: -- which was we saw a
16 pre-version of that, I don't know, two weeks,
17 three weeks ago.
18 MS. ARMSTRONG: Yes. It is just a
19 standard rule. It is not a test procedure
20 rule.
21 MR. HOMBROEK: Got it. I
22 understand.

MS. ARMSTRONG: The compliance date, the test procedure is keyed to the amended standards. So, the J-2 is keyed to the amended standards. So, you don't actually have to use the J-2 procedure until the compliance date of the amended standards, which got published yesterday. That is clear.

MR. KVAIDHYANATHAN: That is March 7, 2015.

MR. HOMBROEK: 2015? Okay.

MS. ARMSTRONG: Okay. Have we dealt with volume?

MS. CLEARY: No.

(Laughter.)

MS. ARMSTRONG: Oh, okay. Keep going with volume.

MS. CLEARY: Jen Cleary.

We have one more to address. The current volume measurement guidance, as well as Appendix J-2, the language does make it clear that the shipping bolts are to remain in place. But neither of those documents

specifies whether the shipping bolts should be supported.

So, AHAM would suggest that DOE should expressly state both in the current guidance and in Appendix J-2, that the shipping bolts should be supported. The reasoning there is that this would prevent the drum from sagging when the water is added and will also keep the unit in as-shipped condition, which we understand to be the intent of both J-2 and the guidance. This will also prevent damage to the unit during the test.

So, I don't know if the manufacturers have more they wanted to add to that.

MR. HOMBROEK: It is Phil Hombroek from GE.

Just to make sure you understand what we mean by being supported, what we mean is that the shipping bolts themselves during the test need to be held or fixed; otherwise,

the back of the unit sags down and creates the distortion that has been talked about that can add an impact on your volume and, also, can damage the unit, as we mentioned.

And we know this varies between third-party labs as to whether it gets done or not. It does have an impact.

Thank you.

MS. ARMSTRONG: Okay. Anybody else on drum volume capacity?

(No response.)

Okay.

MR. MORRIS: Thank you, Ashley. This is Wayne Morris from AHAM.

The issue that we brought up in item No. 6 has to do with the energy test cycle. This is the concern that is expressed. I mean, I am not going to go ahead and read the entire thing. I think you get the picture on this.

But our position is that the sanitization cycle and any other cycles here

1 should not contribute to the accuracy
2 representation. We have suggested here that a
3 consumer usage study needs to be done. If
4 there is not data to show that the consumers
5 use the sanitizing cycle or other cycles
6 often, then the cycle should not be required
7 in the test cycle.
8 So, we would like the Department's
9 comments on this situation, and welcome my
10 colleagues as well.
11 MS. ARMSTRONG: Are you
12 volunteering to do a consumer usage study?
13 MR. MORRIS: Well, we think that it
14 needs to be done.
15 This is Wayne Morris. Sorry.
16 And we would certainly be glad to
17 work with the Department on that.
18 (Laughter.)
19 MS. ARMSTRONG: The Department is
20 always glad to work with you, too.
21 MR. MORRIS: Great.
22 (Laughter.)

Maybe this is one of those where one could supply labor and one could supply money.

(Laughter.)

It would probably have to be a negotiated rulemaking on that one.

(Laughter.)

MS. ARMSTRONG: Okay.

MR. MORRIS: This is Wayne again.

Do you have any questions about what we are suggesting there or why? I mean, I think that that is why we t'd this up today, is to see if you understand kind of what we are leading at.

MS. ARMSTRONG: Yes, I mean, I think we get it, right?

MR. MORRIS: If you want me to, I will go on then. The test cloth loading method varies. We have already talked a little bit about this with regard to the possibility of a setting or a situation that could occur with an unbalance.

1 But the loading of top machines,
2 top-loading machines without an agitator is
3 particularly troublesome, as we have found in
4 some of our testing situations, the test
5 procedure states in the load and the energy
6 clause, by grasping them in the center and
7 shaking them to hang loosely and then putting
8 them into the clothes container. It doesn't
9 define how or where to place that test cloth
10 in the drum.
11 And so, what we had suggested was
12 that DOE could allow the use of a form where
13 the manufacturer indicates the load pattern
14 until a more precise loading can be developed
15 for the test procedure.
16 An alternative to this, also, if
17 the Department is willing, we might be able to
18 look at the possibility of a video, as has
19 been suggested before, that we could develop,
20 circulate comments. And then, if all the labs
21 are in agreement, then we could use that as a
22 loading pattern, if it is an industry-wide

1 situation. If this turns out to be an
2 individual product situation, then this may be
3 a loading pattern that needs to be indicated
4 in some form.
5 So, we would like the Department's
6 thoughts on how best to proceed with this
7 situation. I think we are willing to help
8 with this. But I think that we need to have
9 some indication from the Department which they
10 would prefer before we set out in one
11 direction or another.
12 MS. ARMSTRONG: This is Ashley from
13 the Department.
14 I think, at the outset, we need to
15 understand that there is a significant --
16 there is an impact on consumption and/or
17 ratings with load pattern variance. We need
18 to get to that first.
19 MR. HOMBROEK: This is Phil from
20 GE.
21 Certainly, different machines
22 operate differently and have different sensing

mechanisms by which they determine load size. And it our view that we need to inform the consumer on these specific types of machines, how to properly load the machine to get the best performance. And we do that in our use-and-care manuals, and that is our facility, if you will, to communicate to both the consumer and whoever may be testing our units what the best and most appropriate means to load the machine.

But it all comes down to how you load-sense, and different manufacturers do it differently. Sometimes it is a matter of agitating the machine. Sometimes it is a matter of spinning the machine, and some are very complicated and somewhat proprietary.

So, at the end of the day, they do operate and we do feel an obligation to try to get to that by communicating to the consumer. But I will say that it will certainly have an impact on the DOE measurement if it is not done properly.

1 MR. TEICH: This is Dan from
2 Whirlpool.
3 And I will just fully agree with
4 everything Phil said. I think this was
5 demonstrated as we did our verification lab
6 visits. And that is truly why we got in a
7 discussion to clarify and came up with this
8 proposal. We all instruct in our
9 instructions. And with the newer machines,
10 relatively-newer machines, it is very, very
11 important. It makes a big difference.
12 MS. ARMSTRONG: Okay. So, to
13 answer Wayne's question about how this should
14 be solved, I think the Department needs to
15 think about this and get back to you before we
16 can tell you kind of our position on the best
17 pathway forward.
18 Thanks.
19 MR. HOMBROEK: Let me just add one
20 more thing. This is Phil Hombroek from GE
21 again.
22 About grasping the cloth versus

1 laying it flat in the machine, I just want to
2 make it quick and brief. It does make a
3 difference if you have a cloth that is held in
4 place and tossed in the basket versus it going
5 flat one on top of another all the way around
6 the basket.
7 Cloths that typically are laying
8 flat on top one after another are going to get
9 to that issue where we are going to have more
10 potential for out-of-balance loads. Because
11 if you can imagine the water going right on
12 top of those flat sheets, all you are doing is
13 creating one solid cake, and that is what we
14 are trying to avoid. That is why it is
15 important to us.
16 Thank you.
17 MR. MORRIS: And this is Wayne.
18 I would add to that, that the issue
19 also is that that is not the way the consumer
20 loads a machine. They don't lay something out
21 flat and then pack it into the machine in a
22 flat method one on top of another. At least I

1 don't ever know of any consumer to do it, or
2 if there is anybody on the telephone that
3 wants to volunteer they do, that would be
4 interesting to learn. But I think that most
5 consumers don't behave in that way. So, this
6 will be closer to approximating the way that
7 the consumer actually does load a machine.
8 Thank you.
9 MS. ARMSTRONG: Any other comments?
10 Questions?
11 (No response.)
12 Okay. Water pressure.
13 MR. MORRIS: This is Wayne again.
14 Thank you.
15 Yes, obviously, this is very
16 similar to the issue that we talked about
17 earlier today in regard to the dishwasher.
18 Our experience has been that labs have been
19 seen interpreting how and where the water
20 pressure is measured and controlled
21 differently. And we are concerned that this,
22 as we described earlier, is important because

it is an issue of that drop in pressure that happens when you first open the valve to the situation.

So, again, is there a certain amount of time that the pressure can go below the limit. The lab seems to be applying different limits to this situation. So, we have made a suggestion that the pressure can be measured as the water is flowing. That is consistent with what we have said before and what we have talked about earlier.

DOE made this change request in Appendix J-2, but we are going to be with J-1 for three years. We think it is important that we have a clarification in that situation. Water pressure is expected to drop at the moment the valve opens, and we suggested the two-second limit for the transient pressure drop be added to both the J-1 and the J-2. And so, we are asking that the Department do that by form of guidance.

MR. HOMBROEK: This is Phil

1 Hombroek from GE.
2 I think we all kind of collectively
3 agreed that two seconds was reasonable for our
4 own labs' capabilities, and it is something
5 that kind of drives consistency amongst all
6 the groups.
7 If we placed a higher tolerance on
8 it, for example, that would require additional
9 equipment, and so on, in order to prevent any
10 reduction in pressure for less than a second.
11 For example, that would cause a lot of lab
12 restructuring.
13 MS. ARMSTRONG: And just a
14 question. Is this something you pretty much
15 voluntarily maintain now?
16 MR. MORRIS: We do. This is Wayne
17 Morris. We do. Many of the manufacturers
18 have volunteered that they do that as well.
19 And this is also done with the laboratory that
20 AHAM uses in its verification program.
21 As Phil said, it is a capability
22 situation. The labs are capable of measuring

it in that timeframe without going to extremely-expensive equipment. And we also think that the labs will see a constancy and very little tolerance changes, differences in their measurements if we do this on a flowing basis, which is, I think, what was intended all along and what seems to be intended in other test procedures.

Thanks.

MS. FARBER: This is Julia Farber from UL.

We are measuring the water as flowing and we agree with the two-second recommendation.

Thank you.

MS. ARMSTRONG: Okay. Keep going, yes. Ambient conditions.

MR. MORRIS: Wayne Morris again.

Recording the ambient temperature and humidity is not currently required by the DOE test procedure. This may not be as critical as it was in the dishwasher

1 situation, where the air drying and that
2 situation. But when you pack a large number
3 of washing machines that all are using in some
4 cases heated water as well as cold water into
5 a room to do multiple test runs, all going on
6 at the same time, we think that it is very
7 important that we try to maintain the ambient
8 conditions.
9 And so, we do believe it is
10 necessary that the labs are recording their
11 ambient conditions. And so, we think that it
12 is something that the Department can indicate
13 in guidance that this should be done.
14 We believe it is important for the
15 manufacturers to have the access to those
16 ambient temperatures in case there is any lab
17 dispute that may arise. One of the procedures
18 that the AHAM procedural guide allows for is
19 for the manufacturer to challenge the
20 laboratory. While that is used on the
21 extremely rare occasion, it is important that
22 when you backtrack to those circumstances, and

1 certainly if there is an enforcement action,
2 it is sometimes necessary to go backwards into
3 data. In some cases, you are going backwards
4 a year; you are going backwards a significant
5 period of time.
6 Whereas, a lab may be doing things
7 the same way today that they did, say, 30 days
8 ago, they may be doing things differently
9 today than they did two years ago. And so, as
10 we get more and more data accumulating over a
11 longer period of time, it is important to have
12 these recordings. So, we are suggesting that
13 this is something that the Department, it is
14 good laboratory practice to not only structure
15 this and measure this, but it is also
16 important to record this, if we need to ever
17 go backwards.
18 MR. TEICH: This is Dan from
19 Whirlpool.
20 I guess I would just add that is a
21 practice in our labs. So, that is one of the
22 reasons, if we ever do need to challenge a

1 verification test, we would look for that
2 data.
3 MR. MORRIS: This is Wayne.
4 And it is a practice that we use in
5 our laboratory for our verification program.
6 We think it is probably good laboratory
7 practice for anyone. I find it hard to
8 believe that anybody would not do it, but we
9 also think it is important that, if the
10 Department doesn't specify that, then it is
11 one more variable that we can get to that
12 could affect the results.
13 Thanks.
14 MS. ARMSTRONG: So, a question for
15 you, and forgive my lack of knowledge in being
16 able to quickly find this. Are the humidity
17 conditions actually specified in the test
18 procedure that are required to be maintained?
19 So, why would you want them recorded? I mean,
20 I am not saying at the outset that that
21 wouldn't just be good information to have as a
22 basis for what was going on during the test,

1 but what basis would you have to challenge
2 anything if there is no requirement for them?
3 MR. MORRIS: This is Wayne Morris.
4 The only thing I would say is you
5 are right, it isn't, but it is good laboratory
6 practice in any situation. And almost any
7 standard out there is going to require a
8 temperature and a humidity min and max. So,
9 it is not something that we are asking for
10 that is extremely strange. But if the
11 Department feels that the temperature is the
12 only one they want to ask for being recorded
13 because that is what is in the CFR and the
14 test procedure, we could understand that. We
15 were just asking because it is consistency.
16 MS. ARMSTRONG: Oh, yes. This is
17 Ashley from the Department.
18 As a best practice thing, I am not
19 advocating a position here for the Department.
20 I am just more trying to understand where the
21 request comes from on humidity.
22 MR. MANTHEI: This is Phil Manthei

from Alliance Laundry Systems.

It could impact, I suppose, very slightly when you do the RMC measurement; you are taking that load out and you have to go weigh it. Well, how far away walking with this load and it is evaporating more moisture and the humidity level in the air is going to have some impact on that.

MS. ARMSTRONG: Okay.

MR. MORRIS: Go ahead?

MS. ARMSTRONG: Yes.

MR. MORRIS: Okay. Thank you, Ashley.

No. 10, I guess we are asking a question. Is the Department doing any testing per J-2? It would be useful to observe the standby portion of the test.

Also, should manufacturers discover the ambiguities in the test procedure language with regard to low-power mode, what is the best process for addressing those with DOE? Is it possibly with industry-sought guidance?

1 We would just like to seek some feedback with
2 this situation. I think that the J-2 now
3 calls out the standby or low-power mode
4 measurement. We just would have liked some
5 information in regard to this.
6 MS. ARMSTRONG: This is Ashley from
7 DOE.
8 So, the J-2 rulemaking is complete.
9 We did do testing in support of that
10 rulemaking during the rulemaking proceeding.
11 That being said, obviously, if you
12 come across in your testing ambiguities on how
13 you think people are interpreting J-2 or if
14 you read it and it is unclear on how you
15 should test for J-2, I encourage you to submit
16 a comment or submit a question. You can send
17 it to me. You can submit it through our
18 guidance database, which is the best way to do
19 it.
20 And obviously, we would issue
21 guidance across the board for all, and a test
22 procedure guidance, as our policy was stated

earlier, would be put out for comment.

MR. MORRIS: This is Wayne Morris.

Is the data that you did in regard to the standby portion or low-power mode portion available?

MS. REICH: This is Judith Reich from Navigant.

A summary of that data is available in the notices that accompanied the test procedure rulemaking.

MR. HOMBROEK: This is Phil Hombroek from GE.

I would like to ask, further, if you guys would be willing to offer which lab may have done the testing, so that we might be able to go see some of the testing and maybe set up some of our own units to do that, just to make sure that we are following along what was intended.

MS. ARMSTRONG: We did it at our own lab. So, the answer is going to be no.

But, that being said, like

1 something was mentioned in the hall. To the
2 extent you guys all go to a third party, and
3 you may want to invite the Department, I don't
4 know that we could necessarily articulate,
5 depending on the spot, but we would definitely
6 be willing to be part of those discussions as
7 to what is going on and how the test procedure
8 is being done, if you all wanted to go to a
9 lab to do it, similar to what you did prior to
10 picking a lab for your verification.
11 MR. HOMBROEK: I think that is an
12 excellent idea. And this is Phil from GE.
13 I would certainly like to suggest
14 maybe a third party that we could all agree to
15 go to and run some testing with the J-2 in an
16 open forum where we could see the test run.
17 MR. MORRIS: Well, Ashley, if there
18 is anybody else, that one of my colleagues
19 might have any additional items, I would
20 certainly be willing. But I think that,
21 overall, obviously, we want to thank the
22 Department for today and for Judy and others

1 who have helped with the workshop.
2 This is something that we have been
3 asking for for a while. I know that you all
4 have seen the need for it as well. But, as we
5 get more and more laboratories involved and
6 more manufacturers with their laboratories
7 involved, as well as, then, in the case that
8 we have verification laboratories and now we
9 have enforcement actions and enforcement
10 laboratories involved in this, the lab-to-lab
11 variation is something that we would like to
12 try to reduce as much as possible. And I
13 think the Department would agree with us on
14 that.
15 The importance, also, cannot be
16 overstated with the fact that, as we begin to
17 squeeze the amount of energy out of these
18 machines -- and it doesn't matter whether we
19 are talking room air conditioners or
20 dishwashers or dehumidifiers or whether it is
21 clothes washers, we are talking about water
22 factors now which are down in the tenths of

1 digits. We are talking about calculations of
2 load volumes that in some cases is extremely
3 minuscule between the one division of a
4 section and another. And we have seen
5 examples of that ourselves.
6 As we begin to look at kilowatt
7 hours per year, certainly in the low triple
8 digits, the differences are beginning to be
9 extremely important. We believe that,
10 overall, this program is extremely well run,
11 that the manufacturers have made a huge amount
12 of investment to make sure that there is
13 absolutely as much as possible consistency
14 across all lines.
15 We voluntarily participated in
16 Department of Energy activities of measuring
17 in our verification program. We help with
18 reporting to DOE when there is an issue that
19 may come up, though it is extremely rare. We
20 have been as cooperative as we can with all of
21 these situations.
22 We appreciate the laboratories.

1 And the laboratories have been very, very
2 cooperative with us in all of these
3 situations.
4 But I think that, as we begin to
5 squeeze this amount of energy and water and
6 other activities, the differences between a
7 unit that may potentially be a non-compliant
8 unit and one that is compliant is extremely
9 low. And so, any reduction in the variability
10 we can do is important, not just to us, but to
11 the consumer. We want the consumer to have
12 faith in the numbers that are shown on the
13 machine and in databases and by the
14 manufacturer.
15 The other situation is also
16 important. And that is that, as we begin to
17 squeeze these numbers down less and less, the
18 manufacturers have got to design machines that
19 meet these. And they have got to be able to
20 do design testing in new machines and know
21 that that same test is going to be done
22 multiple times, and it is going to result in

the same results two, three, four years down the road, when it is tested in a verification procedure.

So, we have set requirements for picking units up as a certain percentage. It takes several years before you are going to get all the models. And that means that there is a span of time between the time that that was certification-tested to the time that it is verification-tested. And that period of time allows for differences.

So, the more that we can do to reduce this by giving guidance, writing it down, putting it in procedures, is all going to go to the credibility of the program and building it into a situation that allows the consumer to have most accurate information.

So, thank you, and we appreciate all of the effort that it takes to put these on, people that are on the phone lines as well that have been helpful in communicating. So, it is all a good situation, and we hope that

1 for the other products that we are looking at
2 we can do something like this, and we can do
3 it on an ongoing basis.
4 Thank you.
5 MS. ARMSTRONG: So, I will, just in
6 closing, say we appreciate everyone coming
7 today. We look forward to working together
8 with a lot of the issues that we have
9 identified today that we may not have
10 solutions for right off the bat. But we
11 appreciate your taking the time to come here.
12 As you do encounter additional
13 potential clarifications or issues, I do
14 encourage you to engage the Department early,
15 either through the guidance process or through
16 an email to the product PM or myself. It
17 really helps us both inform our rulemaking
18 processes, but for those that we don't have
19 ongoing, you know, to better understand what
20 we may need to do to help clarify where
21 ambiguities lie, where we can.
22 So, with that, I hope everyone has

safe travels and enjoys their weekend.

Thanks.

(Whereupon, at 1:44 p.m., the meeting was adjourned.)

A

**AB** 2:6 9:6
**Abigail** 10:16
**abilities** 152:2
**ability** 23:11 34:1 170:8
**able** 15:13 46:20 50:2 58:16 76:19 89:13 112:18 142:17 156:2 164:7 177:17 202:17 213:16 217:16 221:19
**abnormal** 161:8
**absence** 42:6
**absolutely** 220:13
**AC** 62:15 63:10 64:11 66:18
**acceptability** 160:14
**accepting** 156:13
**access** 125:11 211:15
**accompanied** 217:9
**accumulated** 55:21
**accumulating** 212:10
**accuracy** 188:9,12 188:14,17 200:1
**accurate** 222:17
**achieve** 152:17
**across-laboratory** 131:5
**ACs** 71:15
**action** 84:10 160:1 163:15 212:1
**actions** 219:9
**active** 81:7
**activities** 181:7 220:16 221:6
**actual** 37:19 43:22 47:17 61:18 74:17 75:21 77:16 85:8 89:19 91:1 93:12 94:21 121:8 124:13 126:16 132:15 133:18 166:4
**add** 18:8 26:2 50:1 55:11 56:8 57:2 57:11 60:8,9 79:17 80:6 111:8 115:11 167:8 198:15 199:3 205:19 206:18 212:20
**added** 51:15,18 56:18 57:8 143:22 198:8 208:19
**adding** 4:19 56:3 59:13 60:5 61:9 61:15
**addition** 17:20 54:15 55:1 58:22 61:22 99:13 125:21 149:15
**additional** 36:21 40:4,13 44:20 47:16 49:13 57:18 83:15,15 84:13 92:4 114:19 115:3 115:5 132:14 163:15 174:16 175:1 209:8 218:19 223:12
**address** 12:18 17:14 19:2 38:15 70:15 86:11,14 87:6 90:6 101:2 108:3 126:18 135:11 137:17 143:5 146:20 160:11 176:21 190:14 197:18
**addressed** 12:19 13:3 17:6 59:16 69:16 93:7,13 99:22 100:2,6 136:17 155:3 180:1 191:12,17
**addresses** 17:18 18:13
**addressing** 170:18 171:7 172:2 215:21
**adds** 60:22 130:9
**adequate** 107:22
**adequately** 191:17
**adjourned** 224:4
**adjust** 109:18
**adopt** 100:8 146:9 146:11,21
**adopted** 67:18
**adopting** 30:7
**adverse** 196:1
**Advisor** 2:3
**advocate** 71:7
**advocating** 63:14 91:16 214:19
**affect** 26:10 46:9 59:20 77:14 139:1 213:12
**affiliation** 7:13 8:6 9:1
**agenda** 20:19 21:13 44:13 54:20,22 186:22
**agent** 5:7 135:12
**agitate** 164:7
**agitating** 204:14
**agitator** 202:2
**ago** 165:15 184:5 185:7 195:22 196:17 212:8,9
**agree** 34:15 58:19 75:2 103:15 108:8 111:14 129:19 130:14 180:17 186:3 205:3 210:13 218:14 219:13
**agreed** 102:20 209:3
**agreeing** 176:11
**agreement** 75:22 103:22 202:21
**AHAM** 2:7,7,8,8 3:2 4:6 9:18 13:17 18:15,21 22:8,16 30:18 32:16 33:20 36:1 44:10 48:9,15 49:21 58:12,14 64:9 76:16 77:3,6 77:21 85:14 87:1 93:2 100:4 102:21 103:12,14 104:19 105:13 106:12 107:19 108:8 124:10 126:1,10 127:1,13 135:12 136:17 137:10 138:11,16 140:17 140:22 141:4,20 142:16 146:5,21 147:8 148:2,15 149:2 150:22 151:19 153:2 154:20 155:13 160:2 161:3,17 173:12,14,19 175:2 179:15 180:12 183:1,18 187:17 190:1 191:10,22 198:3 199:14 209:20 211:18
**AHAM's** 101:18 136:10 146:15
**ahead** 43:5,6 53:14 62:9 88:1 98:21 103:10 134:13 154:18 156:19 159:9,15 176:19 199:18 215:10
**AHRI** 3:2 54:8 66:9,22 67:6 68:21 69:1,10
**AHRI's** 67:16
**aid** 94:4 135:7,8 136:6,7
**aim** 154:10
**aiming** 151:8
**air** 1:3 2:10 3:6 4:16,21 6:16 9:9 10:21 18:4,11 41:3 42:18 43:1 43:22 45:3,4,18 46:8,19 53:1 59:7 61:12 62:11 66:10 66:16 67:18 68:10 71:2,16 72:6,11 72:13,15 74:1,5,6 74:12,13,19 82:14 83:4,12 159:12 211:1 215:7 219:19
**airflow** 50:7 74:3 75:8 78:8 82:2
**algorithms** 162:19 163:15
**aligned** 157:8
**alike** 72:2
**Alliance** 2:9 9:22 11:6 27:7 165:8 169:10 178:4 180:20 186:7 215:1
**allow** 55:16 57:5 96:21 109:4 124:1 138:9 142:11 165:17 202:12
**allowance** 109:14 157:6
**allowed** 35:1 94:1 171:21
**allowing** 152:18
**allows** 56:3 211:18 222:11,16
**alternate** 90:12 129:5
**alternative** 202:16
**Amanda** 2:4 3:5 11:1
**ambient** 5:12,20 150:9,21 151:1 210:17,19 211:7 211:11,16
**ambiguities** 21:4 43:16 215:19 216:12 223:21
**amended** 197:3,4,6
**America** 2:16 3:5,8
**American** 149:5
**amiss** 174:18

**amount** 33:4,17,22 63:9 67:3 77:14 97:3 109:17 110:2 133:19 137:9 164:13 174:16 208:5 219:17 220:11 221:5
**amounts** 33:7,13
**analysis** 171:3
**Anderson** 2:18 3:3 9:12,12 24:14,15 26:17 42:2,3,14 69:11,12 70:14 81:1 147:19
**and-care** 97:16 204:6
**and/or** 104:8 142:20 162:8 175:1 203:16
**ANGELO** 3:8
**annualized** 37:7
**anomalies** 5:15 17:14 160:9 161:2 172:14 173:1 174:10 177:17
**anomalous** 169:21 170:9
**anomaly** 167:22 168:20 173:15 174:20 176:4,5 177:7,20 179:2,8
**ANSI** 29:14
**answer** 64:10 104:5 113:18 115:21 118:16 144:4 205:13 217:21
**answered** 39:11
**anticipate** 100:12
**anti-circumventi...** 136:11
**anxious** 181:17 182:10
**anybody** 22:7 42:20 43:1 44:6 54:12 71:10,11,11 75:16 82:10,13 83:3 121:18 123:1 132:17 145:11 158:5 166:12 175:11 186:13 199:9 207:2 213:8 218:18
**anymore** 105:11
**anytime** 123:17
**anyway** 54:22
**apparently** 71:8
**appendices** 18:20 36:12 39:12 47:9
**Appendix** 106:18 146:7 151:1 155:6 179:21,21 197:20 198:5 208:13
**appliance** 3:3 6:10 11:3,19,21 12:1
**appliances** 2:5,10 3:7 9:3,11
**applicability** 31:9
**applicable** 29:15 31:12 58:7 102:8 102:10
**application** 127:10 129:15
**applications** 130:21 131:20
**applied** 38:17 39:15 40:12,14 42:11 46:6 125:14 126:4
**apply** 37:1 42:17 105:5
**applying** 208:6
**appreciate** 7:4 76:12 77:4 86:9 86:13 100:6,8 186:4 220:22 222:18 223:6,11
**approach** 15:19 16:3 90:7 105:18 128:21 161:13
**approaches** 119:21 188:11
**approach/concern** 96:22
**appropriate** 66:21 68:13,16 75:14 85:12 166:11 204:9
**approved** 104:8
**approximate** 120:14
**approximately** 138:5
**approximating** 207:6
**area** 59:8 77:17 81:19 109:9 141:19 173:8 182:2 192:10,13
**areas** 15:11 81:16 186:16
**argue** 122:4 170:8
**ARIDI** 3:14
**arisen** 6:15
**arm** 145:3
**Armstrong** 1:12 2:2 4:2 6:3,6 9:4 9:7 10:5,5,9 12:2 12:7,12 13:14 20:7 23:14 25:7,8 26:18 29:10 31:3 32:12 36:4 38:14 39:2,21 41:18 42:12,15 44:15 47:12 49:4 50:11 53:10,14 54:9,12 56:5,22 58:1 62:5 63:11,19 65:7,19 66:3,7 67:14 69:20 70:19 71:6 73:3 75:15 76:8 78:12,14 79:11,18 80:13 81:3,11,22 82:5,9,20 84:1 88:1 91:2,14 92:2 92:5,11,14,17 94:15 95:10 97:6 97:13,18 98:3,14 98:19 99:4 102:3 102:6,18 103:13 104:20 106:9 107:17 108:18 110:4 111:2 112:11 113:13 114:3 116:13,18 117:1,14,16 120:3 120:7,21 121:13 121:17 122:3,11 123:1,11,13 125:4 125:7 126:21 131:7 134:7,9,22 135:15 136:12 137:12,19 140:11 141:8 142:7 143:4 144:1,5,13,17 145:11,22 146:3 150:4,20 151:12 152:15 153:4 154:14 155:1,16 156:8,15 157:12 157:17 159:3 162:4,22 163:10 166:12 167:17 173:11,22 175:11 177:1 179:12 181:4 182:3,6,8 182:12 184:15 185:10,13 186:2 186:12,20 187:3 187:11 188:18 189:3 190:17 191:9 193:9 194:14 196:14,18 197:1,11,15 199:9 200:11,19 201:8 201:15 203:12 205:12 207:9 209:13 210:16 213:14 214:16 215:9,11 216:6 217:20 223:5
**array** 81:17
**arrives** 30:13
**articulate** 76:13 125:19 177:18 190:20 218:4
**articulated** 188:22
**ASAP** 2:9
**Ashley** 1:11 2:2 4:2 6:6 10:5 13:12 20:8 23:15 25:8 32:15 35:17 36:5 38:19 39:2,21 41:18 47:14 49:5 50:11 54:18 56:6 58:1 63:12 67:15 69:21 71:11 73:3 75:15 76:10 77:2 78:15 81:22 82:18 84:7 91:14 112:11 125:7 133:7 135:16 177:2 191:19 194:14 199:13 203:12 214:17 215:13 216:6 218:17
**Ashley's** 67:1
**ASHRAE** 29:14 51:6,18 66:19 72:7 76:15 77:8
**aside** 79:19
**asked** 81:11 149:22 157:20 167:18
**asking** 57:7 76:20 169:6 208:20 214:9,15 215:14 219:3
**aspect** 51:4 81:18 109:11
**assessment** 177:5
**assessments** 79:3
**associated** 109:3
**Association** 11:19 11:21 12:1 149:5
**Asst** 2:2
**assume** 131:12 134:13 188:21
**assuming** 196:1
**assumption** 50:17
**assure** 138:19
**as-shipped** 142:9 142:19 143:6 145:17,21 198:9
**attempted** 181:2
**attended** 181:20
**attention** 21:15

24:13 43:21
**attributable** 181:13
**Atty** 2:3
**audit** 27:14 79:20
**automatically** 162:11
**automobile** 63:10
**automobiles** 63:6
**availability** 52:5
**available** 19:14 29:17 43:4 49:17 55:16 101:7,12 103:4 106:5 191:6 217:5,8
**Avenue** 1:10
**average** 39:19 178:15
**averages** 37:1 40:15
**avoid** 206:14
**aware** 21:14 24:5 31:5 35:21 65:15 104:15 109:21 128:12 146:6 181:1 187:21
**Awareness** 11:4
**A-F-T-E-R-N-O-...** 159:1
**a.m** 1:11 6:2 83:21 83:22

**B**

**B** 2:8 69:18
**back** 7:2 8:11 10:10 35:12 63:12 66:22 78:11 79:19 83:18 83:22 84:2 95:8 122:17 125:4 130:5 133:13 139:14 157:2 158:13 159:4 184:4 192:15,16 199:1 205:15
**backing** 196:7
**backtrack** 211:22
**backwards** 212:2,3 212:4,17
**back-end** 81:14
**bad** 17:21 43:4 185:3
**bag** 180:6,13 181:9 184:13,19 190:2
**bags** 180:22 181:22 184:12 185:14 189:21
**balance** 54:4 162:20 164:10,16 165:13
**BALLO** 3:4
**Barhydt** 2:2 10:7,7 27:16 28:16 29:6 32:1,11 33:3 35:2 116:1,1 117:2,2 117:15,18 118:18 118:18 120:2
**barrier** 52:22
**base** 111:12
**based** 41:12 148:12 149:13 150:16,19 161:7
**basic** 4:9,9 15:19 22:1,3,10,21 23:13,19 24:7 45:4
**basically** 31:20 39:15 55:18 58:10 121:3 192:2
**basis** 23:21 30:15 36:20 39:16 40:10 73:17 210:6 213:22 214:1 223:3
**basket** 206:4,6
**bat** 223:10
**bathrooms** 83:10
**becoming** 14:3
**beginning** 42:22 61:15 220:8
**behave** 207:5
**behaving** 119:18
**behavior** 89:18 110:20 119:14 166:22 171:11
**believe** 22:17 24:11 33:8,16 74:15 78:1 92:15 94:2 120:12 146:10,15 160:17 173:9 211:9,14 213:8 220:9
**beneficial** 153:19 155:21
**benefit** 63:16 113:5 114:18 153:14
**BENGSTON** 3:16 120:6,9 121:12,15 133:6 134:8
**best** 19:8,19 30:21 107:4 117:16 123:22 124:4 142:5 152:13 180:15,17 203:6 204:5,9 205:16 214:18 215:21 216:18
**Betsy** 10:3 195:11 195:19
**better** 22:17 46:22 47:10 66:6,7 86:6 98:3 99:18 104:2 115:7 137:2 151:4 153:16,17 177:18 223:19
**beyond** 51:5,11 127:9 152:22
**big** 142:10 205:11
**Billings** 2:13 11:16 11:16 91:7,7 145:18,18 154:7,7 156:21,21 163:4,4
**binding** 32:2
**bit** 16:13 38:5 159:8 160:7 174:22 176:13 201:20
**blasts** 31:18 35:17
**board** 34:16 37:12 41:4 58:7 70:2,3 105:5 216:21
**bodies** 14:11 26:5
**body** 35:8
**bolts** 18:1 197:21 198:1,6,21
**books** 97:16,16 98:8
**bounds** 49:15
**Bowley** 2:11 10:14 10:14 39:8,9 55:7 55:7 56:15,16 57:8 58:8 62:19 62:19 63:17 65:2 65:2 67:4,4 70:21
**box** 44:21 114:20 185:21
**brand-new** 64:6
**break** 82:16 83:8 154:17 158:1,7,7 159:5
**Brice** 2:11 10:14 39:8 55:7 56:16 62:19 65:2 67:4 70:21
**brief** 141:13 206:2
**bring** 6:18 12:22 13:2 21:19 24:13 128:9
**broad** 100:18 176:21 189:10
**broadly** 147:13
**broke** 120:22
**brought** 12:17 13:1 21:12,15 29:11 43:21 44:11 199:15
**Brundage** 2:17 11:7,7
**Brunk** 12:10,10
**brush** 127:5
**BSH** 2:10 9:10 91:3 91:21 92:10 94:17 96:3 102:14 107:1 111:13 113:8,19 118:1 129:18 143:11 156:4
**build** 54:7 119:20
**building** 222:16
**Buildings** 6:7,10 10:6
**built** 110:21
**built-in** 73:20
**bulkheads** 45:19
**burden** 96:13
**burdensome** 107:9
**BURGOS** 3:10
**buy** 49:18

**C**

**C** 106:18 151:1 155:6
**cabinet** 53:5
**CACCIATORE** 3:8
**cake** 206:13
**calcium** 148:12 149:13
**calculated** 39:18,19
**calculation** 5:3 17:3 92:22 93:5 93:17 94:20 167:16
**calculations** 172:1 220:1
**calibrate** 110:22 111:10 115:5,7 116:14,21 117:19
**calibrated** 109:15
**calibrating** 120:20
**calibration** 111:20 111:21 112:5 115:14,17 116:4 116:10,11
**call** 4:2 44:8 76:4 77:6 130:21 148:6 150:2 167:22
**called** 103:3
**calling** 8:2 73:10 168:20
**callout** 129:7 148:5
**callouts** 129:4
**calls** 148:11 216:3
**calorimeter** 51:12
**Canada** 107:5,7,13
**capabilities** 91:11 209:4
**capability** 89:8,9

90:11,13 154:2 209:21
**capable** 153:15 157:16 209:22
**capacity** 192:14,19 193:13,16,20 194:12 195:8 199:10
**capture** 130:13
**carbonate** 148:12 149:14
**cards** 73:11
**care** 101:4
**carefully** 118:13
**Cascade** 93:13
**case** 10:20,20 33:14 44:6 51:16 92:16 93:6 101:6 116:19 126:15 143:1,2 149:12 157:7 161:4 164:17 165:1 191:22 211:16 219:7
**cases** 34:5,16 46:15 46:17 49:10 54:6 72:19 82:7 95:1 107:8 162:12 163:12,22 211:4 212:3 220:2
**categorically** 34:20
**categories** 31:8 187:8
**category** 184:1 189:11
**cause** 143:18 166:19 209:11
**caused** 81:20
**causes** 164:21
**caveat** 25:16 35:6 40:1
**cavities** 46:4
**Cavity** 4:18
**CB** 26:12
**center** 202:6
**centering** 153:9,10 153:16
**certain** 15:2 33:22 54:7 57:4 68:11 69:10 118:15 160:13 173:7 177:8 208:4 222:5
**certainly** 12:22 22:14 23:5 33:21 34:3,12 61:16 64:18 65:5 68:21 69:8 86:15 88:14 93:8,15 101:18 104:13 108:16 109:10 127:11 129:12,13 131:4 153:9,16 156:2 161:17,22 163:14 166:9 172:21 184:6 190:9 200:16 203:21 204:20 212:1 218:13,20 220:7
**certification** 6:8 14:10 16:7 26:5 26:15 31:10 39:6 39:17 75:11 87:4 87:12 91:18 92:1 114:10 119:8 142:2 190:21
**certification-tested** 222:9
**certified** 25:11,14 26:12 27:10,15 37:17,21 38:18 41:22 68:4 70:12
**certify** 68:2
**cetera** 99:9 166:5
**CFR** 36:9 104:8 214:13
**challenge** 128:11 128:16 153:7 177:22 211:19 212:22 214:1
**challenging** 93:20 131:4 147:14
**chamber** 4:18 44:1 152:1
**chance** 21:7 97:19
**change** 16:3 19:22 23:6,8,9,13 24:20 25:2 27:10,11,13 27:20 28:10,11,12 28:13,15,18 29:4 34:6 42:20 100:15 139:17 146:17 167:4 184:7 208:12
**changed** 16:8 26:21 85:22 88:17
**changes** 15:22 19:2 23:3 25:13,17 26:7,10,20 46:8 139:13 155:12 210:4
**changing** 23:7 118:8 174:15
**chapter-and-verse** 89:4
**characteristic** 119:7
**characteristics** 59:20 114:14 166:13 168:21
**characterize** 14:20
**chart** 119:15 121:22 134:20
**charts** 120:12
**chassis** 45:5,6,10 46:6,21 53:5
**check** 37:4 78:20 79:21 144:21 146:1 156:6
**checking** 79:20
**checks** 80:2
**chemistry** 59:21 147:12
**chime** 78:20 85:11 111:4
**Chingos** 10:16,16
**choices** 185:2
**choose** 142:12 183:19
**CHOWDHURY** 3:3
**Chris** 3:7 97:6,11
**Churchill** 2:13 11:14,14 51:20,21 61:7,7 73:13,13
**circulate** 202:20
**circulation** 109:8
**circumstance** 72:8 77:9
**circumstances** 211:22
**cite** 155:21 167:2
**cited** 22:18 146:14
**claim** 25:18,20
**clarification** 16:4 16:13 17:11,16 19:20 88:7 89:12 90:1 148:9 175:1 191:16 208:15
**clarifications** 7:2 21:3,17 223:13
**clarified** 180:14
**clarify** 187:12 192:1 205:7 223:20
**clarifying** 187:13
**clarity** 193:12
**classes** 69:10
**clause** 26:4 202:6
**clean** 111:16,20 114:14,22 115:2
**cleaned** 110:1
**clear** 12:16 13:4 15:14 17:8 19:9 19:18 20:3 23:2 24:16,19 25:5 30:5 41:13 42:10 58:22 100:20 110:9,11 112:5 114:1 131:19 152:21 197:7,21
**clearly** 7:11 92:8 101:22 119:2,4 155:10 190:20
**Cleary** 2:7 4:6 9:18 9:18 13:9,16,17 22:8 30:18 32:16 33:20 36:1 44:10 44:22 48:8,8 49:21 50:20 58:12 85:13 93:1 100:4 102:5 104:11 106:12 107:19 123:8,12,14 125:6 126:10 127:1 134:16 135:1,19 136:9,14 137:14 138:11 140:17 141:9 142:15 146:5 148:18 150:22 151:18 153:2 154:19,19 155:2 160:2 173:19 179:15 183:1 187:1,4,15 189:1,5 197:13,17 197:17
**clear-water** 111:12
**clients** 175:7
**close** 69:2 74:4 78:8 81:4 96:1
**closer** 97:19 194:1 194:1 207:6
**closest** 103:4,8
**closing** 223:6
**cloth** 5:18 18:2 163:21 164:6 165:2 201:18 202:9 205:22 206:3
**clothes** 1:4 5:14 6:16 10:18 17:13 41:4 157:22 158:2 158:10 159:8,14 192:21 193:13,16 193:21 202:8 219:21
**cloths** 163:18 164:2 192:9,12 206:7
**clue** 120:15
**clumps** 128:4
**Code** 29:22
**coffee** 83:8
**cold** 178:9 179:2 211:4
**colleagues** 200:10 218:18

**collectively** 209:2
**color** 23:6
**combination** 13:21
**come** 7:3,8 8:15 21:8 28:8 43:18 52:5 55:14,18 56:3 57:15 72:5 77:5 78:11,17 79:16,19 81:3 103:16 105:2 106:1,7 107:16 112:17 130:5 169:7 182:15 190:11,18 191:8 191:13 216:12 220:19 223:11
**comes** 34:3 55:11 66:20 74:10 94:22 109:2 131:20 153:14 204:11 214:21
**coming** 7:5 15:15 47:13 145:10 176:10 182:17 190:7 223:6
**comment** 12:14 20:21 31:18 33:16 34:1 35:5,14,16 35:22 42:13 57:17 67:1 97:15 98:7 99:1 101:10 107:3 118:3 123:17 124:21 139:22 216:16 217:1
**commenting** 98:12
**comments** 12:20 54:13 86:15 88:5 88:6 93:9,21 94:13 98:5 99:6 99:13 105:7 108:17,19 111:14 129:19 136:22 137:18 144:22 146:15 147:4 150:5 152:5 154:16 193:4,8 196:1 200:9 202:20 207:9
**commercial** 66:10 67:18,21 68:7 69:16 70:1
**committed** 24:1 30:14
**common** 13:22 90:21 107:15 185:16 186:8 191:11
**commonize** 131:3
**commonly** 90:22
**commonly-used** 96:19
**communicate** 128:17 179:10 204:7
**communicating** 204:19 222:21
**communication** 8:9
**companies** 45:1 50:21 87:20 127:14 135:21 142:17 143:1
**company** 2:17 7:13 8:5 9:1 11:8 85:18 98:18
**compare** 41:21 121:7 169:13
**compared** 58:5 188:14
**comparison** 69:15 156:11
**complete** 109:14,19 216:8
**completed** 185:8,8
**completely** 75:2 88:21 162:18 164:2
**complex** 86:22 141:19
**complexity** 118:4 162:17 163:13
**compliance** 15:5 122:14 195:14,21 197:1,6
**compliant** 28:22 221:8
**complicated** 87:20 161:1 163:22 204:16
**components** 55:17 63:1 64:5 65:6
**compressor** 55:17 62:22 64:3 65:6
**compressors** 68:12
**computational** 79:7
**concentration** 96:22
**concern** 22:20 77:5 86:17 169:18,19 183:5 192:3 193:19 199:17
**concerned** 207:21
**concerns** 21:20 22:5 108:20
**conclusion** 185:14
**concrete** 164:6
**condensate** 59:8 61:17
**condense** 59:6 61:11
**condensed** 60:2,2
**condenser** 57:14 59:9
**condensing** 74:12
**condition** 56:1,9 57:16 139:20 154:11,12 157:10 164:20 198:10
**conditioned** 56:10 56:12
**conditioner** 4:16 44:1 46:20 83:12
**conditioners** 1:3 6:16 10:22 18:5 41:3 42:18 43:1 45:5,18 66:17 68:11 71:2 82:14 83:4 219:19
**conditioning** 2:10 3:6 9:9 45:3 66:10 67:19 122:20
**conditions** 5:20 26:4 55:15 61:14 71:5 90:15 132:15 145:21 157:7 165:5 169:20 170:3 210:17 211:8,11 213:17
**conduct** 69:14
**conducted** 21:2 36:8
**confirm** 23:20 27:22 121:2 186:1
**confused** 28:21
**confusing** 108:12
**confusion** 15:9 17:2 34:9 93:3 94:18
**connected** 87:16 93:22
**connection** 113:20
**consensus** 76:16 107:5
**conservation** 37:20
**conservative** 25:22 183:8
**conservatively** 23:11 25:13
**consider** 34:6 42:13 54:5 68:18 143:17 160:1 165:6 170:2 175:15 177:14
**considerably** 149:10
**considered** 34:4 150:1 163:20 184:14 194:20
**consistency** 48:20 76:5 147:16,17 209:5 214:15 220:13
**consistent** 23:17 131:3 208:10
**consistently** 148:3 148:3 168:19 177:11 193:17
**constancy** 210:3
**constant** 52:21
**constantly** 18:16
**constitutes** 22:2
**construction** 45:18
**consult** 19:6
**Consulting** 2:15 3:10,11,11,12,12 3:13 65:13
**consumer** 2:11,12 2:12 28:19 47:17 48:5,14,22 49:3 49:18 52:13,18 94:8 142:20 143:8 149:9 161:7 163:1 163:16 164:21 168:2 192:8 193:22 194:6 200:3,12 204:3,7 204:19 206:19 207:1,7 221:11,11 222:17
**consumers** 28:20 94:3,6 170:13 176:18 200:4 207:5
**consumption** 95:22 136:3 141:14 145:4 172:11 203:16
**contact** 149:4
**contain** 89:7,9
**contained** 45:7
**container** 5:7 135:8 135:13 202:8
**content** 60:3 88:14 89:2 148:13
**context** 89:6
**continue** 17:9 18:14 22:16 67:8 104:17 161:18 167:7
**CONTINUED** 4:22
**continues** 63:1
**contrary** 163:20
**contribute** 200:1
**control** 100:16

169:21
**controlled** 207:20
**controls** 113:20
**convenient** 156:2
**convey** 61:6 119:7
**conveyed** 46:16 47:6
**cooperative** 220:20 221:2
**copied** 22:18
**corner** 131:21
**Corporation** 2:10 2:18,18,19 3:16 121:16
**correct** 25:10 42:1 90:5,9 91:22 121:9 122:8,9,10 185:2 192:22
**correctly** 57:1 188:22
**correlate** 69:19
**correlation** 13:22 22:12
**correspondingly** 18:19
**corrugations** 189:20 192:1
**Council** 9:15 38:10
**Counsel** 10:4,8,17
**countries** 107:16
**couple** 7:7 8:17 42:21 63:13 92:18 95:8 107:7 129:20 155:20 174:13
**coupled** 164:11
**course** 29:5 45:16 72:17 79:5 165:10 165:14 175:5
**coverage** 31:10
**create** 164:5,9
**creates** 199:1
**creating** 206:13
**credibility** 222:15
**creep** 129:8
**criteria** 19:18,22 26:5 173:7,16 175:12
**critical** 14:2 19:16 143:17 178:22 210:22
**Cross-Cutting** 4:7
**cross-cutting-type** 42:16
**cross-sectional** 81:18
**crud** 105:10
**CSA** 3:3
**curious** 42:4 69:13
**current** 88:19 148:5 183:11 197:19 198:4
**currently** 73:7 74:14 92:6 102:2 128:14 140:21 145:15,20 210:20
**CURT** 3:16
**curve** 63:3
**customer** 54:1
**customers** 90:22 97:1
**cut** 15:7 81:10 133:5 161:16
**cutlery** 106:3,4
**cuts** 65:17 97:17 120:14 133:10,14 133:16,19,21 134:4,5
**cutting** 65:22 97:21
**cycle** 5:2,17 16:22 17:1 44:8 85:5,19 85:20,21 87:13,19 88:16,19 89:7,8 89:14,14,16,18,20 90:10,12,19,20 91:5 95:19,20 97:17 108:5,6,13 109:4,7,7,11,14 109:19,22 110:10 110:19,22 111:1,3 111:9 112:14 115:1,1,5,6,9 116:12,22 117:6,9 117:20 118:13 119:4,5,14 120:13 120:17 121:9 122:8 135:9 162:11 166:9,11 167:4,7 168:3,5 169:3 174:15 176:6,15 178:9,10 186:21 199:17,22 200:5,6,7
**cycles** 87:4,9 90:21 94:19 95:3 96:5 98:6,6,8 108:6,15 109:19 111:16 114:9,11,19 115:3 118:5 120:14 121:6 178:13,18 179:7 199:22 200:5
**cylinder** 186:9,10
**CYMBALSKY** 3:4
**C-O-N-T-E-N-T-S** 4:1,22

**D**

**damage** 198:12 199:4
**Dan** 11:11 171:16 175:22 179:3 181:14 184:9 193:1 196:10 205:1 212:18
**DANIEL** 2:19 3:8
**data** 25:11 50:18 62:18 67:2 68:10 148:16 156:9 159:19 169:1,5 171:1,4,15 172:2 172:15 175:3 182:4,5 183:13 184:5 185:6 186:1 200:4 212:3,10 213:2 217:3,8
**database** 216:18
**databases** 221:13
**dataset** 172:9 177:7
**date** 32:21 195:14 195:21 197:2,6
**Dave** 10:20
**David** 2:10 9:8 45:2 48:17 51:4 58:17 61:2 63:22 64:13 75:5 77:7 78:22 80:4
**Dawn** 93:14
**day** 34:18 82:17 195:22 196:6 204:17
**days** 34:10,15 61:10 212:7
**deal** 191:2
**dealing** 78:4 149:8 160:8
**deals** 136:15 189:9
**dealt** 68:8 197:12
**Debra** 3:16 12:10 120:4 132:19,21
**decides** 116:8
**decimal** 41:16,22
**decision** 99:2
**decisions** 118:6 143:16 156:7
**declared** 195:8
**decrease** 56:13 61:16
**default** 115:18 143:9
**defaults** 117:20
**defective** 177:21
**Defense** 9:15 38:10
**deficiency** 46:2
**define** 172:17 176:4 202:9
**definitely** 22:15 99:11 137:2 142:15 167:1 174:4 218:5
**definition** 4:9 17:10 22:2,10 57:21 58:15 60:15 88:16 107:21 176:4
**degrees** 151:3,7,10 154:5
**dehumidifiers** 219:20
**demonstrate** 67:3
**demonstrated** 205:5
**Denise** 11:5
**Department** 1:1 2:2,3,3 4:3 6:7,19 8:9 10:3,6,8 12:17 19:18 20:20,21 23:15 33:11 68:17 70:13 72:21 76:17 84:10 91:15 103:17 104:9 105:2 106:21 112:13,17 141:21 156:16 159:22 163:2 180:16 187:12 200:17,19 202:17 203:9,13 205:14 208:21 211:12 212:13 213:10 214:11,17 214:19 215:15 218:3,22 219:13 220:16 223:14
**Department's** 23:17 31:15 49:9 177:15 200:8 203:5
**depend** 115:15
**depending** 33:8 73:19 115:12 117:6 191:15 218:5
**depends** 115:19 116:8 162:16 163:13 167:5 188:9
**depth** 16:20
**describe** 44:16 80:14 113:11 124:12 141:12
**described** 75:18 137:3 173:1 207:22
**description** 18:2 75:22 90:2 141:13
**descriptions/cha...**

121:5
**design** 17:21,22 25:2 45:5 61:14 79:16 110:18 170:5 180:7 189:10 190:19 191:11 221:18,20
**designs** 45:6,11 189:16 190:6,12 190:15 191:15
**detail** 93:20 94:12 108:16 113:22 127:15 135:20 148:9 149:12 161:19 162:1 179:22 180:9,18
**detailed** 18:2 84:20 106:13 124:22 134:18 147:1 159:19
**detailing** 149:11
**details** 20:11 21:1,4 43:9,12 44:20 54:13 76:19 84:9 84:13,22 87:21 123:15 127:9 131:10 147:4 160:5 194:19
**detected** 117:19
**detergent** 5:3 17:3 92:21 93:4,12 94:2,4,9,20 95:4,7 96:1 97:3 98:20 99:1 103:7 109:17
**determinations** 160:18
**determine** 17:22 91:5,10 94:20 95:3,22 155:11 166:14 168:8 169:7 172:3,18 173:15 179:7 187:22 204:1
**determining** 58:11 114:1
**Detlef** 3:12 65:10 68:9
**develop** 58:10 127:12 202:19
**developed** 20:1 202:14
**development** 2:6 79:6 124:19
**deviation** 77:15 177:19
**device** 75:8
**DFR** 195:22
**dialog** 7:19 14:15 18:13
**dictated** 150:15
**difference** 77:13 145:1 150:13 154:5 174:4 181:9 181:12 195:3 205:11 206:3
**differences** 5:13 23:22 77:15,18 125:13 129:5 133:9 155:9,18 159:21 184:20 210:4 220:8 221:6 222:11
**different** 7:1 14:9 14:22 15:2,3,11 31:8 33:10,13 36:8,21 43:10 44:17,18 56:17 68:15 69:3 72:8 72:17 73:19 79:4 80:9 84:14,15 86:18 94:9 107:7 119:21 121:5 124:14 126:2 130:20 131:9 137:6 142:9 144:1 144:11 152:1,11 160:18,21 161:3 162:2 167:10 168:5,6 170:21 173:4,5 174:13 175:13 176:11,17 185:17 188:1,11 188:12,16,16 189:15 191:13 203:21,22 204:12 208:7
**differential** 81:20
**differentiate** 167:21
**differently** 15:3 21:2 75:17 94:22 131:11,15 134:3 173:8 175:18 189:14 203:22 204:13 207:21 212:8
**difficult** 14:20 106:18 118:2,11 119:22 128:18 164:1
**difficulty** 143:3 151:21
**digit** 41:16
**digits** 15:8 28:13 41:10,11 77:16 220:1,8
**diligently** 105:13
**dips** 152:18
**direct** 59:7 196:13
**direction** 8:13 96:20,21 128:22 203:11
**directly** 52:17 133:14
**dirt** 114:21
**disaster** 181:3
**discharge** 51:8 81:16
**discover** 215:18
**discrepancies** 134:6
**discretion** 142:12 191:15
**discuss** 13:20 14:15 14:19 18:10 20:22 83:5 103:11,15 134:13
**discussed** 127:11
**discussing** 108:3
**discussion** 4:8,16 5:1 6:13 8:1 22:4 30:13 55:6 62:16 187:18 205:7
**discussions** 51:3 218:6
**dish** 133:20
**dishes** 88:22 102:15 123:19 127:6 143:15 145:10
**dishware** 17:5,6 100:13 102:1,2 106:15
**dishwasher** 5:1 85:9 102:15 119:18 138:3 145:15 154:15 156:18 157:18 207:17 210:22
**dishwashers** 1:4 6:15 10:18 12:15 16:21 41:3 84:5 85:3 90:16 124:20 130:7 141:17 154:17 219:20
**dispute** 211:17
**disqualified** 28:2
**disregarded** 160:15
**distance** 72:18 78:3
**distilled-type** 60:5
**distinction** 24:18
**distinguish** 170:12
**distortion** 199:2
**division** 220:3
**docket** 12:21 13:3 88:8,10
**document** 32:4 33:15 35:11,22 47:8 75:12
**documented** 42:9
**documents** 194:10 194:17 195:4 197:22
**DOE** 3:4 10:20 13:12 14:6,10,13 15:13,17,20 16:11 16:14 18:17,19 19:6 20:8 23:20 25:8,9 28:16 29:3 29:15,20 30:7,22 32:11,15 36:5 37:16 38:7,19 39:3,22 41:19,21 47:14 49:5,16 50:12 54:18 56:6 58:2,15 62:13 63:12 67:15,18 69:21 73:4 84:7 86:10,13 87:2,7 88:3 93:7 100:7 101:12,16,20 102:7 104:7 105:3 107:8 109:3 112:12 113:13 116:2 117:3 118:19 124:1,17 125:8 140:21 146:9,17,21 155:7 155:10,14 161:19 163:21 164:2,6,21 165:6 168:10 175:1 177:2 180:4 181:5 187:21 188:5 190:8,11,18 191:19 194:10 195:12,19 198:3 202:12 204:21 208:12 210:21 215:21 216:7 220:18
**DOE's** 14:1 15:10 22:17 26:21 27:18 124:2 152:6 160:11 161:17
**DOE-initiated** 68:6 69:22 70:8
**doing** 16:16 19:3 19:11 24:12 69:6 72:10 80:12 86:8 86:8 87:8 97:1 102:12 115:20 118:7 123:21 124:3,5,10 126:14 128:17 142:14 176:10 180:17

184:18 206:12 212:6,8 215:15
**Don** 11:7
**DONALD** 2:17
**door** 132:8
**doors** 182:16
**dosage** 94:5
**dosing** 96:1
**draft** 31:14,15,17 33:15 34:2
**drain** 5:9 95:5 109:8 123:4 140:20
**dramatically** 63:3
**draped** 189:21
**draw** 168:17 185:14
**drip** 4:19 18:8 55:1 55:2,21 56:8 61:12
**drives** 209:5
**drop** 55:2 63:1 137:4,11 138:18 139:18 157:3 166:1 208:1,16,19
**dropping** 63:3
**drops** 139:14,15
**drum** 5:16 17:16 179:17,20 187:2 189:9,16 192:17 198:8 199:10 202:10
**dry** 89:1 133:14
**drying** 130:11 131:14,19 132:5 154:13 211:1
**dual** 74:7
**due** 145:2
**duration** 64:19 70:11
**DW-1** 122:21 148:6 149:3 155:5,8
**DW-1-1992** 127:7 146:12
**DW-1-2009** 146:22
**dynamics** 79:8
**D.C** 1:11

**E**

**E** 2:8,19 146:7
**earlier** 30:12 96:17 104:1 108:4 163:1 207:17,22 208:11 217:1
**early** 106:16 157:22 159:10 223:14
**EarthJustice** 3:4
**easier** 38:5 169:3
**easiest** 191:2
**easily** 113:10
**easy** 169:2 171:5,14
**Ed** 2:15 9:14 38:9 38:20 41:7 50:13 53:11,12 54:10 58:20 59:19 60:16 64:8 98:16 112:2 138:15 147:6 149:18 169:16 191:20 192:16
**edges** 49:1
**EDWARD** 3:6
**Edwards** 2:10 9:10 9:10 91:3,3,20,20 92:3,10,12 94:17 94:17 95:12 96:3 96:3,9,9 98:22 102:14,14,19 103:11 107:1,1 111:13,13 113:7,7 115:10,10 116:7 116:16 118:1,1 121:19,19 122:9 129:17,17 135:22 143:11,11 144:3,6 144:15 156:4,4,12 157:14
**effect** 32:2 33:18 46:1 56:17
**effects** 56:18
**efficiencies** 46:10
**efficiency** 27:8 41:15 55:18 59:10 67:8,9
**efficient** 16:1 23:10 24:21 25:3,14,18 25:19,21 27:9
**effort** 45:17 222:19
**efforts** 107:14
**egg** 155:19
**either** 7:9 23:8 29:13 34:7 38:16 48:17 59:21 64:9 91:22 103:18 125:22 139:3 147:9 174:14 190:6 223:15
**Electric** 9:3 10:15
**electricals** 45:21
**Electrolux** 2:6 3:5 9:6
**Electronics** 2:14,16 3:9,14 9:17 11:10
**elevators** 83:11
**eliminate** 134:5
**ELIZABETH** 2:3
**email** 83:16 223:16
**Emily** 53:10
**encounter** 170:13 223:12
**encountered** 117:5
**encourage** 7:5 12:20 21:21 37:4 43:8,17 49:7 68:10 84:8 88:2,7 99:12 104:21 159:18 190:18 216:15 223:14
**ended** 183:22
**ends** 143:5
**energy** 1:1 2:2,3,4 2:4,5 3:5,15 4:3 5:17 6:9 10:4,6,8 11:2 14:9 15:16 15:20 16:1 19:5 22:13 23:4,8,9 24:6 26:3,11 27:17 28:1,2,3 37:19 62:22 87:5 95:20 96:2 107:13 108:6 111:21 119:5 120:17 124:19 144:12,14 146:8 155:12 166:9 168:4,12,18 172:11 184:22 186:21 199:16 202:5 219:17 220:16 221:5
**enforcement** 2:2 6:9 10:18,21 14:7 31:10 39:6 70:9 168:16 212:1 219:9,9
**engage** 112:14,18 223:14
**engaged** 110:8,13 113:2 114:13,17
**engineering** 3:16 28:13 76:4,6,14 76:21
**engineers** 193:14
**enjoy** 159:11
**enjoys** 224:1
**enormous** 77:12
**ensure** 28:20 53:3 87:6 95:21 109:8 109:13 113:1 114:12,15 121:7 194:11
**entered** 51:6
**entering** 174:17
**entire** 164:19 199:19
**environment** 60:13
**envision** 170:1
**EPA** 2:5,6 11:1 12:6 23:20 24:4 26:3 63:6
**equal** 24:20
**equations** 171:22
**equilibrium** 18:9 55:14 57:9,10,11 57:12,19,20,20,22 58:4,5,11 60:12 60:15 61:20
**equipment** 113:9 113:19 130:1 153:15 209:9 210:2
**equitably** 142:14
**equivalent** 67:10
**error** 14:5 115:14 115:17
**errors** 46:18
**especially** 21:1 164:4
**essentially** 24:22 160:8
**establish** 110:19
**established** 109:16
**et** 99:9 166:5
**EVA** 3:15
**evaluate** 19:4,19 21:7 183:14
**evaluating** 101:19 190:9
**evaluation** 130:22 136:3
**evaporate** 57:14
**evaporating** 215:6
**event** 26:7,10
**everybody** 12:3 15:14 66:3 98:12 124:10 166:3
**everybody's** 64:16
**everyday** 89:20 90:20
**exact** 130:20 161:15
**exactly** 54:20 57:6 80:15 100:15 101:12 118:3,12 131:9 132:13 148:20 160:12 162:1
**example** 25:12 26:13 29:2 32:20 39:5 41:14 46:19 47:21 48:3,12 51:7 54:8 70:3 101:13 103:2 106:15 114:19 119:13,15 128:3 129:4 160:10,14 167:9 170:19

173:1 209:8,11
**examples** 15:6 16:18 21:1 24:10 129:21 167:2 193:15 220:5
**exceeds** 122:7
**excellent** 218:12
**exchanges** 46:8
**excluded** 192:5
**exclusively** 32:7
**exist** 38:16 40:17 43:16 190:6
**existing** 32:6 109:3 179:20
**exists** 93:4
**expand** 187:5
**expectation** 33:6
**expected** 137:4 208:16
**expedite** 105:22 191:4
**experience** 62:20 150:13 207:18
**experts** 137:3 141:12 161:22
**explain** 43:12 50:16,17 135:17
**explained** 136:4
**explanation** 129:11 134:18
**exploring** 128:14
**exponential** 63:2
**expressed** 41:14 42:1 151:2 199:17
**expressly** 34:8 151:5 198:4
**extend** 107:10,11
**extended** 71:3
**extending** 189:22
**extensively** 71:8
**extent** 23:22 28:9 76:12 88:6 99:5 99:10 100:1 104:6 106:10 125:12,19 125:20 169:20 182:13,14 191:9 192:18 218:2
**external** 112:1
**extra** 50:2,9
**extremely** 211:21 214:10 220:2,9,10 220:19 221:8
**extremely-expen...** 210:2

**F**

**faces** 181:6
**facilities** 64:17 130:6
**facility** 53:21 204:6
**facing** 192:9
**fact** 151:9 164:11 167:13 177:16 219:16
**factor** 133:22 167:9 170:20
**factors** 13:22 219:22
**factory** 114:22
**Fahrenheit** 151:3 151:11
**fail** 177:11
**fair** 121:11,12 189:4
**fairly** 23:17 30:5 106:6 126:8 134:15 152:21 155:19 169:12
**fairlycritical** 99:3
**faith** 221:12
**falls** 143:15
**false** 15:4
**family** 24:8
**far** 8:9 23:18 31:21 37:12,17 51:22 52:4,9,19 55:13 56:18 57:19 60:7 61:9 63:8 74:8 104:4 215:5
**Farber** 2:17 9:19 9:19 74:22,22 80:17 81:5 122:15 122:15 150:10,10 174:1 193:3,11 194:21 195:5 210:10,10
**fashion** 75:4 76:14
**favor** 13:15 151:13 172:21
**favorite** 62:11
**features** 17:22 91:19 189:10
**Federal** 29:22 35:12,13 195:15
**feedback** 117:6 133:1 147:5 216:1
**feeds** 145:3
**feel** 8:15 21:18 44:7 47:16 75:8 83:16 157:18 191:17 204:18
**feels** 214:11
**feet** 74:9
**felt** 149:7,16,19 157:16
**field** 47:19
**Fighting** 93:14
**figure** 113:14,16
**figures** 37:18 122:2
**figuring** 155:14
**fill** 61:12 109:7 135:8 140:3 164:19
**filled** 135:13
**filling** 164:19
**fills** 118:9 140:1
**final** 19:7 32:4,8 34:3 196:13
**finalizing** 86:6
**Finally** 19:17
**find** 28:1 35:12 58:16 103:7 105:14 128:8 152:4 171:5 180:17 213:7,16
**finding** 103:20 124:16 183:18
**findings** 15:5
**fine** 26:16 123:7,11 151:4 158:7 175:20 189:3 191:12
**finish** 162:13 168:3 169:3
**finished** 168:15
**first** 7:14 13:8,11 21:10,22 22:4 42:5 43:12,20 44:4 50:1 62:21 71:7 85:3,16 92:18 93:16 108:10 110:14,21 111:9 112:14,19 114:22 115:1,5,9 116:15 127:4,16 135:6 138:13 159:15 160:6 203:18 208:2
**fit** 156:3
**fits-all** 119:22
**five** 65:4 74:9 138:22 148:8 151:2 152:3,12,20
**fixed** 45:6,7 85:21 98:6,9 198:22
**flat** 164:2 180:9 186:10,18 206:1,5 206:8,12,21,22
**flatware** 17:5 99:17 100:5,14 101:2 104:16
**Fleischmann's** 101:15 103:3
**flesh** 76:19
**float** 139:16
**floor** 22:4 30:16 36:11 38:6 41:1 44:3,9 55:5 62:13 62:15 71:17 82:12 82:15 83:9 131:21
**floors** 130:2
**flowing** 136:19 138:19 139:2,3,5 139:10,12 208:9 210:5,13
**fluid** 79:7
**foam-orientation** 52:16
**focus** 25:6
**folds** 180:10,13
**folks** 80:19
**follow** 47:11,12,18 49:11,16 52:10,13 52:13,17,18 55:4 59:18 70:11 90:7 145:16 160:21
**followed** 36:14,19 37:2,15 39:13
**following** 130:19 217:18
**follows** 54:20
**follow-up** 148:14
**food** 5:13 96:5,10 100:13 101:19 130:1,3,12 131:19 132:2,4 133:18 143:15 155:9
**foot** 138:4
**footnote** 90:19
**Force** 101:18 149:3
**forefront** 168:15
**foregoing** 83:20 158:11
**Forever** 106:5
**forgive** 213:15
**fork** 105:11
**form** 94:3 202:12 203:4 208:21
**format** 34:14
**forth** 113:21
**forum** 4:15,22 6:17 20:22 88:9 189:5 218:16
**forward** 14:16 54:16 205:17 223:7
**found** 27:13,20 28:17 64:5 77:12 202:3
**founding** 37:16
**four** 39:16 40:6,7 222:1
**fourth** 82:19 189:7
**free** 8:15 21:18 44:7 83:16 157:18

**freely** 43:19 49:8
**frequently** 130:18 170:14
**FRIDAY** 1:6
**Friedrich** 2:10 3:6 9:9 45:3 53:13 61:3 64:1,14 75:6 79:1 80:5
**front** 82:21 188:21
**front-load** 167:3
**front-loading** 165:9 174:5,7
**FTC** 37:8
**FTC's** 27:17
**full** 88:22
**fully** 99:9 154:9 205:3
**fun** 181:5
**function** 121:10
**functions** 115:8
**further** 12:14 17:16 84:11 88:7 107:12 138:3 141:12 180:3 191:16 194:6 217:13
**future** 14:16 38:2 38:13,18,22 86:5 104:13

**G**

**gained** 63:16
**gaining** 50:9
**gap** 185:5
**gasket** 189:12,18 189:20,22 190:4 192:2
**gaskets** 45:14 46:6 193:6
**gather** 186:1
**gathering** 172:2
**gauge** 52:6,7
**GC** 2:2 195:12,19
**GE** 2:11,12,12 3:7 3:7 28:7 39:9 55:8 56:16 58:6 62:19 65:3 67:5 70:22 98:19 162:15 172:21 183:15 195:1 196:4 198:18 203:20 205:20 209:1 217:12 218:12
**general** 4:7 9:3 10:4,8,14,17 21:12 36:10 37:5 37:22 41:1 44:16 47:3 75:22 80:14 87:21 107:3 110:5 149:6 155:3 161:9 194:15
**generally** 36:7 38:14,17 52:2 58:6 80:9 140:3 157:10
**generated** 55:20
**GEORGE** 3:5
**germane** 23:6
**getting** 66:16 80:10 100:21 106:18 115:15 117:7 119:10,11 135:2 142:20 168:9 179:6 192:8 194:5
**give** 19:9 115:6 120:15 121:8,22 127:14 129:20 141:13 142:17 161:22 163:7 169:1 174:17 176:8
**given** 52:10 112:22 167:13
**gives** 115:16 179:21
**giving** 106:16 173:6 222:13
**glad** 58:14 101:20 127:2 141:20 147:3 155:14 200:16,20
**glance** 108:10
**global** 31:9
**go** 8:11,18 13:8 16:20 25:15,22 26:1 27:9 35:11 37:17 42:7 51:22 52:4,9 53:14 55:4 62:9 88:1 92:21 97:13 98:21 103:6 103:10 105:20 115:19 120:8 122:17 124:7 125:4 128:7 130:4 134:13 135:3 136:2 138:13 144:20 151:7 152:22 156:6,14 156:19,20 158:10 159:14 164:18 173:5 176:19 180:8 184:16 192:11 199:18 201:18 208:5 212:2,17 215:4,10 217:16 218:2,8,15 222:15
**goal** 152:17
**goes** 8:10 23:18 31:22 33:17 35:5 44:12 48:7 52:19 60:8 70:16 87:14 192:15,16
**going** 6:22 7:16,18 8:18 10:12 13:6 21:9,10 22:3 28:18 30:16 35:15 38:15 40:22 43:7 43:17 44:2 47:19 55:5 56:21 62:8 62:12,17 67:7 70:17,20 71:17 73:5 74:1 78:18 79:18 80:20 82:12 82:16 83:7 84:2,4 84:16 85:6 92:21 97:8 98:5,22 106:1,7 121:1 123:4,5 132:21 137:13 139:17 141:8 150:8 151:22 157:1 158:4 159:7,13,14 159:17 167:9 168:8 172:20 173:12,15 175:8 177:1 180:9 184:17 185:20 186:14,15 187:3 191:1 194:18 197:16 199:18 206:4,8,9,11 208:13 210:1,16 211:5 212:3,4 213:22 214:7 215:7 217:21 218:7 221:21,22 222:6,14
**GONZALEZ** 3:5
**good** 6:3 19:8 25:15 25:22 55:4 62:9 64:6 72:14 76:22 77:10,21 78:13 88:12 91:2 107:11 172:9 179:10 212:14 213:6,21 214:5 222:22
**gotten** 22:1 26:19 36:6
**grabbing** 132:1,7
**grad** 79:12
**gradation** 170:1
**grains** 148:8 149:12
**grams** 59:11
**granted** 21:13
**grappling** 38:2
**grasping** 202:6 205:22
**grateful** 13:19
**gravity** 165:10
**Grease** 93:14
**great** 9:4 16:10 20:7 84:19,21 85:12 105:20 176:12 200:21
**greatly** 19:1
**grid** 81:17
**ground** 7:7 83:9
**group** 102:21 135:5
**groups** 209:6
**growing** 35:3
**guess** 29:1 39:10,13 47:15 56:22 60:11 61:5 66:12 75:20 132:12 136:5 184:4,11 195:16 212:20 215:14
**guidance** 1:3 4:13 5:2 16:12,15,15 17:19 19:7,9,10 19:12,13,20 28:9 31:4,5,6,20 32:3,3 32:4,8,9,13,18,21 32:22 33:1,9,11 33:13,15 34:2,6 34:11,13 35:3,5,9 35:10,15 42:6,10 67:22 72:21 74:19 85:4,17,22 86:7 87:17 90:8 93:6 101:14,16 102:7,9 104:8 105:5,18 151:5 175:8 179:19,20 180:3 190:19 191:18 193:15,22 194:4,8 194:10,16 197:19 198:5,11 208:21 211:13 215:22 216:18,21,22 222:13 223:15
**guide** 211:18
**guidelines** 194:7
**guy** 81:13
**guys** 6:17 7:8 10:10 20:22 27:1 43:15 49:8 68:3 103:14 131:17 156:12 168:20 169:6 175:7 217:14 218:2

**H**

**Haier** 3:8
**hall** 218:1
**hand** 7:21 44:7 138:13
**handle** 160:9,12 161:10
**handling** 161:21
**handout** 44:11 138:17 161:14
**handy** 101:1
**hang** 50:13 202:7
**happen** 48:4 120:20 139:20,22 165:19 166:20
**happened** 121:7
**happening** 43:16 118:12
**happens** 103:20 122:6 139:11 172:4 208:2
**hard** 84:9 101:7 130:13 148:3 150:14 170:7 175:18,21 213:7
**hardness** 5:11 146:4,7,10,22 147:20 148:7,17 149:6 150:6,16
**harmonization** 173:9
**harmonized** 24:2 24:12 37:11
**hate** 154:21 157:1
**HAWRANKO** 3:5
**head** 145:5 148:22
**heads-up** 106:16
**hear** 43:15 65:19 80:21 81:7 98:2 195:17
**heard** 42:5 68:14 121:1 132:22
**hearing** 33:5 175:5
**heated** 211:4
**heavy** 89:17
**heavy-load** 89:15
**height** 5:9 123:5 138:1,3,4 140:20 141:5 145:2
**held** 198:22 206:3
**Hello** 9:5 39:8 51:20
**help** 20:2 43:11 44:21 59:9 61:19 61:22 85:7 128:21 166:10,13 203:7 220:17 223:20
**helped** 118:17 193:17 219:1
**helpful** 21:5,6 34:14 36:3 44:13 85:1 88:15 89:5 123:20 126:16 129:13 130:15 153:22 179:13 222:21
**helping** 183:8
**helps** 129:12 223:17
**hey** 103:18 168:10
**Hi** 9:2 12:5 65:12 93:1
**high** 142:11 166:5
**higher** 209:7
**higher-end** 164:15
**high-speed** 165:22
**hit** 171:21
**holding** 13:13 14:13
**Hombroek** 2:12 162:14,15 163:11 172:20 183:15 194:22 195:1 196:3,4,21 197:10 198:17,17 203:19 205:19,20 208:22 209:1 217:11,12 218:11
**home** 2:10 9:11 11:19,21 12:1 159:10
**hooking** 52:6
**hope** 15:21 18:19 34:3 196:12 222:22 223:22
**hopeful** 8:12
**hopefully** 6:13 14:17 21:6 44:4 57:15 101:3
**horizontal** 167:3
**horizontal-access** 189:13
**hour** 57:9 59:11 154:18
**hours** 55:20 56:2 59:6 61:10 62:21 63:2,4,4,9,9,16 64:5 66:12 67:19 68:2,5 69:9 70:17 220:7
**hours-plus** 66:14
**hour-long** 57:10
**Hudnall** 2:7 11:20 11:20
**huge** 182:1 220:11
**humidity** 56:20 210:20 213:16 214:8,21 215:7
**hundredths** 187:7

**I**

**IAPMO** 3:8
**ICF** 3:9
**idea** 77:1 127:17,18 129:13 176:12 218:12
**ideas** 175:16
**identified** 107:20 189:8,11 223:9
**identify** 87:11,19 89:13 105:12 142:5 159:20 167:14 172:13
**identifying** 17:1 131:9
**IEC** 161:11,15 173:1
**imagine** 60:6 206:11
**imagining** 172:6
**immediately** 35:10
**impact** 19:4 26:14 33:9 82:1,8 96:11 140:1 141:14 143:13 145:6 150:15 153:6 155:11 184:2 199:3,7 203:16 204:21 215:2,8
**impacted** 29:8
**impacts** 184:22
**impede** 75:8,10
**impediments** 75:14
**implementing** 185:1
**importance** 84:17 219:15
**important** 13:18 14:14 20:2 22:11 32:18 64:4 109:11 153:9 154:11 183:10 205:11 206:15 207:22 208:14 211:7,14 211:21 212:11,16 213:9 220:9 221:10,16
**importantly** 192:8
**impossible** 101:7
**improve** 18:16
**improvement** 16:11
**inaccurate** 180:11
**inches** 141:6
**incident** 183:21
**include** 92:4 121:21 176:15 189:19
**included** 136:2 161:13 176:15 192:13
**includes** 88:20 109:7
**including** 62:16 89:1 124:1
**inconsistency** 66:13
**incorporate** 7:19 18:20 155:7
**incorporated** 22:15 36:16,18 94:10 155:6
**incorporates** 18:17
**increased** 14:6
**increases** 130:11
**increasing** 118:5
**Independence** 1:10
**indicate** 48:12 75:12 87:3 97:17 98:8,13 116:6 122:13 136:21 141:16 148:20 176:20 177:9 211:12
**indicated** 32:22 92:8 141:1 142:1 146:16 150:1 203:3
**indicates** 19:12 138:17 157:4 184:21 202:13
**indicating** 187:9
**indication** 121:8 169:1 177:20 203:9
**indication-only** 52:3
**indicative** 122:8
**indicator** 122:12 135:10 163:7 166:15 174:14,18
**indicators** 119:14 119:17
**individual** 142:17 184:6 190:10 203:2
**individually** 191:14
**individuals** 134:2
**indoor** 46:3,8 52:21 53:2
**Industrial** 2:11,12 2:12
**industry** 4:11 16:17 19:9 29:12 29:14 34:5 36:15 36:17 103:9

112:21 114:7 176:3,10 179:11 184:12
**industry-accepted** 157:6,13
**industry-sought** 215:22
**industry-wide** 105:18 202:22
**infiltration** 53:2
**influence** 99:1 143:14 156:7
**influenced** 111:22
**influences** 78:9
**inform** 163:16 204:2 223:17
**information** 50:3,9 58:3 91:17 92:4 118:21 126:17 142:18 154:1 172:12 173:6,21 178:20 213:21 216:5 222:17
**informing** 176:18
**initial** 67:10
**initially** 22:14
**initiated** 57:4
**initiation** 4:19 55:3
**initiative** 86:14
**inlet** 73:18 74:2 81:16,19
**inlets** 74:7
**input** 51:12 86:7
**inside** 46:21
**install** 47:21 48:6
**installation** 4:17 18:7 43:22 47:4 49:11,17 54:14 141:2,3 143:8 145:16
**installed** 47:18 48:21 52:1,4
**installing** 48:22
**instance** 51:17 155:4
**instances** 24:11 112:14 126:19,22 127:2
**institute** 23:13
**instruct** 205:8
**instructions** 46:12 47:4,17 48:11 49:11,16 52:11,12 53:17 125:21 141:3,4 143:7 145:16 150:19 163:8 166:4 205:9
**instrumentation** 80:6
**instruments** 128:8
**insulation** 52:9,11 52:12 53:7
**integrate** 7:22
**intended** 77:8 90:15 110:16 115:8 151:10 166:8 180:5 210:6 210:7 217:19
**intending** 38:12
**intent** 73:22 110:18 151:6 154:10 194:13 198:11
**intention** 72:10
**intentionally** 170:5
**interested** 33:4,5 35:19 81:6 83:10 131:8
**interesting** 207:4
**interfere** 72:13 78:7
**interfering** 50:6
**interim** 86:20 141:22
**interlaboratory** 131:5
**internal** 45:8,17 113:10,19
**internally** 52:4 103:22 104:4 106:11
**internals** 45:13
**International** 3:3,9 3:14
**interpret** 60:14 95:7 134:3
**interpretation** 31:16 32:6 33:10 85:22 93:19 176:13
**interpretations** 44:19 107:6,8 159:22 194:3
**interpretative** 93:3
**interpreting** 15:1 173:4 189:14 207:19 216:13
**interpretive** 17:2
**interrupt** 80:17
**Intertek** 2:13,13,14 10:2 11:15,17 51:21 61:8 68:20 73:14 75:3,17 76:2 91:8 145:19 150:17 154:8 156:22 163:5
**intervene** 170:5
**intervention** 170:2
**introduce** 12:4 129:5 159:16
**introduces** 138:8
**introductions** 4:4 8:19,22
**introductory** 85:10
**invalidate** 160:19
**invalidated** 161:5
**investigate** 84:11
**investment** 220:12
**invite** 218:3
**involved** 123:18 219:5,7,10
**issue** 17:13 22:14 26:18,19 29:11 31:4,5 32:3,4 38:1 43:20 44:16 49:22 50:1,22 54:19,22 55:6 71:15 72:5 75:21 78:17 85:10 85:17 86:2,10,16 87:15,18,22 92:20 93:11,22 96:13 100:17,19 104:15 105:4 106:11 107:18,20 108:3 117:19,22 122:14 125:2 132:3 137:1 142:10 143:18 154:1,2,15,22 157:3,9 159:15 160:6 161:2 162:1 180:6 181:13 183:4,10 187:16 189:7,18 191:13 192:9 193:5 194:16 199:15 206:9,18 207:16 208:1 216:20 220:18
**issued** 34:11 85:17 86:11 102:7
**issues** 6:14,18 12:17,22 13:1,20 14:15 15:7 16:20 17:9,12 18:15 20:6,12 21:19 27:2 40:20 42:16 44:12 71:22 76:20 82:13 83:4 87:15 92:18 101:4 104:12 105:1 123:15,22 126:18 134:14,19 135:4 154:16 156:18 166:19 167:1,12 179:16,22 186:19 187:2 223:8,13
**Issues/Open** 4:15 4:22
**issuing** 6:21 16:12 19:7
**item** 157:2 199:16
**items** 21:12,14,17 84:10 105:9 155:20 218:19

**J**

**J** 2:9,10
**JAVIER** 3:10
**Jen** 9:18 13:16 20:8 22:8 23:16 24:17 24:19 30:18 32:16 33:20 36:1 44:10 48:8 49:21 50:15 54:19 58:12 72:4 85:6,13 93:1 99:20 100:4 103:13 104:19 106:12 107:19 123:6 126:10 127:1 134:12 138:11 140:17 142:16 146:3,5 150:22 151:19 153:2,7 154:19 159:15 160:2 173:19 179:15 183:1 187:17 197:17
**Jennifer** 2:7 4:6 148:10
**Jen's** 30:6 57:17 91:16 96:16 105:7 162:22 191:3
**Joanna** 2:9 11:3
**job** 77:10
**John** 2:14 3:4 11:9
**join** 8:15 43:3
**judging** 157:3
**judgment** 76:4,14 76:21
**judgments** 76:6
**Judith** 2:15 12:8 90:3 95:15 111:6 153:20 217:6
**Judy** 108:3 218:22
**Julia** 2:17 9:19 74:22 122:15 150:10 174:1 193:3 195:10 210:10
**jump** 102:3 157:1 162:7
**JUNE** 1:6
**JUSTIN** 3:11
**J-1** 179:21 195:4,8 196:8 208:13,20

**J-2** 179:21 195:4,9 195:13,20 196:8 197:3,5,20 198:5 198:11 208:13,20 215:16 216:2,8,13 216:15 218:15
**J1** 17:19
**J2** 17:17

**K**

**Kathleen** 2:5 12:5 23:20 24:3
**keep** 59:17 74:11 95:8 116:14 130:1 141:8 158:4 159:17 174:9 175:3 177:3 187:3 192:12 197:15 198:9 210:16
**keeps** 80:20
**Kelley** 2:12 8:20 9:2 28:7
**Kevin** 2:13 3:2 11:14 51:21 61:7 73:13 78:5
**key** 25:6 153:7 154:2
**keyed** 197:2,3
**kilowatt** 220:6
**kind** 15:13 38:3 42:4 65:19,22 77:9 78:5 86:20 87:14 93:22 94:8 100:20 103:4,6 107:22 115:19 116:3 117:20 118:21 119:6 145:4 152:13 163:19 164:8,9,20 167:18 171:19 178:20 191:14 201:13 205:16 209:2,5
**kitchen** 130:6 131:13
**Kline** 2:12 9:2,2 28:7,7 29:1,9
**Klug** 2:18 11:13,13 88:12,13 90:17 92:15 96:15,15 103:1 105:6 107:10 108:22,22 110:17 111:11 112:9 113:17 114:18 116:20 119:12 127:16 137:20 144:18 146:1 147:16,18 147:22 148:5 153:5 155:17
**knocking** 182:16
**know** 6:5 7:8,21 13:7 14:22 17:17 20:6 22:9,12 24:6 28:11 33:22 35:2 42:21 44:3 47:13 48:16 49:6 50:22 51:1 54:20 57:17 62:13 64:16 65:20 66:15 69:1 72:20 80:8 81:9 82:18 100:3,5,14 104:1 104:2,15 107:14 111:4 113:11 116:16,17 117:8 118:3,12,14 119:1 119:9,19 120:19 124:4,10,17 125:12 126:16,19 130:21 132:12,17 132:18 134:17 136:10 137:12,14 138:21 139:13 146:6 152:5 155:13 158:1 160:4,11 163:2 165:12 166:3,11 166:19 167:6,20 168:3 169:15 172:7,10,15 173:13 175:13 178:21 179:18 183:13 185:20 188:9,18 194:18 196:16 198:14 199:5 207:1 218:4 219:3 221:20 223:19
**knowing** 166:8 175:16
**knowledge** 110:11 133:11 181:16 213:15
**knows** 117:21
**Kohl** 2:3 10:3,3 31:1 32:10 195:11 195:11,18,19
**KVAIDHYANA...** 139:9 140:6 166:16 170:15 172:5 179:9 188:6 197:8

**L**

**lab** 14:19 18:7,7 46:17 47:10 48:21 48:21 50:8 61:5 68:5 69:17,18 70:10,17 71:4,4 72:1,1 87:18 105:1 111:15 113:15,16,22 117:8 118:22 119:9 120:11,15 124:8 126:2,2 130:22 131:10 133:17 143:19 147:16 151:22 153:6,15 154:2 173:6,7 181:1,8 183:19,21 205:5 208:6 209:11 211:16 212:6 217:14,21 218:9 218:10
**labels** 37:8
**labor** 201:2
**laboratories** 9:20 14:9 77:18,18 109:21 122:19,20 219:5,6,8,10 220:22 221:1
**laboratory** 175:6 209:19 211:20 212:14 213:5,6 214:5
**labs** 10:2 14:22 18:8 19:15 43:11 49:7 50:1,3 67:13 69:15 72:9 73:7,8 78:18 80:12 86:18 87:7 91:4 102:12 104:22 113:9 118:11 121:6 123:20,21 124:1,2 124:2 125:11 126:7 129:22 130:5,19 133:8,13 134:1 135:7 145:14 152:11 155:22 157:16 160:17,20,20 162:2,8 166:10 173:4,12,17 185:16 187:20 188:3 189:13 190:15 199:6 202:20 207:18 209:4,22 210:3 211:10 212:21
**lab-to-lab** 127:18 147:18 149:17 219:10
**lack** 99:18 110:11 133:10 213:15
**land** 148:4
**language** 22:18 26:8 40:2 47:6 72:22 88:18 108:11 109:2,5 152:17 153:3,10 153:17 190:1 197:20 215:19
**large** 177:7 184:20 185:18 211:2
**larger** 39:5
**latest** 193:14 194:8
**Laughter** 13:10 20:16 73:12 79:13 81:8 117:12 127:3 132:11 137:16 159:6 167:19 182:18 197:14 200:18,22 201:4,7
**Laundry** 2:9 9:22 11:6 27:7 165:8 169:10 178:4 180:20 186:7 215:1
**Laura** 2:2 10:7 32:10 116:1 117:2 118:18
**lawyers** 31:22
**lay** 164:2 206:20
**laying** 206:1,7
**lead** 34:4,7,8 180:11 196:2
**leading** 201:14
**leads** 174:19
**lead-in** 19:10 32:17 32:20
**learn** 207:4
**leave** 135:19 137:2 141:11 149:17
**leaves** 14:4
**leaving** 83:13
**LED** 136:1
**left** 46:21 47:1,21 48:19 83:10
**left-orientation** 52:15
**legal** 32:5
**length** 137:5 138:18
**less-efficient** 23:4
**let's** 27:12 55:20 106:3 125:4
**level** 139:15 140:10 141:6 148:12,16 171:19,21 176:5 215:7
**leveling** 133:18
**levels** 113:21 176:11
**Leybourn** 2:8

11:22,22
**LG** 2:14 3:9 11:9
**lie** 21:4 22:5 43:10 177:7 223:21
**light** 81:2,4 116:4 135:10 136:1 163:7 166:15 168:1 174:15
**Lighting** 3:7
**lights** 169:2 176:20
**liked** 216:4
**limit** 21:16 67:12 67:19,20 137:10 137:11 171:19 172:22 208:6,18
**limited** 14:21 137:8 138:18 185:10
**limits** 69:8 157:4 172:17,17 208:7
**Lincoln** 2:13 11:16 91:7 145:18 154:7 156:21 163:4
**line** 8:1 50:14 79:22 97:7 120:4 133:1 168:17
**lines** 52:6,7 97:9 109:9 220:14 222:20
**Lingrey** 2:10 9:8,8 45:2,3 48:3 50:22 51:4 58:17,18 59:4 60:1 61:2,2 62:4 63:22 64:1 64:13 75:5,5 78:22,22 79:14 80:4 81:9,13 82:3 82:6
**list** 35:18 57:2 71:22 125:3 129:11 136:15 176:8
**listed** 21:13 120:17
**listen** 6:19
**listening** 6:22 53:16
**listening-only** 8:11
**literature** 169:14
**little** 16:13 34:7 35:6 38:5 61:10 108:12 135:20 160:7 174:22 184:22 201:20 210:4
**LLC** 2:17
**load** 17:15 88:22 89:19 96:8,14 111:9 160:10 161:5 162:10 163:21,22 164:1 165:2,11,13,17,21 166:14 168:13 170:22 172:7 177:10 178:5,8,14 178:15 179:1 184:7 202:5,13 203:17 204:1,4,9 207:7 215:4,6 220:2
**loaded** 126:4
**loading** 5:6,18 18:3 123:7,16,18 125:14 134:10 174:5 193:21 201:18 202:1,14 202:22 203:3
**loads** 174:7,8 206:10,20
**load-sense** 204:12
**located** 130:2
**location** 37:13 38:4 48:1 72:12 75:9
**logic** 115:13 169:21
**long** 24:20,22 25:10 50:6 56:12 65:1 90:2 106:4,6 128:4 139:22 158:2 185:1
**longer** 94:1 101:6 130:10 139:15,18 212:11
**longer-term** 94:11 142:4
**look** 14:16 15:17 16:13 37:18 63:7 78:3,10 88:16 89:2 96:17,20 97:5 101:16 109:18 111:1 120:1 127:18 131:5 138:6 139:11 144:20 145:7 152:9 168:22 171:1 172:15 175:17 181:5 182:20 183:13 184:3,4 202:18 213:1 220:6 223:7
**lookback** 30:9
**looked** 65:16 69:6
**looking** 15:12 48:19 55:9 89:22 105:21 111:12 162:4 223:1
**looks** 8:16 89:6
**loosely** 202:7
**loosen-up** 64:4
**losing** 140:7
**lot** 43:13 44:4 55:12 60:3 75:16 105:9 119:20 129:8 132:22 138:8 153:13 164:14 181:12 187:18 209:11 223:8
**loudly** 133:4
**low** 56:20 166:5 220:7 221:9
**lower** 167:7
**lower-speed** 166:1
**low-power** 215:20 216:3 217:4
**lucky** 132:9
**lunch** 154:18,21 158:1 159:4
**luxury** 177:6

**M**

**machine** 110:1 111:17 112:8 114:20 115:2 119:17 162:16,17 162:20 163:13,17 164:7,18,20 165:12 167:5 170:4 172:6 174:17 184:1 189:13 204:4,10 204:14,15 206:1 206:20,21 207:7 221:13
**machines** 97:3 115:4 164:5,15,17 167:6 169:22 174:6,7 202:1,2 203:21 204:3 205:9,10 211:3 219:18 221:18,20
**mailing** 35:18
**main** 17:13 22:20 73:22 95:4 120:18 133:7
**maintain** 52:21 151:7 154:10 209:15 211:7
**maintained** 213:18
**maintaining** 140:9
**major** 53:6 86:17
**majority** 158:3
**making** 13:22 20:21 27:12 28:11 53:1 72:9 160:18
**Manager** 2:4
**Manthei** 2:9 9:21 9:21 27:6,6 28:6 165:7,7 169:9 178:3,3 180:19,19 186:6,6 191:7 214:22,22
**manual** 49:17 91:12 92:1,9 120:18 121:21 143:8,21 144:10 144:13 163:9
**manuals** 121:4 144:16,20 176:19 204:6
**manufactured** 54:1
**manufacturer** 64:3 68:1 73:8 88:21 89:12 90:9 114:10 116:8 118:11 150:19 160:20 191:8,12 202:13 211:19 221:14
**manufacturers** 11:19,21 12:1 23:10 32:8 33:7 33:12 52:11 64:10 72:2 74:18 83:13 87:3 102:11 115:12,20,22 142:12 160:4 162:8 176:14 180:21 181:19 186:3 190:7 198:15 204:12 209:17 211:15 215:18 219:6 220:11 221:18
**manufacturer's** 46:12 48:11 112:22 141:3 190:10,11
**manufacturing** 46:2 53:17 64:15 64:16 111:18 124:2
**March** 197:8
**margarine** 101:14 101:15 102:4,13 102:18,19,20 103:2,5,7 129:4
**Mark** 2:14 10:1 68:19 76:1
**market** 194:5
**marketing** 47:6 170:4
**marketplace** 190:8
**match** 68:6 103:9 129:6
**material** 166:7,7 180:10,13 184:4
**materials** 131:13

**matter** 37:22 47:8 60:19 83:20 86:22 139:5 158:11 204:13,15 219:18
**matters** 6:22
**Mauer** 2:9 11:3,3
**max** 3:9 122:1 214:8
**maximize** 76:6
**maximum** 67:7,8,9 67:12 69:14 122:6 165:17 166:8 178:8,14 179:1
**ma'am** 97:12
**mean** 21:16 32:19 41:13 44:22 50:16 58:5 61:5 67:7 84:21 103:17 116:9 121:22 122:4 131:10 134:16 151:12,16 152:20 158:3 168:13 177:11 182:12,15,19 186:9 187:11 190:17 191:7 198:20,20 199:18 201:11,15 213:19
**means** 15:3 21:15 71:20 81:4 109:7 139:16 171:14 188:10 204:9 222:7
**meant** 40:5 45:19 192:9
**measure** 59:12 133:14 136:11 169:12 189:15 212:15
**measured** 16:1 19:4 23:4,8,9 51:11 95:22 136:16,18 138:10 139:10 155:12 183:22 192:2 193:17 194:12 207:20 208:9
**measurement** 5:8 5:16,21 17:17 63:6 130:22 133:17 138:1,7 179:17,20 180:11 187:2 188:8,12,13 188:14 189:9,19 192:4 193:13,20 197:19 204:21 215:3 216:4
**measurements** 138:2 192:7 210:5
**measuring** 51:12 139:5 193:18 209:22 210:12 220:16
**mechanism** 119:9
**mechanisms** 185:17 191:5 204:1
**medium** 166:5
**meet** 27:15 120:16 221:19
**meeting** 1:3,9 7:3 8:16 13:13,19 14:13 16:19 18:13 20:5,15 31:12 58:10 83:17 224:4
**meetings** 14:16
**meets** 25:1,3
**MEF** 167:8
**members** 20:6 103:19
**mentioned** 22:22 148:18 183:2 199:4 218:1
**Menzer** 2:14 10:1,1 68:19,19 76:1,2
**MESSNER** 3:2
**met** 154:12
**method** 5:18 58:11 126:1 129:15 131:3 188:16 190:14 201:19 206:22
**methodologies** 134:3
**methods** 79:15 91:9 149:14
**metric** 41:12
**MICHAEL** 3:2
**microphone** 7:9 10:12 80:20
**microphones** 66:4 133:2
**middle** 60:11
**midpoint** 151:16
**Miele** 3:10
**migrate** 96:19
**migration** 96:20
**Mike** 2:10 3:15 9:10 91:3,20 94:17 96:3,9 102:14 107:1,11 111:13 113:7 115:10 118:1 121:19 129:17 143:11 156:4
**Mike's** 96:17 113:19 144:22
**MILAKOWSKI** 3:15
**miles** 63:10
**milk** 133:11,14,15
**min** 121:22 214:8
**mind** 53:11 76:11 85:7 95:9 97:10 109:2 123:9 177:3
**mineral** 60:3
**minimize** 76:6
**minimum** 34:22 75:9 77:7 78:3 178:15
**Ministry** 3:15
**minor** 60:6 155:20
**minus** 151:2 152:12,20
**minuscule** 220:3
**minute** 59:11 140:4 140:7,8
**minutes** 59:6 64:21 65:5 83:19 119:2 119:3 185:7
**mix** 164:9
**mixed** 164:1
**mixture** 133:10,15
**MIZANUR** 3:3
**mode** 8:11 215:20 216:3 217:4
**model** 4:9,9,10 16:4,5,6 22:1,3,10 22:21 23:13,19 24:7 25:17 26:20 26:20 27:8,11,13 27:14,19 28:2,4 28:10,13,21,22 112:22 169:14
**models** 15:19 193:18,19 194:5 222:7
**moisture** 55:21 215:6
**moment** 122:19 208:17
**money** 201:3
**monitor** 51:5,7 139:12
**monitoring** 44:5 113:20
**month** 86:12 108:2
**months** 194:4
**morning** 6:4 30:7 54:21 88:12
**Morris** 2:8 11:18 11:18 72:3,3 77:2 77:3 78:13 82:18 149:1,1,21 199:13 199:14 200:13,15 200:21 201:9,17 206:17 207:13 209:16,17 210:18 210:18 213:3 214:3,3 215:10,12 217:2,2 218:17
**motors** 118:8
**mount** 45:11
**mounted** 45:9
**move** 21:9 41:5 42:18,22 43:2 54:16 65:9 82:16 84:4 96:21 102:4 123:4,8 128:22 140:14 146:4 150:8 157:21 159:7
**movement** 72:13
**moving** 8:13 29:10 36:4 43:5 71:14 85:2 107:17 134:12,14 140:16 150:20 186:12,20
**multiple** 36:22 110:14 114:8 116:11 118:5,6 131:1 141:17 170:20,21 171:4 172:7,7,8 211:5 221:22
**municipal** 149:7
**municipal-suppli...** 150:3
**mute** 66:4 97:8,9
**MVUALA** 3:13
**MYRICK** 3:14

## N

**name** 6:6 7:11 8:4 8:22 9:5 13:15 73:10,11
**narrow** 77:14
**Natural** 9:14 38:10
**nature** 60:4 79:8
**Navigant** 2:15 3:10 3:11,11,12,12,13 12:9,11 65:13 90:4 95:16 111:7 153:21 217:7
**near** 72:7,15
**necessarily** 46:16 47:5 98:8 122:7 129:11 169:4 177:9 185:3 193:5 218:4
**necessary** 16:19 33:17 47:16 94:7 125:20 211:10 212:2
**necessitate** 194:17

**need** 15:22 16:7 17:4,6,16,19 18:1 18:12 21:16 23:2 23:5 25:19 30:12 39:15 43:15 45:14 46:6,10 49:16 57:18 58:10 60:14 74:11 76:18 78:8 84:12 100:2,11 106:10 107:3 110:13 134:17,20 135:3 152:4 155:10 160:15 176:3 179:9 183:13 185:5 187:13,18 191:16 198:22 203:8,14 203:17 204:2 212:16,22 219:4 223:20
**needed** 21:3 121:11 125:21 132:16 187:13
**needs** 16:4 17:11 26:21 28:10,15,17 59:16 60:4,10 100:19 114:13 132:18 139:10 141:20 145:8 152:8 160:1 163:20 164:7 173:9 191:11 194:19 200:3,14 203:3 205:14
**negotiated** 201:6
**neither** 197:22
**never** 34:17 181:16
**new** 4:9 8:8 15:19 22:2,21 23:13 28:4,21 31:6 35:15 102:16 160:15 164:19 184:1 195:13,14 195:21 196:5 221:20
**newer** 164:4 205:9
**nine** 178:18
**non-compliance** 15:5 29:3
**non-compliant** 27:21 28:17 221:7
**non-conditioned** 56:20
**non-normal** 89:14
**non-soiled** 123:19
**non-standard** 170:3
**norm** 171:4 172:16 172:19
**normal** 29:4 85:21 88:16 89:6,13,20 90:10,19 119:4 139:14 150:2 162:21 171:6
**normally** 45:14 71:1 121:21 168:6
**normally-soiled** 88:22
**North** 3:5
**note** 98:10 150:12
**notes** 98:11
**notice** 6:20 161:8 174:15
**noticeable** 28:19
**noticed** 34:12 46:18 174:3
**notices** 217:9
**notify** 104:14
**notion** 192:17
**NRCan** 3:13 188:1
**NRDC** 2:15 38:21 41:8 58:21 59:19 60:17 64:8 98:17 112:3 138:15 147:7 169:17
**NSF** 3:14
**number** 4:10 16:6 26:20,20 27:11,19 28:4,10 37:18 59:6 114:9 123:14 128:9 161:12 172:22 211:2
**numbers** 68:15 122:5 167:9 221:12,17

**O**

**oatmeal** 128:2,4,5 133:15
**objective** 147:8
**obligation** 204:18
**observation** 112:4
**observe** 215:16
**observed** 135:7 141:7
**obsolete** 100:17 103:18 106:17
**obvious** 161:4 169:12
**obviously** 32:4 36:13 46:7,10 62:21 64:19 66:18 73:15,22 74:17 75:7 92:7 94:11 102:6 104:2 118:2 122:4 125:18 149:8 164:12 165:3 184:20 207:15 216:11,20 218:21
**occasion** 211:21
**occasions** 72:6 165:5
**occur** 77:15 165:18 171:20 201:22
**occurrence** 170:12
**occurs** 150:3 170:11
**offer** 175:8 185:20 186:4 217:14
**offerings** 112:22
**Office** 10:17,20
**off-balance** 167:11
**Oftentimes** 166:6
**oh** 13:16 38:14 47:12 70:19 103:21 105:10 138:12 156:19,19 168:12 186:13 195:18 197:15 214:16
**oils** 111:17
**okay** 9:7 12:2,7 20:17 21:10 23:14 25:7 26:17,18 27:5,8 28:6,16 29:1,9,10 31:3 40:8,22 42:14,20 46:18 48:6 49:4 53:10 54:9,18 62:5 65:7 66:1,5,8 71:9,16,20 76:8 78:14 82:9 83:1,7 84:1 92:2,11,14 92:17,20 97:6 98:14,20 99:4,14 103:15 106:9 107:17 108:18 116:13,19 117:1 120:2,21 121:13 122:11 123:12 133:6 134:7 135:4 135:15 136:12,14 140:11,16,19 141:8,9 144:5 146:3 150:4 151:12 154:14 155:1 156:8,17 157:17 158:9 159:3 160:2 164:19 165:20 173:11 177:1 178:2 179:14 182:8,22 185:12 186:2,20 187:3 189:6 190:17 193:11 196:7 197:10,11,15 199:9,12 201:8 205:12 207:12 210:16 215:9,12
**old** 28:22
**once** 16:7 21:7 25:9 30:11 84:16 106:21 110:9,12 156:10
**ones** 7:9 82:21 99:11 102:17 169:2 178:19
**one-size** 119:21
**ongoing** 38:1 86:21 100:16 223:3,19
**Ontario** 3:15
**open** 8:17 12:15 13:6 14:15 18:13 21:19 22:3 30:16 36:11 38:6 41:1 42:16 44:2,9 50:14,20 55:5 62:12,15 71:17 82:12,15 88:2,4 92:7 101:2 142:16 146:18 175:4 189:5,6 208:2 218:16
**opened** 139:7,8
**opening** 4:2,5 12:13 13:7 20:9 22:22 183:3
**opens** 137:5 139:13 186:16 208:17
**operate** 48:6 108:1 203:22 204:18
**operating** 51:11 71:4 119:17 154:4
**operation** 55:12 56:4 63:9 65:4 162:21
**opinion** 6:21
**opinions** 43:14
**opportunity** 7:6 13:20 14:14 54:3 115:6 146:19
**oppose** 152:7
**opposed** 176:9 185:22 187:12
**optimal** 47:22
**optimization** 47:5 78:6
**optimize** 59:10
**optimized** 47:2
**optimum** 46:15
**option** 89:1 97:4
**options** 87:4,9 88:20

**order** 1:9 4:2 105:11 111:10 117:21 127:9 155:10,19 186:22 209:9
**organize** 78:1
**original** 51:3 88:18 101:15 103:3,3 129:7
**originally** 27:15
**originated** 51:2
**Osann** 2:15 9:14,14 38:9,9,20,20 41:7 41:7 58:20,20 59:18,19 60:16,17 64:8,8 98:16,16 112:2,2 138:14,15 140:5 147:6,6,17 147:21 148:1,14 149:18,18 169:16 169:16 191:20,20 192:15,16,20
**ought** 42:9 170:10
**outcome** 15:4
**outdoor** 46:3,9 52:21 53:2
**outset** 20:18 203:14 213:20
**outside** 49:15 78:9 80:7 100:16 113:22 118:11 126:1 133:8,13 166:14
**out-of-balance** 163:14 206:10
**overall** 123:16 190:12 218:21 220:10
**overarching** 101:10 124:21
**overcome** 153:8
**override** 117:14
**overriding** 121:10
**oversee** 6:7
**overstated** 219:16
**overview** 120:13
**owners** 176:19

**P**

**P** 2:18
**pack** 206:21 211:2
**packaged** 66:16
**pains** 35:3
**pan** 4:19 18:8 55:1 55:21 56:8 59:8 61:12
**pancake** 164:6
**pans** 89:15
**parameter** 25:6
**part** 13:1 22:12 23:7 24:7 39:4,7 39:14 60:14 77:5 114:16 125:9 142:1 143:3 146:8 181:5 189:2 218:6
**partial** 109:4
**PARTICIPANT** 195:17
**participants** 7:17 8:3
**participated** 220:15
**participating** 185:22
**participation** 83:14
**particular** 13:13,21 14:18 29:3 72:18 90:6 147:20 183:20,22 184:13
**particularly** 17:17 32:18 160:6 202:3
**partly** 55:11 136:16
**parts** 45:8 79:22
**party** 126:6 184:6,8 218:2,14
**pass** 123:5
**passage** 86:3
**passthroughs** 45:20
**pasted** 161:16
**path** 115:18
**paths** 118:14
**pathway** 104:4 205:17
**pattern** 18:3 202:13,22 203:3 203:17
**Paul** 2:6 9:6
**people** 24:6 35:18 35:18 44:17 61:6 73:6 122:4 130:18 130:19 131:1 216:13 222:20
**percent** 41:15 96:22 114:16 168:11 177:11 185:14
**percentage** 60:20 177:9 222:5
**perform** 109:22 155:22
**performance** 26:9 46:22 47:20,22 50:3,10 154:4,6 204:5
**performed** 64:18 109:15
**performing** 79:22 150:18
**period** 4:20 18:11 31:18 57:3,4 64:6 68:13 71:3,12 106:6 212:5,11 222:10
**periodically** 194:11
**permit** 87:2
**permitted** 50:6
**perspective** 79:17 153:12 178:1
**per-unit** 40:10
**petition** 19:21 31:2
**Phil** 2:12 9:21 27:6 162:14 165:7 169:9 178:3 180:19 182:1 183:15 186:6,15 187:9 194:22 196:3 198:17 203:19 205:4,20 208:22 209:21 214:22 217:11 218:12
**PHILIP** 2:9
**philosophy** 115:21
**phone** 44:5 63:21 65:11,17,21 71:12 80:19,22 97:7,17 97:19 104:21 113:5 120:14 132:19 133:4,10 133:14,16,19,21 134:4,5 222:20
**phosphates** 94:1
**photo-video-doc...** 129:14
**picking** 218:10 222:5
**picture** 74:16 128:19 199:19
**pictures** 53:18 132:13
**piece** 145:4
**pints** 59:11
**piping** 45:20
**place** 41:17,22 45:15 46:11 74:8 121:10 129:16 138:7 173:10 195:9 197:22 202:9 206:4
**placed** 72:7,11 75:11 80:10 81:16 133:20 209:7
**placeholder** 16:5,8
**placement** 4:21 18:10 46:16 54:15 62:11 71:16 74:17 74:19 80:14 81:15
**placements** 46:15 73:19
**places** 36:8 129:8
**plan** 12:18 16:20 38:15 173:16
**plant** 137:22
**plastic** 181:2
**plate** 128:4
**platforms** 144:8
**please** 7:10 12:3 24:13 43:18,18 88:10 97:22 100:2 123:13 193:9
**plugged** 110:14
**plus** 151:2 152:12 152:20
**PM** 223:16
**point** 28:19 30:6 38:12 43:14 53:6 53:15 61:20 62:1 74:10 88:4 94:18 95:13,17 96:17,17 103:16 105:16 110:7 125:17 126:7 127:15 131:18 147:14 162:22 168:14 177:15 181:11 187:5,7 191:3
**points** 47:5 60:20 171:5
**policies** 4:13,14 31:4 36:6
**policy** 31:17,21 35:4 36:10 216:22
**POLINSKI** 3:10
**poly** 180:8
**popped** 82:20
**portion** 215:17 217:4,5
**ports** 52:6
**posed** 67:6
**position** 5:10 23:18 49:10 91:17 140:14,19 141:10 141:11,16 142:2,5 142:9,13,19,21 143:7,9 144:14,21 191:22 199:21 205:16 214:19
**positions** 141:18 143:13 157:13
**possibility** 151:21 172:14 174:22 201:21 202:18
**possible** 20:3 66:4 74:4 87:2 96:1

122:14 152:10 162:12 164:14 219:12 220:13
**possibly** 119:7 174:19 215:22
**post** 35:10
**posted** 7:12 31:19 102:7
**posting** 16:12
**posts** 16:14
**potential** 44:18 56:13 60:18 77:17 170:17 182:3,6,7 187:10 191:15 206:10 223:13
**potentially** 96:18 122:13 150:14 221:7
**pots** 89:15
**pour** 164:3
**power** 89:1 93:14 136:3
**ppm** 148:7,12 149:13 150:1
**practice** 35:4 37:22 64:11 124:13 135:11 194:15 212:14,21 213:4,7 214:6,18
**practices** 180:16
**preamble** 35:9
**precise** 202:14
**precondition** 95:3
**preconditioning** 5:5 17:11 94:19 95:19 96:4,8,14 107:18,21 108:5 108:14,20 109:6 109:11,20,22 110:10 111:3,15 114:8 116:15 122:18
**predominantly** 165:10
**prefer** 175:2 203:10
**premature** 166:15 168:2
**prematurely** 162:11 163:3
**prepare** 59:1 130:3 179:10
**prepared** 155:20
**prescribing** 138:6
**PRESENT** 2:1 3:1
**presentation** 20:20 30:7
**presented** 170:7
**presiding** 1:12
**pressure** 5:8,19 52:20 136:15,18 137:4,6,11 138:1 138:4,9,17,20 139:2,3,4,5,10,12 139:12 140:10,13 141:14 143:13 145:2,9 157:2 207:12,20 208:1,5 208:8,16,19 209:10
**pressures** 51:7,8 52:4
**pretty** 38:7 161:1 175:18 182:17 209:14
**prevail** 41:21
**prevails** 165:10
**prevent** 75:13,13 79:17 135:9 198:7 198:12 209:9
**previous** 109:2 194:2
**pre-version** 196:16
**pre-wash** 95:4
**primarily** 155:22
**primed** 109:10
**prior** 4:19 55:2 57:8 86:6 149:4 154:12 218:9
**prioritize** 123:10
**probably** 7:2 31:12 34:17 46:1 58:13 77:21 82:7,16 86:19 88:3 90:18 100:22 104:14 109:1 119:22 145:7 153:7 160:17 163:20 164:22 171:2 187:17 201:5 213:6
**problem** 69:4 116:4
**problems** 143:18
**procedural** 211:18
**procedure** 1:3 4:7 4:11,16 5:1,2 15:3 15:10 17:8 18:15 18:22 19:21 29:12 30:10,22 35:5,7 39:14 40:3,11 62:15 74:10 84:21 85:4 86:1 88:19 90:14 91:1 94:10 105:4 107:13 109:4 124:19 126:8 128:10 129:15 130:14,20 134:6 135:11 137:8 140:21 141:15 142:6 146:9,17 151:5,6 160:11 165:14,16 178:7 180:7,15 187:21 188:2,4,20 191:18 196:19 197:2,5 202:5,15 210:21 213:18 214:14 215:19 216:22 217:10 218:7 222:3
**procedures** 4:13 5:6 6:8 14:1,21 15:1,2 18:17,18 20:3 26:9 30:15 30:20 31:4,21 35:16 36:13,22 37:6 39:12 40:9 42:7 49:10 107:15 123:7,16 127:19 131:6,16 134:10 137:7 156:1 161:17 210:8 211:17 222:14
**proceed** 203:6
**proceeding** 30:4 146:16 216:10
**process** 12:19 15:18 19:3 29:16 51:19 74:15 76:15 76:16,17 100:20 105:17,20,21 111:18 114:22 115:18 130:9,11 168:9 185:9 192:11 215:21 223:15
**processes** 14:19 160:21 223:18
**produce** 62:3
**produced** 61:18
**product** 2:5 15:10 16:19 23:3,7 25:3 25:20 26:9,12 27:20 28:17 31:7 48:5 49:3 64:7,20 69:10,17,19 82:17 110:18 119:16 144:7,7 169:13 203:2 223:16
**productive** 6:13
**products** 15:7 42:17 54:7 66:10 66:11 68:2 69:16 91:18 108:1 112:16 119:20 223:1
**product-by-prod...** 120:1
**product-specific** 41:5
**program** 2:4 6:10 23:18 25:10 26:3 26:22 27:18 29:20 38:8 67:16 68:22 69:1 102:9,10 115:13 173:14 209:20 213:5 220:10,17 222:15
**programs** 69:2,10
**Project** 11:4
**promise** 43:4
**promotional** 166:6
**proper** 138:20 139:2 188:3
**properly** 46:3,7 62:2 110:15 111:10 165:2 204:4,22
**proposal** 86:13 88:6 90:11 93:10 93:16 96:7 99:7 100:8 108:2 136:20 146:11 152:6 156:13 179:10 205:8
**proposals** 95:18 99:10,11
**propose** 50:5 83:8 87:1 140:22 146:9 146:21
**proposed** 24:22 88:5 89:3
**proposing** 86:10 93:7
**proprietary** 204:16
**protocols** 80:8 131:6
**provide** 21:5 31:17 84:9,22 86:15 94:12 108:16 118:22 127:8 147:10 154:1 159:19 173:20
**provided** 90:8 91:12 125:22 173:2
**provision** 30:9 42:8
**provisions** 15:11 36:12,15,21 37:3 37:9,11,15,16 38:16 40:4,11,14 41:21 70:7 90:14
**psi** 138:5
**public** 1:3 20:15

47:3 181:11
**publicly** 19:14 29:17
**publicly-supplied** 149:20
**published** 35:13 108:2 195:15,22 197:7
**pull** 45:8 59:10
**pulled** 145:8
**pulls** 16:16
**pump** 109:9
**purpose** 53:1
**purposes** 52:3 70:9 170:4
**push** 7:10
**put** 31:14,14,17 33:14 35:6,14,16 35:21 44:13 45:15 46:11 55:22 67:11 68:5 69:8 76:21 80:16 85:8 121:20 131:11 132:4 133:13 136:7 161:20 186:10 187:19 217:1 222:19
**puts** 166:3
**putting** 85:15 97:2 183:22 189:6 202:7 222:14
**P-R-O-C-E-E-D-...** 6:1
**p.m** 158:12,13 159:2 224:3

**Q**

**qualification** 26:11 26:15
**question** 28:8,12 32:2 39:10,13 50:15 56:7 60:16 63:11 65:14 66:9 66:20 72:9 78:16 85:3,18 92:5 105:2 110:6 111:8 114:4 118:16 122:18 138:14,16 139:9 146:13 148:15 162:6 167:18 172:2 174:19 183:21 191:21 195:2,7 205:13 209:14 213:14 215:15 216:16
**questions** 6:14 7:1 16:22 18:5 21:16 21:20,22 22:5,10 26:19 27:2 29:18 30:17 32:13 36:7 41:2 42:16 54:13 83:15 98:11 99:16 125:1 127:5 131:7 142:7 150:5 159:20 180:3,4 193:12 201:10 207:10
**quick** 17:8 19:3 20:15 100:20 102:4 159:4 206:2
**quicker** 62:1,2
**quickest** 104:5
**quickly** 56:4 101:22 123:5 134:15 187:5 190:14 213:16
**quietness** 71:20
**quite** 140:8 159:8 159:10 176:13

**R**

**rack** 5:10 140:14 140:18 141:10,10 141:16 142:3 143:10,13
**radically** 33:10
**raise** 7:21 20:6 44:7 94:13 101:4 138:13 169:19
**raised** 22:14 93:11
**raising** 104:12
**Ralph** 2:7 11:20
**ran** 119:1,3
**range** 3:16 78:2 121:15 149:6,21 150:2 151:2,8,14 151:17,20 152:2,6 152:10 153:19
**rare** 211:21 220:19
**rate** 23:11 25:12 143:14
**rated** 25:1,4,5
**rating** 25:11,15,19 25:21,22 27:10 37:21 41:22 68:4
**ratings** 37:17 38:18 169:8 177:8,19 182:16 183:8 203:17
**rationale** 184:18 187:14
**Ravee** 9:16 166:16 170:15 171:18 179:5 188:7
**RAVEENDRAN** 2:16
**reach** 18:9 60:12 67:8
**reached** 33:11
**reacts** 167:5
**read** 40:2 99:9 109:5 120:11 134:20 152:20 199:18 216:14
**reading** 53:17
**readout** 116:5
**reads** 109:6
**ready** 120:8
**real** 102:3 187:5
**reality** 106:7
**realize** 37:10 99:7 114:5
**really** 6:17,19 7:4 20:14,18,19,22 43:13,15 60:7 64:22 65:16 67:2 77:8 81:6 86:22 89:11,22 90:18 97:1 103:6,8 105:19,21 107:16 109:13 111:12 115:21 117:9 123:19 128:7,11 129:7 131:15,22 138:4 139:11,16 154:3,5 159:20,22 162:16 169:20 188:10 223:17
**reason** 110:21 112:15 135:22 142:8 153:1 184:13
**reasonable** 209:3
**reasoning** 198:7
**reasons** 212:22
**rebalancing** 163:17
**recall** 183:20
**receive** 115:13
**received** 32:1
**recertify** 25:19 28:3
**recirc** 75:13 78:17 78:21 80:2,11 81:21
**recirculating** 74:13
**recirculation** 79:3
**recognize** 96:12 168:14 190:9
**recommend** 89:13 120:10 155:7
**recommendation** 66:22 100:7,9 122:22 124:18 180:15 210:14
**recommendations** 101:20 125:2
**recommended** 88:21
**reconstituted** 133:11
**Reconvene** 158:8
**record** 7:11 8:5 10:12 83:21,22 158:12,13 170:10 187:20 212:16
**recorded** 178:18 213:19 214:12
**recording** 5:20 178:8 210:19 211:10
**recordings** 212:12
**rectifying** 170:2
**recycle** 172:11
**redistribute** 163:18
**redistributing** 174:8
**reduce** 19:1 59:1,2 59:4 77:19 164:12 180:13 219:12 222:13
**reducing** 60:20,21 61:1
**reduction** 60:18 62:22 209:10 221:9
**reevaluate** 26:9
**reevaluation** 26:6
**reference** 18:18,21 36:16,18 89:4 127:7 155:6,8,22 196:5
**referenced** 106:17 195:5
**referring** 148:10 157:2 196:12
**reflect** 109:19
**reflects** 194:12
**refrigeration** 130:1
**refrigerator** 132:8
**regain** 162:19 164:15
**regard** 17:21 18:4 22:21 29:7 45:5 46:11 51:1 65:14 66:9 82:13 83:4 88:15 93:17 124:18 138:17 152:6 189:8,18 201:20 207:17 215:20 216:5 217:3
**regarding** 5:2 17:2 18:6 27:2,2 54:14 85:4,5 93:4 99:16

108:20 110:6 150:5
**Register** 35:12,13 195:15
**regs** 22:17
**regular** 23:21 30:15 35:18 73:21
**regulations** 29:22 32:6 37:12
**regulatory** 23:18 25:9 26:22 27:18 29:7,20 38:8 102:9,10 105:3,4 191:5
**Reich** 2:15 12:8,8 90:3,3 95:15,15 96:7,12 111:6,6 153:20,20 217:6,6
**reiterate** 84:17
**relate** 12:21 154:17
**related** 193:4
**relates** 138:21
**relative** 42:7
**relatively** 31:6
**relatively-newer** 205:10
**relevant** 18:22 86:4
**rely** 32:8
**remain** 197:21
**remaining** 42:15
**remarks** 4:2,5 12:13 13:7 20:10 183:3
**remedy** 117:21
**remember** 102:22 148:21
**remind** 88:3 121:14
**remove** 56:21
**reopening** 194:20
**repeat** 121:1
**repeatability** 127:19 192:3,7
**repeatedly** 53:21
**repetitions** 110:20
**replication** 126:6
**report** 15:22 23:2,5 23:12 24:6,20 87:12 92:1 119:8
**reported** 16:2
**reporting** 220:18
**represent** 53:22 166:22 193:20
**representation** 103:5 200:2
**representative** 147:13 148:16 149:19
**represents** 56:2 114:11 194:1
**reproducibility** 127:20
**request** 19:20 73:1 101:21 152:16 156:18 177:3 208:12 214:21
**requesting** 190:13
**requests** 7:2 21:17 42:22 116:11
**require** 27:19 28:4 87:2 95:19 111:9 209:8 214:7
**required** 36:14,19 37:2 112:6 137:7 137:9 188:4 195:13,20 200:6 210:20 213:18
**requirement** 23:12 24:5 28:20 32:5 146:8,10,11 184:17 214:2
**requirements** 4:9 27:17 29:7 37:7 183:6 222:4
**requires** 112:7 178:7 187:21 188:20
**rerun** 121:11
**research** 79:15,19
**reside** 192:9
**RESIDENTIAL** 1:3,4
**residual** 114:21
**resolved** 141:20
**Resource** 38:10
**Resources** 9:15
**respect** 6:15 23:19 27:18
**response** 20:13 27:4 40:21 42:19 54:17 62:7 71:13 71:19 73:9 75:19 82:11 83:6 85:18 92:19 99:6 113:3 115:16 123:3 134:11 140:15 145:13 150:7 157:19 175:14 191:4 199:11 207:11
**responsibility** 77:22
**restart** 160:19
**restarted** 161:6
**restate** 38:11
**restore** 162:20
**restricting** 74:2,5
**restructuring** 209:12
**result** 14:22 15:22 23:3 180:10 184:2 188:15 221:22
**resulted** 172:10
**results** 15:4 50:7 119:16 150:15 161:6 168:9,10 170:9 181:10,18 182:10 183:11 185:18 213:12 222:1
**retesting** 16:7
**review** 30:10,14 93:16
**reviewing** 53:18 86:12 93:9
**revise** 18:20
**revised** 29:13
**revising** 30:19
**revision** 194:17
**revisions** 4:12 29:13
**re-adjust** 176:19
**RICHARD** 3:11
**Richter** 2:6 9:5,6
**right** 6:3 12:12,13 12:15 29:10 36:4 36:5 40:17,18 43:1,5 46:20 47:1 47:22 48:18 52:15 57:19 59:15,15 62:14 65:10 67:3 71:21 73:15 78:1 83:11 84:1,4 85:2 90:17 92:17 94:15 96:7 98:4 100:11 103:13,20 105:14 116:18 122:5 123:1 124:20 132:8 134:12 137:8 140:5,10 151:18 152:10 155:13 158:10 163:11 164:3,8 167:17 169:15 176:2,22 178:6 179:1 182:22 183:9 185:4,11 186:12 193:11 201:16 206:11 214:5 223:10
**rinse** 5:7 94:4 135:6,8,12 136:6 136:7 178:10
**RMC** 178:7,8 215:3
**RMCs** 178:19
**road** 222:2
**Roberts** 3:7 97:7 97:12,14 98:1,4 98:15
**robin** 70:1,16 71:1 71:8 181:7,10,17 182:11 183:12 185:6,22
**room** 1:3,9 4:16 6:16 8:4,19 10:13 10:21 12:3 14:4 18:4 41:3 42:18 43:1,22 45:4 49:7 51:12 55:16 56:1 57:20 58:5 61:21 62:1,15 63:20 64:11 66:4,18 68:10 71:15 73:6 78:18 82:14 83:4 83:12 84:8 93:18 97:9 104:22 113:6 114:6 122:5 125:11 133:3 141:12 157:21 160:5 161:22 183:7 211:5 219:19
**round** 70:1,16 71:1 71:8 181:7,10,17 182:10 183:12 185:6,22
**rounded** 39:17,20
**rounding** 4:14 15:8 36:6,7,11,15 37:3 37:8,10,14 38:15 39:1,12 40:4,11 40:14,19 41:9,20 42:7
**round-robin** 183:18
**routine** 164:9
**routines** 164:14 165:12
**rule** 12:15 30:4 88:3,4 92:7 196:2 196:5,13,19,20
**rulemaking** 12:19 13:2,4 29:16 31:2 35:8 38:3,18,22 39:5,7 66:15 67:22 68:8 86:21 100:22 101:2,5 105:19 146:18 201:6 216:8,10,10 217:10 223:17
**rulemakings** 35:7 35:19
**rules** 7:7 15:12 69:3 158:3

**run** 19:15 55:19 56:19 57:12 64:17 64:21 67:17 69:6 69:7 71:2,2 94:19 94:21 95:19 110:13 111:15 112:19 116:10 117:5,21 118:13 120:16 121:6,9 122:20 135:14 144:11 151:9,10 157:9 160:16,19 161:7 166:11,21 167:10 174:9 179:6 218:15,16 220:10
**running** 56:2 57:21 59:2,5 60:19 62:2 64:12 71:7 75:4 113:14 114:8 116:15 117:9 122:19,20 159:8
**runs** 110:9,12 143:19 167:15,15 170:21 171:3,6,6 171:9,10,12,13,20 172:10,13 211:5
**runtime** 70:18
**run-in** 4:20 18:11 55:11,13,14,16 56:9,13,15,16,18 56:19 57:2,5 62:10,12,14,16 63:7 64:2,6 65:9 65:15,17 66:11,21 67:10 68:13 69:6 69:14 70:6 71:12 83:2
**R&T** 3:8

**S**

**safe** 224:1
**sagging** 198:8
**sags** 199:1
**SAI** 3:14
**sales** 166:7
**sample** 40:5,8,14 81:18
**sampler** 4:21 18:11 62:11 71:17 72:6 72:11 73:16 74:20
**sampling** 40:13 72:14 74:1,6 75:7
**Samsung** 2:16 9:17 166:17 170:16 188:7
**sanitization** 199:22
**sanitizing** 200:5
**saw** 186:19 196:15
**saying** 14:13 80:20 80:22 132:10 139:19 159:18 168:10 182:21 213:20
**says** 26:6,8 45:16 136:6
**schedule** 43:6 159:9
**schematics** 194:11
**SCHMIDT** 3:11
**school** 79:12
**scope** 80:7
**scratching** 145:5
**screen** 44:14 73:1
**se** 169:5
**seal** 45:17,20 189:12,18
**sealed** 46:3 48:22
**sealing** 45:14 48:12 53:4
**sealing-orientation** 52:16
**SEAN** 3:9
**seated** 8:20
**seats** 42:21 43:3
**second** 14:6 50:13 70:17 80:18 111:19 125:5 137:11 182:13 209:10
**seconds** 137:15 138:22,22 139:1,6 139:7 140:8 157:15 209:3
**section** 37:5 41:6 43:13 220:4
**sections** 36:17
**see** 14:14 19:2 20:1 34:21 45:21 49:3 53:20 78:10 81:19 83:18 86:5 100:11 101:16 119:1 124:13 130:18 145:8 171:3 174:6 174:10,14,16 177:7 181:12,17 182:10 185:17,18 187:10 189:1 201:13 210:3 217:16 218:16
**seeing** 48:15 107:6 113:6 190:2
**seek** 19:19 180:3 216:1
**seeking** 191:22
**seen** 28:8 101:14 112:13 133:9,12 134:2 138:2 162:2 163:6 181:16 207:19 219:4 220:4
**segue** 62:9 159:14
**select** 128:2
**selected** 87:10 117:6,10 129:6
**selecting** 148:19
**selection** 5:2 16:22 85:5,19
**self-calibration** 112:6,10
**send** 31:18 35:17 69:18 97:14 216:16
**sense** 45:22 56:14 60:22 70:5 117:10 135:1 152:11 186:9,11
**sensing** 90:11,13 91:11 203:22
**sensitive** 177:16
**sensor** 92:8 98:5 99:2 110:8,15,20 111:10 112:7,15 112:18 113:1 114:12 115:16 118:6 120:16,20 143:15 156:7
**sensors** 95:5 96:10 109:15 110:6,12 117:7 118:7
**sensor-based** 98:9
**sent** 71:3
**separate** 47:8 167:14 171:15
**sequence** 18:3 72:12
**serious** 156:13,16
**serve** 175:6
**set** 97:3 115:4 117:20 128:8 145:15 171:20 173:7,16 203:10 217:17 222:4
**setback** 77:7
**sets** 69:3 175:12
**setting** 95:20 172:22 201:21
**setup** 54:7
**seven** 30:11,20
**seven-year** 30:9
**shaking** 202:7
**SHANDROSS** 3:11
**share** 50:21 87:21 106:14,20 126:20 126:21 127:2 144:22 147:3 156:10 160:5 173:14 193:8,9
**Sharp** 3:14
**sheet** 82:19 87:16 154:16,22 180:8,9 186:10,18 187:17 190:3
**sheets** 181:2,5,9 182:15 185:15 206:12
**shell** 45:11
**ship** 144:2
**shipped** 49:12,14 64:11 92:9 144:9 144:21
**shipping** 18:1 197:21 198:1,6,21
**shoot** 151:15 152:21
**shooting** 152:18
**shop** 83:9
**short-cycle** 59:13
**shot** 98:10
**show** 105:9 132:1,7 143:20 168:11 181:8 183:12 200:4
**showing** 193:15
**shown** 62:20 221:12
**shows** 3:15 68:12 142:11 182:4
**side** 7:9 47:1,1 165:12
**significance** 16:14 127:22 128:1,6,13 128:15 138:8
**significant** 15:8,9 17:4 26:7 27:12 28:15 37:18 41:10 41:11,16 77:16 127:20 128:12 140:9 181:8 203:15 212:4
**similar** 28:1 63:5,8 66:17 75:4 105:1 107:15 116:20 147:1 150:17 161:11,12 182:17 207:16 218:9
**simple** 129:10
**simplicities** 47:7
**simplified** 20:19
**simply** 108:13
**single** 32:7 74:7 166:21 177:18
**sit** 128:5 158:4
**site** 125:16
**sitting** 176:7

**situation** 16:17 34:20 78:6 174:11 178:5 189:12 200:9 201:21 203:1,2,7 208:3,7 208:16 209:22 211:1,2 214:6 216:2 221:15 222:16,22
**situations** 160:12 166:21 170:19 174:14 175:2 202:4 220:21 221:3
**size** 61:5 64:3 156:3 165:17 178:14,15 184:7 204:1
**sizes** 72:17 170:22 172:8
**skip** 62:8
**sleeve** 53:20
**slid** 45:13 46:20
**slide** 45:12
**slideout** 45:10 46:5
**slight** 145:1
**slightly** 25:14 120:22 143:14 215:3
**slinger** 61:13
**slinging** 59:8
**small** 82:4,6
**smoke** 79:4
**SNOPR** 86:11 88:14,17 89:2 90:5 93:8,13 95:18 99:6,7 100:1,6 108:1,10 109:6 136:17,20
**soft** 148:3 150:14
**software** 165:13,20
**soil** 90:10,12,15 91:10 92:8 96:5 96:10,14 99:17 110:6,7,12,15 112:18 113:1 114:12 123:6 127:10 129:6 133:18,20 134:3 143:15 154:13
**soiled** 111:9 123:19
**soiler-to-soiler** 130:17
**soiling** 5:6 123:15 123:18 125:1 126:3 127:6 133:9 133:9 134:6,10,19 155:19
**soils** 5:13 17:5 100:13 101:11,19 114:13 125:13 128:8 129:15 130:1,4,12,21 145:9 155:9
**soil-sensing** 17:1 85:20 87:13,14,19 89:7,9,19 90:16 91:5
**solid** 164:5 206:13
**solution** 86:20 93:7 103:21 129:12 142:4
**solutions** 3:5 223:10
**solve** 123:22 132:3
**solved** 131:22 205:14
**somebody** 35:11 44:17 120:3
**somewhat** 39:11 179:5 204:16
**soon** 8:20 50:14
**sooner** 139:20
**sophisticated** 169:22
**sorry** 12:7 13:16 55:2 71:10 80:18 81:5 82:22 89:4 90:1 138:12 193:2 195:10,18 200:15
**sort** 45:21 46:12 59:16 82:8 90:20 114:21 124:9,20 128:21 170:1 189:10
**sought** 86:7 179:19
**sounds** 81:6 89:12 135:2 185:7
**source** 106:19
**sources** 127:21
**SOUTHARD** 3:9
**Southern** 2:17 11:8
**so-called** 132:9
**space** 51:13 56:11 56:12,20 69:7 193:21 194:2,6,13
**span** 222:8
**spans** 31:7
**spatula** 127:6
**SPC** 51:18
**speak** 6:18 7:5,14 27:1,17 43:8,18 44:3,4,7,18 45:1 49:8 52:8 67:16 68:21 69:1 75:9 88:9 97:20 110:17 120:4,9 133:3 173:17 175:12
**speaker** 65:20 66:2 97:20,21 98:18 120:8 133:3
**speaking** 8:7
**spec** 166:7 171:13
**special** 166:18
**special-cause** 167:12,15 170:18 171:5,10,20
**specific** 20:5 26:4,8 30:1,1 32:21 36:11,15 40:2 41:2,20 49:15 99:7,10 108:19 119:19 125:21 127:8 132:5 134:19 152:17 155:4 167:10 172:13 175:12 190:1 193:5 204:3
**specifically** 27:3 32:14 33:18 39:1 62:14 101:11 104:9 149:16 168:21 189:17 190:20 192:12
**specification** 102:16 146:22 147:15 148:2 169:14 175:16
**specifications** 15:16 22:16 24:9 49:13 147:3
**specificity** 76:7 132:14
**specifics** 54:14 62:17 176:9
**specified** 17:7 40:15 89:21 100:14 101:13 140:21 141:1 157:9 213:17
**specifies** 72:8 114:10 180:7 198:1
**specify** 70:2,6 77:6 213:10
**specifying** 72:17 77:10 149:15
**spectrum** 89:16,17 148:4
**speed** 18:9 166:8 167:7 168:7 169:11 178:18
**speeding** 118:7
**speeds** 166:4,5 169:13
**spin** 165:22 166:1,4 166:8 167:7 168:6 169:11,12 178:18
**spinning** 204:15
**spoke** 153:7
**spoons** 133:18
**spot** 218:5
**spots** 8:17
**spray** 57:12,13 145:3
**spread** 128:3
**Springboard** 3:16
**squeeze** 219:17 221:5,17
**stabilization** 57:6
**stabilized** 56:4 57:15 71:4
**stabilizing** 61:21
**stable** 55:18 56:1 59:17 139:20
**stakeholders** 19:7 19:14 105:14
**stand** 84:9,17
**standalone** 126:8,9
**standard** 33:4 34:10,22 37:19,20 41:12,14 42:1 45:16 51:6 55:15 64:10 66:19 72:7 74:14 77:6 141:6 141:7 147:9 148:2 184:14 188:10,15 194:13 196:19 214:7
**standardization** 147:11,11
**standardize** 38:3
**standards** 3:3 6:11 11:4 14:3 27:21 29:14,14,15 31:9 36:16,17 42:8 66:9 76:5 150:18 183:3 195:14,21 196:8 197:3,4,6
**standby** 5:21 215:17 216:3 217:4
**standpoint** 79:15
**stands** 179:8
**Star** 2:4,5 6:9 11:2 14:10 15:16,21 22:13 24:6 26:3 26:11 27:17 28:1 28:2,3 124:19 146:8
**staring** 113:4
**start** 8:21,21 10:10 13:5,12 56:9 57:9 73:10 84:2 85:16 135:14
**started** 14:12 34:13

66:16
**starting** 8:16 71:7 124:9 135:9
**starts** 181:5
**state** 7:10,13 8:4 13:15 151:5 172:21 173:3 198:4
**stated** 34:9 85:19 105:8 108:13 216:22
**statement** 22:22 41:11 87:4 142:2
**states** 202:5
**static** 139:4
**statistical** 171:2,14 171:19 172:17 178:20
**statistically** 172:3
**status** 26:11,15
**statute** 30:10
**stay** 75:12
**stem** 87:16
**step** 72:4 74:18 107:12
**STEPHEN** 2:8
**step-by-step** 52:14
**Steve** 3:10 11:22
**Stevens** 2:4 11:1,1
**stick** 103:2
**stood** 83:1 181:21 182:1
**stop** 50:8 115:17 130:4 163:17 164:18
**straight** 157:21
**strange** 214:10
**stressing** 18:12
**stringent** 14:4 183:4
**strong** 30:12 84:17
**strongly** 43:8,17 84:8 88:7
**structure** 212:14
**struggling** 176:2
**study** 94:8 147:2 148:19,21 200:3 200:12
**stuff** 88:5 112:1
**stuffed** 190:3
**style** 73:20
**SUAMI** 3:13
**subject** 99:3
**submit** 12:20 31:1 58:15 62:18 68:10 76:17 88:8,10 93:8 99:12 152:5 216:15,16,17
**submitted** 70:12
**subsequent** 116:22 190:22
**subsequently** 83:17
**substitute** 101:19
**substituted** 30:3
**substitutes** 17:4 30:2 105:12 106:20
**substitution** 101:9 103:8 105:15,17
**substitutions** 5:4 17:7 99:15,17,17 99:19 100:11,19 100:21 101:21
**subtle** 127:21 130:16 155:19
**successful** 14:17
**suction** 51:7
**sufficient** 28:14 63:15,18 110:19
**suggest** 58:4 124:16 127:13 135:12 137:10 141:5,22 175:20 180:12 189:17 190:2 198:3 218:13
**suggested** 58:15 73:1 136:18 157:4 200:2 202:11,19 208:18
**suggesting** 48:10 48:16,17 106:20 126:12 161:3 171:18 201:11 212:12
**suggestion** 77:20 77:22 78:11 95:11 106:22 108:9 136:10 149:11 162:3 194:9 208:8
**suggestions** 161:19
**summary** 217:8
**sump** 109:9
**suppliers** 106:3
**supplies** 149:7
**supply** 201:2,2
**support** 93:15 136:20 147:2 148:19 153:10 155:18 156:5 185:5 216:9
**supported** 25:15 198:2,6,20
**supports** 25:11
**suppose** 166:2 215:2
**supposed** 80:1 119:3,5 147:12,13 192:17
**sure** 23:1 24:18 25:4 35:20 40:3 44:22 53:1,3 67:6 69:19 72:9,11 78:7 79:21 80:12 85:13 87:20 107:4 110:1,7,15 114:1 115:8 120:6,7 127:14 132:6 134:22 138:20 144:19 145:5 153:17 155:13 156:6 165:16 172:4 185:13 187:19 189:3 198:19 217:18 220:12
**surprises** 105:10
**surround** 22:1
**suspicion** 67:11 144:9
**SUTHERLAND** 3:12
**SW** 1:10
**Swogger** 11:5,5
**system** 31:6 130:22 166:22 167:6 171:11
**Systems** 2:9 9:22 11:6 27:7 165:8 169:10 178:4 180:20 186:7 215:1
**S-E-S-S-I-O-N** 159:1

**T**

**table** 8:15 43:3 78:16 99:18 122:7
**tablet** 94:3 97:2
**tablets** 96:18
**tableware** 99:19
**take** 65:21 71:22 77:21 82:16 84:10 95:5 97:19 114:11 118:15 156:17 158:2 160:1 163:15 165:20,21 167:16 171:11,22
**taken** 73:17 101:4 114:20
**takes** 53:19 59:5 105:20 110:22 129:16 130:10 138:7 222:6,19
**talk** 7:10,20 8:6 21:11 43:9 62:10 66:11 103:9 104:3 106:10 120:13
**talked** 58:9 61:10 129:3 199:2 201:19 207:16 208:11
**talking** 58:14 97:15 118:4 147:19 172:1 181:18 195:3 219:19,21 220:1
**talks** 37:6 88:19
**tape** 52:20
**taping** 52:19,22 53:4,8
**target** 154:10
**targeting** 153:18
**task** 101:18 131:1 149:3
**Taylor** 2:14 11:9,9
**team** 91:21
**tech** 112:7
**technical** 137:3
**technically** 151:13
**techs** 130:10
**tee** 160:7
**Teich** 2:19 11:11 11:11 171:16 175:22 179:3 181:14 182:5,7,9 182:22 184:9 185:4,12,19 186:14 192:6,19 192:22 193:1 196:10,10,15 205:1 212:18
**telephone** 207:2
**tell** 47:20 67:17 91:6 103:17 113:10,12 157:14 176:18 205:16
**telling** 143:8 144:10
**temperature** 5:12 59:15,22 60:8,13 81:20 120:18 131:19 132:4 150:21 151:1 153:8 154:3 178:11 210:19 214:8,11
**temperatures** 51:8 51:9 118:8 150:9 172:8 178:17 211:16
**ten** 65:5
**tend** 165:11 174:6
**tendency** 174:10
**tenth** 41:22

**tenths** 219:22
**term** 99:18
**terminal** 66:16
**terminate** 162:11 162:18 163:3,12
**termination** 166:15 168:2
**terms** 26:21 37:17 60:22 72:21 79:21 89:18 101:9 126:3 171:7,13 172:9 173:18 187:7 188:17
**terrible** 60:7
**terribly** 24:16 25:5
**test** 1:3 4:7,11,16 4:17,18,19 5:1,2 5:17,18 14:1,21 15:2 18:2,15,16 18:18,22 19:21 20:2 25:11 29:12 30:10,14,19,22 35:4,7,16 36:12 36:21 37:6 39:12 39:14 40:2,9,11 42:6 44:1 48:5 49:10 50:7 51:4 53:19,21 54:6 55:3 57:3,5 59:3,5 60:19 61:16 62:14 64:17 67:2,12 68:10 69:17,18 80:7,8 85:4 86:1 87:5 90:14 91:1 94:10,21 95:21 96:2,13 105:3 107:12 108:7,15 111:21 113:15 117:8 119:5 124:19 126:7 130:13 131:15 135:9,10,14 137:7 137:8 140:21 141:15,15 142:3,6 143:19 144:12,14 145:20 146:8,17 151:4,9,10,16 152:1 154:12 156:14 157:11 160:11,14,15,19 161:5,6 165:14,16 165:18 166:9,10 166:21 168:9,10 168:22,22 169:4 170:19 171:6 172:7,10 174:9 175:3,6 177:6,18 177:20 178:7,8 179:1,7 180:7 186:21 188:20 191:18 196:19 197:2 198:13,22 199:16 200:7 201:18 202:4,9,15 210:8,21 211:5 213:1,17,22 214:14 215:17,19 216:15,21 217:9 218:7,16 221:21
**tested** 39:16 40:6,6 48:18 54:4,8 90:13 130:7 165:16 168:19 170:21 177:12 222:2
**testing** 5:15 6:8,9 6:14 14:5,7,9 17:14,15 27:14 46:17 47:4,9,17 48:2,13 49:2 51:18 59:2 61:1,6 66:19 68:6 70:4,8 70:10 77:19 79:21 82:14 86:18 87:8 89:10 90:14 93:20 101:8 102:13 107:13 112:17 124:3 143:18 150:18 160:9 168:16,16 172:6 177:5,17 178:6,13 178:14,21 181:6 182:14 183:18,20 190:16,22 191:1 202:4 204:8 215:15 216:9,12 217:15,16 218:15 221:20
**tests** 19:15 46:21 69:4,15 75:4 113:11 118:14
**test-procedure-r...** 31:11
**thank** 14:13 20:4 26:17 28:6 29:9 33:21 36:2 53:9 54:9 62:4 74:21 76:8 78:12 82:9 83:13 90:17 91:2 94:15 98:14,15 99:4 108:18 110:4 120:2 121:17 134:7 137:19 145:22 155:16 173:22 175:10 194:21 199:8,13 206:16 207:8,14 210:15 215:12 218:21 222:18 223:4
**thanking** 13:12
**Thanks** 20:8 42:12 56:5 78:13 140:11 153:4 205:18 210:9 213:13 224:2
**thermocouple** 54:15 81:15
**thermocouples** 50:2,19 51:1,22 54:16 80:8 82:3
**thing** 7:16 8:8 21:10 44:19 45:21 46:13 59:16 82:4 94:11 103:12,14 117:4 124:17 126:11 137:21 159:18 166:10 185:3 199:19 205:20 214:4,18
**things** 10:19 21:2,8 23:5 29:5 40:16 47:2 48:4 51:9,14 79:4,8,17 80:9 83:16 84:14 95:8 100:2,15,17 106:7 111:17 118:6,15 120:10 124:11 127:11 128:9 129:2 130:7,12 133:7 144:11 165:14 175:20 184:18 212:6,8
**think** 7:8 13:18 14:19 15:8,16 16:6 18:14 19:8 21:1 22:11,12,16 22:20 23:1,16,19 24:1,2,2 30:5,19 32:17 33:1,21 34:4,14,19,21 40:5,18 41:10 45:18 46:14 48:10 48:15,17,19 49:9 49:22 50:5 51:14 53:6 55:9 58:13 61:4 63:5,17 71:1 76:3,18 77:5,11 77:20 78:4 81:1 82:22 83:15 86:2 86:19 87:15 88:17 89:5 92:3,20 93:5 93:18 94:6,18 95:13 96:16 97:7 98:11 99:15 100:18 101:9,13 101:14 103:1 104:11,13,17 105:6,7,16 106:13 108:11 109:12 113:18 114:18 118:10,20 121:1 123:9,16 125:1 126:12,14 127:16 128:15,22 129:10 131:8 134:18 135:5,7,20,22 136:9 137:22 138:7 139:21 140:19 141:19 142:17 143:3 145:6,9 151:3,20 152:3,7,10,13,16 152:21 153:6,12 154:11 155:2 156:8 161:9 167:8 169:18 170:7 173:20 175:19 176:3,8,12,14,21 177:15,21 178:9 178:20 179:5,12 179:16 180:21 181:12,19,22 183:2,5 185:5,15 185:21 186:8 187:1,4,9,16 188:2 189:1 190:1 190:19 191:3 192:6 194:15 199:19 200:13 201:12,16 203:7,8 203:14 205:4,14 205:15 207:4 208:14 209:2 210:3,6 211:6,11 213:6,9 216:2,13 218:11,20 219:13 221:4
**thinking** 28:14 29:2,4
**thinks** 119:10 135:2
**third** 14:8 60:21 126:5 131:20 184:6,7 218:2,14
**third-party** 14:8 70:10 87:7 102:11 104:22 113:15,16 125:10 126:6 160:20 173:5 199:6
**thought** 107:11 109:1 121:3 137:22
**thoughts** 63:20

163:21 175:5 203:6
**thousand** 128:19
**three** 43:3,14 74:9 130:2 178:16,16 196:17 208:14 222:1
**threshold** 160:13 177:14
**throw** 157:10 169:4 170:8 173:6 175:4 176:6
**tie** 138:9 149:16
**tight** 152:8
**tightening** 151:14 151:14,20 153:13
**tighter** 152:2,9 153:16 183:6,7
**time** 7:13,14,15 18:9 19:10 20:11 27:19 32:17,20 33:5,8,13,17,22 34:4,8,8 35:1,1 38:7 39:18 42:5 57:3,5 59:1,2,5 60:19,20 61:1,16 62:10,12,14,16 64:12 65:4 66:21 67:3,12 68:5,12 69:7,14 71:3 83:7 86:3,3,4 94:6 99:8 101:1 105:8,9,20 106:6 108:21 114:16 130:2,9,11 131:2,19 132:5,22 133:5,21 137:5,9 137:15 139:15 140:1,3,10 143:5 146:17 169:22 172:11 183:10 208:5 211:6 212:5 212:11 222:8,8,9 222:11 223:11
**timeframe** 210:1
**times** 6:20 39:17 40:7 55:12 64:2 105:10 110:14 126:13 131:14 172:3 221:22
**TIMOTHY** 3:4,12
**today** 6:12,20 12:17 13:13,20 14:17,20 15:12 16:20 20:5 21:11 21:14 34:11 58:9 68:14 94:14 96:19 101:4 104:12 106:14 108:1 126:20 127:15 129:3 134:21 161:20 176:7 190:13 201:12 207:17 212:7,9 218:22 223:7,9
**today's** 31:12
**told** 65:17
**tolerance** 151:15 153:1 209:7 210:4
**tool** 124:15 130:15
**top** 148:21 164:3,4 174:4 202:1 206:5 206:8,12,22
**topic** 62:11 88:15 90:1,6 96:16 145:10 179:18
**top-load** 167:3
**top-loaders** 174:12
**top-loading** 193:19 202:2
**tossed** 68:15 206:4
**totally** 175:4
**to-do's** 7:3
**traces** 79:4
**transcript** 7:12
**transient** 137:11 157:6,10 208:19
**transition** 195:8
**transported** 130:8
**travel** 159:12
**travels** 224:1
**treat** 172:14
**treated** 24:8 38:4
**tree** 74:6,20 75:7
**trees** 73:16
**TREMEL** 3:16
**tried** 8:12 54:21 123:9
**triple** 220:7
**trouble** 103:20
**troublesome** 202:3
**TROY** 3:13
**true** 143:12
**truly** 170:9 205:6
**try** 7:18,22 38:3 74:1,4,7,11 77:19 95:14,21 103:7,12 105:12,14 107:4,5 115:8 120:9 132:21 133:6 134:5 149:5 162:19,20 164:15 165:13 176:21 192:12 204:18 211:7 219:12
**trying** 30:8,14 35:20 55:10 59:13 64:19 75:20 98:7 111:21 116:14 132:12 164:12 167:20 184:15,19 186:10 206:14 214:20
**tunnel** 170:19
**turn** 73:5 99:20 159:15 173:12
**turning** 31:22 135:10
**turns** 203:1
**twenty** 138:22 139:7 140:7
**two** 26:18 63:8 73:18 74:7 111:15 122:1 130:17,19 131:7 137:10,15 138:21 142:7 157:15 195:22 196:16 209:3 212:9 222:1
**two-second** 157:4 208:18 210:13
**two-way** 7:19 8:9
**type** 16:17 23:12 44:19 61:4 88:20 131:6 136:11 166:19 167:11 172:22 176:5
**types** 15:6 40:16 45:4 68:11 94:9 165:4 166:20 171:2 204:3
**typical** 171:10
**typically** 98:13 145:20 206:7
**t'd** 201:12

**U**

**UCL/LCL** 40:16
**UL** 2:17 3:15,16 75:1,17 122:16 150:11 174:2 193:3 195:2,10 210:11
**unavailability** 102:12
**unbalance** 165:17 201:22
**unbalanced** 17:15 160:10 161:4 162:10,19 163:2 165:21 166:14,18 167:1 168:13 174:6 177:10 178:5
**unclear** 19:11 216:14
**underscore** 105:7 105:16
**understand** 22:6 44:21 47:10,15 51:10 55:10 57:1 70:15 75:20 77:4 80:10 82:5 84:11 106:10,11 132:13 154:9 167:21 172:15 175:21 184:16,19 196:9 196:22 198:10,19 201:13 203:15 214:14,20 223:19
**understanding** 14:1 96:6 117:13 132:3 142:18 170:18 185:16
**understood** 46:17 110:2 187:15
**Underwriters** 9:20
**Unfortunately** 126:12
**uniform** 32:22 101:8 142:22 161:10 175:15 184:16
**uniformity** 127:13
**uniformly** 70:1 72:1 142:14 190:14
**unique** 17:22 177:19 189:9 190:5
**unit** 4:17 18:7 39:16,16 40:6,12 40:12 45:6,7,8 48:12,18 49:12,14 49:19 51:10 53:5 54:4 55:13 57:19 57:21 58:4,11 59:2 60:12 61:4 61:11,18,19,21 62:1 69:5 70:4,5 70:12 72:7,15 73:16,17,19,20,21 74:2,8,17 81:17 87:13 91:10,13 92:9 116:5 117:20 138:19 139:2 154:6 168:11 177:6,10,21 178:6 178:21 198:9,12 199:1,4 221:7,8
**units** 36:22 40:6 48:21 52:1,5,9 55:12,19 64:11,21 67:7,19 69:5 70:4 72:16 73:17 80:6 117:5 163:6

165:19 170:20 172:7 177:12 204:8 217:17 222:5
**unit-by** 39:15
**unit-by-unit** 36:20
**unit-under** 51:3
**uni-dose** 97:2
**unmuting** 8:1 53:11
**unusual** 69:9
**update** 30:4,22
**updated** 194:11
**updating** 74:15 194:16
**upfront** 103:18
**upper** 5:10 141:10 145:3
**up-to** 67:19,20
**USA** 3:10
**usable** 192:14,19 194:2,12
**usage** 62:22 94:22 95:7 109:16 110:3 119:16 122:6 200:3,12
**usages** 121:20 122:1
**use** 37:8 50:18 53:7 56:10,11 66:18 70:3 72:22 74:6 79:3 90:20 94:8 95:4 96:18 97:1 97:15 101:15 111:21 124:10 127:5 133:3 136:6 136:7 164:14,22 168:4,5,6 171:14 173:16 175:9 180:7 188:16 195:13,20 197:5 200:5 202:12,21 204:5 213:4
**used/allowed** 109:20
**useful** 87:11 124:16 193:21 194:6 215:16
**user** 163:8 166:3
**uses** 107:13 168:11 209:20
**use-and-care** 91:12 97:16 98:7 120:11 163:8
**usually** 120:11 174:8
**utensils** 127:8
**U.S** 1:1

**V**

**vague** 107:22
**Vaidhyanathan** 2:16 9:16,17
**valid** 151:16
**validation** 171:3
**value** 16:2,8 25:1,4 25:5 39:18 60:22 153:8
**values** 39:20 77:16 153:11,13
**valve** 137:5 139:6,7 139:13,16 208:2 208:17
**variabilities** 152:14
**variability** 18:6 182:2 183:9 221:9
**variability/interp...** 186:17
**variable** 33:7 213:11
**variance** 203:17
**variances** 43:10
**variation** 19:1,2 80:1 112:21 114:4 114:5,7 127:21 128:9 129:1,8 130:17 142:11 149:17 185:18 219:11
**variations** 63:13
**varies** 61:4 144:6 199:5 201:19
**variety** 31:8 68:14 99:15
**various** 119:19 121:4
**vary** 64:2 149:9
**varying** 90:15 113:21 143:12 150:14 152:2
**verbally** 135:3
**verbiage** 24:17
**verification** 14:8 27:14 70:9 87:8 91:4 93:19 113:15 143:19 168:16 173:14 181:20 182:14 183:19 190:22 205:5 209:20 213:1,5 218:10 219:8 220:17 222:2
**verification-tested** 222:10
**verify** 188:3
**versa** 46:9
**version** 4:11 18:21 29:19,20,21 30:1 30:8 147:9,10 148:11 155:5,8 161:16
**versions** 29:12 148:6
**versus** 66:14 98:6 114:14 127:6 168:19 173:7 185:15 196:8 205:22 206:4
**vice** 46:9
**video** 124:7,9 125:16 126:13 127:17 128:19 130:14 131:22 132:1,6,9 134:4 202:18
**view** 124:2 177:15 204:2
**Viking** 3:16 121:15
**Vince** 9:12 24:14 42:2 69:11 150:1
**VINCENT** 2:18
**visible** 28:18
**visited** 133:8
**visits** 127:18 181:20 205:6
**visual** 123:20
**Vokes** 2:5 12:5,6 24:3,3 26:2 27:22
**volume** 5:3,16 17:3 17:16,22 59:14,15 92:21 93:4 98:21 179:17,20 187:2 188:1,14 189:9,15 189:19,20 192:1,5 192:17,20 193:18 197:12,16,19 199:3,10
**volumes** 172:11 188:8 220:2
**volume-measuring** 188:4
**voluntarily** 209:15 220:15
**voluntary** 76:16
**volunteer** 13:9 207:3
**volunteered** 209:18
**volunteering** 200:12
**vote** 158:3

**W**

**wait** 61:17 193:7
**waiting** 62:2
**waiver** 105:19
**walk** 15:13 85:9
**walking** 85:8 215:5
**wall** 4:17 45:9 52:22
**want** 7:20 12:14,16 23:1 24:18 25:4 25:18,20,21 27:1 33:7,12 34:21,21 42:20 43:2 44:4 44:15 45:1 47:15 49:16 54:5 55:10 59:12 60:8,9 75:10 76:5 77:19 78:7 82:15 86:5 109:13 123:6,8 126:7,11 127:14 137:14,21 138:6 139:17 145:7,14 146:4 156:6 157:21 158:1,4 172:13 173:13 174:21 175:11,19 188:19 191:10 193:6,8 201:17 206:1 213:19 214:12 218:3,21 221:11
**wanted** 13:11 28:3 53:16 94:13 95:17 97:14 111:8 118:14 122:17 129:20 134:13 161:20 167:2 177:2 183:19 187:19 198:15 218:8
**wants** 8:14 13:8 43:2 44:6 126:21 132:19 207:3
**wash** 95:5 120:18 163:22 178:10 179:2 192:11
**washer** 158:2
**washers** 1:4 5:14 6:16 10:19 17:13 41:4 157:22 158:10 159:8,14 165:9 167:4 187:8 193:13,16 219:21
**washing** 88:22 172:6 174:5 184:1 192:21 211:3
**Washington** 1:11
**wash-and-dry** 88:20
**wasn't** 29:2 51:2
**watch** 118:13 119:13
**water** 4:19 5:8,11 5:19 18:8 55:1,11

56:3,8,17,19,21 57:2,11,12,13 59:1,7,8,14,14,20 60:1,2,5,7,9,10,12 61:9,15,22 62:3,6 94:22 95:21 109:9 109:16 110:3 111:20 114:14 118:9 119:16 121:20 122:1,6 133:13 135:8,13 136:15,19 138:19 139:1 140:13 141:14 145:1,9 146:4,7,9,22 147:20 148:7 149:5,6,8,20 150:3,5,14,16 164:3,13,22 167:8 167:8 168:4,18 170:20 172:10 174:16 187:22 188:8 198:8 206:11 207:12,19 208:9,16 210:12 211:4,4 219:21 221:5
**WATSON** 3:13
**wattage** 119:15
**watts** 51:12
**way** 7:21 10:11 16:11 19:8,12,16 24:8,13 30:21 38:4 48:7 51:5 54:4 63:14 72:10 73:15 78:1 79:22 83:9 84:18,20,20 87:6 105:4 108:1 114:1 115:4 117:8 117:16 123:22 124:4,5,11 125:13 125:14 126:14 142:22 144:2 149:10 154:21 155:3 161:10,10 161:21 165:3 171:7 176:21 185:2,20 190:16 191:2 206:5,19 207:5,6 212:7 216:18
**Wayne** 2:8,18 3:14 11:13,18 72:3 77:2,3 88:13 96:15 102:21 108:22 113:17 119:12 137:20 144:18 148:20 149:1 153:5 199:14 200:15 201:9 206:17 207:13 209:16 210:18 213:3 214:3 217:2
**Wayne's** 205:13
**ways** 79:2 170:17 173:5 176:17 191:4
**wear** 55:17 63:1 65:5
**wear-in** 64:4
**webinar** 7:17,20 8:7,8 44:6 98:11
**website** 7:12 16:15 31:7,20 102:8
**weekend** 159:11 224:1
**weeks** 196:16,17
**weigh** 215:5
**weight** 17:21 187:22 188:9,13
**welcome** 6:12 7:17 54:11 88:9 134:8 152:19 156:9 159:4 200:9
**went** 83:21,21 158:12,12 167:10
**weren't** 46:2
**WES** 3:3
**WESTPHALEN** 3:12 65:12 66:1,5 66:8
**Whirlpool** 2:18,18 2:19 9:13 11:12 11:13 24:15 42:3 69:12 88:13 92:16 96:15 108:22 110:18 111:11 112:9 113:17 116:21 119:12 129:20 137:20 144:18 153:5 155:17 171:17 176:1,14 179:4 181:15 184:10 193:1 196:11 205:2 212:19
**Whirlpool's** 111:14
**whowants** 44:3
**widen** 152:6
**WILBAND** 3:9
**WILLIAMS** 3:7
**willing** 80:14 156:10 173:13 202:17 203:7 217:14 218:6,20
**window** 45:12 48:1
**wire** 82:4
**wish** 20:6 43:19
**withdraw** 196:2
**witness** 54:6
**witnessed** 15:1 133:12,21
**witnessing** 126:16
**wonder** 42:8
**wondering** 66:13 118:20 148:15 193:6
**WOODCOCK** 3:8
**WOODFORD** 3:2
**word** 145:7
**wording** 14:21 90:2 109:18 161:15
**words** 47:19 68:3 69:17 111:4 124:12 128:18,19 132:2
**work** 6:6 8:10 10:17,21 18:14 57:18 72:18 76:13 95:14 105:12,13 106:2 107:5 116:21 127:12 131:2 141:21 142:4 149:3 153:3 155:14 161:18 176:3 191:10 200:17,20
**worked** 134:2
**working** 18:16 23:21 24:1 61:13 103:21 104:16 106:19 110:15 130:3 165:2 223:7
**Works** 149:5
**workshop** 219:1
**worth** 128:19,20
**worthwhile** 114:8 188:2
**wouldn't** 34:21 35:14 47:18 65:5 79:9 82:1 86:5 168:1,1 184:13 213:21
**Wow** 20:14 144:17
**wrap** 186:17
**write** 115:12
**writing** 91:17 222:13
**written** 40:10 86:15 93:9,21 94:13 108:17 130:13 136:21 137:17 147:4
**wrong** 122:8 161:11
**Wuesthoff** 53:12 53:13,15 54:11
**WUESTOFF** 3:6

**X**

**X** 59:5,10 64:21

**Y**

**year** 16:4,5,9 28:14 30:1 69:4 184:5 212:4 220:7
**years** 30:11,20 67:10 165:15,15 180:22,22 181:1 181:22 184:12 208:14 212:9 222:1,6
**yesterday** 8:12 195:16 197:7
**YOOLANDA** 3:7
**YouTube** 124:7,8 125:16

**Z**

**zero** 63:4 148:7,8 150:1
**zone** 75:13

**1**

**1** 1:6 87:15
**1.1.5** 109:6
**1:33** 159:2
**1:44** 224:3
**10** 215:14
**10-minute** 158:6
**10:24** 83:21
**10:47** 83:22
**100** 5:4 114:15 185:14
**100-degree** 60:9
**1000** 1:10
**108** 5:5
**12:08** 158:12
**12:33** 158:13
**124** 5:6
**13** 4:5,6
**135** 5:7
**138** 5:8
**14** 136:15 157:2
**142** 5:9
**143** 5:10
**147** 5:11
**15** 83:19
**15-minute** 83:8 158:7
**152** 5:12
**156** 5:13
**158** 5:8
**16** 51:6,18 66:19 141:9
**160** 5:14

**161** 5:15
**180** 5:16
**1992** 147:1,9 148:6 156:1

**2**

**2** 55:4 87:15,18 133:17 142:10 180:6
**2.6.3.2** 89:3
**20** 66:14,22 67:19 68:2,5 70:3 119:2 141:6 158:8,9
**200** 5:17 177:11
**2009** 146:14 147:9 148:6,10 149:4 155:8 156:1
**2010** 5:2 85:4,19
**2012** 1:6
**2015** 197:9,10
**202** 5:18
**208** 5:19
**211** 5:20
**216** 5:21
**22** 4:8,9
**24** 55:20 56:2 62:21 63:14,15,16,17 64:5 66:12,13 69:9
**25** 158:8
**2500** 69:4,5
**26** 4:10
**29** 4:11

**3**

**3** 187:16
**3-dimensional** 78:5
**30** 34:10,15 212:7
**30-day** 32:20
**31** 4:13
**36** 4:14

**4**

**4** 138:5
**40** 69:2,2 70:17
**40-degree** 60:10
**41** 4:15
**43** 4:16
**430.23** 37:4
**44** 4:17
**45** 119:3

**5**

**5** 102:2 138:5
**5,000** 63:10
**5,000-mile** 63:7
**50** 168:11
**55** 4:19

**6**

**6** 4:2 199:16
**60456** 161:12
**63** 4:20

**7**

**7** 197:9
**70** 151:9 154:5
**72** 63:2,4,9,14
**73** 4:21
**75** 151:2,7,10 152:18,19,21 153:18 154:10

**8**

**8** 125:2
**8E-089** 1:10
**80** 151:9 154:5
**83** 4:22
**85** 5:1,2 148:7 150:1

**9**

**9** 4:4
**9:00** 1:11
**9:05** 6:2
**93** 5:3
**97.6** 41:15

C E R T I F I C A T E

This is to certify that the foregoing transcript

In the matter of: Room A/Cs, Dishwashers and Residential Clothes Washers

Before: US DOE

Date: 06-01-12

Place: Washington, DC

was duly recorded and accurately transcribed under my direction; further, that said transcript is a true and accurate record of the proceedings.

---
Court Reporter