Congressional Research Service
Informing the legislative debate since 1914

The Department of Energy's Appliance and Equipment Standards Program

February 18, 2022

Congressional Research Service
https://crsreports.congress.gov
R47038

CRS REPORT
Prepared for Members and
Committees of Congress

Congressional Research Service
Informing the legislative debate since 1914

SUMMARY

R47038

February 18, 2022

Martin C. Offutt
Analyst in Energy Policy

The Department of Energy's Appliance and Equipment Standards Program

Since 1978 Congress has authorized mandatory federal programs to regulate the energy and water consumption of appliances and commercial equipment used in buildings. The Department of Energy (DOE) has implemented this authority for over 60 categories of devices with the statutory aim of setting standards that achieve significant conservation of energy. In the 1978 law, Congress expressed its desire "to reduce the growth in demand for energy in the United States, and to conserve nonrenewable energy resources produced in this Nation and elsewhere, without inhibiting beneficial economic growth."

Covered products and equipment are those units, devices, or appliances that are deemed subject to the national standards program developed by DOE. Congress specifies these in many instances while in others DOE makes the coverage determination. Some of the better-known covered products and equipment include refrigerators, furnaces, and commercial air conditioning. The standards describe energy conservation in one of two ways. First, the standards establish a maximum energy consumption expressed in units found on utility bills such as kilowatt-hours (kWh) or British thermal units (Btus). For example, standard-sized dishwashers shall not exceed 307 kWh/year. Second, the standards can address the performance of the device in terms of its minimum energy efficiency. Efficiency is sometimes a simple percentage value; for example, gas-fired water boilers must be 84% efficient at converting fuel into heat used in the home. Efficiency can also be a combination of units, and, for example, general service lamps (i.e., light bulbs) meet standards specified in lumens per watt.

The Energy Policy and Conservation Act (EPCA) states that any standard must result in significant energy conservation and be technologically feasible and economically justified. DOE must typically reconsider standards every six years and issue an amended standard if warranted, though such an amended standard cannot result in increased energy use by the product in question. EPCA allows DOE to preserve certain features such as glass oven doors that strictly speaking do not result in energy conservation. This protection of features has become important in the case of natural-gas consuming products. Acknowledging the role of civil society, EPCA has required the Secretary to follow the energy conservation standards set by groups such as the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) for certain commercial equipment.

DOE sets these standards using a multi-year process of analyses and stakeholder interactions. Standards, test procedures, and coverage determinations are set utilizing rulemaking processes defined by statutory and other requirements. EPCA further lists the factors DOE must consider in choosing the quantitative level for an energy conservation standard for a given product. Some standards are in statute, and DOE regulations codify these. In other cases DOE considers the standards and test methods (i.e., the procedures used to establish compliance) set by engineering societies, independent standards organizations, or industry groups—ASHRAE, for example.

The program requires the sale or adoption of equipment that consumes less energy while providing the same service—e.g., a refrigerator with the same storage volume that consumes less electricity. According to a 2017 DOE estimate, the program was expected to deliver energy savings of 71 quadrillion British thermal units (quads) from inception through 2020, which is three-quarters of one year's U.S. primary energy consumption.

Congress could amend EPCA to address the effectiveness of the program and its ability to influence energy conservation. The setting of standards for appliances that use natural gas is subject to an unresolved debate on fuel-switching. Also, DOE has gone back and forth on its own requirements for utilizing the standards and test methods set by ASHRAE, with the key question being whether DOE should adopt ASHRAE standards 'as is' or has latitude to change them. Lastly, DOE's ability to maintain the tempo of issuing amended standards and follow the every-six-year review requirement of EPCA has been challenged in recent years; the statute does not allow the agency to prioritize the backlog. All of these issues have been the subject of recent or ongoing federal litigation.

Contents

Figures

Tables

Contacts

Introduction

Since 1978 Congress has authorized mandatory federal programs to regulate the energy and water consumption of appliances and commercial equipment used in buildings. The Department of Energy (DOE) has implemented this authority for over 70 categories of devices to achieve energy and water conservation. Some of the better-known covered devices include refrigerators, furnaces, and commercial air conditioning. The regulations also cover less noticeable equipment and equipment parts such as transformers and furnace fans. The effect of the national standards program is to require the sale or adoption of devices that consume less energy while providing the same service—a refrigerator with the same storage volume that consumes less electricity, for example. According to a 2017 DOE estimate, the program was expected to deliver energy savings of 71 quadrillion British thermal units (quads)[1] from inception through 2020,[2] which is roughly three-quarters of one year's primary energy consumption in the United States.

This report describes the regulatory concepts that underpin the national standards program; the controlling statutes; how DOE develops and revises the standards regulations; how the program is operated such as through certification and testing; and the impact of the program on energy conservation.

Overview

The Appliance and Equipment Standards Program, as the national standards program is formally known, was authorized in 1975 by the Energy Policy and Conservation Act (EPCA),[3] first as non-binding targets. In 1978 Congress amended EPCA and authorized the Secretary of Energy to set binding standards through regulations.[4] In the 1978 law, Congress expressed its desire "to reduce the growth in demand for energy in the United States, and to conserve nonrenewable energy resources produced in this Nation and elsewhere, without inhibiting beneficial economic growth."[5] With the passage of the National Appliance Energy Conservation Act of 1987,[6] Congress set the first national energy conservation standards. Title III of EPCA established the goal for the standards that remains in effect today: for a new standard to be promulgated, DOE must first find that it would result in significant conservation of energy and be technologically feasible and economically justified.[7]

DOE sets minimum efficiency standards or maximum water[8] or energy use standards both for consumer products and for commercial and industrial equipment—collectively, "products and equipment." Congress has amended EPCA multiple times; **Table 1** lists the significant legislative action related to energy efficiency. Starting in 1975, Title III of EPCA has included targets for

[1] A quad represents roughly 1% of annual U.S. energy consumption.

[2] See U.S. Department of Energy, Office of Buildings Technology, "History and Impacts: Buildings" at https://www.energy.gov/eere/buildings/history-and-impacts. DOE has also issued estimates of the cumulative benefit of the national standards program using a different method of calculating energy savings, discussed later in this report in the section "Impact of the Standards."

[3] P.L. 94-163, 42 U.S.C. §§6291–6317.

[4] National Energy Conservation Policy Act (NECPA), P.L. 95-619.

[5] Section 102(b) of NECPA, P.L. 95-619.

[6] P.L. 100-12.

[7] 42 U.S.C. §6295(o)(3)(B).

[8] There are several plumbing products regulated for water consumption that are not discussed in this report.

energy conservation. In 1978, Congress amended Title III to require DOE to set standards for thirteen covered products.[9] With successive amendments to EPCA, Congress increased the number of covered products and equipment that became subject to the national standards program, and as of February 2022 had done so for 19 products and 11 types of equipment.[10] EPCA also grants the Secretary of Energy authority to identify new covered products and equipment. Congress has directed DOE to follow standards and adopt test procedures set by engineering societies, independent standards organizations, or industry groups in certain instances.

Table 1. Chronology of Select Legislative Action for the Appliance and Equipment Standards Program

Date	Statute	Action
December 22, 1975	Energy Policy and Conservation Act (P.L. 94-163)	Set test procedures, conservation targets (followed by standards if targets are not set) and appliance labeling
November 9, 1978	National Energy Conservation Policy Act (P.L. 95-619)	Amended EPCA from targets to standards
March 17, 1987	National Appliance Energy Conservation Act of 1987 (P.L. 100-12)	Set standards and schedule for DOE to conduct rulemakings
June 28, 1988	National Appliance Energy Conservation Amendments of 1988 (P.L. 100-357)	Added fluorescent ballasts
October 24, 1992	Energy Policy Act of 1992 (EPAct 1992, P.L. 102-486)	Amended EPCA to expand coverage to certain commercial and industrial equipment
August 8, 2005	Energy Policy Act of 2005 (EPAct 2005, P.L. 109-58)	Set standards and schedule for DOE to conduct rulemakings
December 19, 2007	Energy Independence and Security Act of 2007 (EISA 2007, P.L. 110-140)	Set standards, added stand-by power and a six-year look-back provision
December 18, 2012	American Energy Manufacturing Technical Corrections Act (AEMTCA, P.L. 112-210)	Added coverage for other types of motors and a six-year look-back for certain ASHRAE products

Source: CRS analysis; and John Cymbalski, U.S. Department of Energy, "Appliance and Equipment Standards Program: Analysis and Methodology Discussion," presentation to the National Academy of Sciences, Engineering and Medicine's Committee on Review of Methods for Setting Buildings and Equipment Performance Standards, November 19, 2019.

Note: This is not an exhaustive list of laws that amended the appliance and equipment standards program.

[9] These included (1) refrigerators and refrigerator-freezers; (2) freezers; (3) dishwashers; (4) clothes dryers; (5) water heaters; (6) room air conditioners; (7) home heating equipment, not including furnaces; (8) television sets; (9) kitchen ranges and ovens; (10) clothes washers; (11) humidifiers and dehumidifiers; (12) central air conditioners; and (13) furnaces. EPCA §322(a).

[10] U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, "Regulatory Processes: Buildings," at https://www.energy.gov/eere/buildings/regulatory-processes.

Key Concepts in the National Standards Program

Covered Products and Equipment

Covered products and equipment are those units, devices, or appliances that are subject to the national standards program. Products and equipment can be classified as "covered" in two ways. First, Congress has enumerated specific products and equipment to be covered. For example, when the binding national standards program was first authorized in 1978 there were 13 covered products (i.e., consumer products such as appliances) defined by EPCA.[11] The list of covered equipment (i.e., pumps, motors etc.), cumulative from the laws described in **Table 1**, is codified in 42 U.S.C. §6311(1).

Second, DOE may classify additional consumer products as "covered." DOE has broad authority to do so, provided the Secretary of Energy finds it is necessary to carry-out the energy conservation goals of EPCA and DOE estimates the energy consumption of the product will exceed 100 kilowatt hours (kWh) per household per year.[12] A recent example is the Secretary's proposed determination of air cleaners as a covered consumer product.[13]

The process differs slightly for commercial and industrial equipment. EPCA, as amended, includes a list of equipment the Secretary may choose to designate as covered.[14] A recent example is the Secretary's final determination of fans and blowers as covered equipment.[15]

Lighting products are sometimes considered to be a third category, independent of their origin as product or equipment.

Some equipment is known as "ASHRAE equipment"[16]—ASHRAE is the American Society of Heating, Refrigerating and Air-Conditioning Engineers—to acknowledge the standards issued independently by that organization in conjunction with the American National Standards Institute (ANSI) and the Illuminating Engineering Society of North America (IESNA). The relevant provisions of EPCA are discussed below in the section "ASHRAE Equipment."

Classes and Definitions of Products and Equipment

The standard for a particular covered product can be divided or split through creation of product classes. Such classes are created in certain instances to acknowledge, as determined by the Secretary, that a subset of products in the category "consume a different kind of energy" or have "capacity or other performance-related feature[s]" distinct from other products in the category.[17] For example, there are 18 classes of room air conditioners,[18] based in part on cooling capacity, as depicted in **Figure 1**. Other covered products such as water heaters have multiple classes

[11] See Sections 322(a) and 325(a)(1) of EPCA.

[12] 42 U.S.C. §6292(b).

[13] 86 *Federal Register* 51629 (September 16, 2021).

[14] 42 U.S.C. §6311(2)(B).

[15] 86 *Federal Register* 46579 (August 19, 2021).

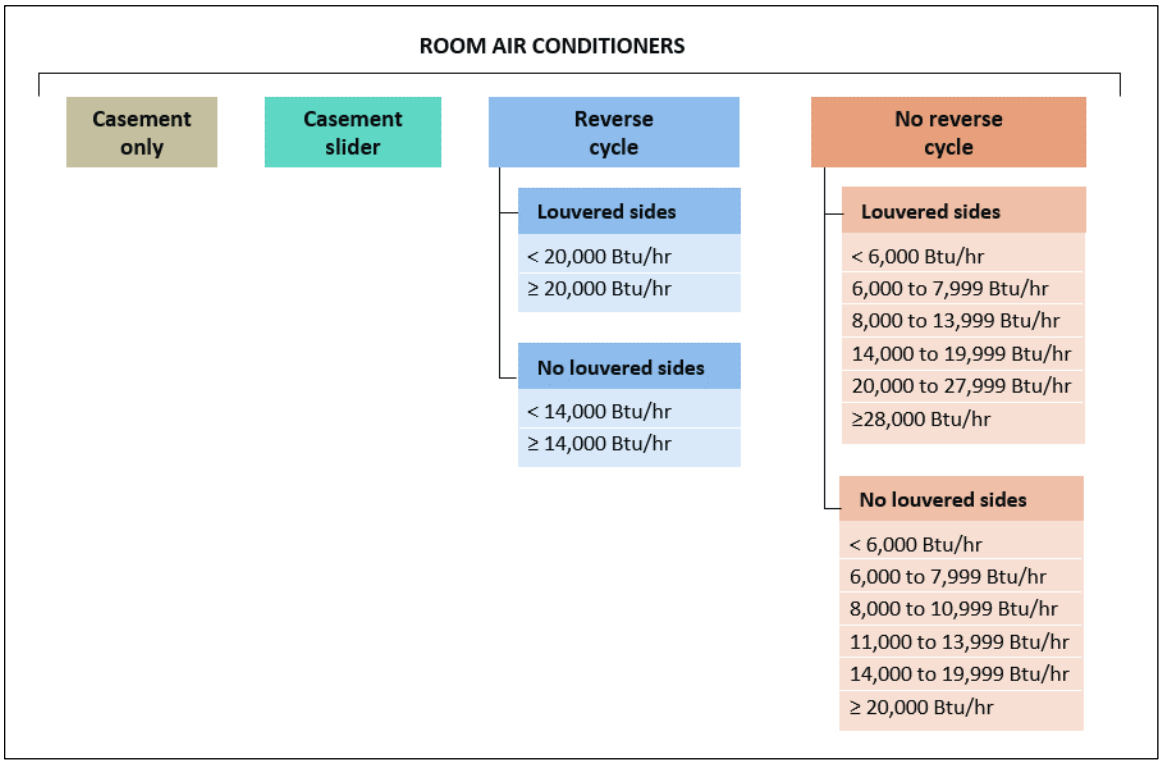
[16] 42 U.S.C. §6313(a)(6). This equipment includes "generally, commercial water heaters, commercial packaged boilers, commercial air conditioning and heating equipment, and packaged terminal air conditioners and heat pumps." 85 *Federal Register* 8708a (July 14, 2020).

[17] 42 U.S.C. §6295(q)(1)(A)-(B).

[18] See 10 C.F.R. §430.32(b).

depending on the type of energy consumed, the presence or absence of a storage tank, and other attributes.[19]

Figure 1. Classes of Room Air Conditioners



Source: CRS based on 10 C.F.R. §430.32(b).

Notes: The two left-most categories have one standard applicable to each. The two right-most categories have multiple standards because the product is split into classes based on the louver and the cooling capacity (measured in British thermal units per hour [Btu/hr]).

In likewise manner, the standards for commercial and industrial equipment divide these into "category" or "equipment category" or "product class" or similar. For example, the standards for commercial refrigerators, freezers and refrigerator-freezers found in Subpart C of 40 C.F.R. Part 431 include a look-up table with rows for refrigerators with solid doors, refrigerators with transparent doors, and so forth. Each has its own maximum daily energy consumption.

Congress itself has shown specific interest in creating additional classes. In the case of residential furnaces, Congress directed DOE to consider a separate standard for the smaller models used in warmer regions.[20] EPCA required DOE to consider the possibility of fuel switching and set a standard that "is not likely to result in a significant shift from gas heating to electric resistance heating with respect to either residential construction or furnace replacement."[21] DOE has estimated that 2.7% of consumers, when faced with a purchasing decision, would switch to heat

[19] 75 *Federal Register* 20111 (April 16, 2010).

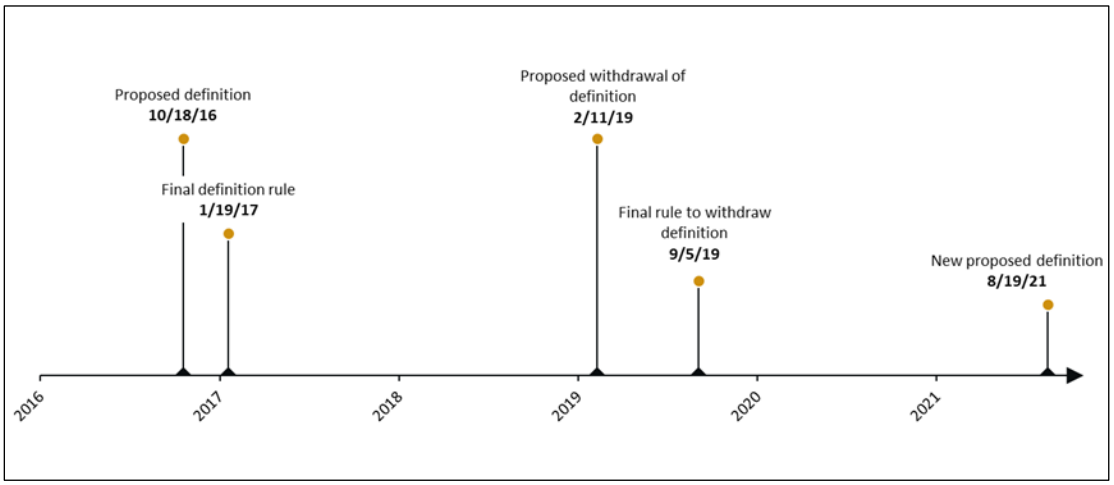
[20] NAECA amended Section 325 of EPCA and directed DOE to consider a separate standard level for small furnaces with an input capacity of less than 45,000 Btu/hr. 42 U.S.C. §6295(f)(1)(B).

[21] 42 U.S.C. §6295(f)(1)(B)(iii).

pumps, and 1.7% to electric furnaces given the new standard.[22] Today there are distinct classes of standards for small furnaces of less than 45,000 Btu/hr capacity.[23]

The scope of coverage of general service lamps (GSLs; i.e., "light bulbs" such as incandescent, compact fluorescent, LEDs [light-emitting diodes] and other types) has also been at issue. EISA amended Section 321(30), subparagraph (D), of EPCA to exclude 22 enumerated incandescent lamps from the definition of incandescent GSLs ("GSILs").[24] The standards are not elaborated into classes, unlike the examples above, but include look-up tables[25] that apply to any and all lamps that meet the definition of GSILs.[26] The definitions are thus important because they determine which lighting products are to be covered by the national standards program and which are not. EISA also required DOE to conduct a future rulemaking, to start before January 1, 2014, to determine whether the exemptions should be maintained.[27] Removing the exemptions would have the effect that more lamps would be subject to energy conservation standards to be developed by DOE. **Figure 2** shows the rulemakings DOE undertook first to remove the GSL exemptions by revising the definitions[28] and, later, to withdraw the proposed definitions (and maintain the exemptions).[29] The withdrawal took place prior to the first rulemaking having taken effect. On August 19, 2021, DOE issued a proposed rule again to remove the exemptions.[30]

Figure 2. Rulemakings on Definition of General Service Lamps



Source: CRS.

[22] See slide 53 of U.S. Department of Energy, "Furnaces," presentation to the National Academy of Sciences, Engineering and Medicine's Committee on Review of Methods for Setting Buildings and Equipment Performance Standards, Washington, DC, November 19, 2019.

[23] 10 C.F.R. §430.32(e)(1).

[24] 42 U.S.C. §6291(30)(BB)(ii).

[25] 10 C.F.R. §430.32(x).

[26] The definition of GSILs may be found at 10 C.F.R. §430.2.

[27] See 42 U.S.C. §6295(i)(6)(A)(i)(II).

[28] Final rule at 82 *Federal Register* 7276 and 7322 (January 19, 2017).

[29] Final rule at 84 *Federal Register* 46661 (September 5, 2019).

[30] 86 *Federal Register* 46611 (August 9, 2021).

Point of Compliance

EPCA makes manufacturers responsible for certifying that their products and equipment comply with the standards. As implemented by DOE, the regulations require testing of a "sample comprised of production units."[31] Notionally, a manufacturer would show compliance by "select[ing] a sample at random from a production line."[32] The regulations do not require field testing in deployment; the unit must comply prior to its being shipped as determined by statistical sampling. The section "Certification, Compliance, and Enforcement" includes further details on testing.

The Form of the Standards

The standards regulations are collected in the Code of Federal Regulations and include written sections related to testing, certification and the binding energy conservation standards that give effect to the prescriptions of EPCA Title III. The standards describe energy conservation in one of two ways. In the first, the standards establish a maximum allowable energy consumption expressed in units found on utility bills such as kWh or Btus.[33] For example, standard-sized dishwashers shall not consume more than 307 kWh/year.[34] Second, the standards can address the performance of the device in terms of its minimum required energy efficiency. Efficiency is a physical measure of the performance of the product or equipment. Efficiency is sometimes a simple percentage value representing how much of the energy in the fuel the appliance is able to convert into a useful service. For example, gas-fired hot water boilers manufactured after January 15, 2021, must have an Annual Fuel Utilization Efficiency (AFUE) of 84%,[35] representing how much of the fuel's energy the boiler delivers as heat inside the home. Efficiency can also be a combination of units, and, for example, general service lamps (i.e., light bulbs) meet standards specified in lumens per watt—the efficacy measure unique to lighting products.

Some of the standards regulations also include design standards necessitating the incorporation of certain features into the product. Design standards have no physical units and no associated testing requirement.[36] The manufacturer submits an annual compliance report to DOE.[37] Nonetheless, design standards can decrease energy consumption. An example of a design feature is that gas-burning clothes dryers cannot have continuously-burning pilot lights.[38]

The Quantitative Level of a Standard

The choice of standard—what is the quantitative level—is the outcome of a detailed process. DOE elaborates a set of possible standards of varying stringency based on the technologies. The first step is the screening analysis, in which "DOE uses information about commercially available technology options and prototype designs as input in identifying technologies used to attain higher energy efficiency levels (EL)."[39] In addition to technological feasibility, DOE also

[31] 10 C.F.R. §429.11(a).

[32] 76 *Federal Register* 12430c (March 7, 2011).

[33] Gas companies will sometimes bill in units known as "therms" which are 100,000 Btus each.

[34] 10 C.F.R. 430.32(f).

[35] 10 C.F.R. 430.32(e)(2)(iii).

[36] 10 C.F.R. 429.13.

[37] 76 *Federal Register* 12424 (March 7, 2011).

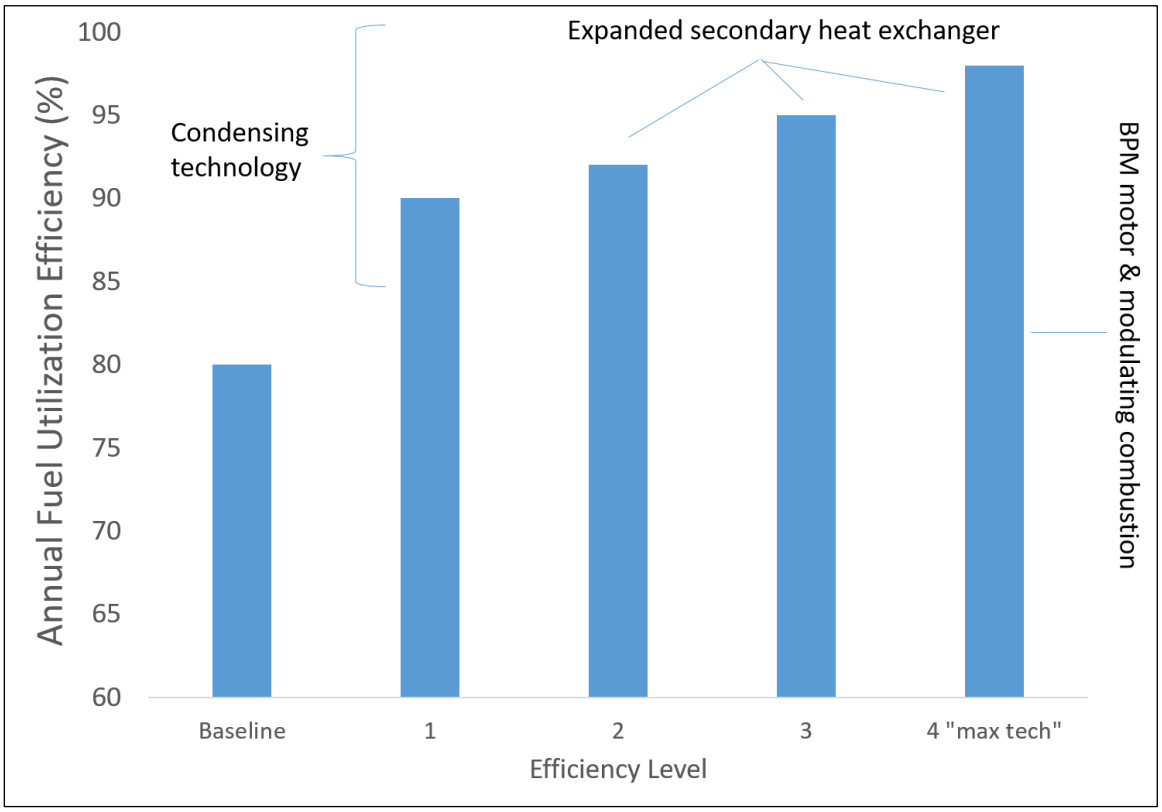
[38] 10 C.F.R. §430.32(h)(1).

[39] John Cymbalski, U.S. Department of Energy, "Appliance and Equipment Standards Program: Analysis and

considers the technological options for their (1) practicability to manufacture, install, and service; (2) impacts on product utility or product availability; and (3) adverse impacts on health or safety.[40] In the engineering analysis, DOE has used an efficiency-analysis approach to elaborate a set of ELs at discrete values of energy consumption or energy efficiency. The highest-performing level identified in the engineering analysis is sometimes known as "max tech." The determination of "max tech" is the result of an analysis required by statue to determine the "maximum improvement in energy efficiency or maximum reduction in energy use that is technologically feasible." 42 U.S.C. §6295(p)(1)). **Figure 3** illustrates the ELs proposed for non-weatherized (i.e., residential) gas furnaces in 2016 and the incremental technology associated with each.

Figure 3. Efficiency Levels Considered for Non-Weatherized Gas Furnaces

September 23, 2016, supplemental proposed rule



Source: Efficiency levels from 81 *Federal Register* 65760 (September 23, 2016).

Notes: BPM = brushless permanent magnet.

The ELs are one of the pieces with which DOE assembles the various trial standard levels (TSLs). TSLs are more fully specified than the ELs because, like the standards regulations themselves, ELs take into account the different appliance sizes, features, and types of fuel consumed. Once elaborated, the TSLs are candidates for the energy conservation standard DOE ultimately promulgates. The rulemaking process solicits public comment on the appropriateness of the various TSLs DOE creates. **Table 2** lists the TSLs for the rulemaking depicted in **Figure 3**

Methodology Discussion," presentation to the National Academy of Sciences, Engineering and Medicine's Committee on Review of Methods for Setting Buildings and Equipment Performance Standards, November 19, 2019.

[40] The list is not exhaustive. See 81 *Federal Register* 65737 (September 23, 2016).

and the associated ELs. Note that some TSLs include two standards, and some of these apply to different sizes of furnaces measured in Btu/hr.

Table 2. Trial Standard Levels (TSLs) for Non-Weatherized Gas Furnaces

A given TSL may have more separate standards for furnaces of different heating capacities (listed in parentheses)

TSL	Standard	Efficiency Level
9	98%	EL 4
8	95% (>55 kBtu/hr) 80% (≤55 kBtu/hr)	EL 3 Baseline
7	95%	EL 3
6	92% (>55kBtu/hr) 80% (≤55 kBtu/hr)	EL 2 Baseline
5	92%	EL 2
4	92% (>60 kBtu/hr) 80% (≤60 kBtu/hr)	EL 2 Baseline
3	95% (North) 80% (Rest of Country)	EL 3 Baseline
2	92% (>70 kBtu/hr) 80% (≤70 kBtu/hr)	EL 2 Baseline
1	92% (>80 kBtu/hr) 80% (≤80 kBtu/hr)	EL 2 Baseline

Source: 81 *Federal Register* 65812 (September 23, 2016).

Notes: kBtu/hr = thousand Btus per hour, a measure of heating capacity. North = Alaska, Colorado, Connecticut, Idaho, Illinois, Indiana, Iowa, Kansas, Maine, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Utah, Vermont, Washington, West Virginia, Wisconsin and Wyoming. See U.S. Department of Energy, *Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Residential Furnaces*, August 30, 2016, p. 9-3, at https://www.regulations.gov/document/EERE-2014-BT-STD-0031-0217.

The manner in which DOE selects from among the various TSLs is known as a "walk-down" approach. To evaluate at which TSL to set the standard, DOE first conducts a series of analyses of the impacts with three principal metrics: (1) the energy savings; (2) the benefits to consumers (savings in fuel costs over the appliance lifetime, net of incremental product cost); and (3) the change in manufacturer cash flow.[41] DOE conducts these analyses at each TSL. The walk-down process begins with a review of these results at the highest TSL or "max tech." (For the example in **Table 2**, this is TSL 9.) If the Secretary finds that "the benefits to the nation of the standards [defined by the given TSL] ... outweigh the burdens"[42] then the max tech TSL is adopted as the energy conservation standard. If the Secretary does not make such a finding, the process "walks down" to the next most stringent TSL (e.g., TSL 8 in the example of **Table 2**), and the process repeats until the TSL then-under consideration meets the criteria. DOE considers other metrics and analyses as well, including, for example, the emissions or pollutants associated with generating electricity.

[41] DOE applies discounting to both the consumer savings and the manufacturer cash flow impacts.

[42] This language occurs in numerous rulemakings. See for example 81 *Federal Register* 1033 (January 8, 2016).

Relationship Between Standards and Energy Consumption

Energy efficiency in general and the standards for minimum energy efficiency in particular can alter consumer purchasing behaviors. These changes in behaviors mean that the relationship between a more stringent energy efficiency standard and a decrease in total energy consumption is not always direct. DOE has analyzed the situation in which a change in standards may lead to the suboptimal use of less efficient technology; a user may continue to use and repair a less efficient technology rather than pay the up-front cost of the appliance that complies with the new energy conservation standard.[43] DOE estimated this effect in the case of furnaces and found the repair-versus-replace effect would occur in an additional 1% to 4% of households subject to the standards.[44]

Likewise, there is a phenomenon known as the rebound effect in which better performing appliances can erode expected energy savings. An appliance that is more energy efficient will consume less fuel and hence have lower operating costs for the same level of energy service provided (i.e., space conditioning [room temperature], hygienic services [hot water], etc.), potentially leading to increased use. In its simplest form, the rebound effect can occur if the lower operating cost induces higher demand for the energy service. DOE considers the rebound effect in the case of furnaces, for example.[45]

Technological progress itself can improve the customer-facing attributes of an appliance and lead to greater use of the energy service the appliance provides. So, for example, improved, thinner insulation can increase the interior volume of the refrigerator and make it possible to provide refrigeration for a greater amount of food. To the extent that this greater volume increases the cooling requirements (i.e., Btu/hr), energy consumption may increase.[46]

Title III EPCA Requirements

Requirement That Standards Be "Economically Justified"

The Secretary of Energy may not prescribe a new or amended standard if doing so "will not result in significant conservation of energy, or ... is not technologically feasible or economically justified."[47] EPCA requires the Secretary to determine whether a proposed standard is "economically justified" based on seven so-called statutory factors described in detail in the section, "Statutory Factors."[48] A rough idea of what constitutes "economically justified" follows from EPCA itself, which specifies that if the additional cost of the standards-compliant product is less than three times the value of the energy savings in the first year, then the standard is

[43] 84 *Federal Register* 3924 (February 13, 2019).

[44] U.S. Department of Energy, "Furnaces," presentation to the National Academy of Sciences, Engineering and Medicine's Committee on Review of Methods for Setting Buildings and Equipment Performance Standards, Washington, DC, November 19, 2019.

[45] See Chapter 8 of U.S. Department of Energy, *Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Residential Furnaces*, Washington, DC, August 30, 2016, at https://www.regulations.gov/document/EERE-2014-BT-STD-0031-0217.

[46] See Daniel Martinez, Ben W. Ebenhack, and Travis Wagner, *Energy Efficiency: Concepts and Calculations* (Elsevier Science, 2019), p. 253.

[47] 42 U.S.C. §6295(o)(3)(B) for consumer products and §6316(a)—the crosswalk provision conveying these to commercial and industrial equipment.

[48] 42 U.S.C. §§6295(o)(2)(B)(i) and 6316(a).

presumed to be economically justified.[49] DOE, however, has favored conducting additional analyses to consider the "full range of impacts to the consumer, manufacturer, Nation, and environment" and believes these have "serve[d] as the basis for DOE to definitively evaluate the economic justification for a potential standard level."[50]

Further, EPCA includes an anti-backsliding provision by which a new or amended standard may not increase the maximum allowable energy use or decrease the minimum required energy efficiency of a covered product[51] or covered equipment.[52]

ASHRAE Equipment

The subset of commercial and industrial equipment known as "ASHRAE equipment" includes "generally, commercial water heaters, commercial packaged boilers, commercial air conditioning and heating equipment, and packaged terminal air conditioners and heat pumps."[53] EPCA requires that DOE adopt standards that, generally speaking, are "at the minimum level specified" in any amendment to ANSI/ASHRAE/IESNA Standard 90.1 (henceforth ''ASHRAE Standard 90.1'').[54]

When these groups amend ASHRAE 90.1—an event known as the "ASHRAE trigger"—DOE must publish an analysis of the energy savings potential of amended energy efficiency standards within 180 days.[55] Thereafter DOE has 18 months to amend its own standard(s) to match the amended ASHRAE 90.1.[56] An exception occurs if DOE finds "clear and convincing evidence" that a more stringent standard than that in ASHRAE 90.1 would result in "significant additional conservation of energy" yet still be "technologically feasible" and "economically justified."[57] In such instances, DOE has 30 months to amend the standard. EPCA requires DOE apply similar considerations in determining "economically justified" as for other standard-setting rulemakings,[58] described further in the section "Statutory Factors."

Recent changes and reverted changes to the way DOE treats ASHRAE equipment are discussed further, below, in "The Process Rule."

Product Availability and the "Features Provision"

Congress included in EPCA the stipulation that an energy conservation standard not reduce consumer choice, sometimes known as the "features provision." This applies to "performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as those generally available in the United States."[59] In the past such features have

[49] 42 U.S.C. §6295(o)(2)(B)(iii). See also U.S. Department of Energy, *Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Residential Furnaces*, August 30, 2016, p. 12, at https://www.regulations.gov/document/EERE-2014-BT-STD-0031-0217.

[50] 81 *Federal Register* 65817c (September 23, 2016).

[51] 42 U.S.C. §6295(o)(1).

[52] 42 U.S.C. §6313(a)(6)(B)(iii)

[53] 85 *Federal Register* 8708a (February 14, 2020).

[54] The title of the ASHRAE standard is "Energy Standard for Buildings Except Low-Rise Residential Buildings."

[55] 42 U.S.C. §6313(a)(6)(A)(i).

[56] 42 U.S.C. §6313(a)(6)(A)(ii)(I).

[57] 42 U.S.C. §6313(a)(6)(A)(ii)(II)

[58] 42 U.S.C. §6313(a)(6)(B)(ii).

[59] See 42 U.S.C. §6295(o)(4); 42 U.S.C. §6313(a)(6)(B)(iii)(II)(aa); and as applicable in certain cases through 42 U.S.C. §6316(a)). Although EPCA 42 U.S.C. §6295(o)(4) applies to consumer products, it also applies to non-

included such items as oven door windows. These were judged to provide utility to consumers by allowing them to monitor what was cooking.[60] DOE preserved this feature even though doing so resulted in a product that raised total energy consumption relative to one without. Another example occurred in 2020 when DOE created another class of dishwashers, "Standard size dishwashers with a 'normal cycle,'"[61] reasoning that units with "a short 'Normal' cycle have a performance-related feature that other dishwashers currently on the market lack."[62] The text box below narrates a further example of an interpretive rule that invoked the statutory provision on features.

Application of the Features Provision of EPCA

An example of the application of the features provision of EPCA was the splitting of efficiency standards for furnaces into two tracks: those having condensing technology[63] versus those with non-condensing technology. In 2015[64] and again in 2016[65] DOE proposed one standard applicable to both. In January 2021,[66] DOE determined that non-condensing technology (and associated venting) comprise a feature under 42 U.S.C. §6295(o)(4) and in a separate notice[67] withdrew the proposed rules from 2015 and 2016.

Underlying this determination were some technical issues. DOE noted that access to venting infrastructure in a building was not always assured.[68] DOE reasoned that, for those consumers with a demonstrated preference for natural gas furnaces,[69] lack of venting infrastructure could be an issue.

In 2019 DOE stated in a proposed interpretive rule that the "totality of such concerns may raise non-condensing appliances (and their associated venting) sufficiently in the consciousness of the consumer as to be deemed a 'feature' under EPCA."[70] In the final interpretive rule, issued in 2021, DOE concluded that "use of non-condensing technology (and associated venting) constitute a performance-related 'feature' under EPCA that cannot be eliminated through adoption of an energy conservation standard."[71] In the same final rule DOE formally withdrew the March 12, 2015 proposal and the September 23, 2016 supplemental proposal covering residential ("non-weatherized") gas furnaces.[72] It also withdrew a May 31, 2016, proposal for commercial water heating equipment.[73]

Based on a rethinking of what qualifies as a feature, DOE proposed an interpretive rule in August 2021 that would eliminate the separate tracks (effectively reinstating the 2015/2016 proposals).[74] In doing so, DOE stated that "the

ASHRAE commercial equipment because of the crosswalk provision of §6316(a). See discussion at 85 *Federal Register* 60091b (September 24, 2020). While EPCA has a "features" provision for standards for ASHRAE equipment, it only applies in the instance that DOE is adopting a more stringent standard than that issued by ASHRAE. See discussion at 85 *Federal Register* 60091c (September 24, 2020).

[60] 63 *Federal Register* 48041 (September 8, 1998).

[61] 10 C.F.R. §430.32(f)(iii).

[62] 85 *Federal Register* 68726c (October 30, 2020).

[63] Condensing technology captures additional heat from the exhaust gases. The technology utilizes the latent heat of condensation of water for home heating, rather than simply exhausting the unclaimed latent heat with the water vapor.

[64] 80 *Federal Register* 13120 (March 21, 2015).

[65] 81 *Federal Register* 65720 (September 23, 2016).

[66] 86 *Federal Register* 4776 (January 15, 2021).

[67] 86 *Federal Register* 3873 (January 15, 2021).

[68] 85 *Federal Register* 60093 (September 24, 2020).

[69] DOE noted at 86 *Federal Register* 4782c (January 15, 2021) as follows: "Many consumers who are currently gas customers may show a preference for that fuel type and would be negatively impacted by a standard that requires the purchase of a condensing unit to the extent they feel compelled to change to a different fuel type."

[70] 84 *Federal Register* 33017a (July 11, 2021).

[71] 86 *Federal Register* 4776 (January 15, 2021).

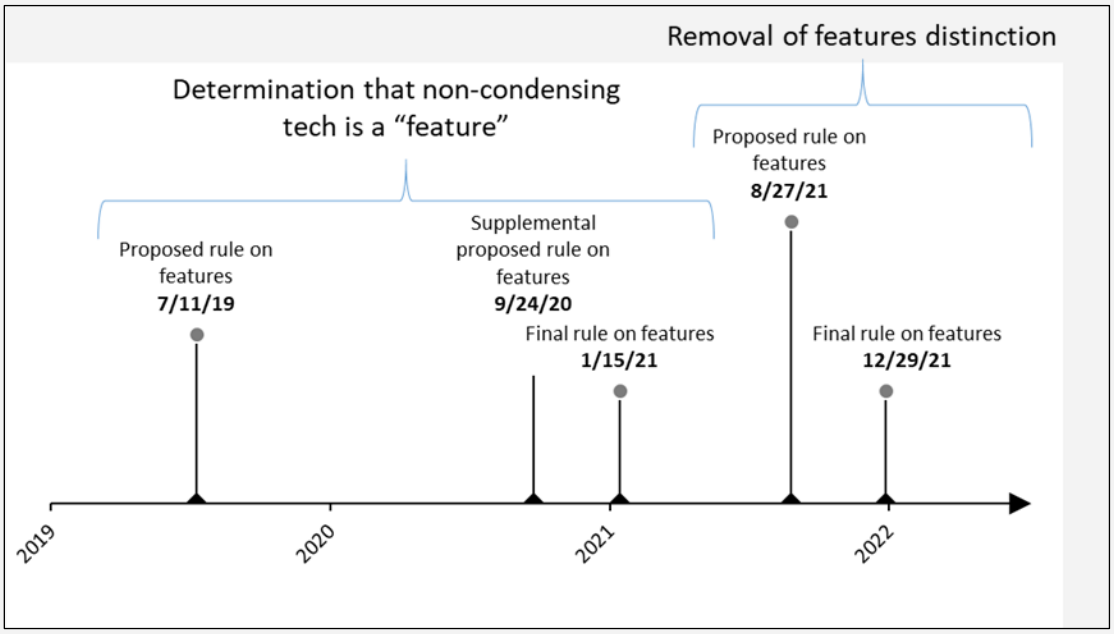
[72] The rule had also included mobile home gas furnaces.

[73] 81 *Federal Register* 34440 (May 31, 2016).

[74] 86 *Federal Register* 48049 (August 27, 2021).

technology used to supply heated air or hot water is not a performance-related 'feature' that provides a distinct consumer utility under EPCA."[75] DOE noted that it had not yet implemented the January 2016 final interpretive rule "in the context of any individual energy conservation standards rulemaking."[76] DOE issued the final rule to make this change on December 29, 2021.[77]

Figure 4. Timeline for Furnace Rulemakings



Source: CRS from Federal Register notices.

Periodic Review ("Lookback")

With the Energy Independence and Security Act of 2007 (P.L. 110-140), Congress required DOE to conduct an every-six-year review of efficiency standards of covered products (42 U.S.C. §6295(m)(1)) and covered equipment (42 U.S.C. §6313(a)(6)(C)).[78] DOE is then required to either publish a determination that a standard does not need amending or issue a notice of proposed rulemaking (NOPR) for a new standard.

In March 2019 the House Energy and Commerce Committee, Subcommittee on Energy, held a hearing after DOE had missed the deadlines for completion of 16 such reviews.[79] Four of the rulemakings accomplishing such reviews had been signed and dated in 2016 but not yet

[75] 86 *Federal Register* 48049c (August 27, 2021).

[76] 86 *Federal Register* 48052c (August 27, 2021).

[77] 86 *Federal Register* 73947 (December 29, 2021).

[78] For certain ASHRAE equipment this became the case with the enactment of AEMTCA in 2012.

[79] U.S. Congress, House Committee on Energy and Commerce, Subcommittee on Energy, Memorandum on Hearing, "Wasted Energy: DOE's Inaction on Efficiency Standards & Its Impact on Consumers and the Climate," 116th Cong., 1st sess., March 4, 2019.

published.[80] A federal court ordered DOE to issue those rulemakings,[81] which DOE then promulgated in January 2020.[82]

Industry has commented on the six-year review requirement. At the March 2019 hearing, both the Association of Home Appliance Manufacturers (AHAM) and the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) expressed their view that six years is too often given the time needed for manufacturers to comply. AHAM further noted that successive revisions can lead to small energy savings relative to the additional costs imposed on the manufacturer. AHRI cited estimates from DOE's 2016 rulemaking on commercial boilers in which DOE estimated a 0.8% savings (0.39 quads) over the 30-year analysis period at a cost to industry of $13.1 million to $23.8 million.[83] DOE further estimated conversion costs for industry to be $27.5 million while the change in consumer net present value (i.e., the cost savings) was to be $0.414 billion (at a 7% discount rate) to $1.687 billion (at a 3% discount rate).[84]

Standards Development Process

Rulemaking

Standards, test procedures, and coverage determinations are set utilizing rulemaking processes defined by administrative statutes and other requirements.[85] EPCA has additional procedural requirements, and for energy conservation standards, rulemakings generally have taken about three years to complete the four phases: framework, preliminary analysis, notice of proposed rulemaking (NOPR), and issuance of a final rule. The test procedures used to certify compliance with and enforce the standards are also set by rulemaking.[86] **Figure 5** provides a notional illustration of the process that applies to products and to equipment other than ASHRAE equipment.

[80] These four rulemakings included the following products and equipment: portable air conditioners, uninterruptible power supplies, air compressors, and commercial packaged boilers. Their status is explained at 85 *Federal Register* 1378.

[81] Pursuant to an order from the U.S. District Court for the Northern District of California in the consolidated cases of *Natural Resources Defense Council, et al. v. Perry* and *People of the State of California et al. v. Perry*, Case No. 17-cv-03404-VC, as affirmed by the U.S. Court of Appeals for the Ninth Circuit in the consolidated cases Nos. 18-15380 and 18-15475.

[82] 85 *Federal Register* 1378 (January 10, 2020).

[83] 81 *Federal Register* 15839 (March 24, 2016).

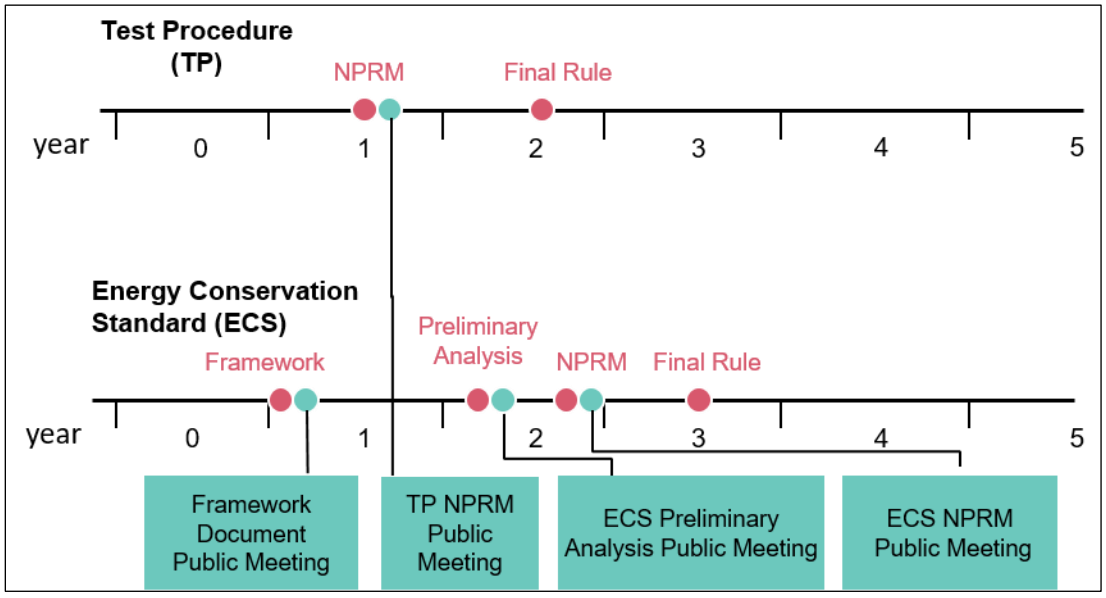
[84] Ibid.

[85] See CRS In Focus IF10003, *An Overview of Federal Regulations and the Rulemaking Process*, by Maeve P. Carey, and CRS Report RL32240, *The Federal Rulemaking Process: An Overview*, coordinated by Maeve P. Carey.

[86] DOE had set a mandatory 180-day waiting period, to be observed after the publication of a revised test method, before a new or revised standard may be proposed (i.e., before a NOPR may be issued). 85 *Federal Register* 8626. In December 2021 DOE issued a final rule that removed the mandatory waiting period. 86 *Federal Register* 18901.

Figure 5. Rulemaking Process for Energy Conservation Standards and Associated Test Procedure

Applies to products and to equipment other than ASHRAE equipment
(sample timeline—actual timeline may vary; see notes for statutory requirements on timeframes)



Source: adapted from Daniel Cohen, U.S. Department of Energy, "The U.S. Appliance Standards Program," at https://www.americanbar.org/content/dam/aba/administrative/administrative_law/appliance_standards_program_deck.authcheckdam.pdf.

Notes: TP = test procedure rulemaking; ECS = energy conservation standard rulemaking; NPRM = notice of proposed rulemaking (same as NOPR). For an ECS rulemaking, EPCA requires at least a 60-day comment period on proposed rules and at least a 90-day period between publication of proposed rule and final rule. 42 U.S.C. §§6295(p) and 6316(a). The differing requirements for ASHRAE equipment is discussed in the section "ASHRAE Equipment."

For some products, Congress established a quantitative energy conservation standard; DOE codified the standards as given in EPCA without conducting its own rulemaking.[87] DOE itself may designate a previously unregulated type of product or equipment as a covered category as well.[88] In other instances, Congress has specified the product category as "covered" but directed DOE to develop the energy conservation standards.

DOE makes documents available and seeks comments through all phases of the rulemaking process until issuance of a final rule. For the framework, preliminary analysis, and NOPR phases, DOE solicits public comment and often holds public meetings that may allow for remote participation. In the framework phase, DOE announces the availability of a framework document in the *Federal Register* and presents the approach and legal authority for the process in a public meeting.[89] The preliminary analysis phase incorporates available information and presents initial determinations to inform the proposed rule. The framework phase and preliminary analysis phase

[87] See, for example, 74 *Federal Register* 12058 (March 23, 2009), with DOE citing "good cause" under the Administrative Procedure Act to issue the final rule without first issuing a proposed rule.

[88] For products, this authority may be found at 42 U.S.C. §6292(b) and for equipment at 42 U.S.C. §6312.

[89] See, for example, 73 *Federal Register* 32243 (June 6, 2008).

are not required by statute. (These various stages are again illustrated in **Figure 5**.) Once DOE issues a final rule, the rule typically sets a compliance date within three to five years.

Statutory Factors

As noted in "Requirement That Standards Be "Economically Justified",'" DOE must first show any new or amended standard to be economically justified. EPCA sets forth seven statutory factors[90] the Secretary must apply to "determine whether the benefits of the standard exceed its burdens"[91] for covered products. The factors cover economic impacts; savings in operating costs versus up-front and maintenance costs; energy savings; competition; utility and performance of the product; and the need for national energy conservation. An additional factor is "other factors the Secretary considers relevant." EPCA does not require these seven factors be analyzed of the commercial and industrial equipment in the national standards program, but DOE does so.[92]

DOE has conducted rulemakings on the process it uses to apply these factors—in effect, it has issued a rulemaking on how it does rulemakings. (These are discussed further below in the section "The Process Rule.") One such rulemaking describes how DOE evaluates the TSLs against the seven statutory factors. The rulemaking addressed whether TSLs would be evaluated comparatively or in a "walk-down" process that considers them seriatim compared to a no-new-standards baseline. See further discussion in the section, "The Process Rule."

Executive Orders

The process of regulatory development is also subject to presidential executive order. E.O. 12866, *Regulatory Planning and Review*, requires that certain proposed and final regulations be accompanied by specific analyses and further, for regulations deemed "significant,"[93] that the Office of Management and Budget review them prior to publication.[94] The E.O. requires that an agency "identify the problem that it intends to address (including, where applicable, the failures of private markets or public institutions that warrant new agency action)."[95] Later executive orders have made changes, perhaps most significantly E.O. 13422, *Further Amendment to Executive Order 12866 on Regulatory Planning and Review*. This latter E.O. again reiterated the need for agencies to identify the market failure or problem the draft regulation is attempting to solve.

The Process Rule

DOE maintains a set of procedures known collectively as the Process Rule[96] for setting efficiency standards and test methods for consumer products. When originally published in 1996, the purpose of the Process Rule was to provide "enhanced opportunities for public input, improved

[90] 42 U.S.C. §6295(o)(2)(B)(i).

[91] 42 U.S.C. §6295(o)(2)(B)(i).

[92] 84 *Federal Register* 3913 (February 13, 2019).

[93] There are several criteria including whether the economic impact is anticipated to exceed $100 million.

[94] The process is discussed in greater detail in CRS Report RL32397, *Federal Rulemaking: The Role of the Office of Information and Regulatory Affairs,* coordinated by Maeve P. Carey.

[95] Section 1(b)(1) of Executive Order 12866, ''Regulatory Planning and Review.''

[96] 10 C.F.R. §430, Subpart C, Appendix A.

analytical approaches, and encouragement of consensus-based standards."[97] DOE follows the Process Rule for much of its work on the standards regulations, in addition to following other procedural requirements established in law and executive order. For example, the Process Rule addresses the statutory criteria provided in 42 U.S.C. §6295(o).[98]

DOE revised a number of provisions of the Process Rule in a February 2020 final rule[99] and an August 2020 final rule[100] in order to "update and modernize"[101] by changing its scope and applicability to cover not only consumer products but also commercial and industrial equipment;[102] clarifying its treatment of test procedures; defining a threshold for what comprises significant energy savings; and for other purposes. DOE reverted a number of these provisions in a December 2021 final rule[103] and modified the scope and applicability so as not to mandate DOE follow the Process Rule in all cases, but may depart from it "to account for the specific circumstances of a particular rulemaking."[104]

Two particular provisions in the revised Process Rule could have had an impact on the quantity of energy conserved. The first of these set a minimum threshold of energy conservation for a potential new or amended standard; to be promulgated, a new or amended standard must have resulted in site energy savings of 0.3 quads, or a 10% reduction in site energy, accrued by units sold over, typically, a 30-year analysis period.[105] DOE removed this provision in the December 2021 final rule, reasoning that the 0.3 quads threshold ignored the question of when the energy savings had occurred. For example, DOE continued, lower energy use during periods of peak demand—important for appliances such as air conditioners—"helps reduce stress on energy infrastructure."[106] The December 2021 final rule also noted that, by focusing on site energy—the physical point at which the energy conservation standards themselves apply—the 2020 revision had neglected the energy used in generating electricity and in extracting, processing, and transporting primary energy sources such as natural gas either to the power plant or to the site.

In the second area affecting the quantitative aspects of energy conservation standards, the December 2021 final rule restored a provision of the Process Rule on the method of choosing among possible quantitative levels for the energy conservation standards (i.e., the TSLs). Known as the walk-down approach (discussed earlier in the section "The Quantitative Level of a

[97] 61 *Federal Register* 36974 (July 15, 1996).

[98] John Cymbalski, U.S. Department of Energy, "Appliance and Equipment Standards Program: Analysis and Methodology Discussion," presentation to the National Academy of Sciences, Engineering and Medicine's Committee on Review of Methods for Setting Buildings and Equipment Performance Standards, November 19, 2019.

[99] 85 *Federal Register* 8626 (February 14, 2020).

[100] 85 *Federal Register* 50937 (August 19, 2020).

[101] 84 *Federal Register* 3911a (February 13, 2019).

[102] The February 2020 final rule modified 10 C.F.R. Part 431—the standards and test methods for commercial and industrial equipment—so that the Process Rule "shall apply to the consideration of new or revised energy conservation standards and test procedures considered for adoption under this part." 85 *Federal Register* 8711 (February 14, 2020).

[103] 86 *Federal Register* 70892. This followed a proposed rule on April 12, 2021, 86 *Federal Register* 18901.

[104] 86 *Federal Register* 70920 and Section 3(a) of Appendix A to Subpart C of Part 430—Procedures, Interpretations, and Policies for Consideration of New or Revised Energy Conservation Standards and Test Procedures for Consumer Products and Certain Commercial/ Industrial Equipment.

[105] In the case of furnaces for example DOE utilized a vintage stock model that considered units sold in 30 years but might be utilized beyond: "National cumulative energy savings (NES_{cum}) are the sum of the annual NES over the lifetime of products shipped in the analysis period." See U.S. Department of Energy, "Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Residential Furnaces," August 30, 2016, p. 10-18, at https://www.regulations.gov/document/EERE-2014-BT-STD-0031-0217.

[106] 86 *Federal Register* 70892 (December 13, 2021).

Standard"), it had been replaced in an August 2020 final rule.[107] Then, DOE had changed its approach to "include a comparison of the benefits and burdens of that TSL against the benefits and burdens of the baseline case ('no new standards' case) and across all other TSLs."[108] In that earlier final rule, DOE had reasoned that the process could otherwise result in selection of a TSL "no matter how minute an estimated cost savings," a reference to the way DOE might otherwise interpret "economic justification" during a rulemaking.[109] In other words, the TSL chosen might provide marginally better energy savings than a less-stringent TSL but at much higher cost. In the December 2021 final rule, DOE reverted to the walk-down approach, explaining that the other approach might have resulted in a standard that "maximizes net benefits" rather than "maximizes energy savings and is technologically feasible and economically justified."[110]

Other provisions affected by the 2020 revisions still stand. DOE has issued a NOPR to revert some of these as well;[111] the final rule is pending as of this writing. For example, the 2020 revisions to the Process Rule addressed the standards that apply to ASHRAE equipment. DOE had added to the Process Rule regarding how and to what extent it must adopt any amendments to ASHRAE 90.1, including what finding it must make before setting a more stringent standard.[112] (These and other EPCA requirements are discussed earlier in the section "ASHRAE Equipment.") DOE asserted, in the 2020 revisions, that there must be "no substantial doubt that a standard more stringent ... would result in a significant additional amount of energy savings [etc.]"[113] and further that it would opt to set a more stringent standard only in "very limited circumstances."[114] DOE further explained that there would be no opportunity for it to revise such standards without the ASHRAE trigger first having occurred. This meant DOE could not amend standards for ASHRAE equipment at a time of its own choosing.

In July 2021,[115] DOE published a NOPR that would, if finalized, revert these changes regarding standards for ASHRAE equipment. DOE explained that the criteria in setting more stringent standards, both in EPCA—the "clear and convincing evidence" standard—and in case law, were sufficiently clear and that the February 2020 final rule had introduced language that was not needed.[116] The July 2021 NOPR also proposed to restore DOE's discretion to amend standards for ASHRAE equipment, not only as a result of the ASHRAE trigger having occurred, but also as a result of DOE's own periodic reviews.[117] Nonetheless, the meaning of "clear and convincing evidence" is part of ongoing litigation.[118] The litigation also touches upon whether DOE could amend a standard for ASHRAE equipment absent the ASHRAE trigger.[119]

Additional revisions to the Process Rule are discussed below in the section "Test Procedures."

[107] 85 *Federal Register* 50937 (August 19, 2020).

[108] *Ibid.*

[109] 85 *Federal Register* 50939 (August 19, 2020).

[110] 86 *Federal Register* 70907a (December 13, 2021).

[111] 86 *Federal Register* 35668 (July 7, 2021).

[112] 42 U.S.C. §6313(a)(6)(A)(ii)(II).

[113] 84 *Federal Register* 3914c and 3915b (February 13, 2019).

[114] 85 *Federal Register* 8635 (February 14, 2020).

[115] 86 *Federal Register* 35668 (July 7, 2021).

[116] 86 *Federal Register* 35676b (July 7, 2021).

[117] 86 *Federal Register* 35675 (July 7, 2021).

[118] See *American Public Gas Association v. DOE*, No. 20-1068 (D.C. Cir.).

[119] Niina Farah, "D.C. Circuit Leans Toward DOE Redo of Major Efficiency Rule," *EE News*, September 10, 2021.

Alternatives to Rulemaking Process

DOE can use variations to the above rulemaking process in certain circumstances. DOE may start the process at the preliminary analysis phase or at the NOPR phase (see **Figure 5**) if it has the necessary data and information to conduct its analysis.

In about 10% of its standards-making activities since 2008, DOE published a direct final rule that established energy conservation standards.[120] The direct final rules were based on documents submitted jointly by stakeholders that "are fairly representative of relevant points of view."[121] An example is the direct final rule issued on residential furnaces in June 2011.[122]

In a further 23% of standards rulemakings since 2008, DOE has applied a technique known as negotiated rulemaking,[123] facilitated by DOE's Appliance Standards and Rulemaking Federal Advisory Committee (ASRAC) using authority granted under the Alternative Dispute Resolution Act (ADRA, P.L. 104-320, 5 U.S.C. §561-570).[124] In 2015, for example, a working group recommended energy conservation standards and test procedures for fans and blowers; this supported DOE's later determination that fans and blowers were to be covered equipment.[125]

Certification, Compliance, and Enforcement

The covered products and equipment cannot enter commerce (e.g., be sold or imported) without first being certified as being in compliance with the standards regulations. DOE requires manufacturers or a third-party labeler to submit a certification report of energy performance; such reports are required when the basic model is first sold and annually thereafter. In addition, DOE conducts selected testing through third-party laboratories to verify energy efficiency performance. The basic models, which are the subject of the tests, can be "a group of models that differ in non-energy-related characteristics like color."[126] For residential water heaters there are roughly 200 basic models but nearly 4,000 individual models.[127]

DOE also engages in enforcement activities and can initiate enforcement testing either under its own initiative or when it receives written information alleging a violation.[128] Such cases focus on manufacturers that distribute products in the United States that, according to DOE, do not meet required energy standards. Compliance certification cases focus on manufacturers that either have submitted invalid compliance certifications or have not certified that the products have been tested and meet the applicable efficiency standards. DOE has applied the principle of enforcement

[120] Email communication from DOE Office of Congressional and Intergovernmental Affairs, December 15, 2021.

[121] 42 U.S.C. §6295(p)(4). In a direct final rule, DOE issues a final rule without prior notice and comment and solicits comment for a period of at least 110 days following the rule's publication in the *Federal Register*. The rule will then take effect *unless* at least one adverse comment is received by the agency within 120 days of publication in the *Federal Register*, in which case the agency withdraws the rule and restarts the proceedings under regular notice and comment procedures. If no adverse comments are received, the rule becomes effective.

[122] 76 *Federal Register* 37408 (January 27, 2011).

[123] Email communication from DOE Office of Congressional and Intergovernmental Affairs, December 15, 2021.

[124] See also CRS Report R46756, *Negotiated Rulemaking: In Brief*, by Maeve P. Carey.

[125] 86 *Federal Register* 46579 (August 31, 2021).

[126] Office of Energy Efficiency and Renewable Energy, "Implementation, Certification and Enforcement: Certification: Certification Reporting System (CCMS)," at https://www.energy.gov/eere/buildings/implementation-certification-and-enforcement.

[127] CRS analysis using data from DOE's Compliance Certification Management System.

[128] 76 *Federal Register* 12434. 42 U.S.C. §6299 (consumer products), §6316 (commercial equipment).

discretion as demonstrated by a recent enforcement policy statement. This policy allowed specific water heater units that do not comply with the applicable energy conservation standards to be sold. This policy was issued following a period in which the test procedures applicable to water heaters were changed by three rulemakings following a mandate in a 2012 law.[129] Stakeholders with unsold residential water heater inventory requested DOE use enforcement discretion to allow the continued sale of what were now non-compliant units.[130] DOE issued an enforcement policy statement to the effect that it would not seek civil penalties for certain products that failed to meet applicable energy conservation standards for the next year.[131] First issued in December 2016, the policy was renewed several times and expired on December 31, 2021.[132]

Other federal agencies have roles in energy efficiency and provide consumers with information on the performance of products—both those covered in EPCA and those that are not. The ENERGY STAR program affixes a label to products indicating they meet minimum energy performance requirements as a way of informing consumers on their purchases.[133] The Environmental Protection Agency ensures that the information that appears on ENERGY STAR labels is independently certified. The Federal Trade Commission uses its authority under Title III of EPCA[134] to require manufacturers to provide EnergyGuide labels[135] on energy use and operating costs of a number of covered products.[136]

Test Procedures

Congress specified test procedures for certain products[137] and equipment[138] and further authorized DOE itself to prescribe test procedures. DOE issues test procedures by rulemaking. For a number of covered products and equipment, DOE adopts procedures set by engineering societies, independent standards organizations, or industry groups in a process known as incorporation by reference (IBR). In this fashion numerous test procedures have become part of the regulations for energy conservation. DOE is required to review test procedures for covered products and

[129] The American Energy Manufacturing Technical Corrections Act (AEMTCA, P.L. 112-210).

[130] DOE, "Enforcement Policy Statement Regarding Testing, Compliance with the Applicable Energy Conservation Standards, and Certification for Certain Consumer Water Heaters," December 12, 2016, at https://www.energy.gov/sites/default/files/2016/12/f34/Enforcement%20Policy%20Statement%20-%20ConsumerWH_Definitions_12-12-16_1.pdf.

[131] DOE specifically "will not seek civil penalties for failure to certify properly or for the distribution in commerce by a manufacturer or private labeler of certain water heaters that are not in compliance with an applicable energy conservation standard" for water heaters meeting certain criteria. See https://www.regulations.doe.gov/ccms/templates/Enforcement_Policy_Statement_Certain_consumer_water_heaters.

[132] See DOE, "Past Water Heater Enforcement Policies," October 17, 2019, at https://www.energy.gov/gc/downloads/past-water-heater-enforcement-policies.

[133] ENERGY STAR® is administered jointly by the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE). For more information, see CRS In Focus IF10753, *ENERGY STAR Program*, by Corrie E. Clark.

[134] 42 U.S.C. §6294.

[135] Further information available at Federal Trade Commission, "How To Use the EnergyGuide Label to Shop for Home Appliances," at https://www.consumer.ftc.gov/articles/how-use-energyguide-label-shop-home-appliances#EnergyGuide.

[136] These products include boilers, ceiling fans, central air conditioners, clothes washers, dishwashers, freezers, furnaces, heat pumps, pool heaters, refrigerators, televisions, water heaters, and room and portable air conditioners.

[137] 42 U.S.C. §6293.

[138] 42 U.S.C. §6314.

equipment at least once every seven years.[139] EPCA has criteria that DOE must consider when adopting a test procedure but leaves it to DOE's discretion to determine if the criteria have been satisfied.[140] EPCA has required that DOE develop test procedures that, for example, are "in accord with"[141] or "conform to"[142] a specific test procedure named in the statute for the covered product or equipment in question.

In 2020, DOE added,[143] and then in a December 2021 final rule reverted,[144] a provision in the Process Rule on the use of IBR for test methods. In the February 2020 final rule, DOE explained that it would be requiring "adoption, without modification, of industry standards as test procedures for covered products and equipment unless such standards do not meet the EPCA statutory criteria for test procedures."[145] With the promulgation of the December 2021 final rule, DOE will retain the discretion to either adopt the test procedure "as is," modify the standard so that it complies with the statutory criteria, or reject it and develop a new test procedure.

Federal and State Authorities

Federal energy conservation standards, test procedures, and label requirements generally supersede state requirements. DOE is authorized to grant a waiver of federal preemption for "unusual and compelling State or local energy or water interests" (42 U.S.C. §6297). Legislation introduced in the 117th Congress (H.R. 1512 and H.R. 1326) would suspend this preemption—allowing states to set their own standards—for instances in which DOE has not updated a standard within eight years of its most recent promulgation.[146] (EPCA generally requires this update within six years.)

Impact of the Standards

For all covered products and equipment, EPCA directs that "the Secretary may not prescribe an amended or new standard" if it would "not result in significant conservation of energy" and is "not technologically feasible or economically justified."[147] (See the discussion in the section "ASHRAE Equipment" for discussion of how that type of equipment is treated.)

DOE estimates the net cumulative energy savings accrued by products purchased over the (typically) 30-year analysis period (i.e., the period starting with the year in which the standard becomes mandatory). The rulemakings calculate the projected energy use assuming the proposed standard and subtract the projected energy use in the counterfactual case of no new standard.

Among revised standards, 2009 to 2017, the savings shown in **Figure 6** have ranged from 14.8 quads for commercial package air conditioners and heat pumps—for which total net cost savings

[139] 42 U.S.C. §§6293(b)(1)(A) and 6314(a)(1)(A).

[140] EPCA requires that test procedures must not be "unduly burdensome" and must "measure energy efficiency, energy use, water use (in the case of showerheads, faucets, water closets and urinals), or estimated annual operating cost of a covered product during a representative average use cycle or period of use." 42 U.S.C. §6293(b).

[141] 42 U.S.C. §6293(b)(5).

[142] 42 U.S.C. §6293(b)(7)(B).

[143] 85 *Federal Register* 8626 (February 14, 2020).

[144] 86 *Federal Register* 70908b (December 13, 2021).

[145] 85 *Federal Register* 8678 (February 14, 2020).

[146] See §321 of H.R. 1512 and §6 of H.R. 1326 in the 117th Congress.

[147] 42 U.S.C. §§6295(o) and 6316(a)—the crosswalk provision.

to consumers were $15.2 billion (at a 7% discount rate) to $50 billion (at a 3% discount rate)[148]—down to 0.16 quads for residential boilers—for which total net cost savings to consumers were $0.35 billion (at 7%) to $1.20 billion (at 3%).[149] (Both these points are labeled in **Figure 6**.) One way in which DOE judges the impact on industry for a rulemaking is the effect on the industry net present value (INPV).[150] The rulemakings DOE concluded from 2009 to 2017 ranged from a slight, one- or two-percent improvement in INPV to an almost 30% decrease (see **Figure 6**),[151] but in all cases DOE had determined that the "the benefits to the nation of the standards ... outweigh the burdens."[152]

[148] See U.S. Department of Energy, *Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Small, Large, and Very Large Commercial Package Air Conditioning and Heating Equipment*, December 2015, p. 1-1.

[149] 81 *Federal Register* 2323 (January 15, 2016). Agencies are required to report the impact of regulations using the discount rates specified in OMB Circular A-4.

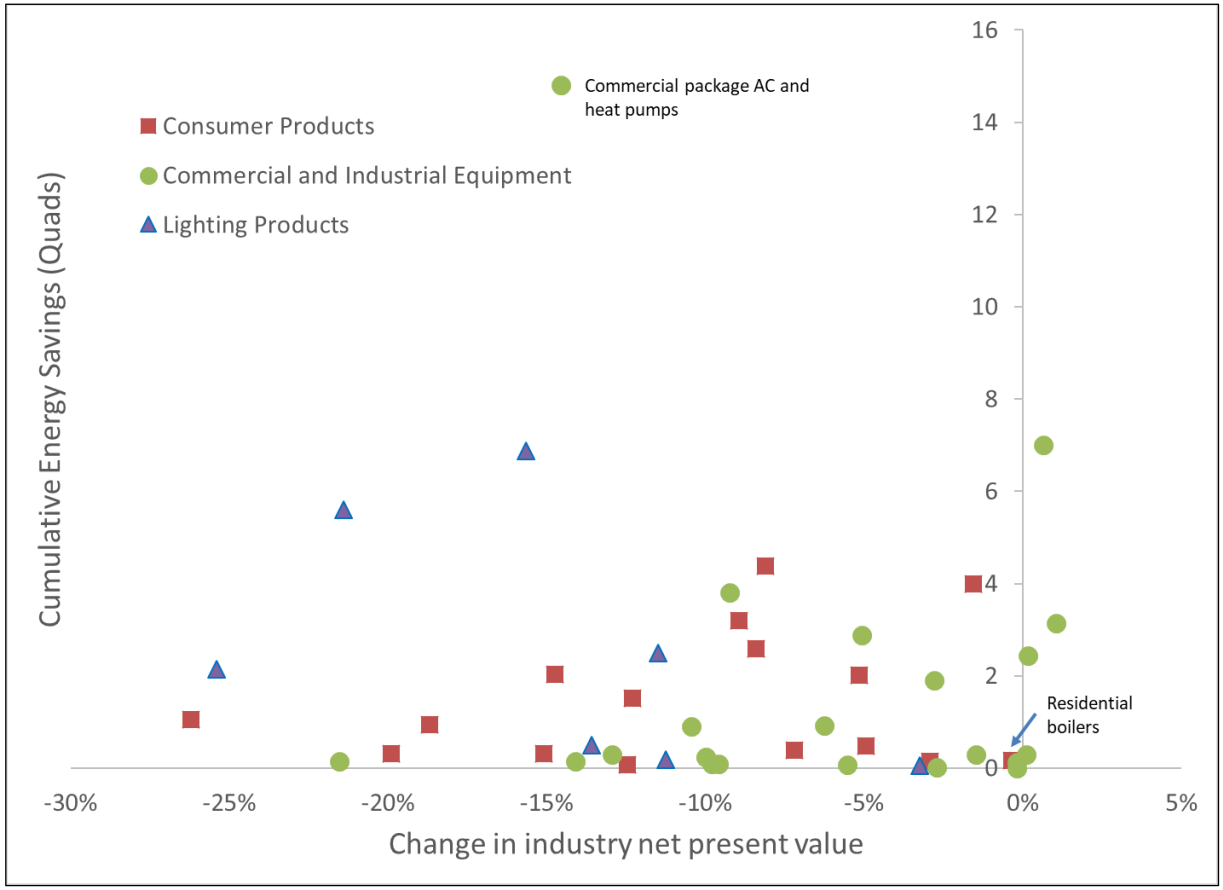
[150] INPV is the sum of the discounted cash flows to the industry from the base year through the end of the analysis period, typically the 30-year period beginning with the first year of compliance.

[151] Some stakeholders have drawn attention to DOE's own analyses that show a percentage of consumers will experience a net cost increase. See Testimony of Joseph M. McGuire, President and Chief Executive Officer, Association of Home Appliance Manufacturers, Before the Committee on Energy and Commerce, Subcommittee on Energy, U.S. House of Representatives Hearing, March 7, 2019.

[152] This language occurs in numerous rulemakings. See for example 81 *Federal Register* 1033 (January 18, 2016).

Figure 6. Effect of Appliance and Equipment Standards Rulemakings

2009-2017



Source: *Federal Register* notices for appliance and equipment standards rulemakings.

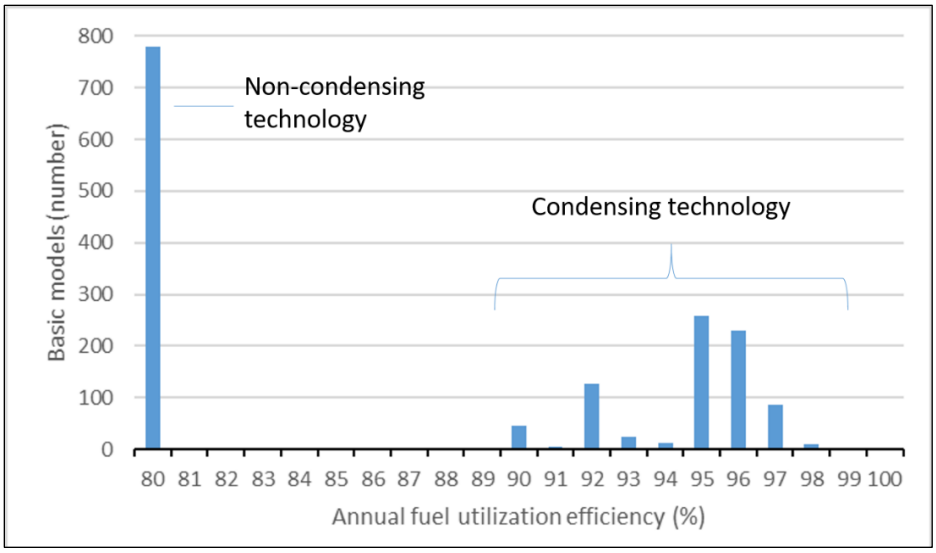
Notes: Each point represents one standards rulemaking and is plotted to indicate DOE's estimates of the change in industry net present value incurred by the rule and the energy savings accrued by products and equipment purchased over the 30-year analysis period. DOE made the calculations using the same models and methods but, as the analyses were performed for different years, the basis for the energy savings and costs may rely on different inputs and assumptions.

DOE has made calculations of the cumulative benefits of the entire national standards program. One estimate, cited earlier in the "Introduction" section, was that the standards completed through 2016 would save 71 quads of energy by 2020 and nearly 142 quads through 2030.[153] A subsequent DOE analysis refined this by considering only the energy that is used or converted directly by the appliance or equipment (i.e., the "site energy," reflecting the physical location where the standards themselves apply). This latter analysis estimated savings to be 55 quads attributable to standards published from 1989 to 2019.[154] The two analyses may not be directly comparable because of the latter's reliance on site energy[155] and its exclusion of any benefits that may derive from DOE's adoption and promulgation of ASHRAE Standard 90.1 (i.e., Standard 90.1 was taken as the baseline "no standards" case).

The impact of a standards regulation is often to remove from the market or require modification of those products or equipment that exceed the maximum allowable energy consumption or, alternatively, fall below a minimum energy performance level. The case of a standard for gas furnaces provides a clear example. As discussed earlier (see "Product Availability"), DOE proposed in 2016 to amend the standards for non-weatherized (i.e., residential) gas furnaces. Then, as now, the gas furnaces can be differentiated by technology according to whether they are condensing and non-condensing. **Figure 7** shows the number of models available at the time of the 2016 proposed rule.

Figure 7. Basic Models of Furnaces at Various AFUEs

Models shown were those analyzed at the time of the 2016 DOE Supplemental Proposed Rule



Source: Data from U.S. Department of Energy, *Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Residential Furnaces*, August 30, 2016, p. 3-19, at https://www.regulations.gov/document/EERE-2014-BT-STD-0031-0217.

Notes: AFUE = Annual fuel utilization efficiency.

[153] See U.S. Department of Energy, Office of Buildings Technology, "History and Impacts: Buildings," at https://www.energy.gov/eere/buildings/history-and-impacts.

[154] 84 *Federal Register* 36038 (July 26, 2019).

[155] Prior to 2001 DOE's analysis in support of its rulemakings did not separately calculate site energy. Ibid. DOE determined in 2011 that it would use the full fuel-cycle measures of energy and emissions when evaluating the impacts of new or amended standards. 76 *Federal Register* 51282c (August 18, 2011).

DOE's proposed standard, which was not finalized, would have required an AFUE of 92% for all non-weatherized (i.e., residential) gas furnaces with capacities greater than 55 kBtu/hr, meaning non-condensing furnaces of that size would not have complied without modification. DOE estimated that roughly half of such furnaces sold would first require modification "to include a secondary heat exchanger or increased overall heat exchanger surface area."[156]

Issues for Congress

The six-year lookback provision, requiring DOE to review all standards of that age, is attracting attention in both Congress and in federal courts. DOE's failure to meet this six-year deadline for a number of standards was addressed in the 116th Congress in a hearing of the House Committee on Energy and Commerce, Subcommittee on Energy in March 2019; in the 117th it has been addressed in two bills (H.R. 1512 and H.R. 1326). At the March 2019 hearing, a representative of the Association of Home Appliance Manufacturers expressed the view that revisions to an existing standard can lead to small energy savings relative to the additional costs imposed on the manufacturer.[157] Currently, EPCA affords DOE no discretion on whether or when to conduct these "lookback" reviews. Congress could amend EPCA to grant DOE regulatory flexibility while balancing the EPCA purpose of energy conservation. For example, it could allow DOE to prioritize certain energy conservation standards that could save more energy in aggregate than other standards. Other approaches to address the backlog could be to extend the time between review periods, or for additional DOE staff to support the regulatory process.

Recent rulemakings have gone back and forth on the question of how much deference DOE should give to engineering societies, standards organizations, and industry groups when considering the energy conservation standards that these groups develop. One noteworthy example is the treatment of ASHRAE equipment. A 2020 final rule, later reverted, would have favored DOE's adopting any new ASHRAE equipment standard "as is." The question of adopting ASHRAE Standard 90.1 is also in ongoing litigation.[158] Congress could clarify to what extent DOE must defer to ASHRAE by treating the latter's equipment standards as final—in other words, clarify to what degree and to what legal standard DOE may exercise its discretion in choosing the quantitative level of energy conservation.

The question of deference to ASHRAE arises, not just when setting energy conservation standards, but also in test methods used to show compliance. For a number of covered products and equipment, DOE adopts procedures set by engineering societies, independent standards organizations, or industry groups in a process known as incorporation by reference (IBR). DOE has changed its procedures back and forth on whether it must accept such test procedures "as is." Congress could likewise clarify to what extent DOE must defer to these organizations when promulgating test methods.

[156] 81 *Federal Register* 65821.

[157] Testimony of Joseph M. McGuire, President and Chief Executive Officer, Association of Home Appliance Manufacturers, Before the Committee on Energy and Commerce, Subcommittee on Energy, U.S. House of Representatives Hearing, March 7, 2019.

[158] See *American Public Gas Association v. DOE*, No. 20-1068 (D.C. Cir.). See also Niina Farah, EE News, "D.C. Circuit Leans Toward DOE Redo of Major Efficiency Rule," September 10, 2021.

Prior amendments to EPCA[159] and court decisions[160] on natural-gas consuming products have favored mitigating the potential for fuel switching (e.g., replacing a natural gas unit with an electric one). This long history continues, and DOE proposed and, in January 2021, finalized an interpretive rule[161] that would further mitigate against fuel switching. DOE has since reversed this interpretive rulemaking,[162] but in doing so may not have settled the question. Congress could amend EPCA to clarify its intentions on fuel switching and thereby make implementation less contentious.

Author Information

Martin C. Offutt
Analyst in Energy Policy

Acknowledgments

Corrie Clark, analyst in energy policy, provided substantive contributions to the development of this report.

Disclaimer

[159] National Appliance Energy Conservation Act of 1987 (P.L. 100-12) required DOE to establish separate standards for residential furnaces depending on size to reduce the fuel-switching impacts of the new standards and to set a rule which "the Secretary determines is not likely to result in a significant shift from gas heating to electric resistance heating with respect to either residential construction or furnace replacement." 42 U.S.C. §6295(f)(1)(B)(iii).

[160] Petition for Review, *American Public Gas Association, et al. v. Department of Energy, et al.*, No. 11– 1485 (D.C. Cir. filed Dec. 23, 2011).

[161] 86 *Federal Register* 4776.

[162] 86 *Federal Register* 48049.