

March 23, 2012

US Environmental Protection Agency
ENERGY STAR Program
Ariel Rios Building 6202J
1200 Pennsylvania Avenue, NW
Washington, DC 20460

To whom it may concern:

This letter includes the comments of Southern California Edison (SCE) in response to the Environmental Protection Agency (EPA) ENERGY STAR Draft 2 Version 5.0 Specification for Residential Refrigerators and Freezers, and the ENERGY STAR Program Draft Test Method to Validate Demand Response (DR) for Residential Refrigerators and Freezers.

SCE supports the EPA's effort to introduce demand response and "smart" capabilities in ENERGY STAR appliance specifications; smart products will be a useful tool for utilities and consumers alike to manage their energy use and costs.

From a utility perspective, the financial benefits and peak demand savings of smart, DR capable appliances will depend on a number of variables which can interact in various ways and are not under utility control. It is important to a utility that, despite these variables, DR programs enjoy as much reliability and certainty as possible. When a utility or third party sends a signal for a DR event, the DR-capable product, as authorized by the consumer, will respond according to the signal sent and its own capabilities. While the actual response will depend on a number of factors, it is essential that utility DR programs be able to estimate and depend on a reliable response. These factors motivate our comments in this letter.

Comments regarding the Draft Test Method to Validate Demand Response for Residential Refrigerators and Freezers

1. Temperature Control (Applies to both Test Method and Specification)

The test method to validate DR should use internal temperature control points to determine whether the system is capable of responding to a DR event. Temporary Appliance Load Reduction (TALR) exemptions based on consumer actions (door openings, water/ice dispensing) likely don't reflect the unit's ability to respond to a DR event.

The current ENERGY STAR Draft 2 v. 5.0 specification, and Draft Test Method to validate DR for residential refrigerators and freezers, allow for consumer response exceptions to the TALR test (door openings, ice or water dispensing). Although these consumer response exceptions may drive refrigerator power demand and energy consumption, they do not directly determine whether a residential refrigerator or freezer will be able to respond to a DR event, and further do not address the condition of a refrigerator or freezer prior to the event being initiated. These exceptions are only proxies for the ability of the unit to respond to a DR signal without compromising food safety (temperature). The interior temperature will both determine food safety and the ability of the unit to respond to a DR signal, and would provide a more accurate exception.

It is likely that the refrigerator controls the interior temperature to not exceed a maximum safety control point. This control point and the unit interior temperature will determine whether or not the unit is able to respond to a DR event when called, not door openings or through the door (TTD) water or ice dispensing. Therefore, temperature is a better measurement to determine unit exemption from responding to the TALR signal.

It would be straightforward to use temperature to determine this exception during the test, because unit interior temperatures are already measured in the draft test method during the DAL and TALR response tests. The EPA could perhaps determine a maximum safe temperature, based on common food safety standards, and adjust the current TALR exemption based on whether the unit interior temperature falls below this maximum limit.

For example, the relevant language in the specification could read as follows:

- (Specification) C.2.b. “Exceptions – Under the following conditions, the product is not required to restrict its average energy consumption by providing a Temporary Appliance Load Reduction response:
 - ii. If the interior refrigerator temperature at the time the event is initiated exceeds the maximum temperature limit as defined in Section XX”.

This exception will still allow refrigerators and freezers to maintain safe operation and to not respond to a DR signal if it would compromise consumer safety and exceed reasonable operational limits.

With the understanding that temperature is a key driver in the ability of these units to respond to a DR signal, a more realistic representation of thermal mass should be considered. In real-world applications, these units will have a significant amount of thermal mass (i.e. refrigerated or frozen goods) that will provide added ride-through capabilities. Commercial refrigeration equipment is required to be tested with product simulators present. We encourage the EPA to consider including similar provisions in these tests, as this will improve the tested unit’s ability to maintain product temperature during a DR event.

2. Power Measurement (Applies to both Test Method and Specification)

The demand response test procedure and DR functionality criteria should measure and rate actual product power during the DR test period, not average power based on average energy consumption.

As currently written, the Draft 2 specification and test procedure requires that a Connected product “reduce its average energy consumption” during both the Delay Appliance Load (DAL) and TALR test. The Draft 1 test procedure, accordingly, measures energy consumption of the unit over the baseline and DR response test periods, and simply divides by the test period times to get average power.

From a utility load management perspective, however, there is a significant and important difference between the average unit power demand over a time period, and the actual demand profile over the same period. The response pattern, length of time to respond, and maximum and minimum demand over the time period, will all matter when attempting to estimate and plan the impact from a DR event.

For example, during the DAL test as currently written, a unit that provides a sustained power reduction of 13% over the 4-hour test period, will provide the same test results as a unit that reduces power by 26% for only 2 hours of the test. But, the actual demand benefits of these two units are quite different, and a utility or other power provider would not be able to reasonably manage load during an event if all units called responded like the second unit in the above example.

We suggest that the specification and test procedure include language to clarify this issue, and measure and rate the actual power of the Connected refrigerator or freezer. For example, the DR Functionality language could be revised to read as follows:

(DAL) 1.a.ii: “reduce its power demand during the delay period to no more than 87% relative to the power measured during normal operation for the same delay period (i.e. the baseline testing, when no event is called)”

(TALR) 2.a. “restrict its power demand during the load reduction period to no more than 50% of the power measured during normal operation for the same delay period (i.e. the baseline testing, when no event is called)”

For comparison, the power demand during the test period (both DAL and TALR) could be compared to the baseline power demand measured during the 24-hr DOE residential refrigerator test procedure.

Redefining the specification and test procedure in this way may require reexamining whether the current power reduction requirements are realistic and appropriate (13% for 4 hours for DAL, 50% for 10 minutes for TALR). We suggest that this issue be raised for public comment.

3. Initiating Defrost in the DR Test Method

The EPA and DOE have noted the difficulty in initiating defrost for the DAL test in the DR test method. SCE has encountered the same difficulties in initiating defrost in residential refrigerator and freezer testing. We encourage that the DOE and EPA research a better method for initiating defrost, but we do not have any suggestions at this time.

The 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 the EPA revisit this assumption.

4. Initiating TALR Response

The current TALR response 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.

Furthermore, some refrigerators and freezers will not allow any changes in the compressor’s operation within five minutes of it turning on, to protect the compressor. At the least, we suggest that the current five-minute period be lengthened.

5. Customer Override and Opt-Out of Connected Functionality

We strongly supports consumer choice and ability to opt in or out of DR events. We recommend that DOE continue to consider a consumer override test for inclusion into the DR test procedure. We agree that it may increase testing burden, and therefore recommend that DOE consider alternative verification methods of the consumer override function.

6. Ice Maker Testing

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, and as a result become increasingly vital to understand.

We encourage the EPA 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). We are aware that the DOE is currently supporting the development of an ice maker test procedure for residential refrigerators as a 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 measurable benefits to manufacturers that incent exploration of additional strategies to respond to DR events.

Comments regarding the Draft 2 Version 5.0 Residential Refrigerators and Freezers Specification

1. Response to DR Signals

A Connected refrigerator or freezer should be able to respond to more than one DR signal within a 24-hour period.

The current Draft 2 specification requires that a Connected refrigerator or freezer responding to a DR signal be able to provide at least one response (DAL or TALR) within a 24-hour period. However, EPA notes that this means that the unit does not need to respond to additional DR signals if called within a rolling 24-hour period, even if the unit is capable of responding (i.e. within the allowable temperature range). Our concern is that manufacturers may interpret this to mean that their unit does not need to respond to additional DR signals, and could design their units to respond to only one DR signal in a 24-hour period.

We ask the EPA clarify and tighten this requirement, and require that units respond to, *at a minimum*, one DR signal within 24 hours, but shall not limit the ability to respond to more, so long as functionality and safety are not jeopardized. Allowing units to ignore additional signals within a 24-hour period is unnecessary and significantly compromises the value of the DR functionality.

It may be necessary to reasonably call more than one DAL or TALR event in a 24-hour period. For example, it could be reasonable to expect that a DR event could be called at 5:00 PM on one day and at 3:00 PM on the subsequent day.

Unless it can be proved that responding to subsequent DR signals within a 24-hour period is impossible, or significantly compromises product performance, we recommend that the EPA strengthen and clarify the current language, such as in the following:

“The product shall be able to provide, at a minimum, one Delay Appliance Load / Temporary Appliance Load Reduction response in a rolling 24-hour period, but shall not limit ability to respond to more, so long as functionality/safety is not jeopardized.”

2. Default Mode

Connected criteria and functionality should be active when shipped and operational in the product's default mode of operation.

The Draft 2 specification for refrigerators and freezers does not currently specify that the Connected criteria for the product be active “out of the box”, default on. It only specifies that the product must “ship with default settings” in regards to DAL and TALR DR responses.

We suggest that this requirement be extended to require that ENERGY STAR rated refrigerators and freezers “ship with default settings active”. We also suggest that this requirement cover all Connected criteria, not only the DR functionality. This will enable the connected functionality to operate and accrue benefits without any necessary consumer action.

3. Response to Cost Signals

Time-based pricing and price signals will become a more important driver of DR events than reliability based signals, and should be tested and incorporated.

In California and across the nation, 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).

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 events, particularly for delaying and shifting load.

For example, a Connected residential refrigerator could have a set of operational options that allow the consumer to set a power price limit, above which the appliance will delay load. A test method that can test the appliance's ability to respond to price signals will be necessary to verify that the consumer will capture the financial benefits of DR.

We suggest that the DOE and EPA gather stakeholder feedback on using price signals to initiate DR events in the test method. We suggest that DOE and EPA 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.

4. Annual Energy Functional Adders for Connected Functionality

The energy functional adder for Connected functionality will compromise the energy savings benefits to consumers and energy efficiency programs in the near term.

We echo our previous comments on this topic¹ in response to the Framework document for this specification. We are concerned that, without existing DR programs for residential consumers, the current 5% adder for Connected functionality will not adequately provide near-term and certain financial, energy-related, or power-related benefits to consumers. This is undesirable not only for consumers, but also for utility and third-party energy efficiency rebate programs, which will suffer a penalty in reduced

¹ PG&E, SCGC, SDG&E, SCE. “Final IOU Comments on the ENERGY STAR Fridge Framework”. Submitted to the EPA on August 12, 2011. Available online at http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/refrig/California_IOUs_Comments_V5_Refrigerator_Framework.pdf?87e0-896d

program energy savings without an immediate benefit.

We know that the EPA ENERGY STAR program prioritizes consumer benefits and choice. We recognize that the EPA has worked in this specification development process to increase and strengthen the Connected criteria to ensure that consumers will receive significant energy, cost, and functional benefits from a Connected ENERGY STAR appliance.

We summarize our concerns on this topic, as previously submitted to the EPA:

- Energy efficiency and demand response programs are evaluated using different metrics. Therefore, for a utility or third party program, offering an incentive for a Connected ENERGY STAR appliance will not provide an equivalent benefit as an incentive for regular ENERGY STAR appliance.
- The financial savings from a Connected appliance are uncertain, while the energy and financial savings from an energy-efficient appliance are known and presently available without consumer intervention. No energy savings will accrue from Connected capability on its own, without being activated and used by the consumer. Furthermore, a Connected appliance may suffer from lost energy savings by responding to DR events.
- A consumer who purchases a Connected appliance will receive a penalty in lost energy and cost savings until DR programs is in place *and* consumers are informed and inclined to take full advantage of such programs. Even when these conditions are met, the benefits to the customer are not likely to match the credit given to the manufacturer (i.e. consumer will be penalized). This is why an optional “Connected” label or designation, which would allow the EPA to highlight Connected products on the Qualifying Products List, would be more appropriate than a credit / energy consumption adder.

We thank the EPA and DOE for the opportunity to be involved in this process and encourage the EPA and DOE to carefully consider the recommendations outlined in this letter.

Sincerely,

A handwritten signature in black ink, reading "Anthony R. Hernandez". The signature is fluid and cursive, with a long horizontal stroke at the end.

Anthony Hernandez, P.E., LEED AP BD + C

Manager

Design and Engineering Services

Southern California Edison