Setting Energy Conservation Standards for Automatic Commercial Ice Makers

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ABSTRACT

In January 2015, DOE published a Final Rule establishing revised and additional standards for automatic commercial ice makers. In rulemakings, DOE is required to set standards that yield maximum national energy savings while being economically beneficial to the nation, and while considering the impact on manufacturers. To do so, DOE analyzes all available technologies for improving the efficiency of such appliances and equipment; as well as the economic impacts on consumers, manufacturers and the nation; the potential for full fuel cycle energy savings; and the reductions in carbon dioxide, nitrogen oxide, and other emissions. Using the example of ice makers, this paper describes the analyses and data requirements of setting standards, some common challenges associated with such analyses, and the ways in which the challenges were overcome in the ice maker analysis. Challenges faced included updating the test procedure to better measure the energy benefits of newer technology, developing appropriate data sources for daily loads and efficiency distributions in the current market, and analyzing the potential consumer impacts from accommodating increased ice maker dimensions and weight. Specifically, while ice makers are ubiquitous, relatively little data was available to support the analyses. Over the next 30 years, the automatic commercial ice maker standard is projected to save the equivalent of Colorado's electricity usage for one year.

Introduction

In the U.S. Department of Energy (DOE) fact sheet dated February 17, 2016, DOE noted that during the Obama administration DOE had issued over 40 new or amended energy efficiency standards across more than 45 commercial and residential products (DOE 2016). Standards for automatic commercial ice makers (ACIMs) are included in this group. The ACIM standard is estimated to achieve 0.2 quads of electricity savings and 4 million metric tons of CO_2 reductions[1] (DOE 2015). For perspective, the energy savings were approximately equal to the electricity usage of the state of Colorado for the year 2013.

Each set of standards established by DOE utilizes the same rigorous analyses, evaluates similar issues, and also addresses issues and challenges specific to the particular rulemaking. The purpose of this paper is to explain the process and analyses, and to highlight the issues and challenges overcome by the ACIM rulemaking team.

Background

The Energy Policy Act of 2005 (EPACT 2005) made numerous revisions to the portion of the Code of Laws of the United States (U.S. Code) that deals with the authority of the DOE to regulate energy efficiency, known as Energy Policy and Conservation Act of 1975 (EPCA). One

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[1] DOE uses a 30-year analysis period beginning in the year that requires compliance with the standard (2018). Thus, the analysis period covers ACIM equipment shipped between 2018 and 2047.

EPACT 2005 revision to EPCA added energy conservation standards for cube type automatic commercial ice makers. EPACT 2005 also added a definition of automatic commercial ice maker and gave the DOE authority to regulate the energy efficiency of additional types of ACIM equipment. The revisions also require DOE to periodically reevaluate standards and test procedures for ACIM equipment covered by standards to determine whether the existing standards and test procedures need to be updated (U.S. Congress 2005). To meet the legislative requirement, in 2010, DOE began a rulemaking process that culminated in the Final Rule issued in January 2015. The final rule revised the standards for cube-type ice makers set by EPACT 2005 and set standards for additional ACIM equipment types.

EPCA directs DOE to consider seven factors when setting standards. Table 1 lists these seven factors and the corresponding analyses performed by DOE. For the Final Rule, DOE published a 583-page Technical Support Document (TSD) describing all of the analyses and results (DOE 2014c).

Table 1: Factors DOE Must Consider When Establishing Standard Levels

Factor	Analysis
Economic impact on consumers and manufacturers	Life-cycle cost (LCC) and Payback Period (PBP) analysis Manufacturer impact analysis (MIA)
Lifetime operating cost savings	LCC analysis
Total projected energy savings	National impact analysis (NIA)
Impact on utility or performance	Screening analysis Engineering analysis
Impact of any lessening of competition	MIA
Need for national energy conservation	NIA
Other factors the Secretary considers relevant	Environmental assessment; Utility impact analysis; Employment impact analysis

DOE performs analyses to address the factors listed in Table 1, and presented the results to stakeholders at several junctures during the ACIM rulemaking. The organization of the rulemaking into phases and the activities that took place in each phase are listed in Table 2. Note, at each phase DOE solicited comments and input from stakeholders, and presented a summary of DOE's response to comments and inputs provided during the previous phase of the rulemaking.

Table 2: Rulemaking Phases

Rulemaking Phase	Activities Performed In Phase
Framework	Identify authority and requirements Identify equipment covered Identify tools and data Request for public comment
Preliminary Analysis	Screening analysis Preliminary engineering Energy analysis Preliminary LCC Preliminary NIA Preliminary MIA Request for public comment
Proposed Rulemaking	Revised preliminary analyses Consumer subgroup analysis Emissions analysis and valuation Utility impact analysis Employment analysis Regulatory impact analysis Proposed standards Request for public comment
Final Rule	Final analyses New and/or amended standards and date they take effect

As noted in Table 2, in the framework stage, the first step in the rulemaking is to identify the equipment to be included. In this first step, DOE typically reviews the legislative definition of the equipment, surveys the market to determine the range of available equipment, and consults with stakeholders—some of whom will be participating in their first rulemaking. Part of the identification process includes identifying the authority to set or amend conservation standards.

During the framework, DOE also identified the data needed for the analyses for which DOE had already identified sources and for which DOE needed assistance in identifying sources, proposed tools to be used in the analysis, and requested comment from stakeholders. Once the framework document was published, DOE held a public meeting to present the framework to stakeholders and encourage their involvement in the process. Comments and input received from stakeholders following the framework meeting were a major source of data, including some very important data provided by manufactures and their trade association the Air-Conditioning, Heating and Refrigeration Institute (AHRI) who submitted historical ACIM shipment information, as well as information used in the engineering and screening analyses.

The framework phase lays the groundwork for the rulemaking, and the next phase, the preliminary analysis phase, is a tool-building phase. In the preliminary analysis, DOE builds tools to conduct the analyses, and develops preliminary results. DOE developed preliminary versions of the key analyses listed in Table 1. Because DOE presents results at the preliminary analysis, NOPR and final rule phases, and the models and results are refined and improved as the rulemaking proceeds, only final rule numerical results are displayed in the results section of this paper. For results of the preliminary analysis phase, readers are referred to the preliminary TSD, and the NOPR notice and TSD, all of which are available through www.regulations.gov using Docket Number EERE-2010-BT-STD-0037 as a search term.

Main outcomes from the work done in the preliminary analysis phase include:

- A list of design options for use in the screening and engineering analyses.
- A set of estimates of the efficiency of the least efficient equipment available (referred to as the base equipment) and the efficiency of the maximum technology (max tech) level.
- A set of engineering estimates showing the impacts of adding design options to base equipment, including changes in rated efficiency and manufacturer selling price.
- A set of estimates of consumer impacts, including energy usage by efficiency level, LCC savings and payback periods for analyzed efficiency levels, and the fraction of consumers who benefit from the levels studied.
- An estimate of national energy savings (NES) and national net present value (NPV) of standards' consumer impacts. NES accounts for point-of-use (site) energy; the energy losses associated with generation, transmission, and distribution of electricity; and the energy consumed in extracting, processing, and transporting or distributing primary fuels.
- A preliminary model to estimate impacts on manufacturers through the MIA.

Upon completion of the work outlined above, DOE published the preliminary analysis and requested comments. DOE also presented the analyses and results at a public meeting where DOE took comments and input from stakeholders.

As shown in Table 2, the proposed rulemaking stage is the next phase of the analysis. Taking into account comments and additional information provided by stakeholders in response to the preliminary analysis, DOE revised the analyses, and performed additional analyses, including the following:

- Evaluated the impact on consumer groups that could be disproportionately impacted.
- Estimated impact of NES on net emissions.
- Estimated the indirect impact on national employment caused by a standard and impacts on electric utility generation.
- Performed a regulatory impact analysis to compare setting new or amended standards with other non-regulatory alternatives to improve the efficiency of ACIM equipment.
- Issued a Notice of Proposed Rulemaking (NOPR) containing the revised analyses, proposing efficiency levels at which to set proposed and amended standards.

After conducting the NOPR analyses, DOE again presented results at a public meeting and requested stakeholder feedback. Following the NOPR public meeting, and in response to stakeholder comments, DOE held an additional public meeting to present and explain the engineering model used in the analyses. DOE also presented draft Final Rule analysis results, after revising models and inputs based on comments received on the NOPR. This was done in the form of a Notice of Data Availability (NODA). A NODA at this stage of the rulemaking process is uncommon but provided stakeholders with a fifth opportunity to provide input on this rule (DOE 2014b). The Final Rule document was made available on the DOE website at the end of 2014.

The remainder of this paper will discuss DOE's initial analysis approach in the Framework document, issues arising at the Framework phase, other issues arising through the course of the rulemaking, and the establishment of standards in the Final Rule phase of the rulemaking.

DOE's Framework for the ACIM Rulemaking

In the framework (DOE 2010), DOE broadly considers all potential options for updating or setting new standards for automatic commercial ice makers and presented a list of the standards to be analyzed in the rulemaking:

- potential amendments to the EPACT 2005 energy and condenser-water conservation standards for cube-type ACIM equipment,
- potential energy and condenser-water standards for flake- and nugget-type ACIM equipment,
- potential extension of standards to larger capacity automatic commercial ice makers, and
- potential water usage conservation standard, targeting water used to make ice.

The framework document outlined the set of potential standards to be studied, the tools necessary to analyze such standard levels, and the available data to support such analysis. Stakeholders are encouraged to review and provide feedback on DOE's regulatory approach at each phase of the rulemaking, which serve to guide DOE's analysis in the subsequent phases.

Key Issues from DOE's Ice Maker Rulemaking Analyses

In response to the framework document, as well as subsequent rulemaking phases, DOE received comments from stakeholders on several primary topics, which are summarized in the following section. In addition, each section presents DOE's response to stakeholders and the impact on the rulemaking. Note, much of the activity in the framework stage and moving into the preliminary analysis stage focuses on primarily legal and policy-related issues, while the NOPR and Final Rule involve more quantitative analyses and results.

Start the rulemaking in 2010. Manufacturers opposed starting the rulemaking in the fall of 2010 because the EPACT 2005 standards became enforceable on January 1, 2010 and there was little real-world experience with the standards (DOE 2011). In response, DOE noted that rulemakings generally require 3 or more years to complete, and DOE had a legislative deadline to complete the rulemaking by January 1, 2015 (U.S. Congress 2005). Therefore, DOE determined it needed to proceed with the rulemaking as a delay could cause DOE to miss the legislative deadline.

Scope of ACIM equipment to include. Issues related to scope of coverage are common to all rulemakings. In response to DOE's framework proposal stated earlier, manufacturers wanted some flake and nugget ACIM equipment and sizes to be excluded from coverage because very few units are shipped each year, and testing and certification requirements would impose burdens on manufacturers but likely yield little energy savings. Concern about equipment having small sales volume is not unique to the ACIM rulemaking. In this case, flake and nugget ACIM equipment styles are not unique to market niches and are somewhat interchangeable with cube-type ACIM equipment. DOE was concerned that if some flake and nugget equipment was excluded (i.e., not covered by standards) such equipment could begin displacing either cube-type equipment that was already covered by standards or other flake- and nugget-style equipment that would eventually be covered by standards. DOE decided to set standards for all equipment types to avoid inadvertently distorting the market.

One manufacturer of large-capacity equipment requested the harvest capacity limit set at 10,000 lb/day, so the manufacturer's equipment would be covered by the standard. The other manufacturers perceived 4,000 lb/day as the upper limit of commercial equipment, above which were industrial equipment sizes. Because the shipments above 4,000 lb/day are extremely low, energy conservation advocates perceived analyzing larger equipment as a low priority for DOE. However, large capacity equipment does not present a substitution risk, like the aforementioned flake and nugget equipment. Since there was general agreement that 4,000 lb/day represented the upper limit of commercial products, DOE decided to cover ACIM equipment up to that capacity (DOE 2012b).

Another type of machine which was considered for inclusion within this rulemaking was ice-making equipment designed to operate with remote condensing racks that serve multiple types of equipment. In responding to comments, DOE determined that this type of equipment did not meet the definition of ACIM equipment. EPCA defines an automatic commercial ice maker as a factory-made assembly (not necessarily shipped in one package) consisting of a condensing unit and an ice-making section operating as an integrated unit with a means for harvesting ice. DOE decided to exclude this equipment because it did not meet the requirement of a condensing unit and an ice making unit operating as an integrated unit (DOE 2012a).

Whether to establish potable water conservation standards. EPACT 2005 standards included limits on water used to cool condensers —the so-called "condenser water." DOE initially considered extending the maximum water usage standard to include water used in making the ice product – the so-called "potable water."

In the framework, DOE noted that 100 lb of solid ice contains 12 gallons of water while makers typically use an additional 15 to 50 gallons of potable water per 100 lb of solid ice (DOE 2010). In the batch process used to make cube-type ice, water is repeatedly passed over the ice-making surface. The excess water in this process washes away impurities that might otherwise adhere to the ice making surfaces or be contained in the ice, and ultimately is dumped into the wastewater system at the end of the ice-making cycle. Many utility and conservation advocacy stakeholders wanted to take this opportunity to reduce the excess potable water used in the making of the cube-type ice, also known as purge water. Manufacturers opposed potable water standards over concern that reducing the amount of water might impair the efficiency of their machines by allowing build-up on ice-making surfaces. Manufacturers also stated reducing water usage could increase operating costs and reduce equipment reliability as impurities coat various components of the ice makers, causing additional maintenance costs and possibly breakdowns (DOE 2011).

DOE ultimately decided to not regulate potable water. Congress, in the EPACT 2005 ACIM standard, set limits on the amount of water used in condensers,[2] but not on the potable water used in the ice-making process. Congress further expressed an explicit knowledge of the two distinct uses of water by including a footnote on the EPACT 2005 standard explicitly drawing the distinction. However, EPACT 2005 did not provide guidance on the regulation of

[2] ACIM condensers expel the heat removed from water when making ice, either to the air in the environment surrounding the machine, or to water. EPCA regulated the amount of water that could be used in condensers per 100 lb/ice produced.

water other than the use of water in condensers of cube-type ice makers (DOE 2014a). Because Congress did not give DOE a clear Congressional mandate to set a potable water standard, DOE determined it had discretion over this issue. DOE decided to not set a potable water conservation standard and allow manufacturers to retain flexibility in this aspect of ice maker design. This decision was repeatedly challenged by stakeholder comments throughout the rulemaking (DOE 2015).

Design options that might increase physical size. ACIM manufacturers argued that in retrofit situations, the new machine in some situations could not be bigger than the machine being replaced, or it simply will not fit into the space, and/or the cost to retrofit the space would be prohibitive. For example, one key market for ice makers is the drive-through window at fast food restaurants, and that space is typically constrained. In its preliminary analysis phase, DOE limited the analysis to options that could be used in a typical machine without changing the physical size of the equipment. Based on additional engineering analysis, DOE determined it was possible to increase the efficiency of the ice-making head equipment class by making it taller, and upon analysis of the additional retrofit costs for installing taller equipment it was found to be economically feasible. In the proposed rule and final rule phases, DOE avoided design options that would change the width and depth of machines, but included design options that might require some machines to become taller. The resulting efficiency levels were ultimately included in the standard, with additional costs assumed to be borne by consumers in the form of higher retrofit installation costs.

One stakeholder proposal for dealing with physical size constraints was to introduce two sets of standards, one for equipment in installations with no space constraints and one for equipment in installations with space constraints. The idea is that the non-space constrained equipment class can achieve greater energy savings by allowing box sizes to increase, and thus DOE could increase the overall energy savings from the standards (DOE 2012c).

DOE chose to not introduce the dual standards for two reasons. First, though DOE recognized the correlation between physical size and efficiency, it was not a definitive factor because some manufacturers had produced more efficient units at smaller sizes (DOE 2014a). The second reason was complexity. Introducing additional equipment classes for space-constrained units complicated the structure and analysis without improving the standards (DOE 2014a).

Accuracy of the engineering model. Manufacturers questioned the accuracy of the engineering model (named FREEZE). In response to the preliminary analysis, manufacturers proposed the DOE collect real world price and energy usage information and perform statistical analyses, rather than continuing to use the FREEZE model.

In response to this comment, DOE attempted to analyze the energy usage/cost relationship empirically, with the intention of using the results for the analysis. Including purchases made during the preliminary analysis and NOPR phases, DOE purchased and studied 39 ice makers.[3] The NOPR contains a discussion of this analysis (DOE 2014a). The results were inadequate to set efficiency standards. Therefore, DOE used the large quantity of new data on equipment from these purchases to improve the FREEZE model specification and benchmarking.

[3] DOE purchased 39 ice makers in the preliminary analysis and NOPR phases to establish a baseline of data. Equipment is used for testing, to tear down for reverse engineering, or both, with the data used to calibrate models.

After the NOPR publication, DOE held a separate workshop to better describe and answer stakeholder questions regarding the mechanics of FREEZE, demonstrate its operation, and clarify how DOE used the model.

Need to Update the Test Procedure

Energy conservation standard rulemakings and test procedure rulemakings tend to go hand in hand. DOE cannot set energy conservation standards for equipment without a test procedure that can be used to quantify the energy performance of the equipment. For ACIM equipment, the existing DOE test procedure prescribed the use of an Air-Conditioning and Refrigeration Institute[4] (ARI) standard which provided a test procedure for cube-type ice makers and an American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standard providing the method of test (DOE 2006). Both the ARI and ASHRAE standards were superseded by revised standards in 2007 and 2009, respectively, to, among other things, include methods for testing flake and nugget type ACIM equipment. In addition, while the older ARI and ASHRAE standards covered equipment capacities up to 2,500 lb per 24-hour period (lb/day), the revised procedures extended the capacity range of to 4,000 lb/day. Finally, the previous test procedure lacked clarity around the coverage of certain subcategories of "batch" type[5] ice makers.

In the 2012 ACIM Test Procedure final rule, DOE amended it test procedure for automatic commercial ice makers to reference the updated AHRI standard as the commercial test procedure and the updated ANSI/ASHRAE standard as the method of testing. DOE further clarified the definition of batch-type ice maker and the applicability of the DOE test procedure to batch-type automatic commercial ice makers, including those that produce cube-type ice (DOE 2012a).

Analytical Results

The final rule Federal Register notice and Technical Support Document (TSD) detail the analyses and results. The following presents a summary of the final rule results. As noted earlier, for preliminary analysis and NOPR results, readers are referred to the preliminary TSD, and the NOPR notice and TSD.[6]

The screening analysis identified 18 possible design options. Eight design options were eliminated from analysis due to one or more of the screening criteria. This left 10 options to be studied (DOE, 2014c).

The engineering analysis estimated that for individual equipment classes, potential maximum technologically feasible levels provided savings ranging from a low of 7–8 percent over baseline equipment for large batch machines to as high as 33 percent for small self-contained (includes all parts of the icemaker plus either storage or ice dispensing capability in one unit) batch machines.

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[4] ARI merged in 2008 with the Gas Appliance Manufacturers Association (GAMA) and became the Air-Conditioning, Heating, and Refrigeration Institute (AHRI).

[5] Cube-type and other batch-type equipment (tube ice and cracked ice) make ice in batches, alternately freezing and harvesting ice. This is in contrast to flake and nugget ice makers, known as continuous machines, which continuously freeze and harvest ice at the same time.

[6] Documents are available on www.regulations.gov using Docket Number EERE-2010-BT-STD-0037 as a search term.

At the Final Rule stage, DOE organizes the efficiency levels into what are called Trial Standards Levels (TSLs). TSLs identify the efficiency level for each equipment class that exhibits a similar set of characteristics in order to limit the number of different efficiency levels that ultimately are considered for setting the standard. After examining possible engineering and economic criteria, DOE defined TSL 1 as approximately a 10 percent reduction in energy usage for all classes; TSL 3 as the level with the maximum NPV for each class; and TSL 5 as the max tech level for all classes. While they have more complete and complex definitions, TSL 2 and 4 were intermediate levels that eliminated potentially large gaps in the TSL sequence.

Table 3 shows key results by TSL. As indicated, the maximum savings potential of the ACIM standards was approximately ½ quadrillion Btus (quads) of energy. As part of the analyses, the rulemaking team identified water savings. However, the water savings were not a result of a new potable water or an amended condenser water standard. Rather, the savings were an additional benefit of an energy saving technology analyzed. The water savings represent a significant portion of the consumer economic benefit of this specific design option, and were summarized and included as a result. However, manufacturers have options for how they meet the energy conservation standard and this specific design option is only one of a number of options. Thus, readers should note the water savings indicated are illustrative of a possible outcome and not a result of standards for water usage.

Based on these selected TSLs, DOE examines all of the evidence collected through stakeholder and manufacturing input and data analysis. The results are summarized in Table 3. (DOE 2015). DOE then weighs all the factors, beginning with the highest TSL, which would yield the highest energy savings. DOE examines the evidence related to energy savings, consumer impacts and benefits, impacts on manufacturers, emissions reductions and other factors. If the evidence indicates that, while maximizing savings, this level may have undesirable impacts that are not outweighed by the positive benefits of energy savings, DOE rejects that TSL as not economically justified and then considers the next highest TSL. This process continues until the level is identified yielding maximum savings that are technologically feasible and economically justified. In the ACIM rulemaking, TSL 3 was selected as the standard level for automatic commercial ice makers in the final rule.

As shown in Table 3, TSL 3 resulted in total consumer net benefits were nearly $1 billion for equipment shipped between 2018 and 2047.

The impacts on industry at TSL 3 indicated that manufacturers would need to redesign 51 percent of batch ice makers and 55 percent of continuous icemakers to meet a standard. However, multiple manufacturers had product lines that could meet a standard set at TSL 3 at all equipment classes analyzed. Conversely, at TSL 5 DOE estimated that manufacturers would need to redesign 84 percent of batch ice makers and 78 percent of continuous icemakers and for five equipment classes, only 1 manufacturer had products that met such a standard. At TSL 4 manufacturers would need to redesign 66 percent of batch ice makers and 55 percent of continuous icemakers and for 4 equipment classes, only 1 manufacturer had products that could meet a standard set to TSL 4.

Table 3 also shows estimated emissions reductions as well as the monetary value of the emissions. Given the wide ranges in emissions values, the total value of emissions ranged from about $50 million to nearly $2 billion. Please refer to the final rule (DOE 2015) for details on the social cost of carbon used for the valuation.

Table 3: Summary of Results for Automatic Commercial Ice Makers TSLs: National Impacts*

Category	TSL 1	TSL 2	TSL 3	TSL 4	TSL5
National Energy Savings (Quads)	0.081	0.136	0.179	0.229	0.321
National Water Savings (billion gallons)	1.0	23.0	37.5	36.8	31.3
Cumulative NPV of Customer Benefits 2018 through 2047 billion 2013$					
3% discount rate	0.389	0.712	0.942	0.822	(0.453)
7% discount rate	0.183	0.328	0.430	0.337	(0.406)
Industry Impacts					
Change in Industry NPV (2013$ million)	(7.5) to (6.6)	(11.2) to (9.3)	(15.1) to (12.1)	(18.6) to (12.3)	(30.0) to (11.8)
Change in Industry NPV (%)	(6.2) to (5.4)	(9.2) to (7.7)	(12.5) to (10.0)	(15.3) to (10.1)	(24.6) to (9.7)
Cumulative Emissions Reductions 2018 through 2047**					
CO_2 (MMt)	4.93	8.29	10.94	13.97	19.63
NO_x (kt)	7.30	12.26	16.19	20.67	29.04
Hg (t)	0.01	0.02	0.03	0.04	0.05
N_2O (kt)	0.06	0.11	0.14	0.18	0.26
N_2O (kt CO_2eq)	17.14	28.81	38.03	48.55	68.23
CH_4 (kt)	21.35	35.89	47.37	60.47	84.97
CH_4 (kt CO_2eq)	597.78	1004.79	1326.27	1693.16	2379.30
SO_2 (kt)	4.18	7.02	9.27	11.83	16.62
Monetary Value of Cumulative Emissions Reductions 2018 through 2047†					
CO_2 (2013$ billion)	0.036 to 0.502	0.061 to 0.843	0.080 to 1.113	0.103 to 1.421	0.144 to 1.997
NO_x – 3% discount rate (2013$ million)	10.7	18.0	23.8	30.4	42.7
NO_x – 7% discount rate (2013$ million)	5.4	9.2	12.1	15.4	21.7

* Values in parentheses are negative numbers.

** "MMt" stands for million metric tons; "kt" stands for kilotons; "t" stands for tons. CO_2eq is the quantity of CO_2 that would have the same global warming potential (GWP).

† Range of the economic value of CO_2 reductions is based on estimates of the global benefit of reduced CO_2 emissions. Economic value of NO_x reductions is based on estimates at $2,684/ton.

Energy Conservation Standards for ACIM Equipment

The process of analyzing any energy conservation standard involves many typical types of analyses. As noted in the background section of this paper, DOE starts by identifying the equipment to be included in the rulemaking. Once the equipment is identified, DOE collects and/or develops a large body of information through research, DOE analyses, and stakeholder input. Ultimately, based on the information collected and analyses performed, DOE identifies the standard level.

Given DOE's mandate to achieve the highest possible energy savings that are technologically feasible while taking into consideration impacts on consumers and manufactures as well as other factors, TSL 3 was selected as the standard level for automatic commercial ice makers in the final rule. The standard is technically feasible because the technology exists for manufacturers to achieve this level of efficiency. The economic benefits to the nation in the form of energy savings, consumer NPV, and emissions reductions outweigh the costs associated with reduced INPV and potential impacts related to manufacturer capacity. The Final Rule documents the analytical results and announces the standards. The Final Rule document was distributed to stakeholders in December 2014 and published in the ***Federal Register*** in January 2015 (DOE 2015). The amended standards for cube-type (and other batch) ice makers and the new standards for continuous ice makers become effective and enforceable on January 28, 2018 (DOE 2015).

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U.S. Energy Information Agency. Undated. *U.S. States: State Profiles and Energy Estimates. Table C11. Energy Consumption Estimates by Source, Ranked by State, 2013.* http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_sum/html/rank_use_source.html&sid=US