

Topic Category	Issue	Proposed Responses and Potential Remedy for CF/DR Responses
Energy Use Criteria	Stakeholders indicated that many manufacturers are currently redesigning and developing new products to meet the forthcoming federal standards. Stakeholders indicated that the current data set does not fully capture products that might be introduced leading up to, and at the time the federal standard becomes effective.	EPA understands that manufacturers are still conducting research and development for new products, and full performance data on those forthcoming models is not yet available. Based on outreach to stakeholders, EPA understands that multiple manufacturers will introduce additional models to the market in 2018 that deliver greater efficiency. ENERGY STAR is a data-driven program, and EPA uses standard equipment as the baseline when determining ENERGY STAR performance levels. When a federal minimum efficiency standard exists, EPA uses that standard to set a new baseline for product performance. Further, in conversations with several stakeholders, including compressor manufacturers currently working with ACIM equipment manufacturers, EPA learned that there are several technology options that may improve the efficiency of ACIMs. EPA reviewed information on potential efficiency gains that could be made with new components and technologies. By optimizing components, including increasing the compressor energy efficiency ratio (EER), making use of climate-friendly refrigerants, and upgrading motors, manufacturers can realize significant energy efficiency improvements. In some cases, compressors designed to incorporate climate-friendly hydrocarbon refrigerants are smaller and require fewer raw materials, which also makes them cost effective. EPA believes the models that will meet the proposed ENERGY STAR levels will represent the top performers in the marketplace when the new DOE standards take effect in 2018.
Energy Use Criteria	Several stakeholders commented on the inconsistent harvest rate break points when compared to the federal minimum efficiency standard. Commenters noted that in establishing different break points, certain harvest ranges within subcategory, would have stricter requirements than others.	EPA has amended the levels to maintain consistent harvest ranges between ENERGY STAR and the federal minimum efficiency standard.
Energy Use Criteria (RCUs)	EPA did not provide separate performance criteria for remote condensing units (RCUs) with remote compressors, and those without remote compressors. EPA should consider creating different criteria for the two types of product to align with the federal	EPA performed an analysis on the two types of RCUs. However, the performance data on the individual types was limited and developing separate performance criteria did not appear to offer customers additional energy savings beyond the approach EPA took in Draft 1. Furthermore, the federal standard has nearly identical requirements for the two types of RCUs. In fact, DOE considered whether efficiency improvements based on design options would be significantly different for remote compressor machines, when compared to non-remote compressor machines. In the end, DOE concluded that there

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	standards.	would be little difference in efficiency improvement or cost between the two types of RCUs. ¹ EPA does not see benefit to further separating the RCU category with different performance criteria.
Potable Water Use Criteria	One stakeholder indicated that EPA should reduce potable water use limit for continuous ACIMs from 15 gal/100 lbs. ice.	<p>EPA received a comment from one manufacturer suggesting a reduction in the maximum potable water use levels for continuous ACIM products. EPA appreciates this feedback, and the commenters drive to encourage water conservation. While EPA understands that some manufacturers in this market are developing additional energy and water efficient technologies, these are not broadly leveraged at this time. Thus, the potable water use levels will remain unchanged in Draft 2.</p> <p>EPA is interested in learning more about new technologies to advance water efficiency and may review the potable water use criteria in a subsequent specification review or revision.</p>
Refrigerants	One stakeholder indicated it is unclear which low-GWP refrigerants achieve efficiency improvements. The commenter states that some low-GWP refrigerants have a lower refrigeration capacity which results in increased energy consumption when using some low-GWP refrigerants. Another commenter requested additional information about energy savings attributable to hydrocarbon refrigerants as well as information about how many models currently use them and how their safety is ensured.	<p>Propane (R-290) is listed as acceptable, subject to use conditions, in new self-contained commercial ice machines under EPA's Significant New Alternatives Policy (SNAP) program (81 FR 86778; December 1, 2016). Based on discussions with stakeholders, propane offers more cooling capacity for the same compressor displacement, when compared to other commonly used refrigerants. While energy efficiency improvements may vary based on other design features, the theoretical advantage of propane over R-404A is a 20% efficiency gain². EPA understands that energy efficiency improvements could be more or less than the theoretical level, based on how well other design components are optimized to work with propane. Additionally, due to the charge limit for propane in self-contained commercial ice-machines, EPA understands that certain machines with higher capacity may present additional challenges.</p> <p>Stakeholders interested in reviewing more information about the health and safety evaluation of propane in self-contained commercial ice machines, technician training</p>

¹ DOE. 2014. Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Automatic Commercial Ice Makers. December 1, 2014.

² Manitowoc, 2015. SNAP Information Notice, September, 2013. EPA SNAP Submittal—Revision to Extend R-290 Use to Commercial Ice Machines, Manitowoc Ice, Inc. October, 2015

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		<p>guidance, and labeling requirements are encouraged to review section VI.A.1 of EPA's SNAP Rule 21 (81 FR 86778; December 1, 2016).³ As part of the evaluation of overall risk to human health and the environment, EPA considers many criteria, including the flammability or toxicity of a substitute, as well as environmental risks such as ecosystem impacts, local air quality, or impacts on the global atmosphere. EPA is aware of several organizations that have collaborated with equipment manufacturers and users to develop technician training programs that address safe use of flammable refrigerant substitutes.</p> <p>Based on the existing performance data, EPA anticipates that the use of propane, as a refrigerant, likely offers one pathway to meeting the proposed Version 3.0 performance criteria.</p>
Refrigerants	Stakeholders recommended EPA develop a drop-down list of approved refrigerants.	The Agency will consider the best option for providing a list of approved refrigerants, and believes providing a selection list would help simplify the process for recording that reporting requirement. EPA's list of acceptable refrigerants in commercial ice machines is available at: https://www.epa.gov/snap/acceptable-substitutes-commercial-ice-machines .
Dump/Purge Water Use	One stakeholder indicated that manufacturers do not currently collect data on the volume of water discharged from products during the dump or purge cycles. The commenter asserts that a test method would need to be developed in order to collect this information. The commenter felt it would be premature to collect this information from manufacturers at this time.	During outreach to stakeholders, EPA received additional verbal feedback indicating that many manufacturers do in fact have information on the volume of water discharged from products. EPA would support and encourage stakeholders who may initiate the process of developing a supplemental test method to determine the volume of water discharged during a dump or purge cycle.
Water Quality	EPA requested additional information related to water use and water quality/filtration. Several commenters noted that it is standard practice for manufacturers to recommend to	EPA encouraged manufacturers to expand on how water quality affects the quality of a machine's ice product. Stakeholders responded stating that it is industry standard practice for manufacturers to recommend to customers the use of a water filter or other water treatments based on the needs and quality of water in the area where the equipment is being installed. Some end users may employ whole-site water treatment systems. EPA

³ EPA. 2016. Protection of Stratospheric Ozone: New Listings of Substitutes; Changes of Listing Status; and Reinterpretation of Unacceptability for Closed Cell Foam Products Under the Significant New Alternatives Policy Program; and Revision of Clean Air Act Section 608 Venting Prohibition for Propane. December 1, 2016. Available at <https://www.gpo.gov/fdsys/pkg/FR-2016-12-01/pdf/2016-25167.pdf>.

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	<p>customers the use of a water filter or other water treatments based on the area where the equipment is being installed. Commenters also indicated that many end users employ whole-site water treatment systems.</p>	<p>appreciates the responses on how manufacturers advise their customers on water quality based on region. EPA may consider re-enforcing manufacturers' recommendations through education and best practice guidance efforts for this product category. However, EPA is not considering implementing a water quality (i.e., filtration) requirement at this time.</p>
<p>Connected Functionality</p>	<p>Several stakeholders raised concerns about the addition of optional connected functionality in ACIMs. Commenters specifically raised concern regarding the potential depletion of ice at an inopportune time (i.e., during peak operating hours), which may compromise food safety requirements in some operations. Stakeholders also indicated that increasing the size of the ice bin and overall space needed for ice making and storage, to accommodate DR or Load Shifting, may not work in some space-limited operations.</p> <p>One stakeholder supports the inclusion of optional connected criteria for ACIMs. Identifying products with connected functionality is important to enable potential load management and customer benefits.</p>	<p>EPA appreciates the feedback on the optional connected criteria for ACIMs. ENERGY STAR products with connected functionality are capable of sharing information with other devices, such as a PC, smart phone or tablet. They can offer end-users tools for understanding and managing their energy use, as well as helping them identify and avoid potential performance problems. Connected products have the potential to dramatically change the way consumers and end-users interact with products. For instance, remote diagnostic functionalities help end-users identify performance problems before they waste energy and possibly even avoid a traditional service call.</p> <p>EPA understands maintaining a supply of ice may be crucial to general operations, or for health and safety reasons in some establishments. Offering connected functionality in all types and sizes of products, or for all market segments, may not be in the best interest of partners and their customers. The addition of these optional criteria allows manufacturers the opportunity to include DR capabilities and features for products in applications where it makes sense and to have that functionality highlighted on the ENERGY STAR product list. DR designs may incorporate the use of exit points. These exit points establish a minimum or critical capacity of ice to be in the storage bin at all times. If harvested ice capacity falls below the exit set point, the maker exits DR mode. These set points can be customized to meet the needs of an end-user. EPA notes that based on feedback from stakeholders, load shifting for an ACIM is an important calculation that can be complex, and as such, end-users may benefit from expert technical assistance. The inclusion of a critical minimum ice level sensor will ensure ice needs are satisfied prior to the exhaustion of harvested ice. The Agency is confident that through utility and manufacturer collaborations, it is possible to determine which end-users are in a position to benefit the most from connected ACIMs capable of load shifting during DR events.</p> <p>End-users ultimately have the ability to maintain control of their equipment, and individual responses to outside signals. Connected products incorporate the ability to override direction from a utility, in the event the timing for load shifting is inopportune. With permission, connected products can make small adjustments in how a product</p>

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		operates – such as shifting an ice maker’s primary ice producing timing to off-peak hours when energy demand is lower, rather than the peak operating hours when energy demand is higher and energy can be more costly.
Connected Functionality, Ice Melt	<p>Stakeholders asserted that DR would increase ice melting and would therefore require the product to make even more ice to compensate. Overall this could lead to using more energy and water.</p> <p>One commenter suggested that DR might lead to lessened ice quality because stored ice loses its clarity, becomes cloudy, holds more water, melts more quickly and this could be problematic for customers.</p> <p>One commenter suggested the DR events could lead to ice quality degradation because stored ice becomes cloudy, holds more water, melts quicker.</p>	<p>EPA understands that there may be a need for end-users to become familiar with the capabilities of a connected products. However, the Agency does not believe that these concerns are or would be limited to ACIMs with connected functionality. EPA has no current information which suggests that incorporating connected features into an ice maker will increase the rate at which ice melts within the storage bin above the normal melt rate. EPA welcomes additional information on this topic.</p> <p>Due to their attached storage bins, ACIMs are in fact equipment models capable of being turned off for periods, or having DR events introduced, without compromising an operation. Storage bins provide ACIMs the inherent capability to produce ice at times that does not necessarily coincide with the time it must also be utilized in specific operations.</p> <p>Based on follow-up conversations with manufacturers, it sounds as though a small amount of ice melting can be expected regardless of the conditions in which the machine was installed, or the ambient environment surrounding the piece of equipment, as a means of keeping the ice cool. EPA requests that manufacturers with data on this topic provide additional detail. The Agency understands that many ice bins are not actively cooled, but most are insulated and in some cases rely on ice production to maintain temperature in the storage bin.</p> <p>EPA is also interested in learning more on the topic of ice quality degradation during DR events. EPA understands that cleaning the bin and manual bin management (e.g., removing stale ice on the bottom of the bin on a monthly basis) can improve ice quality. Based on outreach to stakeholders the absence of an adequate filtration system and/or scheduled cleaning maintenance can significantly impact the output and energy efficiency of the product. EPA understands that water quality can have a significant impact on how quickly and efficiently water freezes, equates to the machine’s capability to produce ice. EPA believes that some of the ice quality concerns related to timing of water filtration maintenance, could be managed more carefully with a connected device. Manufacturers with information on this topic are encouraged to engage in further discussions with the Agency.</p>

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Connected Functionality, Market Characteristics	<p>One stakeholder indicated that there is not enough proof of value and energy savings for DR enabled ACIM products. The commenter believes that many customers would not receive benefit from adding connected functionality. The commenter questioned whether the cost of incorporating the additional features was justified, given DR needs are regional and there is a small market.</p> <p>One commenter indicated that the savings does not justify the cost of a DR setup for an end-user. The stakeholder asserts that a payback of 2 years or more is not cost effective.</p>	<p>Based on publicly available sources of information, both energy and water savings have been realized in the field when DR and load shifting programs have been established.⁴ EPA recognizes that available data is limited; however, the Agency is interested in working with partners who make the decision to develop products with this option functionality.</p> <p>ENERGY STAR products are designed to save energy, which also reduces annual energy costs. While utility programs across the country have varying costs for electricity and grid demand, customers who conserve energy generally see utility bill cost reductions. End-users may also benefit greatly from demand reduction programs and incentives.</p> <p>EPA understands that DR and load shifting may not affect energy costs in a consistent way across the entire country. However, based on characteristics of certain regions, any additional cost of incorporating DR and load shifting features may be justifiable in customer savings. End-users can still participate in partial DR/load shifting, which will exit the DR scenario once ice levels reach a predetermined level. This provides a net benefit to the utility and customer.</p> <p>EPA sees opportunity for end-user convenience, energy savings, and energy shifting associated with connected functionality for these products.</p>
Effective Date	<p>Stakeholders indicated that many manufacturers are in the re-design/re-engineering process for ACIM products, which takes a significant amount of time. EPA should consider delaying the effective date of the Version 3.0 Specification until after January 1, 2018.</p>	<p>EPA acknowledges that the market for ACIMs is currently undergoing many changes. However, multiple manufacturers have demonstrated that efficiency beyond that required by the 2018 federal minimum efficiency requirements is currently achievable. The Agency recognizes that it requires time and resources for manufacturers to re-design their products to improve the energy and water efficiency performances. EPA understands the Version 3.0 criteria to be challenging but achievable. The Agency expects that in time, many manufacturers will be able to have a selection of their models certified.</p> <p>After careful consideration, EPA has retained the proposal of January 1, 2018. Maintaining ENERGY STAR's role as an effective differentiator of highly efficient products in the market is a priority for the Agency. An effective date of January 1, 2018, addresses the need for differentiation given the forthcoming federal minimum efficiency standard.</p>

⁴ Karas, Angelo, David Cowen and Don Fisher. 2011. Ice Machine Field Study: Energy and Water Saving with Ice Machine Upgrade and Load Shifting. http://www.fishnick.com/publications/fieldstudies/Ice_Machine_Upgrade_Load_Shifting_Field_Study.pdf. San Ramon, CA: PG&E Food Service Technology Center.

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Product Testing	<p>One stakeholder indicated that the testing process will further delay ENERGY STAR certification for these products. The commenter noted that testing is expensive and difficult for smaller manufacturers. EPA should accept equipment that meets the Version 3.0 ENERGY STAR levels using the new DOE test procedure, even if testing occurred prior to the effective date of this Version 3.0 specification.</p>	<p>EPA has recognized numerous labs and certification bodies with the intention of allowing a large number of products to be tested simultaneously, as well as driving down costs for partners and will continue to work to do so.</p> <p>EPA requires third-party testing and certification, in an effort to maintain the integrity of the ENERGY STAR program. EPA has aligned with the DOE test method, and believes this may relieve some of the testing burden on manufacturers. Brand owners can use the same laboratory test reports from an EPA recognized lab to satisfy both DOE's and EPA's requirements.</p>
Product & Market Characteristics	<p>One commenter requested additional information on market sales, estimated availability of products, estimated savings above federal minimums, annual water savings, estimated product lifetime, and the estimated incremental cost of ENERGY STAR models.</p>	<p>Based on industry discussions, EPA understands that manufacturers are preparing to introduce new products to the market; however, the performance data and expected sales estimates for those products have not been made publically available. EPA estimated that based on the proposed certification criteria for Version 3.0, approximately 18% of models with publicly available performance data, would be eligible for ENERGY STAR certification. The energy savings for these products ranges from 8 – 20 % beyond what the federal minimum standards establish in 2018. There is no federal minimum standard for Potable Water Use; therefore, EPA compared a subset of product data that meet the Draft 2 Version 3.0 levels to comparable baseline models that meet the 2018 federal minimum standards. Depending on product type and size, potable water savings can be as much as 29%. According to the Database for Energy Efficient Resources (DEER), the average lifetime of these products is approximately 10 years.</p> <p>Based on pricing information research comparing air-cooled versus water-cooled products, for the most part products are equivalently priced. In many cases, air-cooled models are less expensive, when the water delivery system is also considered. In addition, EPA reviewed and compared baseline batch type and continuous type IMH, RCU, and SCU categories to determine the ENERGY STAR incremental costs associated with each product type. Based on this pricing research, EPA found a variety of results indicating that in most cases the incremental cost for ENERGY STAR products to be equivalent to non-ENERGY STAR models. EPA found the incremental costs to range from -14 - 22%; but in the majority of cases, the incremental costs were within approximately ± 10% range when compared to equivalent products.</p>