

Summary and Response to Stakeholder Comments

ENERGY STAR Program Residential Refrigerators, Refrigerator-Freezers, and Freezers Draft 1 Test Method to Validate Demand Response

Comment #	Topic	Comment	Response
1	General	Section 10 specifies various calculations that would be applied during other points in the test procedure. To ensure the utmost clarity, the calculations should instead be provided where they are applied in the test procedure rather than in a separate section. For example, the calculation for EP_{TALR} should be in Section 6.1.C.	DOE acknowledges the comment suggesting a reorganization of the test method to incorporate calculations into the body of the test method; however, the format proposed in the Draft 1 Test Method is consistent with the ENERGY STAR style requirements.
2	Definitions	In Section 3, DOE proposes to define a "Utility Equivalent Communication Device" as a device capable of communicating with the connected appliance and emulating signals sent from a utility. DOE also proposes to define a "Communication Module (Appliance)" as a built-in or external device that enables appliance bi-directional communication with a utility or equivalent communication device. Clarification is requested as to the difference between the "Utility Equivalent Communication Device" in the first definition and a "utility or equivalent communication device" as defined in the second mentioned definition.	DOE has changed "utility or equivalent communication device" in Section 3B to "Utility Equivalent Communication Device" in the Draft 2 Test Method.
3	Signal Type	<p>Around the country, utilities are moving towards using time-based pricing. A customer that has a Connected appliance or HEMS will likely be enrolled in a time-based rate to capture the financial benefits of their Connected appliance. This will mean that DR signals sent to an appliance are more likely to be price based signals, not reliability-based signals (such as DAL and TALR).</p> <p>The current draft test method for DR functionality only tests units using reliability-based signals, though time-based pricing is mentioned as a possible signal type. While reliability will be an important consideration for DR events, the price of power will be more important and will more frequently determine DR event, particularly for delaying or shifting load.</p> <p>EPA and DOE are encouraged to gather stakeholder feedback on using price signals to initiate DR events in the test method. It is suggested that EPA and DOE further consider including in the test method, and future DR efforts, a test to determine the Connected unit's ability to respond to a price signal.</p>	The two capabilities included, Temporary Appliance Load Reduction (TALR) and Delay Appliance Load (DAL), were initially suggested by manufacturers and stakeholders as the core responses that could define a connected refrigerator. For future specification and test procedure revisions, DOE and EPA are open to investigating other capabilities and signal types such as price-based signals, as available, and subsequent responses, while carefully considering the impact they may have on the qualification process and verification testing.

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4	Signal Delivery	The current TALR is tested "within five minutes of the compressor On cycle". There are other points in the refrigerator operation that may draw more peak power and will create a bigger demand, depending on what is operating. We encourage the EPA to perform additional research, or obtain stakeholder feedback, on the "worst case" scenario.	DOE selected the first five minutes of compressor operation for delivery of the DR signal in an effort to test the unit in the "worst case" scenario. Through investigative testing, DOE identified this as an appropriate time to send a TALR signal. DOE welcomes feedback on the point in a unit's operation when it is most in need of drawing power and therefore will be most impacted by a DR request.
5	Connectivity	In Section 3B, the definition should be modified to allow optional participation. Bi-directionality requires a built-in transmitter, which can use a significant amount of standby or 'phantom' power. Moreover, it will also require at least one other transceiver unit, which also consumes significant standby or 'phantom' power. Therefore, it is recommended that the use of bi-directional communication or HEM as optional and not mandatory for privacy and 'phantom' power reasons.	EPA has approached connected by looking to recognize new opportunities that offer near-term benefits for consumers (e.g., alerts, diagnostics) as well as longer-term benefits for the electricity grid. The combined set of proposed connected functions, such as alerts, energy-use reporting and demand response functionality, will require bi-directional communications technologies. EPA and DOE are aware of the possible additional energy consumed by the communication device. See comment #16 for discussion on this topic.
6	Connectivity	In Section 5.2, DOE proposes steps for the communication setup. Missing from the steps for communication setup is any mention of the security settings. There should be a statement instructing any security settings be setup per the manufacturer's instructions. There should be a general statement, stating the communication setup be done per the manufacturer's instructed setup.	DOE has incorporated the requested language into Section 5.2B of the Draft 2 Test Method.
7	Consumer Override	Consumer choice and the ability to opt in or out of DR events are strongly supported. It is recommended that DOE continue to consider a consumer override test for inclusion into the DR test procedure. It is agreed that this may increase test burden, and therefore it is recommended that DOE consider alternative verification methods of the consumer override function.	A consumer override test was not included in the Draft 1 Test Method to minimize test burden. Additionally, DOE and EPA believe that it is in the manufacturer's best interest to properly implement these important consumer features and therefore assume that a test is unnecessary.

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8	Consumer Override	<p>DOE recognizes that the consumer override is an integral feature that consumers will find valuable and necessary. DOE also notes that it is "hesitant to include it as a feature required for testing as it will increase test burden. Consumer override is a feature, which DOE believes manufacturers will address during the development process." DOE and EPA request feedback from stakeholders on the importance and possible inclusion of consumer override testing.</p> <p>It is agreed that there is no need for the consumer override capability to be tested.</p>	See comment #7.
9	Ice Maker	<p>The test procedure indicates that no ice maker energy consumption, or demand, will be factored into the testing. As refrigerators and freezers continue to make efficiency gains, the ice making unit's consumption, and demand, become a larger fraction of the overall consumption, and demand, as a result become increasingly vital to understand.</p> <p>EPA is encouraged to explore viable test methods for including the contribution of ice makers in the DR test (e.g. require the ice bin to be emptied, then measure consumption/demand as the bin is filled). Stakeholder is aware that the DOE is currently supporting the development of an ice maker test procedure for residential refrigerators as part of its energy efficiency standards program; at the time this test will be available, it should be referenced or incorporated into the DR test method as well. The inclusion of ice maker consumption/demand will provide measureable benefits to manufacturers that incent exploration of additional strategies to respond to DR events.</p>	DOE and EPA have returned the ice-making deferral option in the Draft 3 Specification and have developed an ice maker deferral verification test, found in the Draft 2 Test Method. The test will verify deferral of ice making and will not calculate the ice maker energy consumption during the DR period.
10	Ice Maker	In Section 7, the section from the AHAM Smart Refrigerator Test Procedure 2011 regarding icemakers needs to be included to confirm ice making is shut off during delay load operation.	According to Section 5.3.C, the ice maker is on with harvest inoperative as described in the DOE test procedure. The test method also states to remain in this configuration throughout testing unless otherwise specified. Therefore, DOE does not see a need to include additional language that confirms the ice maker is inoperative during testing.

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11	DOE TP Harmonization	<p>In Section 4A, DOE states that "unless otherwise specified, all test conditions and requirements shall be identical to 10 CFR Part 430, Subpart B, Appendices A1 and B1, Section 2." Immediately following this statement, DOE provides input power requirements for Europe, Australia, New Zealand, and Japan in addition to North America in Table 1. This is contradictory to DOE's regulations, which are referenced in this part of the proposed test procedure. The current DOE regulations mandate 115 volts through incorporation by reference to HRF-1-1979, which states: The electrical power supply is to be 115V+/-1%, 60 Hz at the product service connection. The actual voltage is to be reported as measured at the product service connection with the compressor motor operating.</p> <p>Further, the DOE test procedure is not setup to be powered by 230 volts and an ENERGY STAR test procedure is not the proper place for DOE to amend its test procedures. If DOE wishes to expand the range or input power requirements to include a more international scope, it should amend the refrigerator/freezer test procedure through the appropriate notice and comment rulemaking process. The title of Table 1 uses descriptors such as "nameplate" and "1500 watts," which is the only time those descriptors are used in the document, and is only further evidence that Table 1 is out of place in this document. Leaving Table 1 in the test procedure will only cause confusion.</p>	DOE has removed the power requirements from Section 4 and harmonized the Draft 2 Test Method with the DOE Test Procedure found in 10 CFR Part 430, Subpart B, Appendices A and B (DOE TP).
12	DOE TP Harmonization	<p>In Section 4, Parts B through E, DOE proposes definitions for Ambient Temperature, Relative Humidity, Radiation Shield, and Watt Hour Meter.</p> <p>DOE takes two different approaches in describing the test requirements for Ambient Temperature and Watt Hour Meter. For Watt Hour Meter, EPA references specific sections in the DOE test procedure, which is the approach that is fully supported. For Ambient Temperature, DOE recites what is said in the test procedure without reference. Citation to requirements contained in the DOE test procedure is the best way to ensure consistency and harmonization with DOE regulations at all times - it ensures that as DOE test requirements change, ENERGY STAR test requirements change to mirror them. To achieve consistency, the relevant test requirements must be identical to each other at all times. Without such consistency and uniformity there will be significant confusion for manufacturers and for consumers. EPA is strongly encouraged to reference the DOE test procedure in all cases where applicable.</p>	DOE has revised the Draft 2 Test Method to ensure proper harmonization with the DOE TP.

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13	DOE TP Harmonization	DOE proposes to include a test requirement for Relative Humidity. During the March 8 webinar, DOE explained that the reason for Relative Humidity now being a test requirement is because of the DOE's experimental testing to identify a reliable method to predict the defrost cycle. Additional test requirements, which will increase test burden, for a procedure which is recognized as unsuitable and is only DOE's best guess as to how to induce a defrost cycle is opposed. In addition, most energy test rooms do not currently have the capability to tightly control relative humidity, and so adding this requirement to the test procedure would require significant investment in energy test facilities.	DOE has removed the relative humidity requirements in the Draft 2 Test Method. However, DOE continues to request stakeholder feedback on a suitable test for validating defrost deferral at the receipt of a DR signal.
14	DOE TP Harmonization	In Section 6.1D, DOE proposes recording the maximum internal refrigerator and freezer compartment temperatures. AHAM requests clarification as to why the maximum temperatures must be recorded. The procedure is not going from defrost to defrost, so it is unclear how the intervals would be derived.	The draft specification requires that a product with connected functionality continue to meet manufacturer's internal minimum performance guidelines, i.e., food preservation, but does not currently define a maximum allowable temperature. Therefore, DOE has removed the language that would record maximum internal refrigerator and freezer compartment temperatures from the Draft 2 Test Method.
15	DOE TP Harmonization	<p>In Section 8.1.C, the internal temperature is not defined. Would internal temperature be measured by the average across thermal couples and across time? This is not necessary and it was not in the original draft. The purpose was to measure the energy consumption during the periods not the temperature fluctuation during the periods.</p> <p>Similar to the comments in Section 6.A, the internal temperatures are not mentioned anywhere in this document other than in this line, so why measure them?</p> <p>EP_{TALR} also is not defined. DOE should define this term if needed, but it is unclear why this variable is needed and to what it is being compared.</p>	<p>DOE understands the concern with recording data that are not used in the test method.</p> <p>DOE has removed requirements from the Draft 2 Test Method; however, they will be re-considered if a maximum temperature requirement is defined in the specification and incorporated in to the eligibility criteria. See the response to comment #14.</p>

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16	DOE TP Harmonization	<p>AHAM continues to believe that network mode and its associated energy usage in smart appliances should be treated as a distinctive energy user that enhances electrical grid system efficiencies through energy management and thus resulting in reduced carbon emissions. This position applies across product categories and is consistent with IEC Standard 62301, Second Edition. It is also consistent with DOE’s positions in rulemakings that have addressed the measurement of standby and off mode, and examined whether to include network mode. For example, in the clothes washer test procedure rulemaking, DOE stated that it “is unaware . . . of any clothes washers currently on the market with network mode capabilities. . . . Consequently, DOE cannot [sic] thoroughly evaluate these network mode provisions, as would be required to justify their incorporation into DOE’s test procedures at this time. DOE notes that although an individual appliance may consume some small amount of power in network mode, the potential exists for energy-related benefits that more than offset this additional power consumption if the appliance can be controlled by the ‘smart grid’ to consume power during non-peak periods. Although DOE is supportive of efforts to develop smart-grid and other network-enabled technologies in clothes washers, today’s final rule does not incorporate network mode provisions due to the lack of available data that would be required to justify their inclusion.” 77 Fed. Reg. at 13888, 13900 (Mar. 7, 2012). Furthermore, the energy consumed by “all connected and network modes” is not completely in the manufacturer’s control. The energy consumption in network mode will vary depending on transmission range, networking technology deployed (especially when not specified by the manufacturer), and the size and frequency of the data transmissions, all of which may be influenced by devices outside the refrigerator or by parties other than the manufacturer. Not only is the energy consumption from network mode not entirely within the manufacturer’s control, thereby making it impossible to predict for testing purposes, but there is also no data to suggest what the energy consumption would be from consistent or typical consumer use such that these factors could appropriately be incorporated in the test procedure to represent typical consumer use. Accordingly, network mode energy consumption should not be measured during the ENERGY STAR test method baseline test until such time as more products are available and consumer use can be adequately studied.</p>	<p>At this time DOE is not proposing a method to identify and measure the specific energy consumed by the communication module. However, DOE firmly believes that products should be tested as installed and configured per manufacturer instructions.</p> <p>To ensure harmonization and reduce test burden, DOE has instructed that all baseline data be selected from the DOE Test Procedure (10 CFR Part 430, Subpart B, Appendix A or B). DOE will investigate the communication module energy consumption within the DOE Test Procedure and will consider providing guidance on this issue within the federal standards and test procedure rulemaking process.</p>

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17	DOE TP Harmonization	Recommend specifying that anti-sweat heaters must be enabled throughout testing. Also recommend a variety of small modifications to the Test Method to streamline and remove possible areas of confusion.	DOE has not adopted the proposal to place the anti-sweat heater switch in the “on” position. DOE believes that issues will arise with variable anti-sweat heaters which operate based on the ambient relative humidity, which is not specified by the DOE TP. Therefore, DOE proposes in Draft 2 that the anti-sweat heater switch be in the “off” position for all DR tests. The baseline energy consumption will be selected from the section of the DOE TP performed with the anti-sweat heater switch in the “off” position.
18	Defrost Initiation/Prediction	EPA and DOE noted the difficulty in initiating defrost for the DAL test in the DR test method. The same difficulties in initiating defrost in residential refrigerator and freezer testing has been encountered by stakeholders. DOE and EPA are encouraged to research a better method for initiating defrost, but we do not have any suggestions at this time. EPA assumes that delaying defrost will be a necessary part of DAL and TALR response. This assumption may not be true for all manufacturers and products. We suggest that EPA revisit this assumption.	Manufacturers have universally responded that defrost initiation/prediction will likely be impossible because how units initiate and maintain defrosts is proprietary. Given this, while DOE is continuing to investigate options for defrost initiation/prediction and welcome feedback that will aid in these efforts, at this point in time DOE is not planning to validate the defrost deferral requirement in the Test Method. Instead, the test lab will document the occurrence of any defrost operations during the DR tests. Products would not pass the test if defrost operations occur.
19	Defrost Initiation/Prediction	In Section 6.1A, DOE proposes recording the typical compressor duration and compressor cycle interval, which are defined in this section. These are not mentioned anywhere else in this document other than when being defined in Section 6.1.A. What is the purpose of defining and recording these values if they are never used?	DOE anticipated that the compressor profile data would be necessary for predicting defrost operations. As defrost deferral validation is not included in the Draft 2 Test Method, the compressor duration and cycle intervals are no longer necessary.
20	Defrost Initiation/Prediction	Parts A, B, and D in Section 6 are performance and not energy requirements. Capturing this data, therefore, is irrelevant for the purposes of this test procedure.	See responses to comment #19.

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21	Defrost Initiation/Prediction	<p>There is an inconsistency in Section 7.1.A in the description of products with manual defrost or off-cycle defrost. Off-cycle defrost is basically defrosting every off cycle. The procedure then states to send the DAL signal and skip to Step C. In Step D, it says to verify no defrost cycle occurs, but in step A, it was established the off-cycle defrost occurs every off-cycle. This system is naturally going to defrost every off-cycle. At the end of Section 7.1.D, the following statement should be added, "(not applicable for manual or cycle defrost)."</p> <p>The scope of "off cycle defrost" is unclear. It should not apply beyond the freezer defrost. There are food safety concerns for restrictions on refrigerator evaporator defrost cycles. If the scope is intended to include refrigerators, then the intent is questioned, as heaters are not typically employed and there would not be a strong energy savings argument. In fact, skipping off cycle defrost on a heater-less refrigerator coil would lead to more energy being required for the cycle.</p>	As explained in comment #18, DOE has removed the defrost initiation/prediction requirements from the Draft 2 Test Method.
22	Defrost Initiation/Prediction	<p>In Section 7.1.B, the steps outlined may have no impact in triggering a defrost cycle. Typically, door openings impact the defrost after the impending defrost, not the next defrost. Further, there is a risk in performing all of this guess work in that it will increase the energy measured during the test. Section 7.1.B should be removed because the energy impacts are not insignificant and it would be inconsistent with the rest of the procedure.</p> <p>DOE proposes several potential methods for predicting a defrost. DOE states that "to verify that defrost is delayed with a DR signal, there must be a reliable method that predicts the defrost cycle. The final method must minimize test burden and the potential for circumvention, while clearly identifying and predicting defrost cycles at independent test labs."</p> <p>Although we understand DOE's interest in verifying that defrost is delayed with a DR signal, it is impossible to define one procedure for predicting a defrost that would apply across all products and manufacturers. Because DOE does not and cannot know the proprietary algorithms each individual manufacturer uses for triggering a defrost cycle, the steps outlined in Section 7.1 may or may not induce a defrost cycle depending on each individual algorithm. Section 7.1.B should, thus, be removed. DOE itself stated the futile nature of creating a standard method for inducing a defrost cycle when it said, "it was not possible to consistently initiate defrost on the UUT."</p>	<p>See response to comment #18.</p> <p>Since no method was found that consistently initiates or predicts a defrost, DOE has removed the door opening defrost initiation method originally proposed in Section 7.1.B of the Draft 1 Test Method.</p>