

CHAPTER 1. INTRODUCTION

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CHAPTER 1. INTRODUCTION

1.1 PURPOSE OF THE DOCUMENT

This technical support document (TSD) is a stand-alone report that documents the technical analyses and results in support of the information presented in the final rule for establishing energy conservation standards for commercial ice-cream freezers; self-contained commercial refrigerators, commercial freezers, and commercial refrigerator-freezers without doors; and remote condensing commercial refrigerators, commercial freezers, and commercial refrigerator-freezers. Hereafter, this equipment is collectively referred to as commercial refrigeration equipment (CRE).

1.2 OVERVIEW OF COMMERCIAL EQUIPMENT STANDARDS

Part B of Title III of the Energy Policy and Conservation Act of 1975, Public Law 94-163, as amended by the National Energy Conservation Policy Act of 1978 (NECPA), Public Law 95-619; the National Appliance Energy Conservation Act of 1987 (NAECA), Public Law 100-12; the National Appliance Energy Conservation Amendments of 1988 (NAECA 1988), Public Law 100-357; and the Energy Policy Act of 1992 (EPACT 1992), Public Law 102-486 (the Act or EPCA), established the Energy Conservation Program for Consumer Products other than Automobiles. (42 U.S.C. 6291-6309) Part 3 of Title IV of NECPA amended EPCA to add Part A-1 of Title III, which established an energy conservation program for Certain Industrial Equipment¹. (42 U.S.C. 6311-6317) EPACT 1992 included amendments to EPCA that expanded Title III to include additional commercial equipment. The recent Energy Policy and Conservation Act of 2005 (EPACT 2005), Public Law 109-58, updates several existing standards and test procedures; prescribes definitions, standards, and test procedures for certain new consumer products and commercial equipment; and mandates that the Secretary of Energy (the Secretary) commence rulemakings to develop test procedures and standards for certain new consumer products and commercial equipment.

In particular, section 136(c) of EPACT 2005 amends section 342 of EPCA by adding new subsection 342(c)(4)(A) (42 U.S.C. 6313(c)(4)(A)), which directs the Secretary to issue by rule, no later than January 1, 2009, energy conservation standards for commercial refrigeration equipment, manufactured on or after January 1, 2012.

Under EPCA, when the U.S. Department of Energy (DOE) studies new or amended standards, it must consider to the greatest extent practicable, the following seven factors:

- (1) the economic impact of the standard on the manufacturers and consumers of the affected products;

¹ This part was originally titled Part C. However, it was redesignated Part A-1 after Part B of Title III of EPCA was repealed by Pub. L. 109-58.

- (2) the savings in operating costs throughout the estimated average life of the product compared to any increases in the initial cost or maintenance expense;
- (3) the total projected amount of energy savings likely to result directly from the imposition of the standard;
- (4) any lessening of the utility or the performance of the 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 conservation; and
- (7) other factors the Secretary considers relevant (42 U.S.C. 6295 (o)(2)(B)(i) and 42 U.S.C. 6316(e), added by section 136(h)(3) of EPCACT 2005).

Other statutory requirements are set forth in 42 U.S.C. 6295 (o)(1)–(2)(A), (2)(B)(ii)–(iii), and (3)–(4) and 42 U.S.C. 6316(a)(1)–(3), and (e).

DOE considers stakeholder participation to be a very important part of the process for setting energy conservation standards. DOE actively encourages the participation and interaction of all stakeholders during the comment period in each stage of the rulemaking. Beginning with the framework document and during subsequent comment periods, interactions among stakeholders provide a balanced discussion of the information that is required for the standards rulemaking.

Before DOE determines whether to adopt a proposed energy conservation standard, it must first solicit comments on the proposed standard. Any new or amended standard must be designed to achieve significant additional conservation of energy and be technologically feasible and economically justified. (42 U.S.C. 6295(o)(3)(B) as directed by 42 U.S.C. 6316(a)(1) through (3)) To determine whether economic justification exists, DOE must review comments on the proposal and determine that the benefits of the proposed standard exceed its burdens to the greatest extent practicable, weighing the seven factors listed above.

Subsequent to the publication of the Framework Document, the standards rulemaking process involves three additional formal, major public notices, which are published in the *Federal Register*. The first of the rulemaking notices is an advanced notice of proposed rulemaking (ANOPR) that is designed to publicly vet the models and tools used in the rulemaking, and to facilitate public participation before the proposed rule stage. The second notice is a notice of proposed rulemaking (NOPR), which presents a discussion of comments received in response to the ANOPR; analysis of the impacts of standards on customers, manufacturers, and the Nation; DOE's weighting of the impacts; and the proposed standards. The third notice is the final rule, which presents a discussion of comments received in response to the NOPR; the revised analysis of the impacts of standards; DOE's weighting of the impacts; the standards adopted by DOE; and the effective dates of the standards.

1.3 OVERVIEW OF COMMERCIAL REFRIGERATION EQUIPMENT STANDARDS

As mentioned above, section 136(c) of EPACT 2005 amends section 342 of EPCA by adding new subsection 342(c)(4)(A) (42 U.S.C. 6313(c)(4)(A)), which directs the Secretary to issue by rule, no later than January 1, 2009, energy conservation standards for commercial refrigeration equipment manufactured on or after January 1, 2012.

Additionally, section 136(f)(1)(B) of EPACT 2005 amends section 343 of EPCA (42 U.S.C. 6314) by adding new subsection 343(a)(6)(A)-(D) (42 U.S.C. 6314(a)(6)(A)-(D)), which directs the Secretary to adopt test procedures and establish, by rule, appropriate rating temperatures for the above commercial refrigeration equipment. Accordingly, on December 8, 2006, DOE published a final rule establishing test procedures and rating temperatures for commercial refrigeration equipment. 71 FR 71340.

Section 136(a)(3) of EPACT 2005 amended section 340 of EPCA by replacing subsection 340(9) (42 U.S.C. 6311(9)) with definitions for the following terms that describe commercial refrigeration equipment:

“(9)(A) The term ‘commercial refrigerator, freezer, and refrigerator-freezer’ means refrigeration equipment that—

- (i) is not a consumer product (as defined in section 321);
- (ii) is not designed and marketed exclusively for medical, scientific, or research purposes;
- (iii) operates at a chilled, frozen, combination chilled and frozen, or variable temperature;
- (iv) displays or stores merchandise and other perishable materials horizontally, semivertically, or vertically;
- (v) has transparent or solid doors, sliding or hinged doors, a combination of hinged, sliding, transparent, or solid doors, or no doors;
- (vi) is designed for pull-down temperature applications or holding temperature applications; and
- (vii) is connected to a self-contained condensing unit or to a remote condensing unit.

(B) The term ‘holding temperature application’ means a use of commercial refrigeration equipment other than a pull-down temperature application, except a blast chiller or freezer.

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(D) The term ‘pull-down temperature application’ means a commercial refrigerator with doors that, when fully loaded with 12 ounce beverage cans at 90 degrees F, can cool those beverages to an average stable temperature of 38 degrees F in 12 hours or less.

(E) The term ‘remote condensing unit’ means a factory-made assembly of refrigerating components designed to compress and liquefy a specific refrigerant that is remotely located from the refrigerated equipment and consists of one or more refrigerant compressors, refrigerant condensers, condenser fans and motors, and factory supplied accessories.

(F) The term ‘self-contained condensing unit’ means a factory-made assembly of refrigerating components designed to compress and liquefy a specific refrigerant that is an integral part of the refrigerated equipment and consists of one or more refrigerant compressors, refrigerant condensers, condenser fans and motors, and factory supplied accessories.”

In April 2006, DOE published a *Rulemaking Framework for Commercial Refrigeration Equipment Including Ice-Cream Freezers; Self-Contained Commercial Refrigerators, Freezers, and Refrigerator-Freezers without doors; and Remote Condensing Commercial Refrigerators, Freezers, and Refrigerator-Freezers*, describing the procedural and analytical approaches DOE anticipated using to evaluate the establishment of energy conservation standards for CRE. This document is available at http://www.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/comml_refrig_framework.pdf.

DOE held a public meeting on May 16, 2006, to discuss procedural and analytical approaches to the rulemaking, and to inform and facilitate stakeholders’ involvement in the rulemaking process. The analytical framework presented at the public meeting described different analyses, such as the engineering analysis and the life-cycle cost (LCC) and payback period (PBP) analyses, the methods proposed for conducting them, and the relationships among the various analyses.

After the analytical framework public meeting, as part of the information gathering and sharing process for the preliminary manufacturer impact analysis, DOE organized and held interviews with CRE manufacturers. DOE selected companies that represented production of all types of commercial refrigeration equipment, ranging from small to large manufacturers, and included both Air-Conditioning and Refrigeration Institute (ARI) member companies and non-ARI member companies. DOE had four objectives for these interviews: (1) solicit feedback on the draft engineering analysis (including methodology, production costs, manufacturing processes, and findings); (2) solicit feedback on topics related to the preliminary manufacturer impact analysis; (3) provide an opportunity, early in the rulemaking process, to express specific concerns to DOE; and (4) foster cooperation between the manufacturers and DOE.

In July 2007, DOE published an *Advanced Notice of Proposed Rulemaking for Commercial Refrigeration Equipment Including Ice-Cream Freezers; Self-Contained Commercial Refrigerators, Freezers, and Refrigerator-Freezers without doors; and Remote Condensing Commercial Refrigerators, Freezers, and Refrigerator-Freezers*, to consider

establishing energy conservation standards for CRE, and to announce a public meeting to receive comments on a variety of issues. This document is available at http://www.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/comml_refrig_html.pdf

DOE held a public meeting on August 23, 2007, to provide interested stakeholders the opportunity to comment on the proposed equipment classes DOE is considering; the analytical framework, models, and tools (e.g., LCC and national energy savings (NES) spreadsheets) that DOE has been using to perform analyses of the impacts of energy conservation standards; the results of the preliminary analyses; and the candidate energy conservation standard levels.

After the publication of the ANOPR and the presentation of the ANOPR to stakeholders at the public meeting, DOE conducted interviews with CRE manufacturers as part of the manufacturer impact analysis for the NOPR. There were 13 general topics discussed during each of the interviews: (1) general key issues, (2) company overview and organizational characteristics, (3) company financial parameters, (4) production cost breakdown, (5) shipment projections and market shares, (6) equipment mixes, (7) conversion costs, (8) markups and profitability, (9) cumulative regulatory burden, (10) exports, foreign competition, and outsourcing, (11) direct employment impact assessment, (12) market consolidation, and (13) baseline products and different design options.

DOE also developed spreadsheets to conduct the LCC, PBP and national impact analyses. The LCC spreadsheet calculates national distributions of life cycle cost savings at various energy-efficiency levels above the baseline. It can also provide LCC savings based on typical input values for several business types who use CRE. The national impact analysis spreadsheet calculates the NES and national net present values (NPVs) at various energy-efficiency levels. It also includes a model that forecasts shipments for the various equipment classes of commercial refrigeration equipment at different efficiency levels.

In addition to the analyses, DOE reviewed the recommendations made on April 21, 1998, by the Advisory Committee on Appliance Energy Efficiency Standards. (Advisory Committee, No. 96)² DOE's analysis implemented recommendations related to (1) defining a range of energy price futures for each fuel used in the economic analyses, and (2) defining a range of primary energy conversion factors and associated emission reductions based on the generation of energy and emissions that would be displaced by energy-efficiency standards for each rulemaking.

In August 2008, DOE published a *Notice of Proposed Rulemaking for Commercial Refrigeration Equipment Including Ice-Cream Freezers; Self-Contained Commercial Refrigerators, Freezers, and Refrigerator-Freezers without doors; and Remote Condensing Commercial Refrigerators, Freezers, and Refrigerator-Freezers*, to propose energy conservation standards for CRE, and to announce a public meeting to receive comments on a variety of issues. This document is available at

² Advisory Committee, No. 96 refers to the recommendations of the Advisory Committee on Energy Efficiency Standards and is available for inspection at the U.S. Department of Energy, Forrestal Building, Room 1J-018 (Resource Room of the Building Technologies Program) in the file under "Energy Conservation Program for Consumer Products: Procedures for Consideration of New or Revised Energy Conservation Standards for Consumer Products," RIN [1904-AA83], as document number 96.

http://www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/cre_nopr_fr_final.pdf

DOE held a public meeting on September 23, 2008, to provide interested stakeholders the opportunity to comment on the proposed standards, results of the analyses and the trial standard levels (TSL).

After the publication of the NOPR and the presentation of the NOPR to stakeholders at the public meeting, DOE received more than 100 comments from a diverse set of parties, including manufacturers and their representatives, trade associations, wholesalers and distributors, energy conservation advocates, and electric utilities. Comments addressed DOE methodology, the information DOE used in its analyses, results of and inferences drawn from the analyses, impacts of standards, the merits of the different trial standard levels (TSLs), standards options DOE considered and other issues affecting adoption of standards for commercial refrigeration equipment.

1.4 STRUCTURE OF THE DOCUMENT

This Final Rule TSD outlines the analytical approaches used in this rulemaking. The TSD consists of 16 chapters, an environmental assessment, a regulatory impact analysis, and appendices.

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| Chapter 1 | Introduction: provides an overview of the appliance and equipment standards program and how it applies to the commercial refrigeration equipment rulemaking, and outlines the structure of the document. |
| Chapter 2 | Analytical Framework: describes the rulemaking process step by step. |
| Chapter 3 | Market and Technology Assessment: characterizes the commercial refrigeration equipment market and the technologies available for increasing equipment efficiency. |
| Chapter 4 | Screening Analysis: determines which technology options are viable for consideration in the engineering analysis. |
| Chapter 5 | Engineering Analysis: discusses the methods used for developing the relationship between increased manufacturer price and increased efficiency. |
| Chapter 6 | Markups to Determine Equipment Price: discusses the methods used for establishing markups for converting manufacturer prices to customer equipment prices. |

- Chapter 7 Energy Use Characterization: discusses the process used for generating energy use estimates of commercial refrigeration equipment for a variety of equipment classes, climate locations, and standard levels.
- Chapter 8 Life-Cycle Cost and Payback Period Analyses: discusses the economic effects of standards on individual customers and users of the equipment and compares the LCC and PBP of equipment with and without higher efficiency standards.
- Chapter 9 Trial Standard Levels: discusses the trial standard levels and the methods used to derive the energy-efficiency equations corresponding to the proposed energy conservation standards.
- Chapter 10 Shipments Analysis: discusses the methods used for forecasting shipments with and without higher efficiency standards.
- Chapter 11 National Impact Analysis: discusses the methods used for forecasting national energy consumption and national economic impacts based on annual equipment shipments and estimates of future equipment efficiency distributions in the absence and presence of higher efficiency standards.
- Chapter 12 Life-Cycle Cost Sub-Group Analysis: discusses the effects of standards on a subgroup of commercial refrigeration equipment customers and compares the LCC and PBP of equipment with and without higher efficiency standards for these customers.
- Chapter 13 Manufacturer Impact Analysis: discusses the effects of standards on the finances and profitability of equipment manufacturers.
- Chapter 14 Utility Impact Analysis: discusses the effects of standards on the installed generation capacity of electric utilities.
- Chapter 15 Employment Impact Analysis: discusses the effects of standards on National employment.
- Chapter 16 Environmental Assessment for Commercial Refrigeration Equipment: discusses the effects of standards on air-borne emissions of electric utilities.
- Chapter 17 Regulatory Impact Analysis for Commercial Refrigeration Equipment: discusses the present regulatory actions as well as the impact of non-regulatory alternatives to setting energy efficiency standards.
- Appendix A User Instructions for Engineering Analysis Spreadsheet: accompanies Chapter 5, Engineering Analysis.
- Appendix B Engineering Data: accompanies Chapter 5, Engineering Analysis

- Appendix C Detailed Data for Equipment Price Markups: accompanies Chapter 6, Markups for Equipment Price Determination
- Appendix D Annual Energy Simulation Inputs and Results for Commercial Refrigeration Equipment: accompanies Chapter 7, Energy Use Characterization
- Appendix E User Instructions for Life-Cycle Cost Spreadsheet: accompanies Chapter 8, Life-Cycle Cost and Payback Period Analyses
- Appendix F Mapping Between Engineering Analysis and Life-Cycle Cost Analysis Energy Efficiency Levels: accompanies Chapter 8, Life-Cycle Cost and Payback Period Analyses
- Appendix G Detailed Life-Cycle Cost Output: accompanies Chapter 8, Life-Cycle Cost and Payback Period Analyses
- Appendix H User Instructions for National Energy Savings and Net Present Value Spreadsheet: accompanies Chapter 11, National Impact Analysis
- Appendix I Detailed National Energy Savings and National Net Present Value Output: accompanies Chapter 11, National Impact Analysis
- Appendix J Government Regulatory Impact Model (GRIM): accompanies Chapter 13, Manufacturer Impact Analysis
- Appendix K Estimation of Utility and Environmental Results from NEMS-BT Output: accompanies Chapter 14, Utility Impact Analysis