

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 supporting the information presented in the final rule for establishing amended energy conservation standards for certain commercial and industrial equipment covered by the American National Standards Institute (ANSI)/ American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)/ Illuminating Engineering Society of North America (IESNA) Standard 90.1-2010 *Energy Standard for Buildings Except Low-Rise Residential Buildings* (ASHRAE Standard 90.1-2010).

1.2 PROCESS FOR AMENDED ENERGY CONSERVATION STANDARDS FOR ASHRAE EQUIPMENT

Title III of the Energy Policy and Conservation Act (EPCA), Pub. L. 94-163, as amended, sets forth a variety of provisions concerning energy efficiency. Part C¹ of Title III created the energy conservation program for “Certain Industrial Equipment.” (42 U.S.C. 6311-6317) Of particular relevance for this rulemaking is 42 U.S.C 6313(a)(6) which directs DOE, in the event that ASHRAE Standard 90.1 is amended for certain types of commercial and industrial equipment, to adopt that efficiency level unless clear and convincing evidence supports a determination that adopting a more stringent level would produce significant additional energy savings and is technologically feasible and economically justified.

On October 29, 2010, American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) officially released the ANSI/ASHRAE/IESNA Standard 90.1-2010 (hereafter referred to as ASHRAE Standard 90.1-2010), which addressed efficiency levels for certain categories of commercial heating, ventilating, and air-conditioning (HVAC) and water heating equipment covered by EPCA. ASHRAE Standard 90.1-2010 revised the efficiency levels of the previous ASHRAE Standard 90.1-2007 for certain equipment, such as water-cooled and evaporatively-cooled air conditioners and water-source variable refrigerant flow (VRF) heat pumps with a cooling capacity < 17,000 Btu/h. The standard also adopted new energy efficiency levels for water-source VRF heat pumps with a cooling capacity $\geq 135,000$ Btu/h and for air conditioners and condensing units serving computer rooms², which were not previously covered by DOE’s energy conservation standards.

¹ This Part was subsequently redesignated as Part A-1 for editorial reasons after Part C of Title III of EPCA was repealed by Pub. L. 109-58.

² ASHRAE Standard 90.1-2010 refers to this equipment as “air conditioners and condensing units serving computer rooms.” DOE refers to this equipment class as “computer room air conditioners” throughout this document.

EPCA also requires DOE to amend the test procedures for covered ASHRAE equipment, which manufacturers are required to use in order to certify compliance with energy conservation standards mandated under EPCA, to be consistent with the amended industry test procedures in ASHRAE Standard 90.1 unless clear and convincing evidence suggests that the test procedure does not reflect the energy efficiency, energy use, and estimated operating costs of the equipment and is unduly burdensome to conduct (42 U.S.C 6314(a)(2)-(4)).

ASHRAE Standard 90.1-2010 updated its referenced test procedures for small (<65,000 Btu/h) commercial package air conditioning and heating equipment (AHRI 210/240), small³ ($\geq 65,000$ Btu/h and <135,000 Btu/h), large and very large commercial package air conditioning and heating equipment (AHRI 340/360), commercial warm-air furnaces (Underwriters Laboratories (UL) 727 and ANSI Z21.47), and commercial water heaters (ANSI Z21.10.3). These test procedures were updated to the current version at the time of the publication of ASHRAE Standard 90.1-2010 and also included any addenda to those test procedures that were published after the publication of ASHRAE Standard 90.1-2010. ASHRAE Standard 90.1 also specifies AHRI 390 as the test procedure for single package vertical air conditioners and single package vertical heat pumps, ASHRAE Standard 127-2007 as the test procedure for the new equipment class of air conditioners and condensing units serving computer rooms, and AHRI 1230-2010 as the test procedure for VRF systems, which were previously tested under AHRI 210/240-2003 and AHRI 340/360-2004.

The Energy Independence and Security Act of 2007 (EISA 2007) further amended EPCA by setting definitions and minimum energy conservation standards for single package vertical air conditioners and single package vertical heat pumps (42 U.S.C. 6313(a)(10)(B)) and by including a provision specifically for these equipment classes (and no others), which required DOE to review the most recently published ASHRAE Standard 90.1 in accordance with the procedures established for ASHRAE products under paragraph 42 U.S.C. 63131(a)(6). (42 U.S.C. 6313(a)(10)(B)). DOE is currently analyzing energy conservation standards for single package vertical air conditioners and single package vertical heat pumps part of a separate rulemaking; thus, although they are ASHRAE equipment, they are not discussed further in this document.

On May 5, 2011, DOE published a notice of data availability (May 2011 NODA) and request for public comment in the *Federal Register* as a preliminary step pursuant to EPCA's requirements for DOE to consider amended energy conservation standards for certain types of commercial equipment covered by ASHRAE Standard 90.1. 76 FR 25622. Specifically, the May 2011 NODA presented for public comment DOE's analysis of the potential energy savings

³ EPCA defines "small commercial package air-conditioning and heating equipment" as an equipment that is rated below 135,000 Btu/h. Thus, the "small" modifier here is used to describe both equipment classes with a cooling capacity <65,000 Btu/h and with a cooling capacity $\geq 65,000$ Btu/h and <135,000 Btu/h.

estimates for amended national energy conservation standards for certain types of commercial equipment based on: (1) the modified efficiency levels contained within ASHRAE Standard 90.1-2010; and (2) more-stringent efficiency levels. Also, the May 2011 NODA presented DOE's analysis about the changes for the new and amended test procedures for ASHRAE equipment and asked for comment from the stakeholders about the potential effects of these changes.

After receiving public comment from stakeholders on the May 2011 NODA, DOE revised its analysis for the ASHRAE equipment under review (water-cooled and evaporatively-cooled air conditioners, water-source VRF heat pumps with a cooling capacity less than 17,000 Btu/h, water-source VRF heat pumps with a cooling capacity greater than or equal to 135,000 Btu/h, and computer room air conditioners) and summarized the assumptions and presented the results in the notice of proposed rulemaking (NOPR) published on January 17, 2012. 77 FR 2356. In addition, DOE also conducted several other downstream analyses in preparation for the NOPR. On February 14, 2012, DOE presented its analysis and results at the NOPR public meeting.

At the NOPR public meeting, DOE received many comments disagreeing with the DOE's proposed definition for computer room air conditioners and many comments on reviewing the AHRI operations manuals and adopting certain sections that would help clarify the DOE test procedures. In response, DOE published a supplementary notice of proposed rulemaking (SNOPR) on March 22, 2012. 77 FR 16769. In that document, DOE proposed a revised definition for computer room air conditioners and also proposed certain clarifications to its test procedure for the covered ASHRAE equipment based on its review of the AHRI operations manuals.

Next, DOE received more written comments on the analysis and results in the NOPR, at the NOPR public meeting, and in the SNOPR. DOE again responded to those comments and revised its analysis where necessary and published a final rule. This technical support document offers a more detailed analysis of the final rule. A list of the analyses and the corresponding chapter number is presented in the next section.

1.3 STRUCTURE OF THIS DOCUMENT

This final rule TSD outlines the analytical approaches used in this rulemaking. The TSD consists of 11 chapters:

- Chapter 1 Introduction: Provides an overview of process to amend energy conservation standards for ASHRAE equipment and outlines the structure of the document.
- Chapter 2 Market Assessment: Characterizes the market for water-cooled and evaporatively-cooled air conditioners, water-source variable refrigerant flow heat pumps, and computer room air conditioners.
- Chapter 3 Engineering Analysis: Discusses the methods used for developing the price-efficiency relationship for computer room air conditioners.
- Chapter 4 Energy Use Characterization: Discusses the process used for generating energy use estimates for water-cooled and evaporatively-cooled air conditioners, variable refrigerant flow systems, and computer room air conditioners at the current standard levels and at potential amended standard levels.
- Chapter 5 Markups for Product Price Determination: Discusses the methods used for establishing markups for converting manufacturer prices to customer equipment prices.
- Chapter 6 Life-Cycle Cost and Payback Period Analysis: Discusses the economic effects of standards on commercial customers and users of the equipment and compares the LCC and PBP of equipment with and without higher energy conservation standards.
- Chapter 7 Shipments Analysis: Discusses the methods used for forecasting shipments with and without higher energy conservation standards, including how equipment purchase decisions are economically influenced and modeled with econometric equations.
- Chapter 8 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 energy conservation standards.
- Chapter 9 Emissions Analysis: Discusses the environmental effect of amended energy conservation standards, including the impact on emissions of three

pollutants: sulfur dioxide (SO₂), nitrogen oxides (NO_x), and carbon dioxide (CO₂).

Chapter 10 **Monetization of Emission Reductions Benefits:** Discusses the monetization analysis of potential emissions reductions resulting from higher energy conservation standards.

Chapter 11 **Utility Impact Analysis:** Discusses the effects of standards on the installed generation capacity of electric utilities