



ENERGY STAR®

Residential Refrigerators and Freezers Stakeholder Webinar

Draft 3 Version 5.0 Specification

U.S. Environmental Protection Agency
September 20, 2012

Agenda



Introduction – Welcome/Goals

Draft 3 Version 5.0 Specification

- Revisions to Energy Use Criteria
- Other Updates

- Revisions to “Connected” Functionality

Conclude & Next Steps

Webinar Goals



- Present the proposed Draft 3 Version 5.0 ENERGY STAR refrigerator and freezer specification, highlighting key changes.
- Obtain stakeholder feedback, address questions and facilitate discussion on proposals and any related issues.
- Discuss next steps and timelines for the Version 5.0 spec revision and related test method development.

Overview of Draft 3 V5.0



- **Timing**

- The proposed effective date has been revised from January 1, 2013 to March 1, 2014. EPA has timed the V5.0 specification change to mitigate burden on the industry since it falls outside the peak selling season.
- ENERGY STAR certification would remain valid until March, for products certified to V4.1 by Jan. 1, 2013.
- This revised timing avoids need for two specification changes in the next two years; aligns with availability of DOE's amended test procedure that manufacturers have indicated they plan to use for new 2014 refrigerator models.
- While avoiding two closely timed spec changes has clear advantages, EPA also recognizes there are trade-offs with further delay.
 - Overall ENERGY STAR refrigerator market share exceeded 55% in 2011 and continued growth is expected.
 - Disproportionately high ENERGY STAR availability among certain configurations.
 - March effective date differentiates in the 2014 peak selling season.

Overview of Draft 3 V5.0 (cont)



- **Energy Use Requirements**

- Use DOE’s 2014 product classes and are expressed as a “percent above” the 2014 federal standard (10 - 13%).
 - The revised requirements seek to deliver meaningful savings to consumers and recognize a selection of products from different manufacturers and in different configurations.
- EPA is proposing to sunset freezers after considering the stringency of the 2014 Federal standards; the Agency is uncertain there will be cost-effective products that exceed these new standards.

- **Connected**

- With Draft 3, EPA is providing another opportunity for stakeholders to help shape the connected criteria.
- The latest proposal includes a number of revisions to demand response (DR) and communications criteria.

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Annual Energy Use Requirements



- In Draft 3, EPA is proposing revised requirements that leverage DOE's 2014 product classes and are expressed as a "percent above" the DOE's 2014 minimum standards:
 - 10% for most refrigerators and refrigerator-freezers
 - 13% for built-in product classes
- Refrigerators are to be rated using the amended DOE test procedure (Appendix A).
- The Annual Energy Consumption (AEC) shall be less than or equal to AEC_{MAX} :

$$AEC_{MAX} = AEC_{BASE} + \sum_{i=1}^n AEC_{ADD_i}$$

where,

- AEC_{BASE} = annual energy consumption base allowance in Table 1
- AEC_{ADD_i} = annual energy functional adder in Table 2

Proposed Criteria



Product Class	% Less Energy than Federal Standard (Compliance Date of 9/15/2014)
Refrigerators and Refrigerator-Freezers	10%
Built-In Refrigerators and Refrigerator-Freezers	13%
Freezers	Sunset
Compact Refrigerators	10%
Compact Freezers	Sunset

Annual Savings



Configuration		National	Per Unit	
		1 st Year Energy Savings (GWh/yr)	Annual Energy Savings (kWh/yr)	Lifetime Savings (\$)
Full-Size	Top Freezer (18 cu-ft)	129	41	80
	Bottom-Freezer w/ TTD (26 cu-ft)		76	149
	Side-by-Side w/TTD (26 cu-ft)		70	137
	Built-in Side-by-Side w/ TTD (26 cu-ft)		108	211
	Compact Refrigerator (5 cu-ft)	18	29	23

Note: Annual energy savings calculated using the difference between the 2014 federal standard and proposed criteria. Electric price used is 11.5 cents per kWh. Lifetime of 17 years for full-size refrigerators; 7 years for compact refrigerators. National savings assume annual U.S. shipments of 9 million full-size refrigerators and 2.5 million compact refrigerator and 25% ENERGY STAR market penetration.

Proposed Criteria for Refrigerators



- EPA's intent is to provide meaningful savings for consumers seeking ENERGY STAR refrigerators.
 - While also taking into account the potential efficiency impacts from proposed 5% allowance.
 - Research indicates that a variety of design options, some of which are already in use today, that could be used to meet the proposed levels: variable speed compressors; vacuum insulated panels; dual-loop systems; dual evaporators; new foam blowing agent options.
- EPA discussed the test procedure transition and efficiency opportunities with a number of manufacturers.
 - Factoring in the addition of ice-making (84 kWh/yr) plus changes in refrigerator and freezer compartment temperatures.

Proposed Criteria for Refrigerators (cont)



- Based on this, the Agency estimates the 10% level translates into, approximately, 29-35% (relative to current standards) for most refrigerator classes.
 - Refrigerators are available today as high as 36%
 - Approximately 27% of products qualified in 2012 exceed 29%
- EPA is proposing a level of 13% for built-ins to ensure efficiency requirements are strengthened beyond what is required today by ENERGY STAR.
 - 2014 standards are less stringent for built-in products.
 - Considering a side-by-side w/ through-the door-ice (PC 7 BI), EPA estimated:
 - Proposed 13% ESTAR level (relative to 2014 standard), is approx. equivalent to 21 to 25% (relative to 2001 standard).
 - A 10% ESTAR level (relative to 2014 standard), is approx. equivalent to 18% to 22% (relative to 2001 standard). Possibly meaning a reduction from V4.1 requirement of 20%.

Proposal for Freezers



- The 2014 DOE minimum standards will require freezers to use approximately 25-30% less energy than the current federal standard.
- Given the stringency of the new requirements, one manufacturer recommended sunsetting freezers from the ENERGY STAR program.
- At this point, EPA is uncertain that options will exist in the market that provide cost-effective savings beyond the new federal standard.
- EPA is open to evaluating the opportunity to label freezers if data indicates that there will be cost-effective opportunities to differentiate the energy efficiency of freezers for consumers.

Additional Changes



- EPA has proposed a number of changes throughout the specification that reflect the proposals to reference the 2014 DOE test procedure and to sunset freezers:
 - Section 1, Definitions are consistent with Test Procedure in Appendix A
 - Section 2, Scope has been revised to reflect the Agency’s proposal to sunset freezers
 - Section 3B, Determination of Adjusted Volume
 - Section 5, Test Requirements now cites Appendix A
- Section 3C: Significant Digits and Rounding section has been revised to cite the applicable sections of the CFR (consistent with other recent appliance specification revisions).

Feedback/Questions?



- EPA welcomes comments, questions, and discussion on the following:
 - Proposed criteria for refrigerators
 - Proposal to sunset freezers in 2014
 - Timing
 - Other changes integrated into the V5.0 specification

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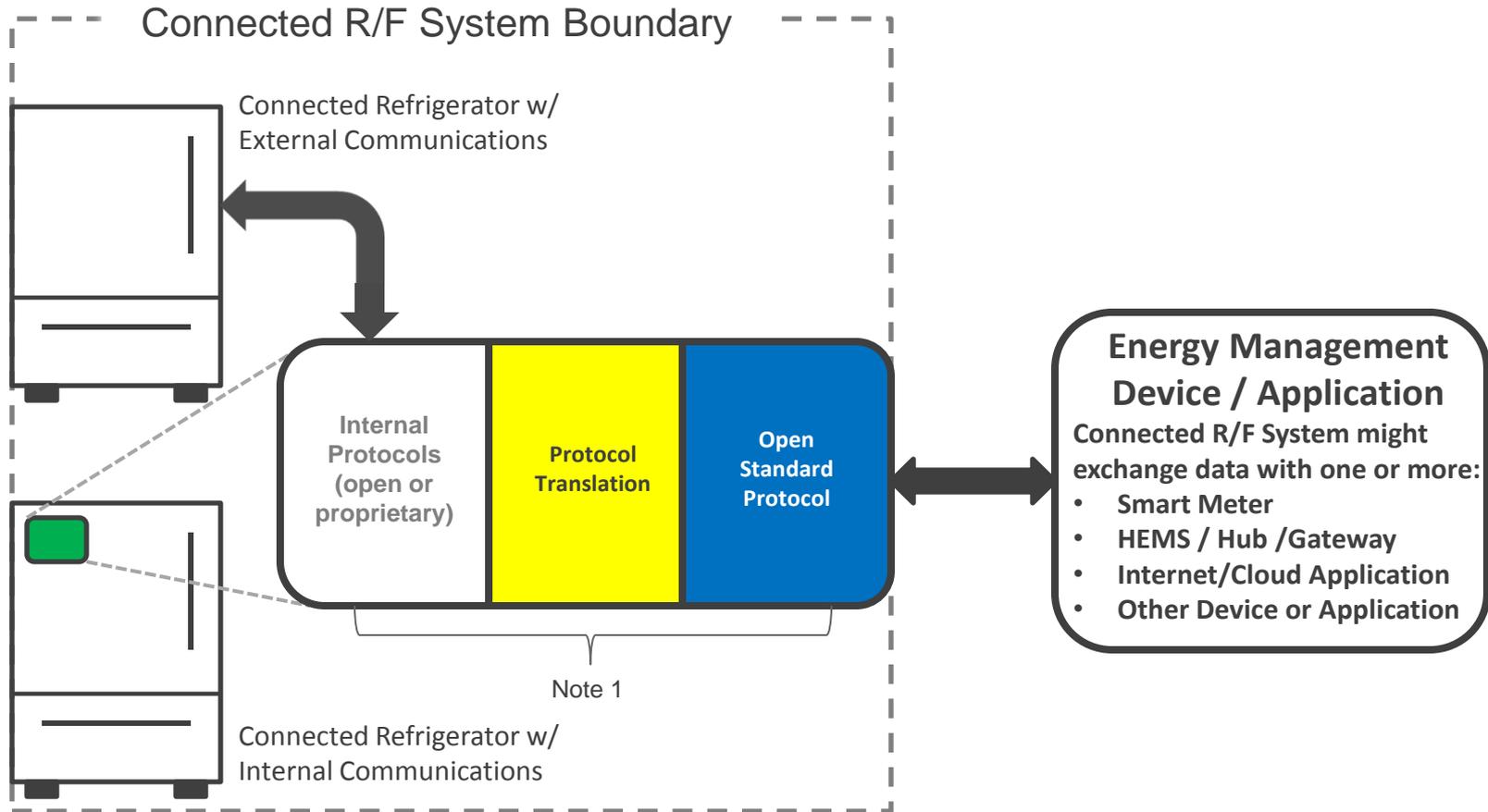
Draft 3:

Connected Product Criteria



- EPA recognizes defining connected functionality for home appliances, at this stage, is complex.
 - The Agency appreciates all the feedback received on the Draft 2.
- In Draft 3, EPA has revised the connected product criteria based upon stakeholder input, including a set of recommendations from utilities and appliance manufacturers. Criteria cover:
 - Connected Refrigerator-Freezer System
 - Communications
 - Open Access
 - Energy Consumption Reporting
 - Remote Management
 - Operational Status, User Setting & Messages
 - Delay Defrost Capability
 - Demand Response
 - Information to Consumers

Connected Refrigerator-Freezer System



Note 1: Communication device(s), link(s) and/or processing that enables open standards-based communication between the Connected R/F System and Energy Management Device/Application(s). These elements could be within the base appliance, and/or an external communication module, a hub/gateway, or in the Internet/cloud.

Connected Refrigerator-Freezer System



- Draft 3 includes a new Figure 1, a block-diagram depiction of a Connected Refrigerator/Freezer System that depicts:
 - elements (hardware & software) of the connected appliance system
 - internal communications
 - external, energy-related communications
- Added criterion requiring inclusion of “*at least one supported configuration that is capable of receiving and directly responding to open standards-based energy related commands on the consumer’s premises.*”

Connected Refrigerator-Freezer System



- EPA believes it is important at this early stage, that ENERGY STAR connected products preserve flexibility for consumers and utilities by, at a minimum, being able to receive and directly respond to an open-standards based signal, without having to depend on a service supplied by the manufacturer via the Internet/cloud.
 - At a minimum, connected refrigerators would need to be able to receive and directly respond to open standards-based energy commands on the consumer's site.
- Products could *also* offer a cloud-based solution for demand response

Communications – Open Standards



- As recommended by stakeholders, open standards criterion was strengthened from a **recommendation** (Draft 2) to a **requirement** that communication with entities outside the R/F System must use, for all communication layers, standards :
 - Included in the Smart Grid Interoperability Panel (SGIP) Catalog of Standards, and/or
 - Included in the NIST Smart Grid framework Tables 4.1 and 4.2, and/or
 - Adopted by the American National Standards Institute (ANSI) or another well-established international standards organization such as the International Organization for Standardization (ISO), International Electrotechnical Commission (IEC), International Telecommunication Union (ITU), Institute of Electrical and Electronics Engineers (IEEE), or Internet Engineering Task Force (IETF).

Communications Hardware Architecture



- In Draft 3, communications hardware criterion was revised to specify that communications can be enabled by any of the following means:
 - a. Built-in communication technology
 - b. Manufacturer-specific external communication module(s) and/or device(s)
 - c. Open standards-based communication port on the appliance combined with open standards-based communications module
 - d. Open standards-based communication port(s) on the appliance in addition to a, b or c, above
- If option b or c is used, the communication module/device(s) must be easy for a consumer to install and shipped with the appliance, provided to the consumer at the time of sale, or provided to the consumer in a reasonable amount of time after the sale.
 - EPA is seeking to provide a level playing field among different options and deliver consumers near-term value from connected functionality.
- In addition to options a, b and c, which have been recommended by stakeholders, EPA has incorporated a fourth option to recognize cases where manufacturers opt to provide more than one type of communication:
 - e.g., Refrigerator with built-in Wi-Fi plus an open-standards based modular communication interface (MCI)

Communications Hardware Architecture (cont)



- This change add an option for a product to include an open standards-based MCI in addition to built-in or modular communications hardware.
 - products with an MCI in addition to built-in or modular communications hardware are not required to ship with an module for the (additional) MCI
 - a product that includes an MCI in addition to built-in or modular communications hardware could, for example, simultaneously connect to cloud services for consumer oriented functionality AND receive and directly respond to open standards-based energy related commands on the consumer's premises using the MCI

Open Access



- In Draft 3, EPA's intent is to continue to promote open access by requiring the release of an API or interface specification.
- Draft 3 incorporates some minor language changes that:
 - embed the energy consumption accuracy reporting requirement while also clarifying the documentation should cover units and measurement interval, and
 - clarify that open-access also applies to communications that enable Delay Defrost Capability

Energy Consumption Reporting



- In Draft 3, EPA is clarifying that energy consumption reporting be to consumers and/or to consumer-authorized 3rd parties
 - Some stakeholders have noted that utility programs may require the ability to verify end-devices provide certain responses. With a consumer's permission, energy consumption data could be used for this purpose.
- With the revised criteria, EPA is recommending reporting in watt-hours for intervals of 15m or less, but is also allowing alternate units and reporting intervals as specified by the manufacturer. (These need to be detailed in the API or interface specification.)
- EPA has also clarified that as an option, energy use feedback could be provided to consumers on the product's interface.

Operational Status, User Settings and Messages



- Consistent with stakeholder recommendations, Draft 3 DR status reporting was strengthened to mandate transmission of DR status to consumer authorized devices, services or applications.

Delay Defrost Capability



- Criteria was restructured to revert to a single 4-hour deferral period per day – Draft 2 had added a 2nd 4-hour deferral period to align with typical Winter peaking.
 - The required 4-hour deferral period is seasonal and shifts from 3 – 7PM to align with Summer peaks to 6 – 10 AM to align with Winter peaks.
- Products must provide the capability for the consumer or consumer authorized 3rd party to modify this capability, for example, to align avoidance periods with local peaking.
- Criteria allows product interconnection as a prerequisite for activation of delay defrost capability.
- Capability is disabled once consumer enrolls in a program where they receive price/event signals.

Demand Response Capability



- Delay Appliance Load (DAL) Capability
 - shifting of ice-making was reinstated
 - 13% minimum load reduction specified relative to average power draw during the baseline test
- Temporary Appliance Load Reduction (TALR) Capability
 - 50% minimum load reduction specified relative to average power draw during the baseline test
- For both DAL and TALR - EPA has clarified intent by specifying load shed relative to average power draw rather than to energy consumption (as specified in Draft 2), during the baseline test.

Questions / Discussion?



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Anticipated Timeline for Version 5.0 Spec Revision



September 6, 2012	Draft 3, Version 5.0 and Published
September 20, 2012	Stakeholder webinar to discuss Draft 3 V5.0 Specification (Today)
October 9, 2012	Comment Period Closes
October/November 2012	Final Draft Specification Distributed and Comment Period
November 2012	Final Version 5.0 Published
March 1, 2014	Proposed Effective Date

- EPA welcomes stakeholder comments by **October 9, 2012**.
- Comments should be submitted in writing to appliances@energystar.gov

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