

## **CHAPTER 1. INTRODUCTION**

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## CHAPTER 1. INTRODUCTION

### 1.1 PURPOSE OF THE DOCUMENT

This preliminary technical support document (preliminary TSD) is a stand-alone report that provides the technical analyses and results supporting the information presented in the preliminary notice of public meeting (NOPM) and executive summary for residential furnace fans. This preliminary TSD reports on the preliminary activities and analyses conducted in the period preceding the notice of proposed rulemaking (NOPR) of this rulemaking.

### 1.2 OVERVIEW OF STANDARDS FOR FURNACE FANS

The U.S. Department of Energy (DOE) is initiating its first rulemaking to consider new energy conservation standards for furnace fans, as required under the Energy Policy and Conservation Act (42 U.S.C. 6295(f)(4)(D), EPCA) which provides as follows:

*Notwithstanding any other provision of this chapter, if the requirements of subsection (o) of this section are met, not later than December 31, 2013, the Secretary shall consider and prescribe energy conservation standards or energy use standards for electricity used for purposes of circulating air through duct work.*

DOE interprets this Energy Policy and Conservation Act (EPCA) language to allow DOE to cover the electricity used by any electrically powered device used in a residential central heating, ventilation and air conditioning (HVAC) system for the purpose of circulating air through ductwork. Consequently, DOE defines a residential furnace fan as any electrically powered device used in a residential central HVAC system for the purpose of circulating air through ductwork. DOE considers a typical furnace fan as consisting of a fan motor and its controls, an impeller, and a housing, all of which are components of an HVAC product that includes additional components, such as the cabinet. The following list describes DOE's provisional decision regarding the scope of coverage of this rulemaking.

- Included products: the furnace fans used in weatherized and non-weatherized gas furnaces, oil furnaces, electric furnaces, modular blowers, and hydronic air handlers.
- Excluded products: other products that incorporate furnace fans, such as central air conditioner (CAC) blower-coil units, through-the-wall air handlers, small duct high-velocity (SDHV) air handlers, energy recovery ventilators (ERVs), heat recovery ventilators (HRVs), draft inducer fans, and exhaust fans.

Products excluded from this rulemaking will be considered in a future, separate coverage determination rulemaking.

There are no current DOE standards for residential furnace fans. In June 2010, DOE initiated this rulemaking by publishing a notice of public meeting and availability of the framework document. 75 FR 31323 (June 3, 2010) The framework document, *Rulemaking Framework Document for Residential Furnace Fans*, describes the procedural and analytical approaches DOE anticipated using to evaluate the establishment of new energy conservation standards for these products. The framework document is available at: [http://www1.eere.energy.gov/buildings/appliance\\_standards/residential/furnace\\_fans\\_framework.html](http://www1.eere.energy.gov/buildings/appliance_standards/residential/furnace_fans_framework.html). Subsequently, DOE held a public meeting on June 18, 2010 (“June 2010 public meeting”) to discuss procedural and analytical approaches to the rulemaking. EPCA directs DOE to establish test procedures in conjunction with new or amended energy conservation standards, including furnace fans. (42 U.S.C. 6295(r)) To fulfill this requirement, DOE is simultaneously conducting a test procedure rulemaking for furnace fans.<sup>a</sup>

### **1.3 PROCESS FOR SETTING ENERGY CONSERVATION STANDARDS**

Under EPCA, when DOE is studying new or amended standards, it must consider, to the greatest extent practicable, the following seven factors (42 U.S.C. 6295 (o)(2)(B)(i)):

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

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<sup>a</sup> U.S. Department of Energy-Office of Energy Efficiency and Renewable Energy, *Energy Conservation Program for Consumer Products: Test Procedures for Furnace Fans, Notice of Proposed Rulemaking*, May 17, 2012. Washington, DC. Federal Register / Vol. 77, No. 94.

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(e).

DOE considers interested party participation to be a very important part of the process for setting energy conservation standards. Through formal public notifications (*i.e.*, *Federal Register* notices), DOE actively encourages the participation and interaction of all interested parties during the comment period in each stage of the rulemaking. Beginning with the framework document and during subsequent comment periods, interactions among interested parties provide a balanced discussion of the information that is required for the standards rulemaking.

Before DOE determines whether or not to adopt a proposed energy conservation standard, it must first solicit comments on the proposed standard. (42 U.S.C. 6313(a)(6)(B)(i)) 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. 6313(a)(6)(A)) 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. (42 U.S.C. 6295 (o)(2)(B)(i))

After the publication of the framework document, the energy conservation standards rulemaking process involves three additional, formal public notices, which DOE publishes in the *Federal Register*. The first of the rulemaking notices is a NOPM, which is designed to publicly vet the models and tools used in the preliminary rulemaking and to facilitate public participation before the NOPR stage. The second notice is the NOPR, which presents a discussion of comments received in response to the NOPM and the preliminary analyses and analytical tools; analyses of the impacts of potential amended energy conservation standards on consumers, manufacturers, and the Nation; DOE’s weighting of these impacts of amended energy conservation standards; and the proposed energy conservation standards for each product. The third notice is the final rule, which presents a discussion of the comments received in response to the NOPR; the revised analyses; DOE’s weighting of these impacts; the amended energy conservation standards DOE is adopting for each product; and the effective dates of the amended energy conservation standards.

In June 2010, DOE published a notice of public meeting and availability of the framework document. 75 FR 31323 (June 3, 2010) The framework document, *Rulemaking Framework Document for Residential Furnace Fans*, describes the procedural and analytical approaches DOE anticipated using to evaluate the establishment of new energy conservation standards for these products. This document is available at: [http://www1.eere.energy.gov/buildings/appliance\\_standards/residential/furnace\\_fans\\_framework.html](http://www1.eere.energy.gov/buildings/appliance_standards/residential/furnace_fans_framework.html).

Subsequently, DOE held a public meeting on June 18, 2010 (“June 2010 public meeting”) to discuss procedural and analytical approaches to the rulemaking. In addition, DOE used the public meeting to inform and facilitate involvement of interested parties in the rulemaking process. The analytical framework presented at the public meeting described the different analyses, such as the engineering analysis and the consumer economic analyses (*i.e.*,

the life-cycle cost (LCC) and payback period (PBB) analyses), the methods proposed for conducting them, and the relationships among the various analyses.

**Table 1.3.1 Analyses Under the Process Rule**

<b>Preliminary Analyses</b>	<b>NOPR</b>	<b>Final Rule</b>
Market and technology assessment	Revised preliminary analyses	Revised NOPR analyses
Screening analysis	Life-cycle cost sub-group analysis	
Engineering analysis	Manufacturer impact analysis	
Energy use determination	Utility impact analysis	
Markups for equipment price determination	Emissions analysis	
Life-cycle cost and payback period analysis	Employment impact analysis	
Shipments analysis	Regulatory impact analysis	
National impact analysis		
Preliminary manufacturer impact analysis		

During the June 2010 public meeting, interested parties commented about numerous issues relating to each one of the analyses listed in Table 1.3.1. Comments from interested parties submitted during the framework document comment period elaborated on the issues raised during the public meeting. DOE attempted to address these issues during its preliminary analyses and summarized the comments and DOE’s responses in chapter 2 of the preliminary TSD.

As part of the information gathering and sharing process, DOE organized and held interviews with manufacturers of the residential furnace fans considered in this rulemaking as part of the engineering analysis. DOE selected companies that represented production of all types of products, ranging from small to large manufacturers, and included the Air-Conditioning, Heating and Refrigeration Institute (AHRI) member companies. DOE had four objectives for these interviews: (1) solicit manufacturer feedback on the draft inputs to the engineering analysis; (2) solicit feedback on topics related to the preliminary manufacturer impact analysis; (3) provide an opportunity, early in the rulemaking process, to express manufacturers’ concerns to DOE; and (4) foster cooperation between manufacturers and DOE.

DOE incorporated the information gathered during the engineering interviews with manufacturers into its engineering analysis (chapter 5) and the preliminary manufacturer impact analysis (chapter 12). Following the publication of the preliminary analyses and the NOPM public meeting, DOE intends to hold additional meetings with manufacturers as part of the consultative process for the manufacturer impact analysis conducted during the NOPR phase of the rulemaking.

DOE developed an LCC spreadsheet that calculates the LCC and PBP at various energy efficiency levels. DOE also developed a national impact analysis spreadsheet that calculates the national energy savings (NES) and national net present values (NPVs) at various energy efficiency levels. This spreadsheet includes a model that forecasts the impacts of amended energy conservation standards at various levels on product shipments. All of these spreadsheets are available on the DOE website for furnace fans: ([http://www1.eere.energy.gov/buildings/appliance\\_standards/residential/furnace\\_fans.html](http://www1.eere.energy.gov/buildings/appliance_standards/residential/furnace_fans.html)).

## 1.4 STRUCTURE OF THE DOCUMENT

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

Chapter 1	Introduction: provides an overview of the appliance standards program and how it applies to this rulemaking and outlines the structure of the document.
Chapter 2	Analytical Framework: describes the rulemaking process and addresses comments from interested parties on the issues raised during the public meeting.
Chapter 3	Market and Technology Assessment: characterizes the market for the considered products and the technologies available for increasing product efficiency.
Chapter 4	Screening Analysis: identifies all the design options that improve efficiency of the considered products and 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 Analysis: discusses the methods used for establishing markups for converting manufacturer prices to customer product costs.
Chapter 7	Energy Use Analysis: discusses the process used for generating energy-use estimates for the considered products as a function of standard levels.

Chapter 8	Life-Cycle Cost and Payback Period Analysis: discusses the methods used to analyze effects of standards on individual customers and users of the products and compares the LCC and PBP of products with and without higher efficiency standards.
Chapter 9	Shipments Analysis: estimates shipments of the products over the 30-year analysis period that is used in performing the national impact analysis (NIA), including how shipments may vary under alternative standard levels.
Chapter 10	National Impact Analysis: assesses the national energy savings, and the national net present value of total consumer costs and savings, expected to result from specific, potential energy conservation standards.
Chapter 11	Consumer Subgroup Analysis: discusses the effects of standards on different subgroups of consumers and compares the LCC and PBP of products with and without higher efficiency standards for these subgroups.
Chapter 12	Manufacturer Impact Analysis: discusses the effects of standards on the finances and profitability of product manufacturers.
Chapter 13	Employment Impact Analysis: discusses the effects of standards on national employment.
Chapter 14	Utility Impact Analysis: discusses the effects of standards on electric and gas utilities.
Chapter 15	Emissions Analysis: discusses the effects of standards on three pollutants—sulfur dioxide (SO <sub>2</sub> ), nitrogen oxides (NO <sub>x</sub> ), and mercury—as well as CO <sub>2</sub> emissions.
Chapter 16	Monetization of Emission Reductions Benefits: discusses the effects of standards on the monetary benefits likely to result from the reduced emissions of carbon dioxide (CO <sub>2</sub> ) and nitrogen oxides (NO <sub>x</sub> ).
Chapter 17	Regulatory Impact Analysis: discusses the impact of non-regulatory alternatives to efficiency standards.
Appendix 6A	Detailed Data for Equipment Price Markups
Appendix 7A	RECS 2005 Variables and Values

Appendix 7B	System Curve Derivation for Furnace Fans
Appendix 7C	Calculation of Furnace Blower Fan Energy Consumption
Appendix 7D	Derivation of House Heating Load for Furnace Fans
Appendix 7E	Determination of Furnace Energy Use in the LCC Analysis
Appendix 7F	Determination of Central Air Conditioner Energy Use in the LCC Analysis
Appendix 7G	Reduced Set of Furnace Fan Models and Characteristics
Appendix 8A	User Instructions for LCC and PBP Spreadsheets
Appendix 8B	Monthly Energy Price Factor Calculations for Furnace Fans
Appendix 8C	Marginal Energy Price Factor Calculations for Furnace Fans
Appendix 8D	Installation, Maintenance, Repair Cost Determination for Furnace Fans
Appendix 8E	Furnace Fan Lifetime Determination
Appendix 8F	Distributions Used for Discount Rates
Appendix 10A	User Instructions for Shipments and National Energy Savings Spreadsheet Model
Appendix 10B	Full Fuel Cycle Multipliers
Appendix 10C	National Net Present Value of Consumer Benefits Using Alternative Product Price Forecast