

# CHAPTER 1. INTRODUCTION

## TABLE OF CONTENTS

1.1	PURPOSE OF DOCUMENT .....	1
1.2	OVERVIEW OF APPLIANCE STANDARDS .....	1
1.3	OVERVIEW OF SMALL ELECTRIC MOTOR STANDARDS .....	2
1.4	STRUCTURE OF THE DOCUMENT.....	4

## LIST OF TABLES

Table 1.3.1	Small Electric Motors Analyses.....	3
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## CHAPTER 1. INTRODUCTION

### 1.1 PURPOSE OF DOCUMENT

This Technical Support Document (TSD) provides the analytical approaches, inputs and results associated with DOE's study of energy conservation standards for small electric motors during the notice of proposed rulemaking (NOPR) phase. This TSD also serves to provide technical detail and is a compendium to the life-cycle cost (LCC) and payback period (PBP), national impact analysis (NIA), and manufacturer impact analysis (MIA) spreadsheets that are posted on the DOE's website for the NOPR analyses.<sup>1</sup>

### 1.2 OVERVIEW OF APPLIANCE STANDARDS

Part C of title III of the Energy Policy and Conservation Act (EPCA) provides for an energy conservation program for certain commercial and industrial equipment. (42 U.S.C. 6311-6317) In particular, section 346(b) of EPCA states that the Secretary of Energy must prescribe testing requirements and energy conservation standards for those small electric motors for which the Secretary determines that standards would be technologically feasible and economically justified, and would result in significant energy savings. (42 U.S.C. 6317(b))

Before DOE determines whether to adopt a proposed energy conservation standard, it first solicits comments on the proposed standard. DOE designs any new or amended standard to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A), 42 U.S.C. 6313(a)(6)(B)(i) and (b)(3)(A), and 42 U.S.C. 6317(a)(1) and (c)) 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 following seven factors:

1. the economic impact of the standard on manufacturers and consumers of products subject to the standard;
2. the savings in operating costs throughout the estimated average life of the covered products in the type (or class) compared to any increase in the price, initial charges, or maintenance expenses for the covered products likely to result from imposition of the standard;
3. the total projected amount of energy savings likely to result directly from imposition of the standard;
4. any lessening of utility or performance of the covered products likely to result from imposition of the standard;

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<sup>1</sup> DOE website:

[http://www.eere.energy.gov/buildings/appliance\\_standards/commercial/small\\_electric\\_motors.html](http://www.eere.energy.gov/buildings/appliance_standards/commercial/small_electric_motors.html).

5. the impact of any lessening of competition, as determined in writing by the Attorney General, likely to result from 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))

### 1.3 OVERVIEW OF SMALL ELECTRIC MOTOR STANDARDS

On July 10, 2006, the Secretary of Energy issued a determination stating "...the Department believes that standards for considered small motors appear economically justified based on balanced consideration of the information and analysis available to the Department at this time." 71 FR 38807. DOE defines "considered small motors" as capacitor-start motors, including both induction-run and capacitor-run, and non-servo three-phase motors.

The Secretary's determination was based partly on analyses conducted by Lawrence Berkley National Laboratory (LBNL). In February 2002, LBNL published a report entitled *Determination Analysis of Energy Conservation Standards for Small Electric Motors*, which assessed options for setting energy conservation standards. That report was based on information from annual sales data, average load data, and research on existing and potential small motor efficiencies obtained from several organizations.

DOE reviewed the comments it received from stakeholders on this draft analysis published in 2002 and then prepared its final, positive, determination for small electric motors on July 10, 2006. In that notice, DOE indicated that it found energy conservation standards for small electric motors appeared to be technologically feasible, economically justified and would result in significant energy savings. 71 FR 38799. As a result of this positive determination, DOE published an *Energy Conservation Standards Rulemaking Framework Document for Small Electric Motors* in 2007. This document describes the procedural and analytical approaches that DOE anticipated that it would use to evaluate the establishment of energy conservation standards for small electric motors.<sup>2</sup> DOE also published the *Notice of Public Meeting and Availability of Framework Document*.<sup>72</sup> FR 44990 (August 10, 2007).

On September 13, 2007, DOE held a public meeting to discuss the proposed analytical framework. The analytical framework presented at the public meeting described different analyses, such as life-cycle cost and payback, the methods proposed for conducting them, and the relationships among the various analyses. Table 1.3.1 below provides a list of all the rulemaking analyses conducted, and at which stage of the rulemaking DOE publishes those analyses.

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<sup>2</sup> The document is available at the DOE website:  
[http://www.eere.energy.gov/buildings/appliance\\_standards/commercial/small\\_electric\\_motors.html](http://www.eere.energy.gov/buildings/appliance_standards/commercial/small_electric_motors.html).

**Table 1.3.1 Small Electric Motors Analyses**

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

Representatives of small motor manufacturers, a nationally recognized trade association, and a prominent energy efficiency advocacy group attended the framework document public meeting and indicated their willingness to work with DOE in its analysis of potential energy conservation standards. The major items discussed at the public meeting included definitions for covered small electric motors and product classes; matters of proprietary designs; ties between efficiency improvements and incremental manufacturing costs; baseline and potential efficiency levels; base-case trends under different regulatory scenarios; analyses of costs to manufacture energy efficient small electric motors and the relationship to selling prices; LCC analyses and methods; LCC subgroups that may be more impacted by efficiency standards over other groups; motor rating, loading, and operating hours; the impacts of a standard on domestic energy supplies; and the scope of an environmental assessment.

As part of information gathering and sharing, DOE prepared and circulated three interview guides to small motor manufacturers in 2007 and early 2008 (see preliminary TSD appendices 12A, 12B, and 12C). DOE issued these interview guides to small electric motor manufacturers with the following objectives: (1) to obtain the manufacturer selling price (MSP) versus efficiency curves for the engineering analysis; (2) to obtain market-related information for the covered motors, including an estimate of shipments; (3) to assess any preliminary impacts on manufacturers that may be associated with higher efficiency designs; and (4) to foster cooperation between DOE and these interested parties, who may choose to participate in the manufacturer impact analysis following the public meeting comment period. The interview guides requested input on (1) the relationship between manufacturing selling price and efficiency for four representative units selected by DOE; (2) market data such as distribution channels and end-use operating profiles for small motors; (3) preliminary manufacturer's impacts; and (4) national shipment estimates (to be aggregated by the Business Information Service of the National Electrical Manufacturers Association).

DOE incorporated the information gathered at these meetings in its engineering analysis. Following the publication of the preliminary TSD and the public meeting for the preliminary analyses on January 31, 2009 DOE held additional meetings with manufacturers as part of the consultative process for the manufacturer impact analysis (Chapter 12). During this period, DOE received numerous comments regarding the preliminary analyses.

DOE developed three spreadsheet tools for this rulemaking. The first spreadsheet tool calculates LCC and payback periods. The second spreadsheet tool calculates impacts of trial standards at various levels on small electric motor shipments, and calculates the NES and NPV at various standard levels. The third spreadsheet is for the government regulatory impact model (GRIM) used to calculate the INPV for the manufacturer impact analysis. The spreadsheets are posted on DOE's website along with the complete TSD documenting the analysis supporting this NOPR.

## **1.4 STRUCTURE OF THE DOCUMENT**

This TSD consists of 16 chapters including an environmental assessment and a regulatory impact analysis, plus additional appendices.

- Chapter 1      Introduction: Provides an overview of the appliance standards program and how it applies to the small electric motors rulemaking, provides a history of DOE's actions to date, and outlines the structure of the TSD.
- Chapter 2      Analytical Framework: Describes the rulemaking process step by step.
- Chapter 3      Market and Technology Assessment: Characterizes the small electric motor market and the technologies available for increasing equipment efficiency.
- Chapter 4      Screening Analysis: Discusses the design options identified in chapter 3 that improve small motor efficiency, and determines which of these are viable for consideration in the engineering analysis.
- Chapter 5      Engineering Analysis: Presents detailed cost and efficiency information for the motors that constitute the representative units for analysis. This chapter describes DOE's approach to the engineering analysis for determining manufacturer costs and selling prices.
- Chapter 6      Energy Use and End-Use Load Characterization: Discusses the process DOE used for generating energy use estimates and end-use load profiles for small electric motors.
- Chapter 7      Markups for Equipment Price Determination: Discusses the methods DOE used for establishing markups to convert manufacturer selling prices to installed customer equipment prices.

- Chapter 8 Life-Cycle Cost and Payback Period Analyses: Describes the impact of potential candidate standards on consumers of small electric motors. This chapter compares the life-cycle cost of small motors and other measures of consumer impact with and without trial standard levels.
- Chapter 9 Shipments Analysis: Provides a shipments estimate for 200X and the methods DOE used for forecasting shipments with and without new energy conservation standards.
- Chapter 10 National Impact Analysis: Describes the national forecast of energy consumption, efficiency of new units, and annual equipment sales with and without new energy conservation standards.
- Chapter 11 Life-Cycle Cost Subgroup Analysis: Evaluates impacts on any identifiable groups or customers who may be disproportionately affected by any proposed national energy efficiency standard level.
- Chapter 12 Manufacturer Impact Analysis: Assesses the impacts on small motor manufacturers of any proposed energy efficiency standard. 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 the manufacturing practices for these products.
- Chapter 13 Utility Impact Analysis: Analyzes the effects of proposed small electric motor standard levels on electricity sales. The utility impact analysis compares model results for the base case and policy cases in which proposed standards are in place.
- Chapter 14 Employment Impact Analysis: Estimates national job creation or elimination (direct and indirect effects) resulting from possible standards due to reallocation of the associated commercial expenditures for purchasing and operating equipment.
- Chapter 15 Environmental Assessment for Small Electric Motors: Discusses the effects of energy conservation standards on airborne emissions of electric utilities.
- Chapter 16 Regulatory impact Analysis: Discusses the impact of the present regulatory actions and of non-regulatory alternatives to setting energy conservation standards.