6450-01-P

DEPARTMENT OF ENERGY

10 CFR Parts 429 and 430

Energy Conservation Program: Test Procedures for Cooking Products, Notification of Petition for Rulemaking

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Notification of petition for rulemaking; request for comment.

SUMMARY: On March 26, 2018, the Department of Energy (DOE) received a petition from the Association of Home Appliance Manufacturers (AHAM) to withdraw, and immediately stay the effectiveness of, the conventional cooking top test procedure. Through this notification, DOE seeks comment on the petition, as well as any data or information that could be used in DOE's determination whether to proceed with the petition.

DATES: Written comments and information are requested on or before **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN *FEDERAL REGISTER*]**.

ADDRESSES: Interested persons are encouraged to submit comments, identified by "Test Procedure Cooking Products Petition," by any of the following methods:

Federal eRulemaking Portal: *http://www.regulations.gov*. Follow the instructions for submitting comments.

Email: CookProducts2018TP0004@ee.doe.gov. Include the docket number and/or RIN in the subject line of the message.

Mail: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, Mailstop EE-5B, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. If possible, please submit all items on a compact disc (CD), in which case it is not necessary to include printed copies.

Hand Delivery/Courier: Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, 950 L'Enfant Plaza, SW., Suite 600, Washington, D.C., 20024. Telephone: (202) 586-6636. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

Docket: For access to the docket to read background documents, or comments received, go to the Federal eRulemaking Portal at *http://www.regulations.gov*.

FOR FURTHER INFORMATION CONTACT: Celia Sher, U.S. Department of Energy, Office of the General Counsel, 1000 Independence Avenue, SW., Washington, DC 20585. E-mail: *Celia.Sher@hq.doe.gov*; (202) 287-6122.

SUPPLEMENTARY INFORMATION: The Administrative Procedure Act (APA), 5 U.S.C. 551 et seq., provides among other things, that "[e]ach agency shall give an interested person the right to petition for the issuance, amendment, or repeal of a rule." (5 U.S.C. 553(e)) DOE received a petition from AHAM, as described in this document and set forth verbatim below,[1] requesting that DOE reconsider its final rule on Test Procedures for Cooking Products, Docket No. EERE-2012-BT-TP-0013, RIN 1904-AC71, 81 FR 91418 (Dec. 16, 2016) (Final Rule). In promulgating this petition for public comment, DOE is seeking views on whether it should grant the petition and undertake a rulemaking to consider the proposal contained

[1] Attachments and data submitted by AHAM with its petition for rulemaking are available in the docket at http://www.regulations.gov/docket?D=EERE-2018-BT-TP-0004.

in the petition. By seeking comment on whether to grant this petition, DOE takes no position at this time regarding the merits of the suggested rulemaking or the assertions in AHAM's petition.

In its petition, AHAM requests that DOE undertake rulemaking to withdraw the cooking top test procedure, while maintaining the repeal of the oven test procedure that was part of the Final Rule. And, in the interim, AHAM seeks an immediate stay of the effectiveness of the Final Rule, including the requirement that manufacturers use the final test procedure to make energy related claims. Should DOE continue to pursue a revised cooking top test procedure, AHAM asserts that DOE should address repeatability and reproducibility and demonstrate, through round robin testing, that the test is repeatable and reproducible and, for gas cooking tops, accurate. AHAM claims that its analyses show that the test procedure is not representative for gas cooking tops and, for gas and electric cooking tops, has such a high level of variation it will not produce accurate results for certification or enforcement purposes and will not assist consumers in making purchasing decisions based on energy efficiency.

Although DOE welcomes comments on any aspect of the petition for reconsideration, DOE is particularly interested in receiving comments and views of interested parties concerning the following issues:

1) The repeatability and reproducibility of the test procedure for conventional electric and gas cooking tops. DOE previously presented results from round robin testing completed by the Department and by IEC in the docket of the test procedure rulemaking. DOE seeks comments on that data as well as the new data AHAM has supplied supporting its petition;

2) The accuracy of determining the simmer setting and turndown temperature;

3) The impact of heating element cycling during the initial heat-up phase of testing on the overall measured energy consumption of electric cooking tops, and the prevalence of such cycling in units available on the market.

4) The extent of any warpage which may have been observed at the bottom surface of test vessels during cooking top testing;

5) The impact of varying gas burner and grate systems on the representativeness of the water-heating test method for gas cooking tops;

6) The type of control system, heating element, and other product redesigns necessitated by changes in safety standards for electric cooking tops, and the impact of these new product designs on the repeatability, reproducibility, and representativeness of the electric cooking product test procedure;

7) Characteristics of a representative test sample for electric and gas cooking tops for use in any additional round robin testing to evaluate the applicability of the test procedure to the conventional cooking top market as a whole;

8) Information on how consumers cook differently on gas cooktops versus electric cooktops;

9) Information on how consumers use the simmer setting on a gas cooktop; and,

10) The test burden associated with the test procedure for conventional electric and gas cooking tops, including the ability of testing laboratories to meet the required ambient test conditions.

Submission of Comments

DOE invites all interested parties to submit in writing by **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]** comments and information regarding this petition.

Submitting comments via *http://www.regulations.gov*. The *http://www.regulations.gov* web page will require you to provide your name and contact information prior to submitting comments. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

However, your contact information will be publicly viewable if you include it in the comment or in any documents attached to your comment. Any information that you do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. Persons viewing comments will see only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

Do not submit to *http://www.regulations.gov* information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information (CBI)). Comments submitted through *http://www.regulations.gov* cannot be claimed as CBI. Comments received through the website will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section.

DOE processes submissions made through *http://www.regulations.gov* before posting. Normally, comments will be posted within a few days of being submitted. However, if large volumes of comments are being processed simultaneously, your comment may not be viewable for up to several weeks. Please keep the comment tracking number that *http://www.regulations.gov* provides after you have successfully uploaded your comment.

Submitting comments via hand delivery, or mail. Comments and documents via hand delivery or mail will also be posted to *http://www.regulations.gov*. If you do not want your personal contact information to be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information on a cover letter. Include your first and last names, email address, telephone number, and optional mailing address. The cover letter will not be publicly viewable as long as it does not include any comments.

Include contact information in your cover letter each time you submit comments, data, documents, and other information to DOE. If you submit via mail or hand delivery, please provide all items on a CD, if feasible. It is not necessary to submit printed copies. No facsimiles (faxes) will be accepted.

Comments, data, and other information submitted electronically should be provided in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format. Provide documents that are not secured, written in English and free of any defects or viruses. Documents should not include any special characters or any form of encryption and, if possible, they should carry the electronic signature of the author.

Campaign form letters. Please submit campaign form letters by the originating organization in batches of between 50 to 500 form letters per PDF or as one form letter with a list of supporters' names compiled into one or more PDFs. This reduces comment processing and posting time.

Confidential Business Information. According to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email, postal mail, or hand delivery two well-marked copies: one copy of the document marked confidential including all the information believed to be confidential, and one copy of the document marked non-confidential with the information believed to be confidential deleted. Submit these documents via email or on a CD, if feasible. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

Factors of interest to DOE when evaluating requests to treat submitted information as confidential include (1) a description of the items, (2) whether and why such items are customarily treated as confidential within the industry, (3) whether the information is generally known by or available from other sources, (4) whether the information has previously been made available to others without obligation concerning its confidentiality, (5) an explanation of the competitive injury to the submitting person which would result from public disclosure, (6) when such information might lost its confidential character due to the passage of time, and (7) why disclosure of the information would be contrary to the public interest.

It is DOE's policy that all comments may be included in the public docket, without change and as received, including any personal information provided in the comments (except information deemed to be exempt from public disclosure).

DOE considers public participation to be a very important part of its process for considering rulemaking petitions. DOE actively encourages the participation and interaction of the public during the comment period. Interactions with and between members of the public provide a balanced discussion of the issues and assist DOE in determining how to proceed with a petition. Anyone who wishes to be added to DOE mailing list to receive future notifications and information about this petition should contact Appliance and Equipment Standards Program staff at (202) 586-6636 or via e-mail at *CookProducts2018TP0004@ee.doe.gov*.

Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this notification of petition for rulemaking.

Signed in Washington, D.C. on April 18, 2018

Daniel Simmons
Principal Deputy Assistant Secretary
Energy Efficiency and Renewable Energy

Before the

UNITED STATES DEPARTMENT OF ENERGY

Office of Energy Efficiency and Renewable Energy

In the Matter of	)	
	)	
Energy Conservation Program:	)	Docket No. EERE-2012-BT-TP-0013
Test Procedures for Cooking Products	)	RIN 1904-AC71
	)	

PETITION FOR RECONSIDERATION

The Association of Home Appliance Manufacturers (AHAM) respectfully petitions the Department of Energy (DOE) for reconsideration of its final rule on Test Procedures for Cooking Products, Docket No. EERE-2012-BT-TP-0013 RIN 1904-AC71, 81 Fed. Reg. 91418 (Dec. 16, 2016) (Final Rule).

AHAM believes that, overall, the adoption of a water-boil test procedure for cooking products is the appropriate procedure. And we thank DOE for making changes to its earlier proposed test procedure which would have used a hybrid block after AHAM demonstrated the practical difficulties associated with that test. But DOE adopted a final cooktop test procedure

too hastily, especially in light of comments AHAM submitted that demonstrated the test's lack of repeatability and reproducibility and questioned the use of a test procedure meant for electric cooktops for gas cooktops. AHAM has evaluated the Final Rule and conducted additional testing on gas cooktops. Our analyses show that the test procedure is not representative for gas cooktops and, for gas and electric cooktops, has such a high level of variation it will not produce accurate results for certification or enforcement purposes and will not assist consumers in making purchasing decisions based on energy efficiency.

AHAM thus requests that DOE withdraw the cooktop test procedure. And, in the interim, we seek an immediate stay of the effectiveness, including the requirement that manufacturers use the final test procedure to make energy related claims, of the cooktop test procedure. Should DOE continue to pursue an improved cooktop test procedure, DOE should address repeatability and reproducibility and demonstrate, through round robin testing, that the test is repeatable and reproducible and, for gas cooktops, representative.

FACTS

DOE began revisions to the cooktop test procedure with a notice of proposed rulemaking on January 30, 2013 (January 2013 NOPR) in which DOE proposed amendments to Appendix I to subpart B of 10 C.F.R. part 430 (Appendix I) that would allow for the measuring of active mode energy consumption of induction cooking products. Specifically, DOE proposed to require the use of test equipment—hybrid test blocks comprised of an aluminum body and a stainless steel base—compatible with induction technology.

AHAM objected to DOE's proposed amendments to the test procedure because the amendments did not enhance the accuracy and/or representativeness of the test procedure. *See* AHAM Comments on DOE's Notice of Proposed Rulemaking on Test Procedures for Conventional Cooking Products With Induction Heating Technology (April 15, 2013). AHAM commented that any test procedure DOE adopts to measure induction heating technology must be both repeatable and reproducible. *Id.* AHAM cautioned that significant further study was necessary before DOE could adopt a test procedure that accurately measures induction cooktop energy efficiency. *Id.* More specifically, AHAM opposed the proposed test procedure because the proposal had a number of technical problems and ambiguities (e.g., ambiguous construction of hybrid test block); DOE's data did not clearly identify one method (test block versus water

heating) as being preferable to the other for induction units; and the proposed procedure would treat induction technology differently than other technologies, thereby penalizing it. *Id.* AHAM also questioned whether the test block method in general was representative of actual consumer use. *Id.*

In response to stakeholder comments, DOE published a supplemental notice of proposed rulemaking modifying its proposal. 79 Fed. Reg. 71894 (Dec. 3, 2014) (December 2014 SNOPR). DOE's modified proposal maintained a hybrid test block approach despite AHAM's comments. DOE proposed to add a layer of thermal grease between the stainless steel base and aluminum body of the hybrid test block to facilitate heat transfer between the two pieces, and DOE proposed additional test equipment for electric surface units with large diameters and gas cooking top burners with high input rates.

AHAM's comments on the December 2014 SNOPR raised serious concerns about the hybrid test blocks and the thermal grease. *See* AHAM Comments on DOE's Supplemental Notice of Proposed Rulemaking on Test Procedures for Conventional Cooking Products (Feb. 2, 2015). AHAM also raised questions about the testing of flexible cooking zone areas, testing units with flexible concentric burner sizes, and the use of the smallest dimension of a noncircular electric surface unit to determine block size. *Id.*

Based on comments it received in response to the December 2014 SNOPR and a series of manufacturer interviews DOE conducted in February and March 2015, DOE subsequently withdrew its proposal for testing conventional cooktops with a hybrid test block in yet another supplemental notice of proposed rulemaking. 81 Fed. Reg. 57374 (Aug. 22, 2016) (August 2016 SNOPR). In the August 2016 SNOPR, DOE instead proposed to modify its procedure to incorporate by reference the relevant sections of EN 60350-2:2013 "Household electric cooking

appliances Part 2: Hobs – Methods for measuring performance," which uses a water-heating test method to measure energy consumption of electric cooktops. Despite the fact that the EN test procedure DOE cited applies only to electric cooktops, DOE also proposed to extend that method to gas cooktops.

AHAM generally agreed and continues to agree with DOE that the best test method for cooktops is a water boil test and supported DOE's abandoning of the hybrid test block method. *See* AHAM Comments on DOE's SNOPR on Test Procedures for Cooking Products (Sept. 21, 2016). Nevertheless, AHAM commented extensively on potential sources of variation with DOE's proposed procedure that needed to be resolved before DOE finalized a cooktop test procedure. *Id.*

Prior to DOE proposing a water-heating test, AHAM conducted a round robin based on the Second Edition of IEC 60350-2 (2015), Household Electric Cooking Appliances – Part 2: Hobs – Methods for Measuring Performance. *Id.* The AHAM round robin consisted of four units encompassing a different combination of controls and heating elements. *Id.* AHAM assessed radiant, coil, and induction heating elements as well as infinite and step controls. Participating labs performed at least three full tests on the three electric technologies. The results demonstrated that the procedure was not reproducible from lab to lab. AHAM data demonstrated significant variation in the proposed test procedure—coefficients of variation of *9.2* percent for electric radiant cooktops, 7.1 percent for electric coil cooktops, and 8.4 percent for induction cooktops. *Id.*

Based on that testing, AHAM commented that a significant amount of work remained to be done to finalize a test and to demonstrate that the final test is repeatable and reproducible. *Id.* Specifically, AHAM listed a number of items that needed to be resolved, including several

potential sources of test procedure variation, before DOE could finalize the test procedure, and requested that DOE issue a notice of data availability or supplemental notice of proposed rulemaking to provide stakeholders with an opportunity to comment:

- Lack of a tolerance on staying "as close as possible" to 90° C;
- Variability in energy consumption during the simmering phase;
- Variability in determining the turn down temperature;
- Variability in determining the turn down setting;
- Unit cycling;
- Specifying a temperature sensor for measuring the water temperature;
- A proposal to use a moving average for calculating the final result;
- Limited suppliers of test pots;
- No tool or tolerance specified for cooktop diameter measurement;
- Test pots do not accommodate all grate designs;
- Difficulty with placement of pots on gas cooktops;
- Impact of gas burner system, geometry, spacing, and grates on repeatability and reproducibility;
- Impact of using the electric test pots on gas cooktops; and
- Overshoot temperature of the water can reach beyond 90° C for some gas cooktops. *Id.*

AHAM also requested that DOE indicate how the changes to the test procedure would impact the proposed standards and allow stakeholders additional time to comment on those proposed standards based on the test procedure changes. *Id.*

In response to AHAM's comments, DOE sent AHAM a request for data on September 27, 2016. That data request was voluminous and overlapped with the comment period on the proposed standards for cooking products—which ended on November 2, 2016—and DOE proposed in parallel with the August 2016 SNOPR. *See* Energy Conservation Program: Energy Conservation Standards for Residential Conventional Cooking Products, Supplemental Notice of Proposed Rulemaking; 81 Fed Reg. 60784 (Sept. 2, 2016). Nevertheless, AHAM worked to answer DOE's questions and, on November 23, 2016, filed a detailed response, including a significant amount of raw data DOE requested which AHAM submitted to Navigant Consulting

under a confidentiality agreement. *See* AHAM Comments on DOE's SNOPR on Test Procedures for Cooking Products (dated Nov. 22, 2016).[1] AHAM informed DOE in advance that it would be submitting the response. Despite having asked for that data and having been informed AHAM would be providing it, DOE issued a final test procedure on that same day, November 23, 2016, which it published on December 16, 2016.

The Final Rule adopted DOE's proposed test procedure with some changes DOE believed would improve repeatability and reproducibility. In support of the final test procedure, DOE conducted additional testing. DOE conducted testing of five electric cooktops incorporating different heating technologies and control types. For each unit, DOE conducted testing on surface units capturing a range of heating element sizes. DOE conducted two to three tests per surface unit. For each individual test, DOE performed the full surface unit test method, including the preliminary test required to determine the turndown temperature and simmering setting for a given surface unit. DOE varied test operators for surface unit tests, but did not conduct testing in different laboratories. In addition, DOE included test results from previous tests of these units conducted in support of the August 2016 SNOPR. DOE relied on that minimal data to determine that the final test procedure, finalized only two months after DOE received voluminous comments from AHAM concerning a lack of repeatability and reproducibility as demonstrated through 27 tests on three units at three different laboratories.

ARGUMENT

The Energy Policy and Conservation Act of 1975, as amended (EPCA) requires that test procedures be reasonably designed to produce test results which measure energy efficiency, energy use, or estimated annual operating cost of a covered product during a representative

[1] We hereby incorporate into this petition by reference all data AHAM submitted to DOE and Navigant as part of the test procedure rulemaking.

average use cycle and shall not be unduly burdensome to conduct. 42 U.S.C. § 6293(b)(3). This requirement is meaningless if the test procedure is not repeatable and reproducible—only a repeatable and reproducible test procedure can produce accurate results that DOE can rely on for certification and verification purposes and that consumers can rely on to compare energy use or efficiency across products.

AHAM appreciates that DOE made changes from the August 2016 SNOPR to the Final Rule in an attempt to address AHAM's September 21, 2016 comments. AHAM also appreciates that DOE conducted additional testing to further assess the proposed and final test procedure. But DOE did not take the time or do the work necessary to finalize a test procedure that fully or satisfactorily addresses the significant issues AHAM raised in its comments or the data AHAM provided in response to DOE's request. This is further demonstrated based on additional testing and analysis AHAM conducted after the Final Rule was published.

DOE did not support the Final Rule with sufficient data to demonstrate that it is accurate, repeatable, and reproducible. More specifically, as discussed more fully below:

- DOE has not demonstrated that the test procedure is representative for gas products. DOE did not demonstrate that its deviation from the international approach—testing gas cooktops using a different procedure than is used for testing electric cooktops—was warranted or would produce accurate, representative results. And DOE tested only a small sample that cannot be representative of the many different types of gas models on the market and the result is that the test may not adequately address the different systems available to consumers. Thus, DOE has not demonstrated that the test procedure is representative or accurate for gas products.

- DOE's testing of electric and gas cooktops was insufficient to evaluate repeatability and reproducibility and, thus, DOE's conclusions are based on results with a low confidence level which is highlighted by AHAM's conflicting results. Accordingly, DOE did not produce sufficient evidence to demonstrate that its test procedure is supported by data.

- Although DOE tried to address variation by requiring recording of the simmering setting selection, AHAM's testing demonstrates that that requirement does not in fact reduce variation.
- Although DOE attempted to clarify when the simmering period starts, DOE's clarification does not adequately reduce variation.
- DOE improperly dismissed unit cycling's contribution to variation.
- DOE did not account for the fact that electric coil cooktops are currently undergoing significant redesign to comply with voluntary safety standards. It is possible that the new products will not respond the same way to the test.
- DOE did not investigate the impact of pan warpage on test results. Initial data from a study done for AHAM shows pan warpage will contribute to variation.
- Based on data from a round robin AHAM conducted with gas cooktops, the test procedure is not repeatable or reproducible for gas cooktops. Within unit and between unit variation also contributes to the total variation and DOE has not accounted for it.

In addition, the test procedure is unduly burdensome to conduct. Based on AHAM's experience to date, it takes on average 20 hours to conduct a single test on a four burner cooktop and requires the testing of every single burner or element individually. And, because the test requires the technician to determine the turn-down temperature before every test and the ambient conditions are quite tight, several runs are often required before a valid run can be achieved. Our testing, which is described more fully below, found that some tests took upward of five days for a single cooktop. Moreover, the test cost is much higher than DOE concluded in its Final Rule on both an up-front and ongoing basis.

Because the final test procedure may not be representative for gas products and is not repeatable or reproducible for either gas or electric cooktops, it does not accurately measure cooktop energy efficiency and will not allow consumers to compare products on that basis. Thus, because the test is also unduly burdensome to conduct, the cooktop test procedure as a

whole does not meet EPCA's statutory requirement that test procedures be reasonably designed to produce representative results and are not unduly burdensome to conduct. Moreover, because DOE did not support the conclusions in the Final Rule with sufficient data, DOE's Final Rule could be determined to be arbitrary and capricious. Accordingly, AHAM respectfully requests that DOE withdraw the Final Rule amending the cooktop test procedure. And, in the interim, we seek an immediate stay of the effectiveness, including the requirement that manufacturers use the final test procedure to make energy related claims, of the Final Rule. To be clear, AHAM is not seeking reconsideration regarding DOE's decision to repeal the oven test procedure.

I. DOE Has Not Demonstrated That The Test Procedure Is Representative for Gas Cooktops.

In the August 2016 SNOPR, DOE proposed to extend the electric test procedure in EN 60350-2:2013 "Household electric cooking appliances Part 2: Hobs – Methods for measuring performance" to gas cooktops. AHAM commented in its September 21, 2016 comments that there is no consumer data on the consumer representativeness of that method for gas cooktops. AHAM noted that DOE's proposal, and now Final Rule, is not harmonized with the European approach, which uses a different test procedure and different test pots to test gas cooktops. DOE's methodology is also different than ASTM F152, "Standard Test Methods for Performance of Range Tops," which DOE reviewed during the test procedure rulemaking and is used by the commercial range industry. DOE dismissed ASTM F1521 because of the BTU range for commercial range tops, and AHAM is not arguing that it is the appropriate procedure for residential products. But the science behind the test setup in ASTM is similar to the EN gas test procedure which demonstrates that the basic methodology for testing gas products is well established.

Accordingly, no manufacturer or third party test laboratory—in the U.S., Europe, or elsewhere in the world—had experience with DOE's proposed test procedure for gas cooktops other than DOE's minimal testing in one laboratory prior to the publishing of the Final Rule. Thus, neither DOE nor manufacturers have knowledge of whether this test will be representative for gas products. Accordingly, DOE does not have the necessary data to justify the use of this method on gas cooktops in the United States, especially in light of the fact that Europe uses a different approach.

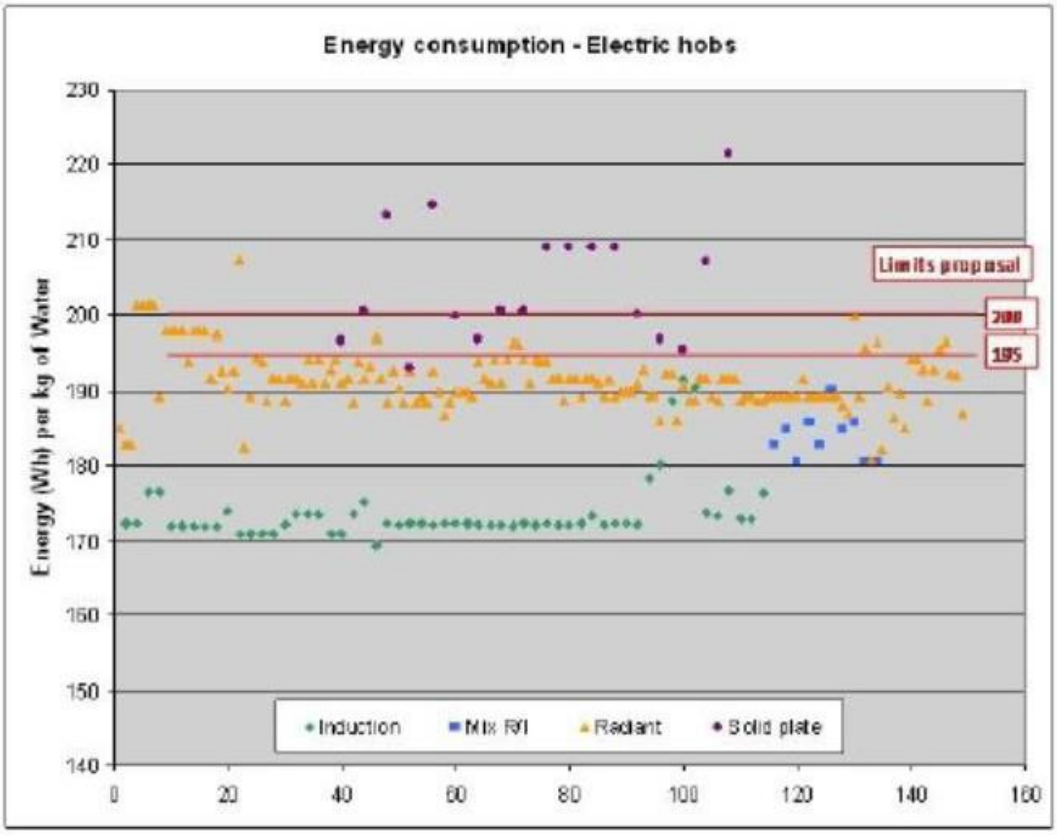
In fact, AHAM believes that the evidence supports the opposite conclusion—i.e., that the cooktop test procedure is not representative for gas cooktops. The EN and ASTM standards use a different test procedure for gas cooktops and do so for good reason. Unlike electric cooktops, gas cooktops utilize a system approach—every component and design choice is connected to other components and design choices and they work together. The cooking heat out to the pot depends on the design of the burner, flow of gas, mass of the grate, and height of the grate from the burner.

Gas testing is a science, and DOE did not do sufficient study to determine whether the electric test procedure it adopted would measure representative results for gas cooktops:

1. First, the purpose behind EN 60350-2:2013 was to establish a test to determine <u>minimum</u> energy for electric cooktops. The reason that the working group that developed the test decided to assess simmer for electric cooktops was to show the distinction in energy use between the different electric technologies, i.e. induction, radiant. For electric cooktops, technology has an impact on how much energy is used to get to boil and also how much energy it uses to keep a simmer temperature. Thus, some technologies may appear to be

more or less efficient if just a time to boil was assessed. For electric, the simmer portion of the test is needed to accurately show the cooktop's energy use and to allow comparison across the product types. Figure 1 below shows how the test distinguishes between electric technologies.[2]

Figure 1: CECED Test Results For Electric Cooktops



2. In an attempt to keep one test method, DOE extended this electric method to gas cooktops. AHAM appreciates the attempt to reduce the number of test methods. But, in this case, there is no reason to use one type of test. There are not different types of gas technologies and so a simmer period is not needed to differentiate between technologies

[2] CECED, 2012.

as it is in electric. The significant added burden of including the simmer setting (and the variation it introduces) is not likely balanced by a benefit in terms of energy savings.

In addition, most consumers likely replace their cooktops with the same fuel that is already in their home. Based on a 2010 study conducted for AHAM, the vast majority of consumers surveyed replaced their cooktops and ranges with a similar unit. According to the study, nearly nine in ten households that bought a freestanding single oven range did a direct replacement. Homeowners were even more likely to do a direct replacement of this type of appliance, at 94 percent.[3] So, it is unlikely that consumers are comparing gas and electric products.

3. The best comparison for comparing gas cooktops to other gas cooktops would be based on a simple bring to boil test, which is what Europe and the ASTM methods both use. DOE is the first to reinvent the wheel and require gas and electric cooktops to be tested in the same way.
4. On a gas unit, there is very little overshoot which means there is no retained heat. Electric cooktops, on the other hand, often have a significant amount of retained heat. A gas cooktop's ability to maintain simmer in the absence of retained heat is largely a function of grate to burner relationships, burner design, valve design, and pan position. This relationship is not accounted for in the electric cooktop test because it does not need to be. But it does need to be addressed in a test applicable to gas cooktops.
5. More so than electric elements, gas burners are designed for a specific cooking purpose. For example:

[3] Bellomy Research for AHAM, 2010 Major Appliance Consumer Research Survey, Cooking Appliances (2010).

a. Small or semi-rapid burners are typically used for simmering. This simmering performance is developed for melting chocolate and fine sauces, not keeping water simmering.

b. Ultra rapid or rapid burners are designed to reduce time to boil, or for frying. Often flame stability suffers at low rates, making simmering results poor.

c. Other high input burners are designed for rapid cooking (i.e. Wok) and are not designed for simmering.

Each of these burner types have been optimized in design to serve a particular cooking function for consumers. Thus, it may not make sense to apply a water boil test to all of them. For example, a consumer would not likely boil water on the small/semi-rapid burner that is meant to be used for melting chocolate or cooking fine sauces—the time to boil on such a burner would be extremely long, perhaps 40 minutes. In addition to not being representative, the test will drive significant variation in the assessment because DOE did not address this in the test procedure. DOE did, however, address this issue for electric cooktops—the test procedure removes certain burners from assessment.

6. Additionally, because DOE extended a test meant for electric cooktops to gas cooktops, the test does not require preheating of the gas burner. A gas system will change rates and how it performs as it warms. The European test for gas products has a 10 minute preheat because the working group that developed that test found that preheating improved the representativeness of the test results as well as repeatability and reproducibility. The ASTM test has a 30 minute stabilization period at 50 percent heat for the same reason. Thus, DOE's failure to include preheating in the gas test ignores the wisdom generated by other groups' extensive testing and experience and likely contributes to the high degree of variation we describe below.

7. The pots specified by the European electric test are different than the pots used in the European gas cooktop test. The gas pots are Aluminum test pans having a matt base and polished walls—that material is of the highest level of conduction. The electric test pans are a very thick stainless steel plate (6 mm) with thin stainless walls (1 mm) that are joined by a heat resistant glue. The pan construction is significantly different which will have an impact on heat transfer from the burner to the pan. The pot spacing of the large flat corner pans designed for electric cooktops will perform differently with the gas burners compared to the EN specified Aluminum pots and will not drive representative results. A gas flame heats a pot differently and this should be accounted for in the test.

DOE did not assess a sufficient variety of gas cooktop designs to conclude that the test procedure it adopted is representative for gas products, especially in light of Europe's use of a different procedure for residential gas products. As highlighted above, the residual heat loss of a gas burner on simmer is significantly different than simmer on electric unit where the electric unit retains heat from the cooktop. DOE also has specified stainless steel pans whereas the European procedure for gas cooktops uses Aluminum, which has a higher level of conduction. The pan construction is also different which will have an impact on heat transfer from the burner to the pan.

AHAM has not been the only commenter to question the representativeness of extending the European electric test procedure to gas cooktops. During the test procedure rulemaking, Southern California Gas Company, San Diego Gas and Electric, and Southern California Edison (collectively, the Southern California investor-owned utilities (SoCal IOUs)) commented that DOE should conduct a sensitivity analysis of the impact of ambient temperature

and pressure conditions on the test results for gas and electric cooking products in order to ensure consistent test results across various regions, climates, and altitudes. In addition, the SoCal IOUs commented that validating the ambient condition requirements would address the impact of the proposed correction to the gas heating value to standard temperature and pressure conditions. DOE responded only that it incorporated the ambient air pressure and temperature conditions specified in EN 60350-2:2013 and thus believed that the results "should not" be impacted by tests being conducted in different locations. [4] But DOE did not do any additional testing to determine if that is in fact the case and, as discussed below in Section II, AHAM's testing demonstrates reproducibility issues which could be attributed, in part, to these differences. Moreover, efficiency for a gas cooktop depends heavily on the external environment, much more so than for electric products. Simmering is, thus, not the right parameter to measure the ability to keep the control in this technology. That is yet another reason why the European gas test does not include the simmer setting—it will be variable and inaccurate.

In addition, the U.S. market consists of a wide array of grate and burner offerings to consumers and DOE did not sufficiently assess those offerings in developing the test procedure. DOE itself acknowledged 283 gas configurations.[5] Yet DOE tested only five units. The varying designs available to consumers, most of which DOE did not assess, have offerings of a sealed/unsealed burner, stacked burner, different burner shapes, a range of grate weight and shape, and different grate materials. DOE has not shown that the test procedure is repeatable and reproducible for the different designs on the marketplace. For DOE to conclude these issues do not exist simply because it did not observe them in its small test sample is illogical. DOE made

[4] *See* Final Rule, 81 Fed. Reg. 91418, 91434 (Dec. 16, 2016).

[5] *Id.* At 91438 ("DOE surveyed 335 electric cooking tops and 283 gas cooking tops available on the market in the United States.")

assumptions that are not supported by sufficient data and are in direct conflict with the technical support for the European gas test and ASTM standard which drove those procedures to have a pre-heat requirement, to exclude a simmer assessment, and to use specifically constructed Aluminum pans. Until and unless DOE can demonstrate that data show the cooktop test procedure is representative of actual U.S. consumer use of gas cooktops and will deliver accurate results, DOE should withdraw the test procedure. Keeping it in place will very likely result in inaccurate information to consumers and is contrary to EPCA's and the Administrative Procedure Act's requirements.

II. DOE Has Not Demonstrated That The Test Procedure Is Repeatable or Reproducible For Gas Cooktops.

A. Lab to Lab Variation

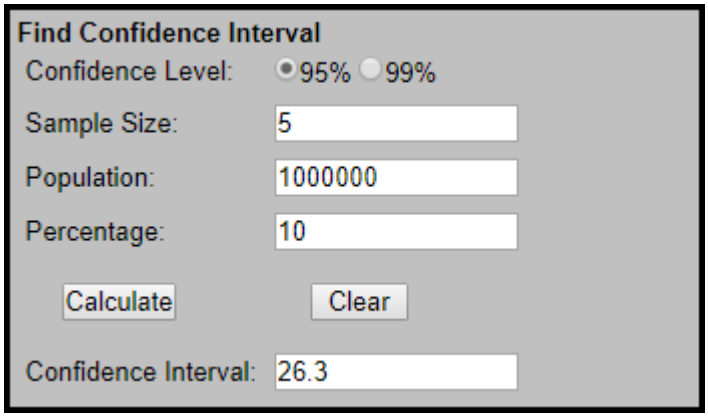
Because of the short comment period on the August 2016 SNOPR, AHAM was not able to conduct a round robin to assess the repeatability and reproducibility of the test procedure for gas products. And DOE had no data regarding repeatability or reproducibility upon which to rely. DOE instead relied on a European Committee of Domestic Equipment Manufacturers (CECED) round robin conducted five years ago on electric cooktops. But, that round robin is irrelevant. As discussed above, Europe does not extend its electric cooktop test procedure to gas cooktops for good reason. DOE would be the first to do that. Thus, there is no historical data for that test procedure. Therefore, AHAM commented that DOE should evaluate its proposed procedure even more carefully and in more detail than the electric cooktop test procedure. Repeatability and reproducibility cannot be established based only on DOE's limited within lab testing and complete lack of lab to lab testing.

In order to address AHAM's concerns, DOE conducted investigative testing on gas cooktops in support of the Final Rule. DOE conducted testing on five gas cooking tops that covered a range of burner input rates, installation widths (two 30 inch and three 36 inch), burner quantities (two four burner, three six burner), and grate weights. To evaluate variation in the test, DOE conducted two to three tests on each burner. For each individual test, DOE performed the full test method, including the preliminary test required to determine the turndown temperature and simmering setting for a given burner. DOE also included test results from previous testing conducted in support of the August 2016 SNOPR. The coefficient of variation DOE observed for the measured AEC for its test sample was, on average 1.0 percent. DOE also noted that the average per-cycle energy consumption coefficient of variation for each burner was 1.7 percent.

DOE based its Final Rule conclusions regarding total variation of the entire plethora of cooktops in the marketplace on only this meager five unit sample and a simulated round robin. DOE's testing did not truly test reproducibility from lab to lab because DOE simply used different technicians for some of its tests. DOE did not conduct testing on the same units in different labs. It makes sense that under those conditions—using the same laboratory equipment and test technicians trained in the same laboratory—variation would be lower. Moreover, this assessment looks at within lab variation and not total variation. As discussed below regarding DOE's electric cooktop testing, DOE's testing is insufficient to support a conclusion that the test procedure for gas cooktops is repeatable and reproducible and, thus, is insufficient to support the final test procedure.

Moreover, because DOE tested such a small sample the confidence level of its results is low (the same is true for electric cooktops). For a sample size of five, trying to represent the millions of units that will be produced and the tens of different labs that will be doing testing this inherently has a large margin of error as shown in Figure 2.[6]

Figure 2



Based on this sample size, results can vary plus or minus 26 percent. We fully understand that a larger sample size is a function of cost and that there are limitations on the amount of further testing that can be done. **Nevertheless, it is important not to lose sight of the fact that DOE's sample size results in as much as 50 percent in variation on the expected results**. Thus, it is no surprise that AHAM's testing has shown significant variation that DOE's did not. This large confidence interval, which the difference between DOE's and AHAM's test results bear out, further supports AHAM's request that DOE withdraw the cooktop test procedure. A test procedure that could be required to demonstrate compliance with possible energy conservation standards should not be finalized with such a high confidence interval, particularly when conflicting data has been provided to highlight this high confidence interval.

[6] *See, e.g.*, www.surveysystem.com

At a minimum, this demonstrates that DOE's data alone and when added together with AHAM's data raises significant questions about whether the test is repeatable and reproducible. Thus, DOE's Final Rule is not supported by adequate data and could be considered arbitrary and capricious.

Moreover, as with electric cooktops and discussed more fully below, DOE did not engage stakeholders—either manufacturer labs or third party labs—in its assessment of the Final Rule. Thus, based on DOE's testing, neither DOE nor stakeholders have any idea what the actual test procedure total variation is.

In order to assess whether the final test procedure for gas cooktops is repeatable and reproducible, after DOE issued the final test procedure rule, AHAM conducted a round robin on gas cooktops. It is likely that even more testing would be helpful in better understanding both the test procedure and its variation, but these results are enough to demonstrate that there is sufficient doubt regarding the gas cooktop test procedure's accuracy such that DOE should withdraw it.

AHAM's gas cooktop round robin included four units (two cooktops and two ranges), with a range of product types.[7] Four labs tested the burners with the highest and lowest burner input rates (i.e., one high capacity and one low capacity burner was tested for each unit).[8] Each burner was tested three times each using the procedure specified in the DOE Final Rule. Labs recorded the simmering setting selection for the energy test cycle and the first laboratory marked the turn down temperature. AHAM's test plan is attached in Exhibit B and AHAM provided Navigant with raw data under a confidentiality agreement.

[7] A summary of the test unit characteristics is attached at Exhibit B and data in Exhibit C.

[8] Unit A was tested by five labs.

We note that some of the tests could not meet the specified ambient temperature requirements. Specifically, some of the laboratories were not able to hold the ambient temperature as required during the duration of the test. Manufacturers ran the tests in the tightest environments that are currently available at +/- 5 °F in their laboratories. The Final Rule requires new equipment to maintain +/- 2 °F, which is difficult or, in some cases, impossible to do in existing laboratories. Section IV below further discusses this point. The labs that ran the tests have been approved by the safety certification bodies and Canadian Energy Verification organization. We removed the most errant runs and included the test data to show the variation that was noticeable during our tests as it is representative of the current lab capability. Importantly, improving the ability to maintain ambient temperature will involve significant upgrades to laboratories, which will add cost and burden for manufacturers.

As mentioned above, AHAM's test plan called for running the test differently than the DOE test by having the first laboratory mark the turn down temperature it used. AHAM understands that this is not fully consistent with DOE's test procedure. But, because the test procedure is unduly burdensome to conduct, as discussed below, this method was necessary to reduce the test burden—reducing the number of possible settings for the cooktop was seen as a worthwhile experiment. Importantly, it was not always possible for laboratories to use the marked temperature and so, in several instances, laboratories followed DOE's test procedure to the letter. In the end, only half of the labs were able to follow AHAM's test plan. The other half ran the test according to the DOE test procedure as written. Our data below differentiates these methods by referring to the tests that used the marked turndown temperature as the "truncated test" or "preset."

The DOE test procedure tried to address some of the variation that is not controllable in the methodology of its burdensome test procedure—e.g., heating values, different ambient temperatures, equipment, and technicians. AHAM's methodology was an effort to determine if the extra burden aimed at reducing that variation reduced it enough to justify the extra time, labor, and cost. Our conclusion: it is not. **Although neither method showed results with an acceptable level of variation, the runs that used the truncated test resulted in less variation.** Regardless, the results cast significant doubt on DOE's small amount of supporting data for the Final Rule and support AHAM's request that DOE withdraw it.

Good lab practice is that within lab variation should clearly be less than two percent. For current data acceptance programs within the appliance industry, it is common practice that data between labs should be no more than three percent variation. DOE's data within its own lab fell within the target zone for variation for four of the five units DOE tested. DOE did not test at different labs, so the Final Rule is not based on any accurate lab-to-lab data showing an acceptable range of lab-to-lab variation.

AHAM's round robin shows similar results to DOE's in terms of within lab variation. Significantly, however, as shown in Table 1, lab-to-lab variation considerably exceeds the three percent maximum lab-to-lab variation target regardless of whether the full DOE test was run or the truncated test was run.

Table 1: AHAM Gas Round Robin Summary Results

cooking Unit	width	Number of Burners	Minimum Input Rate (Btu/hr)	Maximum Input Rate (Btu/hr)	Average Annual Energy consumption (kBtu/yr)	Coefficient of Variation - 1 lab Repeatability	Coeffiecient of Variation across multiple labs Reproducibility
AHAM A - set	36	5	8000	18000	936.3	0.89%	3.60%
AHAM A - Preset					918.7	0.68%	2.30%
AHAM B	30	4	5000	15000	1034.1	9.20%	17.10%
AHAM B - Preset					870.1	1.70%	13.50%
AHAM C	30	4	5000	15000	843.1	2.70%	12.50%
AHAM C- Preset					827.9	1.80%	7.00%
AHAM D	30	5	5500	18000	1077.2	0.78%	12.00%
AHAM D - Preset					1123	1.59%	12.00%

This highlights the significant gap in the data DOE used to justify the rule. DOE assumed that low variation in one lab means repeatability and reproducibility across labs. But AHAM's round robin demonstrates that this is not the case. Our round robin shows reproducibility is not present in the current procedure as demonstrated by only one of the three units, Unit A, having an acceptable coefficient of variation across labs. Notably, the low input rate on that burner is 8,000 BTU. AHAM units B, C, and D all have low capacity burner rates of or about 5,000 BTU. DOE only tested one of its five units with a low capacity burner at 5,000 BTU. DOE's coefficient of variation for that model was 1.40 percent. Some of the best AHAM single lab coefficients of variation for models at that rate are 0.78, 1.59, 1.70, and 1.80 percent. The AHAM data would appear to agree that one lab can repeat the same results, **but that is not the full story.**

Focusing on the units with low simmer rates and digging deeper into the data, AHAM's data show the following:

cooking Unit	width	Number of Burners	Minimum Input Rate (Btu/hr)	Maximum Input Rate (Btu/hr)	HC Etvg(Btu)	Coefficient of Variation - 1 lab Repeatability	Coeffiecient of Variation across multiple labs Reproducibility	LC Etvg(Btu)	Coefficient of Variation - 1 lab Repeatability	Coeffiecient of Variation across multiple labs Reproducibility
AHAM A - set	36	5	8000	18000	7032.9	0.93%	3.80%	4817.4	0.83%	3.00%
AHAM A - Preset					6752.8	0.88%	4.10%	4821.6	0.36%	1.00%
AHAM B	30	4	5000	15000	6248	4.23%	5.90%	3907.1	24.22%	30.80%
AHAM B - Preset					5937.1	1.18%	4.80%	3228.9	1.33%	3.30%
AHAM C	30	4	5000	15000	6444.2	2.05%	5.60%	2381.3	3.08%	33.10%
AHAM C- Preset					6120.1	0.68%	3.20%	2587.7	2.23%	16.30%
AHAM D	30	5	5500	18000	5819.6	1.11%	4.50%	4403.1	0.26%	11.40%
AHAM D - Preset					6748.7	1.02%	16.70%	4260.8	3.41%	11.60%

- On all units except one, Unit B, the repeatability on the high capacity burner within the lab had acceptable variation but the reproducibility across labs did not. Overall, **on the high capacity burner, the variation was higher using the DOE test procedure than it was using the truncated test and none of the variation was within an acceptable range from lab-to-lab.**

- On all units, the repeatability on the low capacity burner was marginal□25 percent of the time the variation was greater than the two percent maximum target. There is a distinct difference in the low capacity variation and the three units that had simmer at or near 5,000 BTU had significant repeatability and reproducibility issues. In some cases, using the truncated test actually improved lab-to-lab variation. This demonstrates that the burden associated with determining the turn down temperature in DOE's full test procedure is not always justified—it does not categorically improve repeatability and reproducibility. Thus, not only is DOE's final test procedure rule unsupported by sufficient data to demonstrate its reproducibility, but it is also unduly burdensome to conduct. In addition, this highlights the weakness in the DOE test procedure which conducts a water boil and simmer test on small burners that are not meant for either purpose. As discussed above in Section I, those burners are designed to provide a

simmer only cooking function for melting chocolate and cooking sauces, not for boiling or simmering water.

B. Within Unit And Between Unit Variation

DOE did not evaluate or account for variation within units. There are issues inherent in testing gas cooktops and ranges that contribute significantly to within unit variation. For example, heating value, gas pressure, and atmospheric pressures all have an impact. More specifically, as atmospheric pressure changes due to weather, test results will vary even on the same unit from day to day. Also, gas pressure and atmospheric pressure can vary from run to run, and that can have an impact on how the gas is mixing within the burner port which then impacts burner combustion and energy creation. Moreover, heating values vary within a lab on a daily basis and likely vary greatly between labs. Thus, the same unit tested on different days in the same lab or in different labs will not perform the same unless the heating value of the gas is the same. That is statistically unlikely because values vary every day. It is not likely that the heating value is 1075, so there is a conversion from what it actually was to 1075 and this artificial adjustment induces variation. Each of these factors, among others, individually and collectively contribute to variation from test to test and DOE has made no effort to understand the impact of these factors.

This inherent variation in gas cooking product testing has been known for decades and is the reason the safety test, ANSI Z21.1, requires certified technicians to drill testing orifices. The drilling of orifices achieves precise rates for nominal, high, and low values. Experience shows that certified gas technicians can dial in the precise values for assessment by using number sized drills but there are also factors the technician must manage in this process such as burrs from the drilling. AHAM is not suggesting that DOE require testing orifices be drilled for purposes of

energy testing—the burden is significant to say the least and would make the test unduly burdensome to conduct. Although such burden is justified for purposes of ensuring the safety of cooking products, which carry inherent safety risks, it is not justified for purposes of energy testing. And, because safety testing is not similar to energy testing (for example, cooktops are tested on high for hours and products are over-stressed in abnormal conditions), it is not possible to re-use the units tested for safety purposes for energy testing.

In addition, neither DOE nor AHAM have evaluated or accounted for the additional variation inherent in producing gas products, i.e., between unit variation. This is significant because it will add further variation on top of the within lab variation, lab to lab variation, and within unit variation. In order to ensure compliance with any future energy conservation standard, manufacturers will have to take this total variation into account. The result will likely be that it becomes difficult or impossible to meet standards because the buffer needed to ensure accurate ratings will require levels of efficiency that are not economically justified or technologically feasible. AHAM explored this concept in more detail in its comments on DOE's proposed standards, which we hereby incorporate by reference.[9]

One of the test requirements that will vary within the unit is the simmer setting on gas products. Subsequent to AHAM's round robin, Lab Three conducted some additional investigative testing to determine whether using the same simmering setting improves repeatability. The lab used two different operators to test a unit and provided both with the same instructions, which are identified in Exhibit A. The test plan was as follows:

1. Operator F conducted the test and found the simmer setting and gas flow;

[9] AHAM Comments on DOE's SNOPR for Energy Conservation Standards for Residential Conventional Cooking Products; Docket No. EERE-2014-BT-STD-0005; RIN 1904-AD15 (Nov. 2, 2016).

2. Operator M conducted the test independently and found a simmer setting and gas flow;
3. Operator M repeated the test using the Operator F simmer setting; and
4. Operator F repeated the test using the Operator M simmer setting.

The results show that technicians are likely to be able to work to achieve passing results on their own efforts to determine a simmering setting. But when given the target setting, the results show that it is likely that different technicians cannot recreate a first technician's passing result about half of the time.

The data also highlight that there are more issues with finding the right simmer setting on low capacity burners—the Lab Three technicians each failed the first time they tried to set the low capacity burner. Also, see in Exhibit A where an additional experiment was run with one of Lab Four's technicians developing the simmer setting without using the previously provided information. This resulted in different energy average and lower variation values between the two Lab 4 technicians.

According to these results, relying on a given setting actually increased variation and retests due to failing performance. Thus, though recording the turn down temperature as required by the Final Rule may help understand differences in results between labs, it does not reduce variation. And it does not seem that simply following the test procedure to the letter, as DOE suggested in response to AHAM's comments and discussed in Section II below, reduces variation. AHAM's test results demonstrate that additional efforts to reduce variation on turndown settings were unsuccessful—even standardizing the simmering setting does not drive sufficient variation reduction. (Moreover, for gas products, it will not be possible to specify turndown settings for gas products due to orifice variation, which is discussed in more detail

below). Accordingly, because DOE's final test procedure does not sufficiently reduce total variation, DOE should withdraw the cooktop test procedure.

C. Full Population and Total Variation

As stated previously, DOE's small sample size could not address the full population or total variation. Table 2 below lists the units have been tested to the final test procedure as specified from both DOE's sample and AHAM's sample and Figure 3 shows the samples and their results graphically.

Table 2: DOE and AHAM Test Samples Combined

cooking Unit	width	Number of Burners	Minimum Input Rate (Btu/hr)	Maximum Input Rate (Btu/hr)	Burner Configuration	Grate Type	Grate Weight per burner (lbs)	Average Annual Energy consumption (kBtu/yr)	Coefficient of Variation - 1 lab Repeatability	Coeffiecient of Variation across multiple labs Reproducibility
DOE 1	30	4	9000	9000	open	Steel-wire	0.5	640.4	2.40%	N/A
DOE 2	30	4	5000	15000	Sealed	Cast Iron	3.7	854.4	1.40%	N/A
DOE 3	36	6	18000	18000	Sealed - stacked	Cast Iron	4.4	974.8	0.40%	N/A
DOE 4	36	6	9200	15000	Sealed-stacked	Cast iron - Continuous	5.8	963.5	0.30%	N/A
DOE 5	36	6	15000	18500	Sealed	Cast iron - Continuous	7	893.1	0.30%	N/A
AHAM A	36	5	8000	18000	Sealed - stacked?	Cast iron - Continuous	?	936.3	0.89%	3.60%
AHAM B	30	4	5000	15000	Sealed	Cast Iron	?	1034.1	9.20%	17.10%
AHAM C	30	4	5000	15000	Sealed	Cast Iron	?	843.1	2.70%	12. 5 %
AHAM D	30	5	5500	18000	Sealed	Cast Iron	?	1077.2	0.78%	12.00%

Figure 3: DOE and AHAM Test Samples Combined

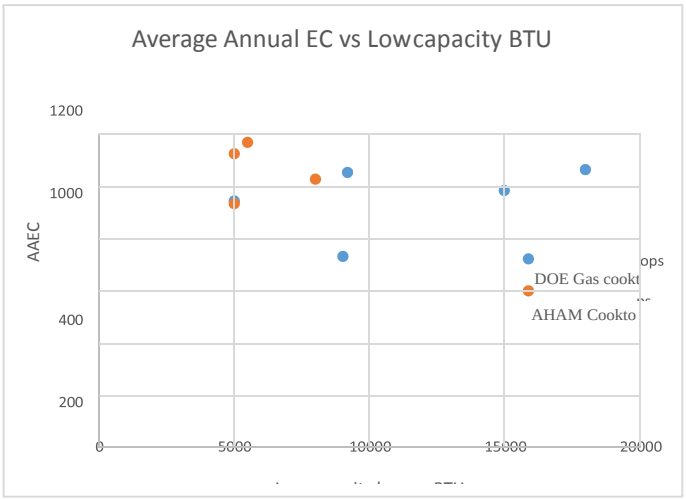


Figure 3 shows the units tested and what their AAEC number is versus their lowest burner capacity rating. It highlights how skewed the DOE sampling was, especially as compared to AHAM's. As discussed above in Section I, DOE identified that nearly half of the models in the market had a 5,000 BTU burner. Yet, DOE selected only one unit with a burner of that capacity. Aside from the fact that DOE's sample inadequately represents the market, this demonstrates that DOE's test procedure will produce inaccurate results for most of the gas products on the market. The test has a high degree of variation for those products, as shown above, and, thus, the test will not allow consumers to compare across products.

Neither DOE nor AHAM have evaluated or accounted for the all of the variation inherent in producing gas products, i.e., total variation across the population. It is a large task and assuming the small amount of work applies to the total picture is not acceptable and further supports the withdrawal of the test procedure.

III. DOE Has Not Demonstrated That The Test Procedure Is Repeatable Or Reproducible For Electric Cooktops.

As discussed above, in response to the August 2016 SNOPR, based on round-robin testing, AHAM identified several sources of potential variation that needed to be resolved prior to DOE finalizing a cooktop test procedure. DOE conducted additional testing in order to evaluate AHAM's concerns and made clarifications to attempt to address many of them. Unfortunately, DOE's testing was not sufficient to demonstrate that the final test procedure significantly reduced the high degree of total variation AHAM identified in its comments. AHAM does not agree that the final test procedure is sufficiently repeatable and reproducible. Accordingly, AHAM respectfully requests that DOE withdraw the cooktop test procedure.

A. DOE's Testing

DOE did not do enough testing to verify that its clarifications resulted in a final test procedure that is repeatable and reproducible and, so, the Final Rule is not supported by sufficient data. DOE conducted testing of five electric cooktops incorporating different heating technologies (one coil element cooktop, two radiant element cooktops, and two induction cooktops) and control types (four with step controls and one with infinite). For each unit, DOE conducted testing on surface units capturing a range of heating element sizes. DOE conducted two to three tests per surface unit. For each individual test, DOE performed the full surface unit test method, including the preliminary test required to determine the turndown temperature and simmering setting for a given surface unit. DOE varied test operators for surface unit tests, but did not test at different laboratories. DOE also included test results from previous tests of these units conducted in support of the August 2016 SNOPR.

AHAM appreciates that DOE conducted this testing. But it is not enough to justify finalizing the test procedure. DOE did not complete full tests—it tested only two to three burners. Although that is helpful in assessing potential variation, AHAM is concerned that DOE would finalize a rule based on the results of only partial tests.

DOE's testing demonstrates a low average coefficient of variation of 1.2 percent. It is uncertain whether those results are accurate given that DOE did assess the full IAEC for an entire cooktop. But, assuming that the partial tests do give a reasonable understanding of repeatability and reproducibility, DOE has not identified why DOE's coefficient of variation was so much lower than AHAM's.

One potential reason is that DOE's testing did not truly test reproducibility from lab to lab—DOE simply used different technicians for some of its tests. DOE did not conduct testing on the same units in different labs. It makes sense that under those conditions—using the same laboratory equipment and test technicians trained in the same laboratory—variation would be lower. DOE's test parameters did not accurately simulate reproducibility. The simulation run by DOE only changed the test technician. It is unclear from DOE's analysis if those technicians had previous knowledge of the procedure or were allowed to imprint their interpretation on the execution of the test. DOE did not simulate running the test with different equipment and a different environment, as would be run in a true round robin.

Conversely, AHAM's tests were conducted on the same units in three (now four) different laboratories. Those laboratories have different technicians with different training, different equipment, and, potentially, different interpretations of the test procedure. These true round robin conditions are far more likely to reveal ambiguity in the test and sensitivities that cause variation. They also replicate a real scenario—one lab attempting to verify the results of a different lab. As discussed above in Section II, the testing conducted to date, necessarily, has a low confidence level and the differences between AHAM's and DOE's results demonstrate that. AHAM's testing resulted in significantly higher variation than DOE's and the large confidence interval that results supports AHAM's request for DOE to withdraw the cooktop test procedure.

Moreover, DOE did not engage stakeholders—either manufacturer labs or third party labs—in its assessment of the Final Rule. Thus, based on DOE's testing, neither DOE nor stakeholders have any idea what the actual total test procedure variation is. The test laboratory DOE used to run the tests in support of the proposed and final rules will not be a lab that regularly runs the test procedure when reporting and/or compliance with standards is potentially

required. (The labs that participated in AHAM's round robin, will, of course, be conducting testing to demonstrate compliance with any potential future standards). Thus, because DOE's reproducibility testing is essentially theoretical and only simulates a round robin test, DOE's testing is helpful, but not enough to determine the repeatability and reproducibility of the test.

B. Determining the Simmering Setting

AHAM commented that there is variability in determining the simmering setting for the simmering phase of the test and noted that the simmering setting plays an important role in the overshoot temperature and the ability to maintain a temperature as close as possible to 90 °C during the simmering phase of the test.

DOE responded that it expects that correctly following the methodology—starting with the lowest simmering setting and repeating the test as necessary with the next highest setting until the setting that maintains the water temperature above, but as close as possible to 90 °C, is identified—will result in only a single appropriate simmering setting for a given surface unit.

DOE agreed with AHAM that the selection of the simmering setting has a significant impact on the overall energy consumption of a surface unit and amended Appendix I to require that the simmering setting selection for the energy test cycle of each cooking area/zone be recorded. AHAM appreciates that DOE required recording the simmering setting selection—it will help in enforcement/verification actions to understand differences in test results. Unfortunately, recording the setting will do nothing to decrease variation or prevent false findings of potential noncompliance.

AHAM acknowledges that in its initial round robin, laboratories did not start at the lowest simmering setting—laboratories started at the lowest setting they believed would be able to maintain a water temperature above and as close as possible to 90 °C. AHAM is a proponent

of conducting the test that way in order to reduce test burden which, as discussed further below, is already significant.

Nevertheless, in order to understand if variation would decrease by following the letter of the test procedure as DOE suggested in the Final Rule, AHAM, in conducting a round robin on gas cooktops, required participating laboratories to a) follow the DOE test procedure for selection of the simmering setting; b) record their simmering setting; and c) for the first lab, mark the turn down temperature on the unit itself.[10] Our data, which are discussed above in Section II, show that following the letter of the test procedure does not sufficiently reduce variation. In particular, lab-to-lab variation remains high for gas cooktops and AHAM's round robin testing for electric cooktops provided data to support a conclusion that it is likely also high for electric cooktops. DOE did not adequately address AHAM's concern in its Final Rule and AHAM's gas testing casts further doubt on this question.

AHAM incorporates by reference the data we submitted to DOE during the rulemaking regarding our electric round robin, which is summarized in the below tables. These data highlight that the simmer setting is a significant source of variation. Because DOE has not yet adequately addressed it, and, thus has not sufficiently demonstrated that its test procedure is valid, DOE should withdraw the cooktop test procedure.

[10] Results of the AHAM gas round robin are discussed in Section II.

Reproducibility

Unit	Coefficient of Variance Between Labs of Energy Consumed			
	Technology	Heat Up to 90°C	20 min Simmer	Total
A	Radiant	1.1%	25.0%	9.2%
	Coil	2.1%	19.4%	7.1%
B	Induction	3.5%	21.3%	8.4%
C				

Note data is for the total Cooktop. Including pot differences.

Repeatability

Coefficient of Variance within Labs of Energy Consumed					
Unit	Lab		Heat Up to 90°C	20 min Simmer	Total
		Mean	0.9%	2.1%	0.9%
		Max	2.8%	15.0%	3.3%
		Min	0.2%	0.0%	0.1%

C. Spiking Temperatures When Reaching 90 °C

AHAM commented that our round robin demonstrated difficulty in determining when the water temperature first reaches 90 °C to start the 20-minute simmering phase of the test because, when the temperature first reaches that temperature, it may oscillate slightly above or below it. DOE's testing showed similar fluctuations. Thus, DOE amended Appendix I to clarify that the 20-minute simmering period starts when the water temperature first reaches 90 °C and does not drop below 90 °C for more than 20 seconds after initially reaching 90 °C.

AHAM thanks DOE for making this clarification which seems like it could reduce variation. DOE's testing—completed in a single lab and with technicians trained in the same lab—does not, however, adequately demonstrate that this clarification sufficiently reduces

variation and improves reproducibility. AHAM's members were not able to dedicate resources

to re-performing a round robin to verify DOE's findings on a single unit. Without knowing whether total variation has, in fact, been reduced, DOE should not have finalized the test procedure and DOE cannot rely on assumptions that this change will reduce total variation—to do so could be considered arbitrary and capricious. Total variation is made up of within lab and between lab variations AND within and between units variations. DOE only addressed some of the within lab variation causes, meaning that other causes of variation are unaddressed. DOE does not have sufficient data to demonstrate that the test procedure is reproducible and should withdraw the test.

D. Heating Element Cycling

AHAM commented that cycling of power to the heating element is unpredictable and causes variation in test results. It is unknown if the surface unit will cycle the heating element off during a critical phase of the test—i.e., at the start of the simmering phase or when determining the simmering setting. In response to DOE's September 27, 2016 data request, AHAM provided further data on how this was observed during our testing. DOE could not have reviewed or considered that data in drafting the Final Rule given that the Final Rule was issued the same day AHAM provided the data. AHAM incorporates the data we submitted on November 23, 2016, in this petition by reference.

DOE did, however, examine its own data. DOE indicated that it observed only one electric smooth-radiant cooktop in its sample for which the heater cycled on and off during the heat-up phase of the test. That particular unit cycled back on within a few seconds of cycling off and, as a result, the water temperature continued to rise at a "fairly steady state." Thus, DOE concluded that it was infrequent for heating elements to cycle during the heat-up phase and, so, it was unlikely that other electric smooth-radiant cooktops would require any substantive amount

of heating element cycling to protect the glass surface. DOE indicated that it did not expect any measurable impacts of heating element cycling on the total measured per-cycle energy consumption.

DOE based its conclusions on the single unit in its sample and is *guessing* that because only one unit in its small sample did not cycle on and off during the heat-up phase, it must not occur frequently and/or if it does, it will not have a measurable impact on the total per-cycle energy consumption. But AHAM also observed element cycling during its testing. Thus, in only the small amount of testing conducted in the U.S. to date, unit cycling during the heat-up phase has been observed twice. That is not insignificant. Almost 20 percent of units in the combined AHAM and DOE tested sample experienced unit cycling.

Moreover, AHAM submitted additional data to DOE regarding the unit cycling it observed. As mentioned in that data submission, AHAM tested two eight-inch coil elements on different cooktops with the same model number to evaluate unit to unit variation. One cooktop cycled during the T70 turndown test and the other did not. The unit that cycled resulted in a higher turn down temperature when compared to the test that did not cycle. The unit did not cycle on either test run during the final T90 simmer test. The high Tc value caused one test run to have a higher overshoot and allowed for a lower turn down during the simmer phase driving unit to unit variation. This resulted in 36 watts less power on the unit with the lower turn down. This is six percent of the normalized power level. Six percent is not insignificant and demonstrates the potential difference between the energy measured on two units of the same construction. DOE should withdraw the Final Rule for cooktops and review and consider the data AHAM submitted. This issue must be addressed in order to reduce total variation.

Furthermore, DOE did not address the arguments AHAM made about the uncertainty regarding how unit cycling will impact test results and test burden—this is a significant concern and could drive redesign of products. Heating element cycling is key to cooking performance for electric ranges because the algorithm that governs heating element cycling controls the temperature of the food being cooked. If the temperature is not properly maintained, the consistency of the food can change. Moreover, for smooth top electric ranges, heating element cycling also serves a safety function. Such cooktops are equipped with a glass break sensor to monitor temperature. That sensor will dictate when a unit needs to cycle down to avoid glass breakage. AHAM is concerned that the test procedure, as finalized by DOE, could drive changes to the algorithm for heating element cycling design. Any such changes will result in significant product development efforts which have not been accounted for in DOE's test procedure rulemaking. A test procedure change should not dictate this sort of design change simply to manage uncertainty and variation.[11]

For these reasons, DOE should withdraw the cooktop test procedure due to total variation that is not fully understood and, from available data, appears to be at an unacceptable level.

E. Upcoming New Cooktop Designs

As AHAM has commented to DOE many times, Underwriters Laboratory (UL) Standard 858 will soon require a new test for electric coil element cooktops. The change to the voluntary safety standard, which AHAM developed and proposed to UL with the support of the Consumer

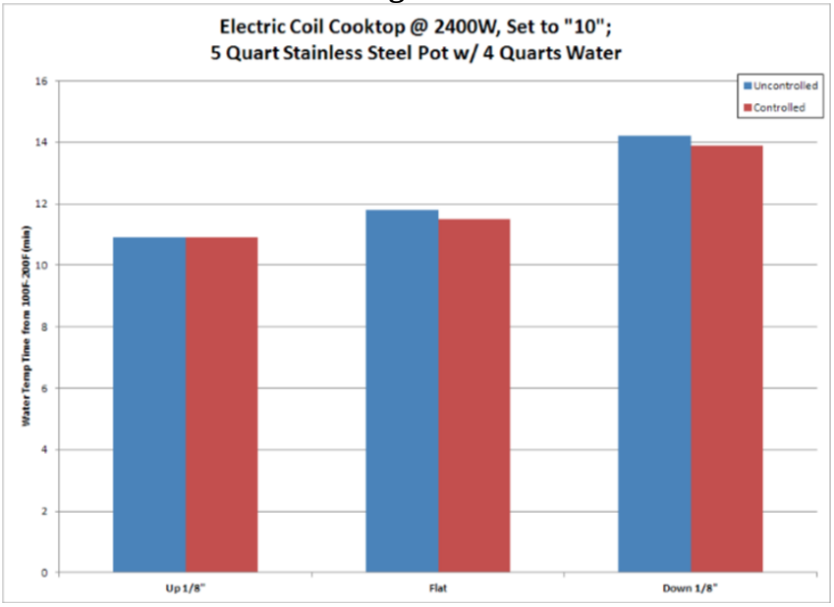
[11] It is possible, for example, consumers often jump from one side (rolling boil) to the other side (boil action lost) a couple of times before they understand where to set the dial to maintain their desired simmering temperature. If manufacturers make the dials more precise in order to reduce variation in the energy test, that could result in more settings and consumers could change back and forth more times because they see less impact in adjusting the knob. This could actually drive consumers to use more energy in the field. Accordingly, DOE should examine potential unintended consequences of addressing this uncertainty.

Product Safety Commission, will require electric coil element cooktops and ranges to monitor and limit pan bottom temperature and is aimed at reducing the incidences of unattended cooking fires. It represents a major redesign for all electric coil cooktops by every manufacturer. The change will be required to show compliance on coil cooktops with the updated voluntary safety standard as of June 15, 2018.

Given the date of this requirement, it is certain that any cooktop standard DOE may promulgate (and AHAM opposes any change to the existing standards for conventional cooking products) would apply to these newly designed products. But, because these products are still in development, DOE has not done testing on products using these controls and neither have manufacturers. Because company designs to comply with the UL 858 requirements may involve cycling of the element, it is quite possible that heating element cycling will be different than it is for existing products. Thus, DOE's data, even as supplemented by AHAM's data, on heating element cycling may be irrelevant because it does not represent products that will be on the market if the test is required to demonstrate compliance with possible energy conservation standards.

As shown in Figure 4, initial data, based on testing conducted by Primaria LLC to develop UL 858's new requirements, show that though time to boil water may not increase significantly using temperature limiting controls on coil cooktops, the difference could be enough to further impact the current assumptions on variation. And, the control cycling could be somewhat different as well. DOE should understand how the energy test will respond to these new technologies.

Figure 4



F. Pan Warpage

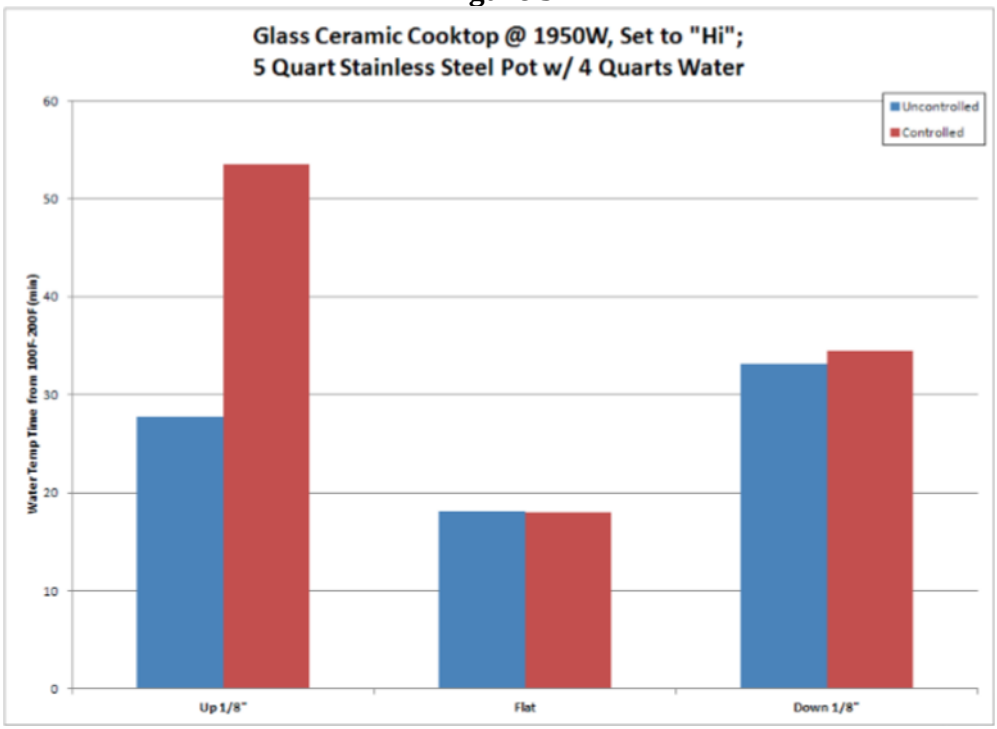
Although DOE sought feedback on the degree to which the heating element or cookware may deform and impact the heat transfer between the two surfaces in its rulemaking on energy conservation standards for cooktops, DOE did not investigate the impact of pan warpage on the repeatability and reproducibility of the test procedure.

The UL 858 test for coil cooktops initially required use of an aluminum pan. But, based on manufacturer experience doing significant testing, AHAM proposed a cast iron alternative to aluminum pans for the test. UL published this update in August of 2017. The shift is to account for warping and the variation and lack of repeatability it is driving in the safety assessment. There is no reason to believe this variation will not also extend to energy testing.

The data from the UL 858 work with Primaira show that any variation in pans of the same type will drive variation that the energy testing has not yet shown because the pans have yet to warp substantially. Significantly, using a warped stainless steel pan on a ceramic cooktop did increase the boil time with the cooktop fire mitigation control active (that control cycles the

element on and off per an algorithm). And, warpage on stainless steel pans style will cause a difference in energy use on units without a limiting control as shown in Figure 5. DOE's failure to further investigate this issue means that its test procedure is not adequately supported.

Figure 5



IV. The Cooktop Test Procedure Is Unduly Burdensome To Conduct.

The discussion in the sections above highlights several significant burdens associated with conducting DOE's cooktop test procedure that AHAM believes make it unduly burdensome to conduct. Specifically:

- The test procedure takes about 20 hours for an average four burner cooktop and requires the testing of every single burner or element individually. And, because the test requires the technician to determine the turn-down temperature before every test and the ambient conditions are quite tight, several runs are often required before a

valid run can be achieved. Our testing found that some tests took upward of five days for a single cooktop.

- As indicated by AHAM's truncated gas test plan, it is burdensome to determine the turn down temperature for each individual test and burner. And doing so does not serve any purpose as it appears that it does not decrease variation.
- The ambient temperature requirements are incredibly tight and it is difficult or impossible for some laboratories to meet them without investing in lab improvements. Some companies had difficulty maintaining the ambient conditions and AHAM could not use their data in its round robin results.
- Test pots will warp during testing and will need to either be repaired or replaced frequently.
- The test procedure variation means that manufacturers will need to add a larger than usual "buffer" to any eventual energy conservation standards ratings, which will effectively increase the stringency of any future standard, probably by a large amount.

In addition to the test burden itself, there is also substantial cost associated with the test procedure. DOE determined that the test procedure would cost $700 per test for labor, with a one-time investment of $2,000 for new test equipment, which was split between test pots and other instrumentation. AHAM collected data from its members on the cost of the test procedure, both ongoing and initial investments. This data is based on company experience with the test through AHAM's round robins and in testing in Europe, on the number of models each company has, and on the potential need for third party testing. AHAM's data show that DOE significantly underestimated the cost associated with running the cooktop test procedure.

Table 3 below shows the difference between DOE's estimates in the Final Rule and AHAM's data.

Table 3: Per Test Costs (DOE Estimate v. AHAM Data)

Cooktop Full Product Line	**One time (initial year)**		**On-going (annual)**	
Per Test Costs (per Manufacturer	**DOE**	**AHAM**	**DOE**	**AHAM**
Labor Costs	$700	$970		$970
Instrumentation (equipment for testing)	$15	$1,432		$38[1]
Test pots (vessels)	$152	$113		$209[2]
Testing structures	$8	$159		$43[3]
Transducer (for ambient air temp.)	$2	N/A		$0
Total	$876	$2,673	$700	$1,260

NOTE: On average, 543 tests will be required to certify companies' full product lines

[1]This includes equipment maintenance (new / existing and calibrations for testing equipment

[2]Manufacturers will require ongoing replacement of test pots due to warping

[3]This includes increased / new annual costs from third party labs and/or UL and ISO (re) certification

One of the significant differences between DOE's estimate and AHAM's data is the total number of tests required and the number of models to be tested. It is difficult for manufacturers to determine at this stage how many basic models they would have. DOE's proposed energy conservation standards for cooktops, which AHAM strongly opposes, would be the first time manufacturers would need to certify compliance with standards and determine basic models. To do that may require testing of all models in order to determine likely model families, particularly because cooking products are complex. It will be difficult to determine which models can be grouped together in a basic model. That said, AHAM understands that not each individual model will need to be tested. Thus, it is likely that something between DOE's estimate and AHAM's data would be the actual average total number of models tested.

Nevertheless, the difference in the number of tests and number of models to be tested is shown below in Table 4. DOE cost estimations (particularly for labor) are on a per-test basis. As described above, it is difficult to determine the total number of tests to be performed in the initial year. Comparing the DOE estimation of number of tests to AHAM member data shows a signficant difference or wide range. As a result, total costs are substantially higher when considering the average number of tests required according to AHAM member data.

Table 4: Average Number Of Tests And Models To Be Tested

			Estimated Total Coast	
Tests / Models Comparison	**DOE**	**AHAM**	**DOE**	**AHAM**
Average total number of tests required	66	543	$46,000 – $58,000	$1,100,000 – $1,450,000
Average total number of models tested	21	166		

Another important difference is that DOE did not address upfront investments made in order for manufacturers to be able to perform the test procedure. But those costs should not be ignored. Manufacturers identified significant investments in specialized equipment to perform the test procedure successfully. For example, all respondants to AHAM's survey expressed frustration in obtaining the necessary test pots because the supplier is overseas. Acquiring even one set is difficult, as AHAM has discussed in previous comments, and the cost is about $9,500 excluding shipping and handling. Manufacturers indicated they would require between three and 24 sets to do certification testing.

DOE concluded that it would cost about $500 to fabricate existing testing structures. But manufacturers identified significantly higher costs. AHAM's members consistently cited investments to redesign entire lab stations and expand facility space. These changes would be needed to control for ambient temperature at the tight levels DOE's test requires, cool test units,

add new equipment, and account for much higher volumes of testing. AHAM also believes that third party testing (for certification only) could cost over $2,500 per model. Table 5 details the comprehensive costs.

Table 5: Comprehensive Costs

Cooktop Full Product Line	Overall Per Company Costs
	AHAM
Labor costs (annual total salaries)	$272,186[1]
Instrumentation (equipment for testing)	$376,635[2]
Test pots (vessels)	$84,200[3]
Testing structures	$368,100[4]
Transducer (for ambient air temp.)	N/A
Total	$1,101,121

NOTE: Overall costs may not align with per-test costs due to reporting measures and averaging
[1]Annual salary for full-time technicians across multiple labs (1 to 5, up to 13 stations / chambers)
[2]Specialized equipment (designed / purchased) to complete test procedure

[3]Companies require on average 3 sets of test pots to be replace over multiple years

[4]Combination of costs from third party labs, certifications (UL / CSA / ISO), retrofitting existing facilities

The test and cost burden associated with the cooktop test procedure is not likely justified by any balancing benefit to consumers or the environment. In 2009, DOE determined that none of the trial standards levels that included efficiency standards instead of just prescriptive design standards had benefits that were outweighed by the economic burden that would be placed on consumers. DOE found that the potential economic savings realized by average consumers were outweighed by the risk that certain consumers would not realize the savings and the adverse loss of industry net present value, among other things. Thus, DOE prescribed standards consisting of prescriptive design standards, not energy performance standards. As we have commented previously, AHAM does not believe anything has changed since 2009 to justify amended

standards.[12] The available technology options have not changed. The energy savings opportunities remain small. Thus, the cooktop test procedure is not necessary and its burden is not balanced by any benefit to consumers.

Given the extraordinary regulatory burden the cooktop test procedure will place on manufacturers, **the procedure is an ideal candidate for repeal** consistent with Executive Order 13771, Reducing Regulation and Controlling Regulatory Costs, which requires agencies to repeal two regulations for every new one issued and offset the costs. Because, as AHAM has demonstrated above, DOE's cooktop test procedure may be considered arbitrary and capricious because it is not supported by sufficient data and likely has a high degree of total variation, the test procedure does not benefit consumers. It serves only to burden manufacturers who must comply with a test procedure that does not adequately represent products and, due to variation, will require manufacturers to make conservative claims.

CONCLUSION

Because AHAM's testing shows that DOE did not sufficiently demonstrate that the cooktop test procedure is repeatable or reproducible for gas and electric cooktops, because DOE has yet to demonstrate—as EPCA requires it to do—that the final test procedure is representative for gas cooktops, and because the test procedure is unduly burdensome to conduct, we respectfully request that DOE withdraw the final cooktop test procedure while maintaining the

[12] *See* AHAM Comments on DOE's Energy Conservation Standards for Residential Cooking Products, Request for Information; Docket No. EERE-2014-BT-STD-0005; RIN 1904-AD15 (Apr. 14, 2014) (AHAM does not, however, believe that energy conservation standards different from those currently in place for conventional cooking products are technologically feasible or economically justified. There have been no significant changes since the existing standards for gas cooking tops and "no standard" standard for other conventional cooking products were promulgated that would result in justified standards. The available technology options have not changed, the energy savings opportunity remains small, and consumer cooking behavior still plays a significant role in the energy use of cooking products.

In addition, AHAM believes that the introduction of new standards for cooking products could have a significant impact on the utility of cooking products . . .").

repeal of the oven test procedure that was part of this same Final Rule. Even absent an energy conservation standard for cooktops that requires use of the test procedure, manufacturers are required to report energy use via a test procedure DOE has not demonstrated is representative of consumer use for all product types and AHAM has demonstrated is not reproducible. This means that reported energy values for some products could be inaccurate and, for all products, will not be directly comparable to each other across manufacturers. Thus, consumers could be misled when evaluating and comparing energy claims. Accordingly, we also seek an immediate stay of the effectiveness of the cooktop test procedure, including the requirement that manufacturers use the final test procedure to make energy related claims.

Respectfully submitted,

Association of Home Appliance

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