Rulemaking Framework for
Walk-In Coolers and Walk-In Freezers
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LIST OF ACRONYMS

AEO	Annual Energy Outlook
AHRI	Air Conditioning, Heating, and Refrigeration Institute
ANOPR	advance notice of proposed rulemaking
ANSI	American National Standards Institute
ARI	Air-Conditioning and Refrigeration Institute
ARW	Air Conditioning & Refrigeration Wholesalers Association
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASTM	American Society for Testing and Materials
BOM	bill of materials
BT	Building Technologies Office
Btu	British thermal units
Btu/h	British thermal units per hour
CAIR	Clean Air Interstate Rule
CAMR	Clean Air Mercury Rule
CBECS	Commercial Building Energy Consumption Survey
CFC	chlorofluorocarbon
CFR	Code of Federal Regulations
CO_2	carbon dioxide
COP	coefficient of performance
CSL	candidate standard level
DOE	United States Department of Energy
DOJ	Department of Justice
EERE	Energy Efficiency and Renewable Energy
EEV	electronic expansion valve
EIA	Energy Information Administration
EISA	Energy Independence and Security Act of 2007
EPA	Environmental Protection Agency
EPACT	Energy Policy Act of 2005
EPCA	Energy Policy and Conservation Act of 1975
GRIM	Government Regulatory Impact Model
HARDI	Heating, Air Conditioning, and Refrigeration Distributors International
HCFC	hydrochlorofluorocarbons
Hg	mercury
ImSET	Impact of Sector Energy Technologies
LCC	life-cycle cost
MIA	manufacturer impact analysis
MPC	manufacturer production cost
NEMS	National Energy Modeling System
NEMS-BT	a version of the NEMS developed for DOE-Building Technologies office
NES	national energy savings
NHRAW	North American Heating, Refrigeration & Air Conditioning Wholesalers
NIA	national impact analysis
NIST	National Institute of Standards and Technology
NOPR	notice of proposed rulemaking

NO_X	oxides of nitrogen
NPV	net present value
OHA	Office of Hearings and Appeals
OMB	Office of Management and Budget
PBP	payback period
R&D	research and development
SG&A	selling, general, and administrative
SNOPR	supplemental notice of proposed rulemaking
SO_2	sulfur dioxide
TMY	typical meteorological year
TSD	technical support document
TSL	trial standard level
TXV	thermostatic expansion valve
WACC	weighted-average cost of capital

Rulemaking Framework for Walk-In Coolers and Walk-in Freezers

1. INTRODUCTION

The purpose of this document is to describe the procedural and analytical approaches the U.S. States Department of Energy (DOE) anticipates using to evaluate and update existing energy conservation standards for walk-in coolers and freezers.

The DOE Appliances and Commercial Equipment Standards Program, within the Office of Energy Efficiency and Renewable Energy's (EERE's) Building Technologies Program (BT), develops and promulgates test procedures and energy conservation standards for residential appliances and commercial equipment. The process for developing standards involves analysis, public notice, and consultation with interested parties. Such parties, collectively referred to as "stakeholders," include manufacturers, commercial customers, energy conservation and environmental advocates, State and Federal agencies, and any other groups or individuals with an interest in the standards.

This document is intended to inform stakeholders about the process of developing an energy conservation standards rulemaking for walk-in coolers and freezers, and to encourage and facilitate stakeholder input during the rulemaking. This document is the starting point for developing standards and is not a definitive statement about any issue to be determined in the rulemaking.

Section 1 provides an overview of the rulemaking process. Sections 2 through 16 discuss the analyses DOE intends to conduct to fulfill the statutory requirements for this standards rulemaking. DOE will perform a set of separate analyses, including an engineering analysis, life-cycle cost (LCC) and payback period (PBP) analyses, a national impact analysis, and a manufacturer impact analysis for each type of appliance classified into equipment classes covered by this rulemaking.

Information regarding this rulemaking will be maintained on the DOE website at www.eere.energy.gov/buildings/appliance_standards.

This document contains comment boxes that highlight issues on which DOE seeks comment and requests feedback from interested parties. These boxes are also used to ask specific questions on the approaches DOE plans to follow in conducting the analyses required for the standards rulemaking. Such requests for stakeholder feedback are numbered according to the section in which they appear.

1.1 The Appliances and Commercial Equipment Standards Program

Part A of Title III of the Energy Policy and Conservation Act of 1975 (EPCA), Pub. L. 94-163, as amended by the National Energy Conservation Policy Act (NECPA), Pub. L. 95-619, the National Appliance Energy Conservation Act of 1987, Pub. L. 100-12, the National Appliance Energy Conservation Amendments of 1988, Pub. L. 100-357, and the Energy Policy

Act of 1992 (EPACT 1992), Pub. L. 102-486, created the "Energy Conservation Program for Customer Products Other Than Automobiles," and the "Energy Policy Act of 2005" (EPACT 2005), Pub. L. 109-58 (42 U.S.C. 6291-6309).[1]

NECPA amended EPCA to add Part C of Title III (42 U.S.C. 6311-6317), which established an energy conservation program for certain industrial equipment.[2] Part A-1 provides for a program similar to Part A for certain industrial equipment. EPACT 1992 included amendments to EPCA that expanded Title III to include additional commercial equipment.

More recently, EPCA was amended by the Energy Independence and Security Act of 2007 (EISA), Pub. L. 110-140. In particular, section 312(a) of EISA amends section 340 of EPCA by adding in new subsection 340(20) (42 U.S.C 6311(20)), which defines walk-in coolers and freezers as follows:

> *(20) WALK-IN COOLER; WALK-IN FREEZER.—*
>
> *(A) IN GENERAL.—The terms "walk-in cooler" and "walk-in freezer" mean an enclosed storage space refrigerated to temperatures, respectively, above, and at or below 32 degrees Fahrenheit that can be walked into, and has a total chilled storage area of less than 3,000 square feet.*
>
> *(B) EXCLUSION.—The terms "walk-in cooler" and "walk-in freezer" do not include products designed and marketed exclusively for medical, scientific, or research purposes.*

In addition, section 312(b) of EISA amends section 342 of EPCA in several ways.

First, section 312(b) adds new subsection 342(f)(1) (42 U.S.C. 6313(f)(1)), which establishes prescriptive standards for walk-in coolers and freezers manufactured on or after January 1, 2009:

> *(1) IN GENERAL.—Subject to paragraphs (2) through (5), each walk-in cooler or walk-in freezer manufactured on or after January 1, 2009, shall—*
>
> *(A) have automatic door closers that firmly close all walk-in doors that have been closed to within 1 inch of full closure, except that this subparagraph shall not apply to doors wider than 3 feet 9 inches or taller than 7 feet;*
>
> *(B) have strip doors, spring hinged doors, or other method of minimizing infiltration when doors are open;*
>
> *(C) contain wall, ceiling, and door insulation of at least R–25 for coolers and R–32 for freezers, except that this subparagraph shall not apply to glazed portions of doors nor to structural members;*
>
> *(D) contain floor insulation of at least R–28 for freezers;*

---

[1] This part was originally titled Part B; however, it was redesignated Part A after Part B was repealed by Energy Policy Act of 2005 (EPACT 2005), Pub. L. 109-58.

[2] This part was originally titled Part C; however, it was redesignated Part A-1 after Part B of Title III was repealed by Energy Policy Act of 2005 (EPACT 2005), Pub. L.-109-58.

(E) for evaporator fan motors of under 1 horsepower and less than 460 volts, use—

(i) electronically commutated motors (brushless direct current motors); or

(ii) 3-phase motors;

(F) for condenser fan motors of under 1 horsepower, use—

(i) electronically commutated motors;

(ii) permanent split capacitor-type motors; or

(iii) 3-phase motors; and

(G) for all interior lights, use light sources with an efficacy of 40 lumens per watt or more, including ballast losses (if any), except that light sources with an efficacy of 40 lumens per watt or less, including ballast losses (if any), may be used in conjunction with a timer or device that turns off the lights within 15 minutes of when the walk-in cooler or walk-in freezer is not occupied by people.

Second, section 312 of EISA amends section 342 of EPCA by adding new subsection 342(f)(2) (42 U.S.C. 6313(f)(2)), which establishes requirements for electronically commutated motors for walk-in coolers and freezers described in paragraph (1)(E)(i);

(2) ELECTRONICALLY COMMUTATED MOTORS.—

(A) IN GENERAL.—The requirements of paragraph (1)(E)(i) for electronically commutated motors shall take effect January 1, 2009, unless, prior to that date, the Secretary determines that such motors are only available from 1 manufacturer.

(B) OTHER TYPES OF MOTORS.—In carrying out paragraph (1)(E)(i) and subparagraph (A), the Secretary may allow other types of motors if the Secretary determines that, on average, those other motors use no more energy in evaporator fan applications than electronically commutated motors.

(C) MAXIMUM ENERGY CONSUMPTION LEVEL.—The Secretary shall establish the maximum energy consumption level under subparagraph (B) not later than January 1, 2010.

Third, section 312 of EISA amends section 342 of EPCA by adding new subsection 342(f)(3) (42 U.S.C. 6313(f)(3)), which establishes additional requirements for walk-in coolers or walk-in freezers with transparent reach-in doors manufactured on or after January 1, 2009;

(3) ADDITIONAL SPECIFICATIONS.—Each walk-in cooler or walk-in freezer with transparent reach-in doors manufactured on or after January 1, 2009, shall also meet the following specifications:

(A) Transparent reach-in doors for walk-in freezers and windows in walk-in freezer doors shall be of triple-pane glass with either heat-reflective treated glass or gas fill.

(B) Transparent reach-in doors for walk-in coolers and windows in walk-in cooler doors shall be—

(i) double-pane glass with heat-reflective treated

glass and gas fill; or
(ii) triple-pane glass with either heat-reflective treated glass or gas fill.

(C) If the appliance has an antisweat heater without antisweat heat controls, the appliance shall have a total door rail, glass, and frame heater power draw of not more than 7.1 watts per square foot of door opening (for freezers) and 3.0 watts per square foot of door opening (for coolers).

(D) If the appliance has an antisweat heater with antisweat heat controls, and the total door rail, glass, and frame heater power draw is more than 7.1 watts per square foot of door opening (for freezers) and 3.0 watts per square foot of door opening (for coolers), the antisweat heat controls shall reduce the energy use of the antisweat heater in a quantity corresponding to the relative humidity in the air outside the door or to the condensation on the inner glass pane.

Finally, section 312 of EISA adds new subsection 342(f)(4) (42 U.S.C. 6313(f)(4)), which directs the Secretary to issue by rule, no later than January 1, 2012, performance-based standards for walk-in coolers and freezers manufactured on or after 3 years after the final rule is published, or 5 years if the Secretary determines, by rule, that a 3-year period is inadequate. This requirement is the subject of this framework document.

(4) PERFORMANCE-BASED STANDARDS.—

(A) IN GENERAL.—Not later than January 1, 2012, the Secretary shall publish performance-based standards for walk-in coolers and walk-in freezers that achieve the maximum improvement in energy that the Secretary determines is technologically feasible and economically justified.

(B) APPLICATION.—

(i) IN GENERAL.—Except as provided in clause (ii), the standards shall apply to products described in subparagraph (A) that are manufactured beginning on the date that is 3 years after the final rule is published.

(ii) DELAYED EFFECTIVE DATE.—If the Secretary determines, by rule, that a 3-year period is inadequate, the Secretary may establish an effective date for products manufactured beginning on the date that is not more than 5 years after the date of publication of a final rule for the products.

1.2 Overview of Walk-In Coolers and Freezers

Walk-in coolers and freezers (also known as “walk-ins”) are large, insulated refrigerated spaces with access door(s) large enough for people to enter. Walk-ins temporarily store refrigerated or frozen food or other perishable materials. Two major classes exist: low-temperature refrigerated space (-10°F to -20°F) and medium-temperature refrigerated space (-10°F to 30°F). Although walk-ins can be used in a wide variety of applications, they are primarily used in food service and sales. Food service includes fast food establishments and

restaurants. Food sales include retail sales and wholesale food sales such as grocery or convenience stores.

1.3 Test Procedures

DOE is required to develop both test procedures and energy conservation standards for walk-in coolers and freezers. DOE is developing a test procedure in a separate concurrent rulemaking proceeding to enable manufacturers to test their products for compliance. DOE expects that the final rule for the test procedures will be issued before the notice of proposed rulemaking (NOPR) for energy conservation standards is issued (section 1.4).

Section 312(c) of EISA amends section 343(a) of EPCA (42 U.S.C. 6314(a)) by adding new subsection 343(a)(9) (42 U.S.C. 6314(a)(9)), which establishes test procedure definitions for walk-in coolers and freezers and directs the Secretary to establish test procedures to measure their energy use.

> *(9) WALK-IN COOLERS AND WALK-IN FREEZERS.—*
> *(A) IN GENERAL.—For the purpose of test procedures for walk-in coolers and walk-in freezers:*
> *(i) The R value shall be the 1/K factor multiplied by the thickness of the panel.*
> *(ii) The K factor shall be based on ASTM test procedure C518–2004.*
> *(iii) For calculating the R value for freezers, the K factor of the foam at 20°F (average foam temperature) shall be used.*
> *(iv) For calculating the R value for coolers, the K factor of the foam at 55°F (average foam temperature) shall be used.*
> *(B) TEST PROCEDURE.—*
> *(i) IN GENERAL.—Not later than January 1, 2010, the Secretary shall establish a test procedure to measure the energy-use of walk-in coolers and walk-in freezers.*
> *(ii) COMPUTER MODELING.—The test procedure may be based on computer modeling, if the computer model or models have been verified using the results of laboratory tests on a significant sample of walk-in coolers and walk-in freezers.*

Accordingly, DOE intends to propose such test procedures under a separate rulemaking. Test procedures may incorporate by reference portions of test procedures and definitional information from relevant sources, such as those developed by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), the Air-Conditioning, Heating, and Refrigeration Institute (AHRI), the American Society for Testing and Materials (ASTM), or the American National Standards Institute (ANSI). The following 6 test procedures are of interest for walk-in coolers and freezers:

- ARI Standard 520-2004, "Performance Rating of Positive Displacement Condensing Units;"
- ARI Standard 540-2004, "Performance Rating of Positive Displacement Refrigerant Compressors and Compressor Units;"
- ASHRAE Standard 23-1993, "Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units;"
- ARI Standard 460-2005, "Performance Rating of Remote Mechanical-Draft Air-Cooled Refrigerant Condensers;"
- ANSI/ASHRAE Standard 20-1997, "Method of Testing for Rating Remote Mechanical-Draft Air-Cooled Refrigerant Condensers;" and
- ARI Standard 420-2008, "Performance Rating of Forced-Circulation Free-Delivery Unit Coolers for Refrigeration."[3]

DOE is currently considering several potential testing methods. These methods include adapting an existing test procedure for commercial refrigeration equipment, such as ARI Standard 1200-2006, "Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets" or ANSI/ASHRAE Standard 72-2005, "Method of Testing Commercial Refrigerators and Freezers," and applying it to walk-in coolers and freezers; combining several test procedures from sources such as the 6 listed above; or developing a computer model to simulate operation of a walk-in cooler or freezer.

Because EISA did not establish specific test metrics and normalization factors, DOE will do so as part of the test procedures rulemaking. Sample test metrics include daily or annual energy use; sample normalization factors include refrigerated volume or floor area. Energy conservation standards could be developed using these test metrics and normalization factors. For example, the energy conservation standard could be developed as an equation describing the maximum amount of daily energy use per unit volume as tested under the DOE test procedure.

Item 1–1 *DOE welcomes comments on the test procedures listed above and on any additional test procedures that should be considered along with the reasons for their consideration.*

Item 1–2 *DOE seeks feedback and supporting reasons regarding appropriate test procedure options for the walk-in coolers and freezers covered under this rulemaking.*

Item 1–3 *DOE seeks feedback on appropriate test metrics and normalization factors (e.g., daily energy use per unit volume or per-unit floor area) for the walk-in coolers and freezers covered under this rulemaking. Along with any detailed feedback, the reasons supporting the inclusion (or exclusion) of a particular metric or normalization factors should be submitted.*

[3] On January 1, 2008, the Air-Conditioning and Refrigeration Institute (ARI) and the Gas Appliance Manufacturers Association (GAMA) merged to become AHRI.

1.4 Rulemaking Process and Stakeholder Participation

Under EPCA, any standard DOE prescribes for consumer products shall be designed to "achieve the maximum improvement in energy efficiency … which the Secretary [of Energy] determines is technologically feasible and economically justified." (42 U.S.C. 6295(o)(2)(A)) Moreover, EPCA prohibits the Secretary from establishing an amended standard that would not result in "significant conservation of energy" or "is not technologically feasible or economically justified." (42 U.S.C. 6295(o)(3)(B)) In determining whether a standard is economically justified, DOE considers the following 7 factors to the greatest extent practicable:

(1) the economic impact of the standard on the manufacturers and customers of the products subject to such standards;

(2) the savings in operating costs throughout the estimated average life of the covered products in the type (or class) compared to any increases in the price, or in the initial charges for, or maintenance expenses of the covered products which are likely to result from the imposition of the standard;

(3) the total projected amount of energy (or as applicable, water) savings likely to result directly from the imposition of the standard;

(4) any lessening of the utility or the performance of the covered products likely to result from the imposition of the standard;

(5) the impact of any lessening of competition, as determined in writing by the Attorney General, that is likely to result from the imposition of the standard;

(6) the need for national energy and water conservation; and

(7) other factors the Secretary considers relevant.

(42 U.S.C. 6295(o)(2)(B)(i) and 42 U.S.C. 6316(a))

Additional statutory requirements are set forth in 42 U.S.C. 6295(o)(1)–(2)(A), (2)(B)(ii)–(iii), and (3)–(6) and 42 U.S.C. 6316(a).

Developing efficiency standards involves analysis, public notice, and consultation with interested parties. DOE considers stakeholder participation to be a very important part of the process for setting energy conservation standards. The Department encourages the participation of all interested parties during the comment period at each stage of the rulemaking to ensure a balanced discussion of the information that is part of the standards rulemaking process.

In conducting the test procedure and standards rulemakings, DOE involves stakeholders through a variety of means, including formal public notifications (*i.e.*, *Federal Register* notices) and public meetings. As discussed in further detail below, the standards pre-rulemaking and rulemaking process generally involves a preliminary publication of analyses on the Department's

website and two major public notices, which are published in the *Federal Register*. The publication of the preliminary analyses, as well as the NOPR, will be accompanied by public meetings to solicit stakeholder comment to guide the rulemaking process.

- Publication of preliminary analyses and public meeting (section 1.4.1): The publication of preliminary analyses and notice of the public meeting is designed to obtain public review of the models and tools that DOE will use in the rulemaking, and to facilitate public participation before the proposed rule stage. Candidate standard levels (CSLs), which span the range of efficiencies from baseline equipment to the most efficient technology, are the basis for demonstrating the functionality of the models and tools.[4]

- NOPR (section 1.4.2). The NOPR presents a discussion of comments received in response to the preliminary analyses; DOE's analysis of the impacts of standards on customers, manufacturers, and the Nation; DOE's weighting of the impacts; and the proposed standard levels for public comment.

- Final rule (section 1.4.3). The final rule presents a discussion of comments received in response to the NOPR, the revised analysis of the impacts of standards based on comments and any updated data, DOE's weighting of the impacts, and the standard levels DOE is adopting. The final rule also establishes the effective date of the standards.

1.4.1 Preliminary Analyses and Other Activities

DOE's preliminary activities typically include identifying product technology options and determining whether they warrant detailed analysis or can be eliminated from further consideration. This process includes a market and technology assessment (section 3) and a screening analysis (section 4). DOE applies four criteria in the screening analysis to determine which technology options to eliminate from further consideration: technological feasibility; practicability to manufacture, install, and service; adverse impacts on product utility or availability; and adverse impacts on health or safety. DOE calls technologies that pass the screening analysis "design options," and considers them in the engineering analysis as methods of improving the efficiency of the covered products.

Also in its preliminary analysis stage, DOE collects data on manufacturer costs, historical shipments, shipment-weighted average efficiency, and preliminary manufacturer impacts (e.g., capital conversion expenditures, marketing costs, and research and development costs). Given these data, and the efficiency levels achievable by the design options developed earlier, DOE estimates the impact of potential standards on individual consumers and the nation as a whole.

[4] For past rulemakings, DOE was required to issue an Advanced Notice of Proposed Rulemaking (ANOPR) following publication of the framework document. The Energy Independence and Security Act of 2007 (EISA) eliminated the requirement that DOE issue an ANOPR as part of the standards rulemaking process; see EISA, at sec. 307. Instead, DOE will use an alternative process to provide the same information and ability for public comment as the ANOPR, but without publication of analyses in the *Federal Register*..

These calculations are contained within the following analyses and explained in subsequent sections of this framework document:

- the engineering analysis (section 5);
- the consumer life-cycle cost (LCC) and payback period (PBP) analysis (section 8);
- the national impact analysis, which considers national energy savings (NES) and national consumer net present value (NPV) (section 10); and
- a preliminary manufacturer impact analysis (section 12).

DOE will present the results of these analyses in a technical support document (TSD) to be published prior to the NOPR stage of the rulemaking. The publication of the TSD, which will be made available on the Department's website, will be followed by a public meeting to discuss these analyses. A meeting agenda, presentation slides, and an executive summary highlighting the issues on which DOE seeks comment will accompany the TSD on the website. DOE will publish a notice announcing the availability of the materials and the public meeting in the *Federal Register*.

Discussion of various CSLs in the TSD will facilitate stakeholder review of the spreadsheet models that serve as the basis for the analyses. DOE will use stakeholder comments to refine the models for the NOPR stage of the rulemaking analyses, where DOE will propose specific efficiency levels for adoption. Based on the results, DOE selects CSLs from the energy-efficiency or energy-use levels considered in the preliminary analyses. In addition to the efficiency levels corresponding to the maximum technologically feasible ("max-tech") design and the minimum LCC point, DOE generally selects levels or design options for consideration that span the full range of technologically achievable efficiencies.[5] DOE typically analyzes the following CSLs:

- the baseline CSL (*i.e.*, the minimum level) is represented by the product with the lowest energy-efficiency level currently sold on the market for a given product class; for classes where minimum energy-efficiency standards already exist, the baseline efficiency level is typically defined by the existing energy conservation standard;

- the highest CSL or lowest energy consumption level that is technologically feasible (*i.e.*, the "max-tech" level);

- the level with the minimum LCC or greatest LCC savings; and

- levels that incorporate noteworthy technologies or fill in large gaps between other CSLs considered.

In the preliminary analyses, DOE uses analytical models and tools to assess the different product classes at each efficiency or energy use level analyzed. Many of these analytical models

[5] The "max-tech" represents the most efficient design that is commercialized or has been demonstrated in a prototype with materials or technologies available today. "Max-tech" is not constrained by economic justification, and typically is the most expensive design option considered in the engineering analysis.

and tools are in the form of spreadsheets, some of which DOE uses to conduct the LCC and PBP analyses and to determine the NES and NPV of prospective standards. Preliminary results may facilitate discussions among interested parties on potential joint recommendations for standard levels.

In addition to the other materials mentioned above, DOE will make the spreadsheet tools used for the preliminary analyses available on its website for review and will consider comments after the public meeting.[6] DOE will provide a 60-day public comment period following the publication of the notice. Furthermore, preliminary results may facilitate discussions among interested parties on potential joint recommendations for standard levels. DOE encourages stakeholders to develop such recommendations. Any consensus recommendation must satisfy the statutory criteria provided by EPCA in determining whether an energy conservation standard is technologically feasible and economically justified and will result in significant conservation of energy (42 U.S.C. 6295(o)(2)(A), (o)(3), (v)). Any consensus recommendation should also include information that DOE can use to assess the 7 statutory factors that determine whether the benefits of the standard exceed its burdens. (42 U.S.C. 6925(o)(2)(B)(i))

1.4.2 Notice of Proposed Rulemaking

In developing the NOPR, DOE will first review and consider all the comments it receives after the preliminary public meeting. This process may result in revisions or refinement to the preliminary analyses, including the engineering and LCC analyses. DOE will also conduct additional economic and environmental impact analyses at this stage of the rulemaking. These analyses generally include a customer LCC subgroup analysis (section 11), a manufacturer impact analysis (section 12), a utility impact analysis (section 13), an employment impact analysis (section 14), an environmental assessment (section 15), and a regulatory impact analysis (section 16).

DOE will describe the methodology used and make the results of all the analyses available on its website for review. DOE will consider comments after publication of the NOPR. This review-and-comment process may result in revisions to the analyses. This process ends with the selection of proposed energy conservation levels (if any) that will be presented in the NOPR. DOE selects these levels from the trial standard levels (TSLs) it analyzed. The NOPR, published in the *Federal Register*, will document the evaluation and selection of any proposed standards, along with a discussion of other TSLs considered but not selected (and the reasons DOE did not select them).

The selection process for proposed efficiency standards generally runs as follows. For each equipment class, DOE will identify the maximum improvement in energy efficiency or maximum reduction in energy use that is technologically feasible. If DOE proposes a level that is below this "max-tech" level, it will explain the reasons for eliminating higher levels, beginning with the highest level considered. DOE will present the results of the analysis in the NOPR and the details of the analysis in an accompanying TSD.

[6] All materials associated with the walk-in coolers and freezers rulemaking are available on DOE's website at http://www1.eere.energy.gov/buildings/appliance_standards/commercial_products.html.

DOE considers many factors in selecting proposed standards. These factors or criteria are established by statute and capture the many benefits, costs, and impacts of energy conservation standards. DOE will carefully consider any joint recommendations in its decision process.

When DOE publishes the NOPR, it will provide the U.S. Department of Justice (DOJ) with a copy of the NOPR and TSD and will solicit feedback on the impact of the proposed standard levels on competition. DOJ will review these standard levels for any lessening of competition likely to result from the imposition of standards. (42 U.S.C. 6295(o)(2)(B)(i)(V) and (ii)) DOE will consider DOJ's determination on the impacts of the proposed standard on competition in preparing the final rule. The NOPR will be followed by a public comment period that includes one public meeting.

1.4.3 Final Rule

Revisions to the analyses may result from the public comments on the NOPR. On the basis of the public comments, DOE will review the engineering and economic impact analyses and proposed standards and make modifications as necessary. After publication of the NOPR, DOE will conduct a thorough review of all analyses performed and of the TSLs, and make revisions as appropriate.

Before the final rule is issued, DOE will consider any comments from DOJ on the impacts of the proposed standard levels on competition to determine whether changes to these standard levels are needed.

The standards rulemaking will conclude with publication of the final rule. DOE will select the final standard levels based on the complete record of the standards rulemaking. The final rule will promulgate the final standard levels and their effective date and explain the basis for their selection. The final rule will be accompanied by a final TSD.

2. OVERVIEW OF ANALYSES FOR RULEMAKING

The purpose of the analyses conducted in support of the standards rulemaking will be to ensure that DOE selects the final energy conservation standards that achieve the maximum energy savings that satisfy the criteria of technological feasibility and economic justification. Economic justification includes consideration of the economic impacts on domestic manufacturers and customers, national benefits (including environmental impacts), issues of customer utility, and impacts from any lessening of competition.

This section offers an overview of DOE's analytical methodology and discusses the major components of the analyses DOE will conduct. A consistent approach to analysis throughout the rulemaking will be ensured by considering each analysis as a part of the overall standards-setting process.

Figure 1 summarizes the analytical components of the standards-setting process. The "analyses" are presented in the center column. Each analysis has a set of "key inputs," which are data and information required for the analysis. "Approaches" are the methods that DOE will use to obtain key inputs, which may vary depending on the information in question. For example,

some key inputs exist in public databases, some will be collected from interested parties or others with special knowledge, and some will be developed by the project team in support of the rulemaking. The results of each analysis are “key outputs,” which feed directly into the rulemaking. Arrows connecting one analysis to another indicate the flow of information.

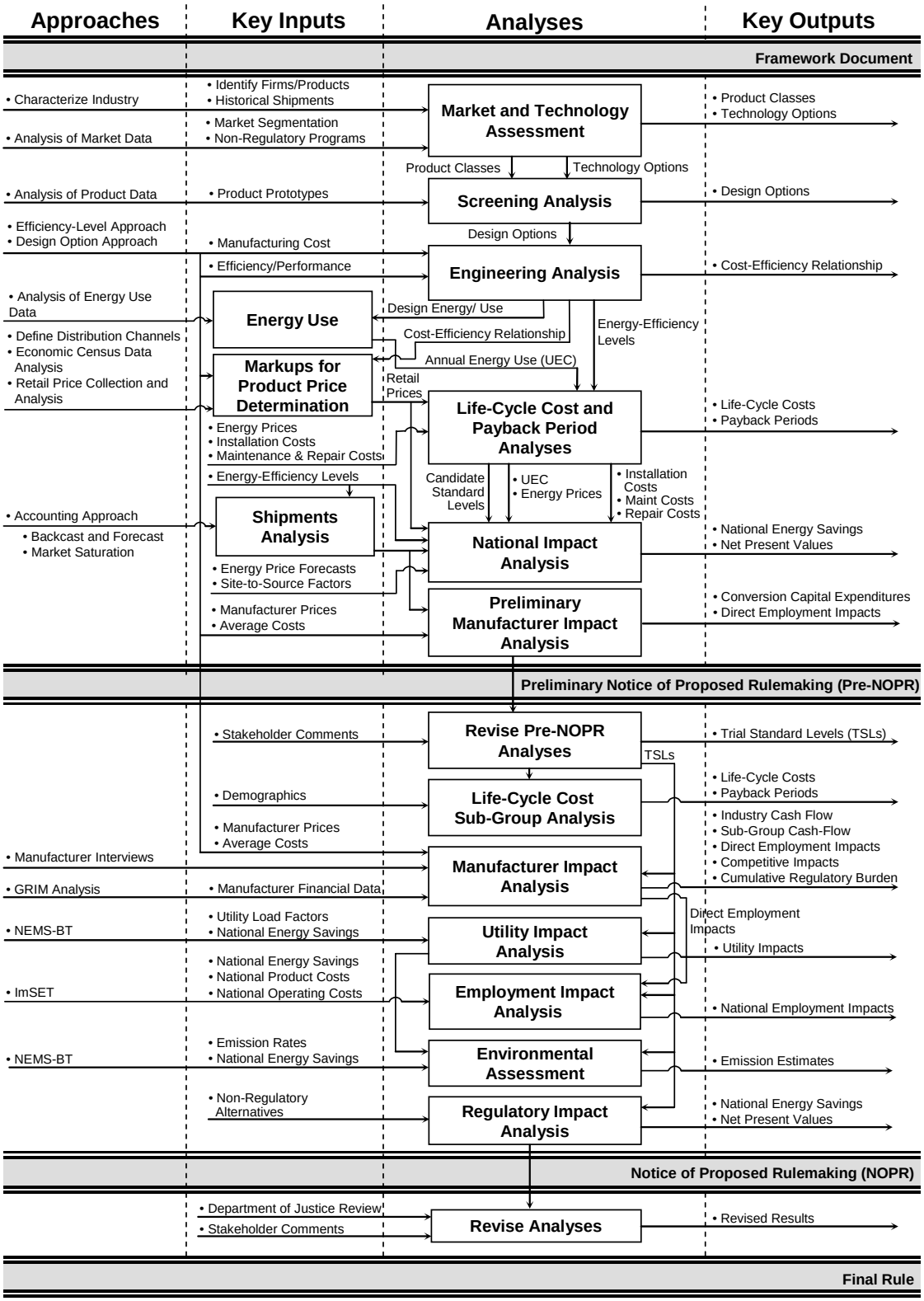

Figure 1. Flow Diagram of Analyses for the Walk-in Coolers and Freezers Standards Rulemaking Process

3. MARKET AND TECHNOLOGY ASSESSMENT

The market and technology assessment will provide information about the walk-in coolers and freezers industry and market, and about the performance attributes of the equipment that DOE will use throughout the rulemaking. This assessment is particularly important at the outset of the rulemaking to determine equipment classes and identify potential design options or efficiency levels for each equipment class.

This section discusses the market assessment (section 3.1), equipment classes (section 3.2), and technology assessment (section 3.3).

3.1 Market Assessment

DOE will qualitatively and quantitatively characterize the structure of the industry and market for walk-in coolers and freezers. In the market assessment, DOE will identify and characterize the manufacturers of this equipment, estimate market shares and trends, and address regulatory and non-regulatory initiatives intended to improve the energy efficiency of walk-in coolers and freezers. The assessment will also explore the potential for technological improvements in the design and manufacturing of such equipment.

The market assessment phase allows DOE to gather data that will assist in identifying important issues later in the rulemaking, such as potential small business impacts, competitive disruptions, and other factors that may arise from enacting standards. For example, DOE will use historical equipment shipments and prices as an indicator of future shipments and prices. Market structure data will be particularly useful for assessing competitive impacts as part of the manufacturer impact analysis. This phase also allows DOE to start updating design options by reviewing product literature, industry publications, and company websites.

EISA establishes prescriptive standards for the walk-in coolers and freezers covered under this rulemaking that are manufactured on or after January 1, 2009. (42 U.S.C. 6313(f)(1)) However, walk-in coolers and freezers have never before been the subject of performance based energy conservation standards at the Federal level. Some limited data on energy consumption and energy efficiency is available for this equipment. A preliminary investigation by DOE indicates that there is little or no publicly available data on the cost of manufacturing this equipment, manufacturer market shares, shipments, or channels of distribution. Such data are essential to the development of technologically feasible, economically justified energy conservation standards. Stakeholders are encouraged to submit any applicable data to DOE.

AHRI represents manufacturers of walk-in coolers and walk-in freezers and DOE expects this group will play an important role in providing market information, including information on manufacturers, market shares, and trends in the market.

Item 3–1 DOE seeks information that would contribute to the market assessment for walk-in coolers and freezers, including information on manufacturers, market

shares, trends in the market, technological improvements, and any other applicable information. Examples of the type of information sought by DOE, include, but are not limited to: a listing of walk-in cooler and freezer manufacturers and their respective market shares, historical shipment data by equipment class, equipment efficiency data by equipment class, etc.

3.2 Equipment Classes

DOE intends to separate walk-in coolers and freezers into different equipment classes. The criteria for separating equipment into different classes are: (1) the type of energy used; (2) capacity; and (3) other performance-related features, such as those that provide utility to the customer or other features deemed appropriate by the Secretary that would justify the establishment of a separate energy conservation standard. (42 U.S.C. 6295(q))

Possible equipment classes to consider for walk-in coolers and freezers include condensing unit type (self-contained vs. remote condensing), application (integrated interior systems vs. external addition systems), and capacity (small, medium, and large capacities). These features provide utility and affect energy efficiency. Examples of possible classes could include:

- small, self-contained, integrated interior systems;
- medium, self-contained, integrated interior systems;
- large, self-contained, integrated interior systems;
- small, self-contained, external addition systems;
- medium, self-contained, external addition systems;
- large, self-contained, external addition systems
- small, remote condensing, integrated interior systems;
- medium, remote condensing, integrated interior systems;
- large, remote condensing, integrated interior systems;
- small, remote condensing, external addition systems;
- medium, remote condensing, external addition systems; and
- large, self-contained, external addition systems.

Integrated interior systems are fabricated within a building and have limited cooling capacities. External addition systems can be constructed as extensions to most existing buildings and are generally not limited by capacity.

Systems with small, medium, and large capacities can be partitioned into units less than or equal to 1,000 square feet (ft^2), units greater than 1,000 ft^2 and less than or equal to 2,000 ft^2, and units greater than 2,000 ft^2 and less than or equal to 3,000 ft^2, respectively.

Item 3–2 DOE requests feedback on which equipment classes among the ones listed above it should use in its analysis and the reasons for their inclusion.

Item 3–3 *DOE also seeks information regarding other equipment classes it should consider for inclusion in its analysis. Please provide reasons supporting the inclusion of each class.*

3.3 Technology Assessment

Typically, DOE uses information about existing and past technology options and prototype designs to help identify technologies that manufacturers could use to meet and/or exceed energy conservation standards. In consultation with interested parties, DOE intends to develop a list of technologies to consider in the analysis. Initially, this list will include all those technologies considered to be technologically feasible and will serve to establish the maximum technologically feasible design. DOE is currently considering the specific technologies and design options listed below**.**

The following design options and technologies are relevant to walk-in coolers and walk-in freezers:

1. hot gas defrost;
2. thicker insulation;
3. floating head pressure;
4. ambient subcooling;
5. external heat rejection;
6. economizer cooling;
7. higher-efficiency evaporator and condenser fan blades;
8. higher-efficiency evaporator and condenser fan motors (*e.g.*, electronically commutated motors (ECM));
9. electronic ballasts;
10. higher-efficiency lighting;
11. anti-sweat heating control (*e.g.*, dew point sensor);
12. evaporator and condenser fan motor controllers (*e.g.*, optimize duty cycle); and
13. non-electric anti-sweat.

The following design options and technologies are relevant only to walk-in freezers:

1. defrost controls.

Item 3–4 *What technologies or design options, if any, should DOE add to or remove from these lists? Please provide the rationale for any such recommendations.*

4. SCREENING ANALYSIS

The purpose of the screening analysis is to eliminate design options and technologies that will not be considered further in the analysis. Following development of the initial list of design options and technologies, DOE will review each one based on the following four criteria:

1. *Technological feasibility.* Design options and technologies that are not incorporated in commercially available equipment or in working prototypes will not be considered further.

2. *Practicability to manufacture, install, and service.* If DOE determines that mass production of a design option or technology in commercially available equipment and reliable installation and servicing of the technology could not be achieved on the scale necessary to serve the relevant market at the time of the effective date of the standard, that design option or technology will not be considered further.

3. *Adverse impacts on product or equipment utility to customers or availability.* If DOE determines that a design option or technology has significant adverse impact on the utility of the product on a significant number of customer subgroups, or results in the unavailability of any covered product type with performance characteristics (including reliability), features, size, capacities, and volumes that are substantially the same as equipment generally available in the United States at the time, it will not be considered further.

4. *Adverse Impacts on Health or Safety.* If DOE determines that a design option or technology will have significant adverse impacts on health or safety, it will not be considered further.

10 CFR part 430, subpart C, appendix A.

The reasons for eliminating any design options or technologies during the screening analysis will be fully documented and published as part of the preliminary analyses and available for stakeholder review and comment.

5. ENGINEERING ANALYSIS

After conducting the screening analysis, DOE performs an engineering analysis based on the remaining design options that would improve efficiency. The engineering analysis consists of estimating the energy consumption and cost of equipment at various levels of increased efficiency. In this section, DOE discusses the engineering analysis (section 5.1), baseline units (section 5.2), the approach for determining the cost-efficiency relationship (section 5.3), the maximum technologically feasible efficiency level (section 5.4), manufacturer prices (section 5.5), proprietary designs (section 5.6), and regulatory changes outside the realm of DOE's energy conservation standards process and other regulatory changes that affect the engineering analysis (section 5.7).

5.1 Engineering Analysis Overview

The engineering analysis estimates the cost-efficiency relationship, which is the cost of equipment at various levels of increased energy efficiency above a baseline (*i.e.*, equipment that just meets the minimum energy conservation standards). This relationship serves as the basis for the cost-benefit calculations for individual customers, manufacturers, and the Nation. In determining the cost-efficiency relationship, DOE will estimate the increase in manufacturer cost associated with the design options and technologies available to manufacturers for increasing the efficiency of equipment above the baseline.

5.2 Baseline Units

Once DOE establishes equipment classes, it will select a baseline model as a reference point for each equipment class for use in the engineering analysis and the life-cycle cost and payback-period analyses. The baseline model represents the typical characteristics of equipment in each class. Using this baseline, DOE can estimate changes resulting from energy conservation standards. To determine energy savings and changes in manufacturer selling price, DOE will compare each higher-efficiency level against the baseline model.

Item 5–1 *DOE seeks information on what particular components and features (e.g., materials, dimensions, compressors, coils, expansion devices, fans, motors, controls, and panel construction characteristics) characterize the baseline model in each equipment class.*

5.3 Planned Approach for Determining the Cost-Efficiency Relationship

DOE typically structures its engineering analysis using one of three approaches: (1) design-option; (2) efficiency-level; or (3) reverse-engineering (or cost-assessment). A design-option approach uses individual design options, or combinations of design options, to identify increases in efficiency. Under this approach, estimates are based on manufacturer or component supplier data or engineering computer simulation models. Individual design options, or combinations of design options, are added to the baseline model in ascending order of cost-effectiveness. An efficiency-level approach establishes the relationship between manufacturer cost and increased efficiency at predetermined efficiency levels above the baseline. Under this approach, manufacturers typically provide manufacturer cost data for incremental increases in efficiency. A reverse-engineering or cost-assessment approach involves purchasing representative walk-in coolers and/or walk-in freezers, disassembling the units, and reverse-engineering the manufacturing costs based on a “bottoms-up” manufacturing cost assessment.

For this rulemaking, DOE plans to use a design-option approach for determining the cost-efficiency relationship because it provides transparency of assumptions and results and the ability to perform independent analyses for verification of industry data. This will involve

consultation with outside experts, review of publicly available cost and performance information, and modeling of equipment cost and energy consumption.

For each equipment class, the engineering analysis will estimate manufacturer production costs (MPCs) for each design option considered. DOE plans to develop a cost model to estimate the cost of the core case (*i.e.*, the MPC of the structure, walls, doors, shelving, and fascia of walk-in coolers and freezers), but not the cost of any energy-using components.

This cost model can be adapted from a cost model developed for DOE's rulemaking on commercial refrigeration equipment (CRE).[7] The approach for commercial refrigeration equipment involved disassembling a self-contained refrigerator, analyzing the materials and manufacturing processes for each component, and developing a parametric spreadsheet to model the cost to fabricate or purchase each component and the cost of assembly. Because of the similarities in manufacturing processes between commercial refrigeration equipment and walk-in coolers and walk-in freezers, DOE can adapt the commercial refrigeration equipment cost model by maintaining many of the assumptions about materials and manufacturing processes, but modifying the dimensions and types of components for walk-in coolers and freezers. To confirm the accuracy of the cost model, DOE plans to obtain input from stakeholders on the production cost estimates and other assumptions in the model. DOE believes this approach is acceptable, given the similarities in materials and manufacturing processes between commercial refrigeration equipment and walk-in coolers and freezers.

DOE plans to select models with a representative cooling capacity for each equipment class, while considering the possible design constraints at very small and very large capacities.

Item 5–2 *DOE requests feedback on using a design-option approach to determine the relationship between manufacturer production cost and energy-efficiency levels for walk-in coolers and freezers.*

Item 5–3 *DOE requests feedback on an appropriate representative capacity (i.e., the most common or highest-volume capacity) for each equipment class of walk-in coolers and freezers.*

5.4 Maximum Technologically Feasible Efficiency Level

For each equipment class of walk-in coolers and freezers, DOE will analyze a baseline efficiency level and a maximum technologically feasible ("max-tech") efficiency level. (42 U.S.C. 6295(p)(2))

[7] See www.eere.energy.gov/buildings/appliance_standards/commercial/refrigeration_equipment.html for further detail on and validation of the commercial refrigeration equipment cost model.

Item 5–4 DOE seeks input from stakeholders on an appropriate maximum technologically feasible efficiency level for each equipment class and the reasons in support of that level.

5.5 Manufacturer Prices

DOE plans to apply a manufacturer markup to convert manufacturer production cost to manufacturer selling price. DOE will estimate this manufacturer markup from publicly available financial information (*e.g.*, Securities and Exchange Commission 10-K reports).

Item 5–5 DOE seeks comment on the planned markup approach for developing estimates of manufacturer selling prices.

5.6 Proprietary Designs

DOE will consider in its engineering and economic analyses all design options that have not been screened out, including proprietary designs. DOE will consider proprietary designs in the subsequent analyses only if those designs are not unique paths to given efficiency levels. Otherwise, the analyses would appear to favor one manufacturer over others.

DOE seeks manufacturer input on the competitive impacts assessment and other economic analyses. DOE will make provisions to maintain the confidentiality of any proprietary data submitted by manufacturers or discussed during manufacturer interviews. This data may be provided under a confidentiality agreement with DOE's contractor responsible for this part of the rulemaking analysis, Navigant Consulting, Inc. (NCI). NCI regularly works with confidential data from manufacturers and other organizations, preparing aggregated results for DOE's analysis that do not divulge sensitive raw data, but enable other stakeholders to review and comment on the aggregated dataset. Alternatively, stakeholders may submit confidential data to DOE, indicating in writing which data should remain confidential. To prevent public disclosure of the data due to actions taken by a third party, stakeholders providing confidential information to DOE must submit that data according to 10 CFR 1004.11. This information will provide input to the competitive impacts assessment and other economic analyses.

Item 5–6 Are there proprietary designs or technologies that DOE should consider for any of the equipment under consideration in this rulemaking? If so, how should DOE acquire the cost data necessary for evaluating these designs?

5.7 Outside Regulatory Changes Affecting the Engineering Analysis

In conducting an engineering analysis, DOE must consider the effects of regulatory changes outside DOE's statutory energy conservation standards rulemaking process that can affect the manufacturers of walk-in coolers and freezers. Some of these changes can also affect the energy efficiency or energy consumption of the equipment covered under this rulemaking. DOE will attempt to identify all such outside engineering issues. The consideration of these

issues is closely related to the cumulative regulatory burden assessment that DOE will conduct as part of the manufacturer impact analysis.

After considering the comments received on the engineering analysis in the preliminary phase, DOE will make the necessary changes to the analysis. Those changes will be reflected in the NOPR.

Item 5–7	*Are there outside regulatory issues that DOE should consider in its engineering analysis of walk-in coolers and freezers?*

6. ENERGY USE ANALYSIS

6.1 Overview of Energy Use Analysis

The purpose of the energy use and end-use load characterization analysis is to assess the energy- and peak-demand-savings potential of walk-in coolers and freezers of different efficiencies and equipment classes. These energy savings estimates form the basis of the energy cost savings estimates DOE uses to assess economic benefits for higher-efficiency standards. As part of the energy use analysis, DOE must make certain engineering assumptions about equipment application, including how the equipment is operated and under what conditions.

Critical to these assumptions are the climate (which affects cooling loads for walk-in coolers and freezers located outside of a conditioned building, as well as estimates of condensing system performance), lighting operating hours for lights used in walk-in coolers and freezers, the size and design of the prototypes being studied, and the corresponding equipment performance characteristics. In addition, because the majority of walk-ins are likely located indoors, characterizing the energy savings estimates of walk-in coolers and freezers may include understanding the effect on building heating and cooling loads and the corresponding building energy use. Some installations of walk-in coolers and freezers release heat into the conditioned building space. Other installations release heat outside of the building.

A 1996 study by Arthur D. Little, Inc., provided information on the energy consumption of walk-in coolers and freezers, including an examination of a self-contained walk-in freezer that rejected heat inside the conditioned building space and of a cooler (with doors) in a convenience store that rejected heat outside of the building. The study did not address the energy impact on the building space.

In 2007, DOE examined the energy impact of specific design changes for commercial refrigeration equipment (*i.e.*, display cases) for the CRE Advance Notice of Proposed Rulemaking (ANOPR).[8] This research did not reveal significant overall impacts on building space heating and cooling energy in grocery stores for the remote condensing equipment and

[8] For this rulemaking, the ANOPR step has been replaced by a notice of a public meeting and the availability of an accompanying technical support document.

design options DOE examined.[9] For equipment with the condensing unit located within the building space, all design options that save energy reduced building space cooling loads and generally increased space heating loads. For remote condensing equipment, some design options (*e.g.*, lights and fans) reduced the internal heat generation within the walk-in cooler, and thus the load and heat release on the compressor, but had no direct impact on a building's space load. Other design options (*e.g.*, increased insulation, reduced infiltration) increased the building's space cooling load, but also reduced the space heating load due to reduced heat transfer from the building to the cooler. The impact on space heating and cooling loads was further complicated by: the array of buildings that use walk-in coolers and freezers (large grocery, small grocery, full-service restaurants, fast food restaurants, and institutional buildings); the mix of self-contained and remote condensing coolers and freezers that may be used in individual building types; and whether the heat release is occurring in fully or partially conditioned space (*e.g.*, heated only work areas) in the building.

DOE is considering conducting a simplified analysis of walk-in coolers and freezers that does not address the impact of higher-efficiency design options on building space heating and cooling loads, but is based on the engineering analysis tools DOE is developing for walk-in coolers and freezers. DOE seeks input on the relative merits of including whole building analysis for the energy analysis of walk-in coolers and freezers. If a whole building analysis approach is recommended, DOE also requests suggestions on the type of analysis and level of detail that would be justified for the present standards rulemaking.

For the fraction of the market that consists of remote condensing equipment, DOE is considering modifying the engineering analysis tools to address these issues as well.

Item 6–1 *DOE seeks input on the relative merits of incorporating whole building space heating and cooling energy in its energy analysis of walk-in coolers and freezers. If a whole building analysis is recommended, DOE seeks the reasons supporting this type of analysis as well as comments on what building types and analysis tools, and for which equipment classes, such analysis should be considered.*

7. MARKUPS FOR EQUIPMENT PRICE DETERMINATION

DOE uses manufacturer-to-customer markups to convert the manufacturer selling price estimates from the engineering analysis to customer prices, which are then used in the LCC and payback period analyses and the manufacturer impact analysis. Retail prices are needed for the baseline efficiency level and all other efficiency levels under consideration. DOE will obtain these retail prices by applying manufacturer-to-customer markups to the manufacturer selling price estimates. To validate these markups, DOE will attempt to collect data on existing prices in

[9] The commercial refrigeration equipment rulemaking ANOPR and technical support document are available on DOE's website at www1.eere.energy.gov/buildings/appliance_standards/commercial/refrigeration_equipment.html.

the market either by purchasing large data sets or by downloading data from distributor internet sites.

Before it can develop markups, DOE must identify distribution channels (*i.e.*, how the equipment is distributed from the manufacturer to the customer). Once it establishes proper distribution channels for each product class, DOE will rely on economic census data from the U.S. Census Bureau and industry input from the industry to determine how equipment is marked up from the manufacturer to the customer. To the extent possible, DOE also will use collected retail price data to help quantify overall manufacturer-to-customer markups.

This analysis will generate retail prices for each possible efficiency level. Because it expects to generate a range of price estimates, DOE plans to describe new retail prices within a range of uncertainty. If the range of retail prices for the equipment is large enough, DOE will conduct a sensitivity analysis to determine how high or low estimates of retail pricing could affect the economic feasibility of amended energy conservation standards.

DOE has done a great deal of work to estimate manufacturer-to-customer markups for CRE. In the recent CRE rulemaking, DOE's analysis focused on three distribution chain paths and calculated markups for individual points along these paths. Two of these paths involved selling the equipment through a mechanical contractor and then through a general contractor before the equipment reached the final customer (82.5 percent of sales). A third "national account" path involved selling the equipment directly from the manufacturer to the end customer (17.5 percent of sales). The CRE analysis noted that in the case of replacement equipment (approximately 70 percent of the CRE market), a general contractor typically was not involved and therefore no general contractor markups were incurred for replacement equipment.

DOE's review of walk-in coolers and freezers suggests a set of three distribution channels:

Manufacturer → Distributor → Mechanical Contractor → Customer

Manufacturer → Distributor → Customer

Manufacturer → Customer (National Account)

A general contractor would not normally enter into the distribution path for this equipment. The relative fractions of equipment distributed in each path of the distribution channel could be different depending on the equipment class.

Item 7–1	*DOE requests information from stakeholders on the proposed distribution paths for the walk-in coolers and freezers covered under this rulemaking. DOE also requests information on the relative fractions of shipments expected for each path.*

Once it establishes proper distribution channels for each equipment class, DOE will rely on economic census data from the U.S. Census Bureau and input from industry trade associations such as the Heating, Air-Conditioning, and Refrigeration Distributors International (HARDI) to determine how equipment is marked up from the manufacturer to the customer.[10] HARDI represents wholesalers for walk-in coolers and freezers and other heating, ventilation, and air-conditioning (HVAC) equipment.

At each point in the distribution chain, companies mark up the price of their equipment to cover their business costs and profit margin. In financial statements, *gross margin* is the effective markup on a company's cost of sales. It includes: all corporate overhead costs; sales, general, and administrative costs; research and development and interest expenses; depreciation and taxes; and profits. For equipment sales to contribute positively to company cash flow, markups must be greater than the corporate gross margin less the company's operating profit margin. Individual equipment may command a lower or higher markup depending on the equipment's perceived added value and the competition the company faces. DOE generally assumes that gross margins on baseline refrigeration equipment are lower than the average gross margin of a diversified company.

DOE based the CRE analysis of general contractor markups on U.S. Census Bureau data for the commercial and institutional building construction sector. These data are not disaggregated by individual firms, but examine the sector as a whole. DOE developed sector-average data for general contractors in terms of contractor revenue per dollar of direct sale costs. DOE used these data to develop both average markups for general contractors and incremental markups. Incremental markups assume that certain industry costs, such as labor and building occupancy expenses, do not increase with an increase in cost of goods sold.

DOE intends to develop both an overall baseline markup (for obtaining the customer cost of baseline efficiency equipment) and an overall incremental markup to obtain the incremental cost of higher-efficiency equipment. Both of these overall markups will include an average multiplier to account for State sales tax applied at the last stage of the distribution channel. DOE intends to use the State Tax Clearinghouse to calculate applicable sales taxes.[11]

The overall markups DOE developed for the CRE analysis resulted in a multiplier of 2.31 for the manufacturer price for the average markups in the distribution chain, and a multiplier of 1.56 for the incremental markup. These multipliers were applied to any increase in manufacturer prices that resulted from standards for higher-efficiency equipment. Both markups include an average multiplier of 1.07 to account for sales tax applied at the last stage of the distribution chain.

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[10] U.S. Census Bureau. 2002. Plumbing, Heating, and Air-Conditioning Contractors: 2002. Report EC02-231-238220.

[11] Sales Tax Clearinghouse, Inc., *State Sales Tax Rates along with Combined Average City and County Rates*. Available at http://thestc.com/STrates.stm. tax rates along with combined average city and county rateso calculate applicable sales taxes.ill make the necessary

Item 7–2	*DOE requests feedback on the overall markups for the walk-in coolers and freezers covered under this rulemaking for each path in the distribution chain.*
Item 7–3	*DOE requests feedback on its proposal to use incremental distribution chain markups for the LCC analysis.*
Item 7–4	*DOE seeks comment on other sources of relevant data that could be used to characterize markups for the walk-in coolers and freezers.*

8. LIFE-CYCLE COST AND PAYBACK PERIOD ANALYSES

8.1 Overview

The effects of new energy conservation standards on equipment result in changes in operating expenses—usually a decrease—and changes in purchase price—usually an increase. DOE will analyze the net effect of new standards on customers by evaluating the net LCC using the cost-efficiency relationship derived in the engineering analysis, energy costs derived from the energy use and end-use load characterization analysis, and equipment retail prices. Inputs to the LCC and PBP analyses include the installed cost to the customer (purchase price plus installation cost), operating expenses (energy costs, maintenance costs, and, if applicable, repair costs), the lifetime of the appliance, energy price forecasts, and discount rates.

The installed and operating costs of the equipment typically change in response to new energy conservation standards. (Installed cost typically increases while operating cost typically decreases.) Thus, there is a specific time in the life of higher-than-baseline-efficiency appliances when the net operating cost benefit (in dollars) from the time of purchase is equal to the incremental first cost of purchasing the higher-efficiency appliance. The length of time required for the appliance to reach this cost-equivalence point is known as the payback period (PBP).

DOE considers both LCC and PBP (section 1.4) to determine whether a standard is economically justified and whether the benefits of an energy conservation standard will exceed its burdens to the greatest extent practicable. However, because LCC uses an explicit discount rate (that depends on customers' cost of financing), takes into account changing energy prices, and does not require selection of a baseline efficiency level, DOE considers this rate to be a better indicator of the likely economic impacts on customers. For the preliminary phase, DOE will conduct the LCC and PBP analysis using appropriate values for equipment life, equipment retail price, national or regional energy costs, and discount rates.

DOE will perform the LCC and PBP analyses using a spreadsheet model combined with Crystal Ball to account for uncertainty and variability among the input variables.[12] Each Monte Carlo simulation will consist of 10,000 LCC and PBP calculations. The models will perform each calculation using input values that are either sampled from probability distributions and

[12] Crystal Ball is a commercially available software add-on program to Microsoft Excel that DOE uses to conduct stochastic analysis using Monte Carlo simulation and probability distributions.

household samples or characterized with single point values. The analysis results will be a distribution of 10,000 data points showing the range of LCC savings and PBPs for a given efficiency level relative to the baseline level. For any sensitivity analyses it conducts, DOE will account for correlations that may exist among inputs (*e.g.*, there may be a correlation between energy usage and energy prices).

Based on the results of the LCC analysis, DOE will select CSLs for the preliminary analysis. The range of CSLs typically will include the efficiency level with the minimum LCC, the highest efficiency level that is technologically feasible, and other intermediate levels.

The following sections discuss the methodologies DOE plans to use to develop several of the inputs to the LCC and PBP analysis, including (1) electricity prices; (2) discount rates; (3) maintenance, repair, and installation costs; and (4) equipment lifetime. The following sections discuss the methodologies DOE plans to use in determining these values. The other inputs to the LCC and PBP analysis—namely, manufacturer costs (section 5), annual energy consumption (section 6), and markups for determining customer retail prices (section 7)—have been discussed previously.

8.2 Energy Prices

DOE will review energy price data from the Energy Information Administration (EIA) for walk-in coolers and freezers to establish electricity and natural gas prices. DOE plans to rely on regional average energy price data for the commercial sector. DOE will use projections of these energy prices for commercial customers to estimate future energy prices in its life-cycle cost and payback period analyses. DOE will use EIA's *Annual Energy Outlook* (*AEO*) as the default source of projections for future energy prices.

Item 8–1 DOE seeks comment on the proposed approaches for estimating current and forecasted energy prices.

8.3 Life-Cycle Cost Discount Rates

The calculation of customer LCCs requires the use of an appropriate discount rate. For walk-in coolers and freezers, DOE plans to use the same approach it relied on for developing discount rates for CREs and distribution transformers. DOE will derive the discount rates for commercial customers by estimating the cost of capital to companies that purchase walk-in coolers and freezers covered under this rulemaking. DOE commonly uses the cost of capital to estimate the present value of cash flows to be derived from a typical company project or investment. Most companies use both debt and equity capital to fund investments, so the cost of capital is the weighted-average cost to the firm of equity and debt financing. This corporate finance approach is referred to as the weighted-average cost of capital (WACC). Companies that purchase walk-in coolers and freezers may differ from those that purchase commercial unitary air conditioners or distribution transformers, which may result in different discount rates.

DOE will present the discount rates and associated calculations when the notice announcing the public meeting and availability of the preliminary analyses is published and invite comments.

Item 8–2	*DOE seeks comment on the proposed approaches for estimating discount rates for customers using the equipment covered under this rulemaking.*
Item 8–3	*Given the relatively narrow commercial application of most of the equipment covered under this rulemaking, which, if any, commercial sectors beyond grocery stores and restaurants should DOE consider in its evaluation of discount rates? In addition, do stakeholders feel government purchases of this equipment are large enough to require including them in the evaluation of discount rates?*

8.4 Maintenance, Repair, and Installation Costs

DOE will consider expected changes to maintenance, repair, and installation costs for the equipment covered in this rulemaking. Typically, small incremental changes in equipment efficiency incur no, or only very small, changes in repair and maintenance costs over baseline equipment. There is a greater probability that equipment with efficiencies that are significantly greater than the baseline will incur increased repair and maintenance costs since such equipment is more likely to incorporate technologies that are not widely available. DOE will rely on input from manufacturers and other stakeholders in developing appropriate repair and maintenance costs if stakeholders feel such estimates are necessary.

Unless the efficiency increases considered for this rulemaking result in significantly larger or heavier equipment, DOE expects that more efficient walk-in coolers and freezers will not incur increased installation costs.

Item 8–4	*DOE seeks feedback on whether changes in maintenance, repair, and installation costs will be negligible for equipment with lower energy consumption. DOE also seeks feedback on whether changes in maintenance, repair, and installation costs will change as a result of efficiency increases and, if so, whether those changes are likely to be negligible. If those costs are not likely to be negligible, please explain what those costs would be and why this would likely be the case.*
Item 8–5	*If it is not appropriate to assume that changes in maintenance, repair, or installation costs would be negligible for equipment with lower energy consumption, DOE seeks comment on appropriate methodologies for assessing changes to each of these costs.*

8.5 Equipment Lifetimes

DOE will use information from various literature sources (*e.g.*, *Appliance Magazine*, handbooks published by ASHRAE, etc.) and input from manufacturers and other stakeholders to establish average equipment lifetimes for use in the life-cycle cost and subsequent analyses.

Based on consideration of the comments responding to the preliminary analyses, DOE will make necessary changes to the analyses. These changes will be reflected in the NOPR documentation.

Item 8–6	*DOE seeks comment on the appropriate equipment lifetimes for estimates to use the equipment covered in this rulemaking and the basis for these estimates.*

9. SHIPMENTS ANALYSIS

Shipment forecasts are required to calculate the national impacts of standards on energy, NPV, and future manufacturer cash flows. DOE plans to develop shipment forecasts based on an analysis of key market drivers for walk-in coolers and freezers.

9.1 Base Case Forecast

To evaluate the various impacts of standards, DOE must develop a base case forecast against which to compare forecasts for higher efficiency levels. The base case forecast is designed to depict what will happen to energy consumption and energy costs over time if DOE does not adopt new energy conservation standards for the equipment covered under this rulemaking. In determining the base case forecast, DOE will consider historical shipments, the mix of efficiencies sold in the absence of standards, and how that mix might change over time. For these purposes, DOE needs data on historical product shipments and the market shares of the different efficiency levels offered in each equipment class.

Appliance Magazine reports historical shipments for walk-in coolers and freezers as an overall product group. The U.S. Census Bureau has also published limited statistics on the quantity and value of equipment shipments for those companies with shipments over $100,000 in both 1997 and 2002. While the Bureau's data identify several equipment classes separately, the data by product class are limited. Data for remote condensing and self-contained walk-in coolers and freezers are provided separately. Additionally, the data provide the dollar value of shipments rather than the actual shipment quantities in most cases.

DOE hopes to obtain shipment data within each equipment class, as well as market-share efficiency data (*i.e.*, data on the distribution of equipment shipments by efficiency) for each equipment class. DOE recognizes that this information may be difficult to obtain, which may necessitate the consideration of other methods to estimate the efficiency distribution in the market. For example, when market share efficiency data are not available, DOE may use efficiency distributions based on available models as a proxy. DOE may also request separate

shipment information for equipment sold with specific design features (*e.g.*, ECM evaporator fan motors).

9.2 Accounting Methodology

DOE proposes to determine annual shipments in the base case by accounting for new building construction and historical rates of equipment ownership (saturation rates) in buildings. For equipment retirements, DOE will use the same equipment lifetimes and retirement functions that it generates for the life-cycle cost and payback period analyses. This method has the advantage of separately accounting for units installed in both new construction and existing buildings and also permits DOE to express equipment saturation rates as a function of customer price and operating cost to capture their impact on future shipments. DOE plans to rely on EIA's *Annual Energy Outlook (AEO)* to forecast new commercial construction.

DOE will also consider any other input provided by stakeholders.

Item 9–1	*DOE seeks information on representative saturation rates for each equipment class covered under this rulemaking, as well as industry trend data regarding relative growth in each equipment class.*

9.3 Impacts of Standards on Equipment Shipments

For each equipment class, DOE will develop a set of shipment forecasts for the covered equipment for each set of standards analyzed. These standards case forecasts will be used to evaluate the impacts of standards on equipment shipments. Standards case forecasts are derived using the same datasets as base case forecasts; however, because the standards case forecasts take into account the increase in purchase price and the decrease in operating costs caused by standards, forecasted shipments typically deviate from the base case. The magnitude of the difference between the standards case and base case shipment forecasts depends on the estimated purchase price increase as well as the operating cost savings caused by the standard. Because the purchase price tends to have a larger impact than operating cost on equipment purchase decisions, standards case forecasts typically show a drop in product shipments relative to the base case.

DOE's past standards analyses have attempted to quantify the sensitivity of shipments to purchase price and operating cost savings. Because the data required to develop these sensitivities are limited and often difficult to obtain, DOE will consider modeling standards case shipment forecasts with scenarios (*i.e.*, specific impacts on product shipments) rather than developing sensitivities to purchase price or operating cost savings.

Market pull programs, such as customer rebate programs that encourage the purchase of more efficient equipment and manufacturer tax credits that encourage the production of more efficient equipment, also affect standards case forecasts. When such programs exist, DOE considers their impact on the forecast of both standards case and base case shipments.

Item 9–2	*As part of its preliminary manufacturer impact analysis, DOE will seek input from manufacturers on the potential impact of new energy conservation standards on product shipments. Other stakeholders are also invited to provide input. DOE also requests input on any market pull programs that promote the adoption of more efficient equipment (e.g., customer rebate programs and manufacturer tax credits).*

10. NATIONAL IMPACT ANALYSIS

Section 8 discusses methods for estimating the LCC savings and payback period for individual customers. This section discusses DOE's assessment of the aggregate impacts at the national level. Measures of impact to be reported include the NPV of total customer life-cycle costs and national energy savings.

10.1 Inputs to Forecast

Analyzing national impacts of Federal energy conservation standards requires comparing projected U.S. energy consumption for the walk-in coolers and freezers covered under this rulemaking with and without new or amended energy conservation standards. The forecasts contain projections of unit energy consumption for new equipment, annual equipment shipments, and the price of purchased equipment. The derivations of the base case shipment forecasts and approaches to determining per unit net energy consumption impact are discussed in section 6. Approaches to determining retail prices are described in section 7.

10.2 Calculation of Energy Savings

DOE intends to calculate national energy consumption for each year beginning with the expected effective date of the standards. It will calculate national energy consumption by fuel type for the base case and each standard level analyzed. DOE plans to perform this calculation using a spreadsheet model that effectively multiplies annual shipment forecasts by unit energy savings.

In response to comments by stakeholders who asked for a simple, transparent model, DOE has developed NES spreadsheet models for its standards rulemakings since 1996. DOE expects the NES spreadsheet model to provide a credible, stand-alone forecast of national energy savings and net present value for walk-in coolers and freezers.

DOE has prepared NES spreadsheet models for other equipment to forecast energy savings and demonstrate how growth in efficiency can be accounted for over time.[13] Although these models are specific to each equipment type, their general structure can be applied to walk-in coolers and freezers.

[13] For example, the NES model used in the commercial refrigeration equipment rulemaking is available for examination at www.eere.energy.gov/buildings/appliance_standards/commercial/docs/nes_cuac.xls.

Based on consideration of the comments DOE may receive during the preliminary phase, DOE will make any necessary changes to the analysis. Those changes will be reflected in the NOPR documentation.

Item 10–1 DOE seeks comment on its plan to develop NES spreadsheet models for estimating national impacts of amended energy conservation standards.

10.3 Net Present Value

DOE calculates the national NPV of the standards in conjunction with the NES and calculates annual energy expenditures from annual energy consumption by incorporating forecasted energy prices, and using the shipment and average energy conservation forecasts described in section 9.1. DOE calculates annual equipment expenditures by multiplying the price per unit by the forecasted shipments. The difference between a base case and a standards case scenario gives the national energy bill savings and increased equipment expenditures in dollars. The difference each year between energy bill savings and increased equipment expenditures is the net savings (if positive) or net cost (if negative). DOE discounts these annual values to the present time and sums them to give an NPV.

Based on consideration of the comments received during the preliminary phase, DOE will make any necessary changes to the analysis and candidate standard levels. If major changes are required at this stage, DOE will give stakeholders an opportunity to review the revised analysis.

11. LIFE-CYCLE COST SUBGROUP ANALYSIS

This section describes how DOE analyzes customer impacts by dividing customers into subgroups and accounting for variations in key inputs to the life-cycle cost analysis. A customer subgroup comprises a subset of the population that is likely to be affected disproportionately by new or revised energy conservation standards. The purpose of a subgroup analysis is to determine the extent of this impact. DOE will work with stakeholders early in the rulemaking process to identify subgroups. However, DOE will not analyze the customer subgroups until the NOPR stage of the analysis.

In comparing potential impacts on the different customer subgroups, DOE will evaluate variations in regional energy prices, energy use, and installation costs that might affect the NPV of a standard to customer subgroups. To the extent possible, DOE may obtain estimates of the variability or each input and consider this variability in its calculation of customer impacts. DOE will discuss the variability of each input and likely sources of information with stakeholders.

DOE intends to consider the impact of any new standards on customer subgroups.

Item 11–1 DOE seeks input on which customer subgroups DOE should consider in the present rulemaking. Examples of possible subgroups DOE could consider appropriate for walk-in coolers and freezers include independent grocery stores and small convenience stores.

12. MANUFACTURER IMPACT ANALYSIS

DOE announced changes to the manufacturer impact analysis format through a report, "Energy Conservation Standards Activities," which was submitted to Congress on January 31, 2006 (as required by section 141 of EPACT 2005).[14]

Previously, DOE did not report any manufacturer impact analysis results during the ANOPR phase; however, under this new format, DOE will collect, evaluate, and report preliminary information and data prior to the issuance of a NOPR.[15] Such preliminary information includes the anticipated conversion capital expenditures by efficiency level and the corresponding anticipated impacts on employment. DOE will solicit this information during the preliminary engineering analysis manufacturer interviews.

The analysis is intended to provide DOE with an assessment of the potential impacts of energy conservation standards on manufacturers. In addition to financial impacts, a wide range of quantitative and qualitative effects may occur following adoption of a standard that may require changes to manufacturing practices. DOE will identify these effects through interviews with manufacturers and other stakeholders.

DOE intends to supplement the results of the preliminary manufacturer impact analysis prior to the publication of the NOPR. More detailed analyses will follow with the NOPR. Specifically, DOE will conduct an industry-wide cash-flow analysis using the Government Regulatory Impact Model (GRIM), identify and analyze subgroups of manufacturers whose businesses vary significantly from the industry as a whole, perform a competitive impacts assessment, and review the cumulative regulatory burden for the industry.

12.1 Sources of Information

Many of the analyses described earlier provide important information that DOE uses as inputs for the manufacturer impact analysis. Such information includes financial parameters developed in the market assessment (section 3.1), manufacturing costs and prices from the engineering analysis (section 5), retail price estimates (section 7), and shipment forecasts (section 9). DOE supplements this information with information gathered during manufacturer interviews. The interview process will play a key role in the manufacturer impact analysis, which provides an opportunity for interested parties to express their views on important issues.

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[14] This report is available on the DOE website at www.eere.energy.gov/buildings/appliance_standards/2006_schedule_setting.html.

[15] "Energy Conservation Standards Activities," January 31, 2006, p. 48.

DOE will conduct detailed interviews with manufacturers to gain insight into the range of potential impacts of energy conservation standards on the covered equipment. During the interviews, DOE will solicit information on the possible impacts of standards on manufacturing costs, equipment prices, sales, direct employment, capital assets, and industry competitiveness. Both qualitative and quantitative information are valuable for this analysis. DOE will schedule interviews well in advance to provide every opportunity for key individuals to be involved. In addition, an interview guide will be provided before the interviews to allow the manufacturers to gather the appropriate information. Although a written response to the questionnaire is acceptable, DOE prefers an interactive interview process because it helps clarify responses and provides the opportunity for additional issues to be identified.

DOE will ask interview participants to identify all confidential information provided, both in writing and orally. DOE will determine whether the information submitted is entitled to confidential treatment. While it will consider the information it gathers in its decision-making process, DOE will not make confidential information from individual manufacturers available in the public record, although the Department may aggregate information to prevent the attribution of information to a particular manufacturer. DOE will also ask participants to identify all information that they wish included in the public record, but do not want to have associated with their interview. DOE will incorporate this information into the public record, but will report it without attribution.

DOE will collate the completed interview questionnaires and prepare a summary of the major issues and outcomes. This summary will become part of the technical support document for this rulemaking.

12.2 Industry Cash-Flow Analysis

The industry cash-flow analysis relies primarily on the GRIM. DOE uses the GRIM to analyze the financial impacts of more stringent energy conservation standards on the industry that produces the equipment covered by the standard.

The GRIM analysis uses a number of factors to arrive at a series of annual cash flows, beginning from the announcement of the new standard and continuing for several years after its implementation. These factors include annual expected revenues and manufacturer costs, such as costs of goods sold; selling, general, and administrative costs; taxes; ordinary capital expenditures related to depreciation; capital expenditures related to standards; costs of new standards; and maintenance costs. DOE will compare the results against base case projections that involve no new standards. The financial impact of new standards is the difference between the two sets of discounted annual cash flows. Other performance metrics, such as return on invested capital, also are available from the GRIM.

DOE will gather this information from two primary sources: (1) the analyses conducted to this point, and (2) interviews with manufacturers and information from other stakeholders. Information gathered from previous analyses will include financial parameters, manufacturing costs, price forecasts, and shipment forecasts. Interviews with manufacturers and information from other stakeholders will be essential in supplementing this information.

12.3 Manufacturer Subgroup Analysis

The use of average industry cost values may not adequately assess differential impacts among subgroups of manufacturers. DOE recognizes that smaller manufacturers, niche players, and manufacturers exhibiting a cost structure that differs significantly from the industry average may be affected differently by new standards. Ideally, DOE would consider the impact on every firm individually. In highly concentrated industries, this may be possible. In industries having numerous participants, however, DOE will use the results of the market and technology assessment to group manufacturers into subgroups, as appropriate.

The Regulatory Flexibility Act (5 U.S.C. 601 et seq.) requires preparation of an initial regulatory flexibility analysis (IRFA) for any rule that by law must be proposed for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by Executive Order 13272, (Proper Consideration of Small Entities in Agency Rulemaking), 67 FR 53461 (August 16, 2002), DOE published procedures and policies on February 19, 2003, to ensure that the potential impacts of its rules on small entities are properly considered during the rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of General Counsel's website, http://www.gc.doe.gov.

Small businesses, as defined by the Small Business Administration (SBA) for walk-in cooler and freezer manufacturers, are enterprises with 750 employees or fewer. Small business size standards are listed by North American Industry Classification System (NAICS) code and industry description. Walk-in cooler and freezer manufacturing is classified under NAICS 333415. As part of its subgroup analysis, DOE will attempt to identify whether any small businesses are affected by the rulemaking, and if so, determine if there are differential impacts on these companies that result from new energy conservation standards. DOE will examine publicly available data and contact manufacturers, when needed, to determine if they meet the SBA's definition of a small business and if their manufacturing facilities are located within the United States. The detailed manufacturer subgroup impact analysis will entail calculating cash flows separately for each defined class of manufacturer.

DOE will review the proposed rule under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. Unless DOE certifies that the proposed rule will have no significant economic impact on a substantial number of small entities, it will prepare an IRFA in accordance with the guidance from the SBA.

Item 12–1 DOE seeks comment on whether there are manufacturer subgroups for walk-in coolers and freezers that DOE should consider in a manufacturer subgroup analysis and the basis for their inclusion.

12.4 Competitive Impacts Assessment

EPCA directs DOE to consider any lessening of competition likely to result from the imposition of standards. (42 U.S.C. 6295(o)(2)(B)(i)(V) and 6316(a)) It further directs the

Attorney General to determine, in writing, the impacts, if any, of any lessening of competition. (42 U.S.C. 6295(o)(2)(B)(ii) and 6316(a)) DOE will make a determined effort to gather firm-specific financial information and information on any competitive impacts. DOE will then report the aggregated impact of the standard on manufacturers. DOE will provide the Attorney General with a copy of the NOPR for consideration in evaluating the impact of standards on the lessening of competition. DOE will base the assessment on manufacturing cost data and on information collected from manufacturer interviews. The interviews will focus on gathering information that will help in assessing asymmetrical cost increases to some manufacturers; whether fixed costs will increase, potentially increasing business risks; and potential barriers to market entry (*e.g.*, proprietary technologies).

12.5 Cumulative Regulatory Burden

Other regulations may apply to equipment covered under this rulemaking, as well as on other equipment produced by the same manufacturers affected by this rulemaking. Multiple regulations may result in a cumulative regulatory burden on these manufacturers. DOE will analyze and seek to mitigate the overlapping effects on manufacturers of amended DOE standards and other regulatory actions affecting the same equipment or companies.

Item 12–2 What regulations or pending regulations should DOE consider in its analysis of cumulative regulatory burdens on manufacturers of the equipment covered in this rulemaking?

13. UTILITY IMPACT ANALYSIS

To estimate the impacts of energy conservation standards for walk-in coolers and freezers on the electric utility industry, DOE plans to use a variant of the EIA's National Energy Modeling System (NEMS) called NEMS-BT.[16] NEMS is a large, multi-sectoral, partial-equilibrium model of the U.S. energy sector that EIA has developed over several years, primarily for the purpose of preparing the *AEO*. NEMS produces a widely recognized reference case forecast for the United States through 2030 and is available to the public.

The utility impact analysis is a comparison between the NEMS-BT model results for the base case and standard cases. Outputs of the utility impact analysis usually parallel results that appear in the latest *AEO*, with some additions. Typical outputs of the utility impact analysis include forecasts of electricity sales, price, and avoided capacity. DOE plans to conduct the utility impact analysis as a scenario departing from the latest *AEO* reference case. In other words,

[16] For more information on NEMS, please refer to the U.S. Department of Energy, Energy Information Administration documentation. A useful summary is *National Energy Modeling System: An Overview 2000*, DOE/EIA-0581 (March 2000), available at http://tonto.eia.doe.gov/ftproot/forecasting/05812000.pdf. EIA approves use of the name NEMS to describe only an official version of the model without any modification to code or data. Because this analysis entails some minor code modifications and the model is run under various policy scenarios that are variations on EIA assumptions, DOE refers to the model by the name NEMS-BT. ("BT" refers to DOE's Building Technologies Program, under whose aegis this work is performed.)

DOE will model the energy savings impacts from amended energy conservation standards using NEMS-BT to generate forecasts that deviate from the *AEO* reference case.[17]

Item 13–1 DOE seeks input from stakeholders on its plans to use NEMS-BT to conduct the utility impact analysis on the equipment covered under this rulemaking.

14. EMPLOYMENT IMPACT ANALYSIS

DOE estimates the impacts of standards on employment for equipment manufacturers, relevant service industries, energy suppliers, and the economy in general. This analysis covers both direct and indirect employment impacts. Direct employment impacts are changes in the number of employees at the plants that produce the covered equipment, along with the affiliated distribution and service companies. DOE will evaluate direct employment impacts in the manufacturer impact analysis, as described in section 12.

Indirect employment impacts may result from expenditures shifting between goods (the substitution effect) and changes in income and overall expenditure levels (the income effect) that occur due to standards. DOE defines indirect employment impacts from standards as net jobs eliminated or created in the general economy as a result of increased spending driven by increased equipment prices and reduced spending on energy.

The combined direct and indirect employment impacts will be investigated in the employment impact analysis using the Pacific Northwest National Laboratory's "Impact of Sector Energy Technologies" (ImSET) model. The ImSET model was developed for DOE's Office of Planning, Budget, and Analysis, and estimates the employment and income effects of energy-saving technologies in buildings, industry, and transportation. In comparison with simple economic multiplier approaches, ImSET allows for more complete and automated analysis of the economic impacts of energy conservation investments.

Item 14–1 DOE requests feedback on its approach to assessing employment impacts on the equipment covered under this rulemaking.

15. ENVIRONMENTAL IMPACT ANALYSIS

DOE will prepare its draft environmental assessment (EA) pursuant to the National Environmental Policy Act and the requirements under 42 U.S.C. 6295(o)(2)(B)(i)(VI) and 6316(a), to determine the environmental impacts of the amended standards. The intent of the

[17] Several descriptions of NEMS-BT models from previous rulemakings, including residential furnaces and boilers, can be found on DOE's website at www.eere.energy.gov/buildings/appliance_standards/residential/pdfs/fb_fr_tsd/chapter_13.pdf.

environmental assessment is to provide emissions results estimates and to fulfill requirements to properly quantify and consider the environmental effects of all new Federal rules.

The environmental assessment will focus on the impact of possible energy conservation standards on the significant pollutants and emissions of electricity-generating power plants. Specifically, the environmental assessment for this rulemaking will consider three types of energy-related emissions — oxides of nitrogen (NO_X), mercury (Hg), and carbon dioxide (CO_2). An additional emission, sulfur dioxide (SO_2), was previously considered. However, DOE has determined that due to the presence of national caps on SO_2 emissions as addressed below, any such reduction resulting from an energy conservation standard would not affect the overall level of SO_2 emissions in the United States.

DOE will estimate the reduction in total emissions of carbon dioxide (CO_2) using the NEMS-BT computer model. DOE proposes to calculate a range of estimates for reduction in NO_X emissions and Hg emissions using current power sector emission rates. DOE will conduct each portion of the environmental impact analysis performed under this rulemaking as an incremental policy impact (*i.e.*, an energy conservation standard for WICFs) of EIA's *AEO* forecast. Forecasts conducted with NEMS-BT consider the supply-side and demand-side effects on the electric utility industry. Thus, DOE's analysis will account for factors affecting the type of electricity generation and, in turn, the amount of airborne emissions the utility industry generates.

The NEMS-BT is run similarly to the AEO2008 NEMS, except the energy use is reduced by the amount of energy saved due to the TSLs. DOE obtained the inputs of national energy savings from the NIA spreadsheet model. For assessing the environmental impact on CO2 emission, the output analyzed is the forecasted physical emissions. The net benefit of the standard is the difference between emissions estimated by NEMS-BT and the AEO2008 Reference Case. The NEMS-BT tracks CO_2 emissions using a detailed module that provides results with a broad coverage of all sectors and inclusion of interactive effects.

Item 15–1 DOE seeks input from stakeholders on its plans to use NEMS-BT to conduct the environmental impact analysis on the equipment covered by this rulemaking. DOE is particularly interested in whether there are any other approaches to the environmental assessment that it should consider and the advantages and disadvantages for each of those approaches.

The Clean Air Act Amendments of 1990 set an SO_2 emissions cap on all power generation. The attainment of this target, however, is flexible among generators through the use of emissions allowances and tradable permits. Although NEMS includes a module for SO_2 allowance trading and delivers a forecast of SO_2 allowance prices, accurate simulation of SO_2 trading implies that the effect of energy conservation standards on physical emissions will be zero because emissions will always be at or near the ceiling. However, there is an SO_2 benefit from energy conservation, in the form of lower SO_2 allowance expenditures. DOE will examine the potential monetary impact or value of an SO_2 benefit that may arise from a standard.

Under the Clean Air Interstate Act (CAIR) and the Clean Air Mercury Rule (CAMR), future emissions of NO_X and Hg would have been subject to emissions caps.[18,19] The current NEMS-BT model, based on the model used for the AEO2008, assumes that both NO_X and Hg emissions would be subject to CAIR and CAMR emissions caps. However on July 11, 2008, the U.S. Court of Appeals for the District of Columbia Circuit (D.C. Circuit) issued its decision in *North Carolina v. Environmental Protection Agency*,[20] in which the court vacated the CAIR. Similarly, on February 8, 2008, the U.S. Court of Appeals for the District of Columbia Circuit (D.C. Circuit) issued its decision in *New Jersey v. EPA*, 517 F.3d 574 (D.C. Cir. 2008), in which the Court, among other actions, vacated the CAMR.

In the case of NO_X emissions, CAIR would have permanently capped emissions in 28 eastern States and the District of Columbia. Because the current NEMS-BT model assumes NO_X emissions would be subject to CAIR, DOE proposes to establish a range of NO_X reductions based on the use of a NO_X low and high emissions rates (in metric kilotons (kt) of NO_X emitted per terawatt-hours (TWh) of electricity generated) derived from the current AEO for generation technologies. To estimate the reduction in NO_X emissions, DOE will multiply these emission rates by the reduction in electricity generation due to the standards considered. Similarly for mercury, because the current NEMS-BT model applies the emissions caps specified by CAMR, DOE will be unable to use NEMS-BT model's emission outputs to estimate the physical quantity changes in mercury emissions due to energy conservation standards. To estimate mercury emission reductions due to standards, DOE proposes to use an Hg emission rate (in metric tons of Hg per energy produced) based on the current AEO. Because virtually all mercury emitted from electricity generation is from coal-fired power plants, DOE will base the emission rate on the metric tons of mercury emitted per TWh of coal-generated electricity. To estimate the reduction in mercury emissions, DOE will then multiply the emission rate by the reduction in coal-generated electricity associated with standards considered.

In the event that the NEMS model available at the time of the environmental analysis is modified to be consistent with current legislation on NO_X and Hg emissions in the power sector, DOE proposes to develop the emissions reductions for NO_X and Hg directly from the NEMS-BT output for these emissions, similar to what is proposed for CO_2 emissions.

Item 15–2 Because court actions have vacated both the CAMR and CAIR, DOE seeks stakeholder input on how it should address the respective emissions addressed by these vacated rules for purposes of this rulemaking.

Nothing in EPCA, nor in the National Environmental Policy Act, requires that the economic value of emissions reductions be incorporated in the net present value analysis of the value of energy savings. Unlike energy savings, the economic value of emissions reductions is not priced in the marketplace.

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[18] See http://www.epa.gov/cleanairinterstaterule/.

[19] The EPA's Clean Air Mercury Rule was published on May 18, 2005. 70 FR 28606.

[20] Case No. 05-1244, 2008 WL 2698180 at *1 (D.C. Cir. July 11, 2008).

For those emissions for which real national emission reductions are anticipated (CO_2, Hg, and NO_X), only a range of estimated economic values based on environmental damage studies of varying quality and applicability is available. Consequently, DOE is reporting and weighing these values separately and is not including them in the NPV analysis.

Item 15–3 DOE invites comments on how to estimate such monetary values associated with emissions reductions or on any widely accepted values which might be used in DOE's analyses.

Item 15–4 DOE seeks input on other environmental factors to consider in this rulemaking.

16. REGULATORY IMPACT ANALYSIS

In the NOPR and final rule stages of this rulemaking, DOE will prepare a regulatory impact analysis. This analysis will address the potential for non-regulatory approaches to supplant or augment energy conservation standards to improve the efficiency of walk-in coolers and freezers on the market. DOE recognizes that voluntary and other non-regulatory efforts by manufacturers, utilities, and other stakeholders can result in substantial efficiency improvements. DOE intends to analyze the likely effects of non-regulatory initiatives on product energy use, customer utility, and LCCs. DOE will attempt to base its assessment on the actual impacts of any such initiatives to date, but will also consider information presented on the impacts that any existing initiative might have in the future.

If DOE determines that amended energy conservation standards for walk-in coolers and freezers would constitute a significant regulatory action, DOE will prepare and submit to OMB the assessment of costs and benefits required under section 6(a)(3) of Executive Order 12866, "Regulatory Planning and Review," 58 FR 51735 (October 4, 1993).