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Energy Conservation Program: Energy Conservation Standards for Packaged Terminal Air Conditioners and Packaged Terminal Heat Pumps; Final Rule

DEPARTMENT OF ENERGY

10 CFR Part 431

[Docket Number EERE–2012–BT–STD–0029]

RIN 1904–AC82

Energy Conservation Program: Energy Conservation Standards for Packaged Terminal Air Conditioners and Packaged Terminal Heat Pumps

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Final rule.

SUMMARY: The Energy Policy and Conservation Act of 1975 (EPCA), as amended, prescribes energy conservation standards for various consumer products and certain commercial and industrial equipment, including packaged terminal air conditioner (PTAC) and packaged terminal heat pump (PTHP) equipment. EPCA requires the U.S. Department of Energy (DOE) to determine whether more-stringent standards for PTACs and PTHPs would be technologically feasible and economically justified, and would save a significant amount of energy. In this final rule, DOE is adopting amended energy conservation standards for PTACs equivalent to the PTAC standards in American National Standards Institute (ANSI)/American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)/ Illuminating Engineering Society (IES) Standard 90.1–2013. DOE is not amending the current energy conservation standards for PTHPs, which are already equivalent to the PTHP standards in ANSI/ASHRAE/IES Standard 90.1–2013. DOE has determined that adoption of PTAC and PTHP standards more stringent than ANSI/ASHRAE/IES Standard 90.1–2013 is not economically justified.

DATES: The effective date of this rule is September 21, 2015. Compliance with the amended standards established for standard-sized PTACs in this final rule is required on January 1, 2017.

ADDRESSES: The docket, which includes **Federal Register** notices, public meeting attendee lists and transcripts, comments, and other supporting documents/materials, is available for review at regulations.gov. All documents in the docket are listed in the regulations.gov index. However, some documents listed in the index, such as those containing information that is exempt from public disclosure, may not be publicly available.

A link to the docket Web page can be found at: *http://www.regulations.gov/#!docketDetail;D=EERE-2012-BT-STD-0029.* This Web page contains a link to the docket for this document on the *www.regulations.gov* site. The *www.regulations.gov* Web page contains simple instructions on how to access all documents, including public comments, in the docket.

For further information on how to review the docket, contact Ms. Brenda Edwards at (202) 586–2945 or by email: *Brenda.Edwards@ee.doe.gov.*

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I. Summary of the Final Rule

Title III, Part C [1] of the Energy Policy and Conservation Act of 1975 (EPCA or the Act) (42 U.S.C. 6291, *et. seq.*) established the Energy Conservation Program for Certain Industrial Equipment.[2] This equipment includes packaged terminal air conditioners (PTACs) and packaged terminal heat pumps (PTHPs), the subjects of this document. The current Federal energy conservation standards for PTAC and PTHP equipment were adopted in 2008. 73 FR 58772 (October 7, 2008).

EPCA, as amended, requires the U.S. Department of Energy (DOE) to consider amending the existing Federal energy conservation standard for certain types of listed commercial and industrial equipment, including packaged terminal air conditioners and heat pumps, each time the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings, is amended with respect to such equipment. (42 U.S.C. 6313(a)(6)(A)) On October 9, 2013, ASHRAE Standard 90.1–2013 raised the standards for standard-size PTAC equipment EPCA further directs that if ASHRAE Standard 90.1 is amended, DOE must adopt amended energy conservation standards at the new efficiency level in ASHRAE Standard 90.1, unless clear and convincing evidence supports a determination that adoption of a more-stringent efficiency level as a national standard would produce significant additional energy savings and be technologically feasible and economically justified. (42 U.S.C. 6313(a)(6)(A)(ii))

Pursuant to EPCA, DOE must also, every six years, evaluate each class of covered equipment and publish either a notice of the determination that standards for the product do not need to be amended or a notice of proposed rulemaking including new proposed standards. (42 U.S.C. 6313(a)(6)(C)(i)) Under the six-year look back requirement, DOE must also demonstrate clear and convincing evidence supporting adoption of a national standard at a more-stringent efficiency level than that in ASHRAE Standard 90.1. (42 U.S.C. 6313(a)(6)(C)) Conduct of a rulemaking subsequent to ASHRAE action satisfies this six-year look back requirement.

Based on the analysis supporting this final rule, DOE is not able to show with clear and convincing evidence that energy conservation standards for PTAC and PTHP equipment at any of the considered efficiency levels that are more stringent than the minimum level specified in the ANSI/ASHRAE/IES Standard 90.1–2013 are economically justified. Therefore, in accordance with these and other statutory provisions discussed in this document, DOE is amending energy conservation standards for standard-sized PTAC equipment to be equivalent to the standards for standard-sized PTAC equipment found in ANSI/ASHRAE/IES Standard 90.1–2013.

The amended standards for PTACs, which are the minimum allowable cooling efficiency, are shown in Table I.1. These amended standards apply to all standard-sized PTAC equipment manufactured in, or imported into, the United States on or after the compliance date indicated in Table I.1. The standards for PTHP equipment remain unchanged.

TABLE I.1—AMENDED ENERGY CONSERVATION STANDARDS FOR STANDARD-SIZED PTAC EQUIPMENT

Equipment class			Minimum cooling efficiency *	Compliance date ***
Equipment	Category	Cooling capacity		
PTAC	Standard Size **	<7,000 Btu/h ≥7,000 Btu/h and ≤15,000 Btu/h. >15,000 Btu/h	EER = 11.9 EER = 14.0 − (0.300 × Cap ††). EER = 9.5.	January 1, 2017.

* For equipment rated according to the DOE test procedure, Air Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 310/380–2014.
** Standard size refers to PTAC equipment with wall sleeve dimensions greater than or equal to 16 inches high, or greater than or equal to 42 inches wide.
*** Amended standards shall become effective for equipment manufactured on or after a date which is two years after the effective date of the applicable minimum energy efficiency requirement in the amended ASHRAE/IES standard. (42 U.S.C. 6313(a)(6)(D)(i))
†† Cap means cooling capacity in thousand British thermal units per hour (Btu/h) at 95 °F outdoor dry-bulb temperature.

II. Introduction

The following section briefly discusses the statutory authority underlying this final rule, as well as some of the relevant historical background related to the establishment of standards for PTACs and PTHPs.

A. Authority

Title III, Part C [3] of EPCA (42 U.S.C. 6291, *et. seq.*), established the Energy Conservation Program for Certain Industrial Equipment, which includes the PTAC and PTHP equipment that is the subject of this final rule.[4] In general, this program addresses the energy efficiency of certain types of commercial

[1] For editorial reasons, upon codification in the U.S. Code, Part C was redesignated Part A–1.

[2] All references to EPCA in this document refer to the statute as amended through the American Energy Manufacturing Technical Corrections Act (AEMTCA), Public Law 112–210 (Dec. 18, 2012).

[3] For editorial reasons, upon codification in the U.S. Code, Part C was re-designated Part A–1.

[4] All references to EPCA in this document refer to the statute as amended through the American Energy Manufacturing Technical Corrections Act (AEMTCA), Public Law 112–210 (Dec. 18, 2012).

and industrial equipment. Relevant provisions of the Act include definitions (42 U.S.C. 6311), energy conservation standards (42 U.S.C. 6313), test procedures (42 U.S.C. 6314), labeling provisions (42 U.S.C. 6315), and the authority to require information and reports from manufacturers (42 U.S.C. 6316).

EPCA contains mandatory energy conservation standards for commercial heating, air-conditioning, and water-heating equipment. Specifically, EPCA sets standards for small, large, and very large commercial package air-conditioning and heating equipment, PTACs and PTHPs, warm-air furnaces, packaged boilers, storage water heaters, instantaneous water heaters, and unfired hot water storage tanks. (42 U.S.C. 6313(a)) EPCA established Federal energy conservation standards that generally correspond to the levels in ASHRAE Standard 90.1, as in effect on October 24, 1992 (*i.e.,* ASHRAE/Illuminating Engineering Society of North America (IESNA) Standard 90.1–1989), for each type of covered equipment listed in 42 U.S.C. 6313(a).

EPCA requires that DOE conduct a rulemaking to consider amended energy conservation standards for a variety of enumerated types of commercial heating, ventilating, and air-conditioning equipment (including PTACs and PTHPs) each time ASHRAE Standard 90.1 is amended with respect to the standard levels or design requirements applicable to such equipment. (42 U.S.C. 6313(a)(6)(A)) Such review is to be conducted in accordance with the procedures established for ASHRAE equipment under 42 U.S.C. 6313(a)(6). According to 42 U.S.C. 6313(a)(6)(A), for each type of equipment, EPCA directs that if ASHRAE Standard 90.1 is amended, DOE must publish in the **Federal Register** an analysis of the energy savings potential of amended energy efficiency standards within 180 days of the amendment of ASHRAE Standard 90.1. (42 U.S.C. 6313(a)(6)(A)(i)) EPCA further directs that DOE must adopt amended standards at the new efficiency level specified in ASHRAE Standard 90.1, unless clear and convincing evidence supports a determination that adoption of a more-stringent level would produce significant additional energy savings and be technologically feasible and economically justified. (42 U.S.C. 6313(a)(6)(A)(ii)) In addition, EPCA requires DOE to review its already-established energy conservation standards for ASHRAE equipment every six years. (42 U.S.C. 6313(a)(6)(C))

If DOE proposes an amended standard for ASHRAE equipment at levels more stringent than those in ASHRAE Standard 90.1, DOE must determine, after receiving comments on the proposed standard, whether the benefits of the standard exceed its burdens by considering, to the maximum extent practicable, the following seven factors:

(1) The economic impact of the standard on manufacturers and consumers of the products subject to the standard;

(2) The savings in operating costs throughout the estimated average life of the product in the type (or class) compared to any increase in the price, initial charges, or maintenance expenses of the products likely to result from the standard;

(3) The total projected amount of energy savings likely to result directly from the standard;

(4) Any lessening of the utility or the performance of the products likely to result from the standard;

(5) The impact of any lessening of competition, as determined in writing by the Attorney General, that is likely to result from the standard;

(6) The need for national energy conservation; and

(7) Other factors the Secretary considers relevant.

(42 U.S.C. 6313(a)(6)(B)(ii))

Because ASHRAE did not update its efficiency levels for PTACs and PTHPs in ANSI/ASHRAE/IES Standard 90.1–2010, DOE began this rulemaking by analyzing amended standards consistent with the six-year look back procedures defined under 42 U.S.C. 6313(a)(6)(C). However, before DOE could finalize this rule, ASHRAE acted on October 9, 2013 to adopt ANSI/ASHRAE/IES Standard 90.1–2013. This revision of ASHRAE Standard 90.1 contained amended standard levels for PTACs, thereby triggering DOE's statutory obligation under 42 U.S.C. 6313(a)(6)(A) to promulgate an amended uniform national standard at those levels unless DOE determines that there is clear and convincing evidence supporting the adoption of more-stringent energy conservation standards than the ASHRAE levels. Consequently, DOE prepared an analysis of the energy savings potential of amended standards at the ANSI/ASHRAE/IES Standard 90.1–2013 levels (as required by 42 U.S.C. 6313(a)(6)(A)(i)) and updated the proposed rule and its accompanying analyses to reflect appropriate statutory provisions, timelines, and compliance dates.

ANSI/ASHRAE/IES Standard 90.1–2013 did not contain amended standard levels for PTHPs, and the PTHP standard levels published in ANSI/ASHRAE/IES Standard 90.1–2013 are equivalent to the current Federal minimum standards for PTHPs.

DOE is adopting amended standards for PTAC equipment equivalent to those set forth in ANSI/ASHRAE/IES Standard 90.1–2013. DOE is not adopting amended standards for PTHP equipment.

EPCA, as codified, also contains what is known as an ''anti-backsliding'' provision, which prevents the Secretary from prescribing any amended standard that either increases the maximum allowable energy use or decreases the minimum required energy efficiency of a covered product. (42 U.S.C. 6313(a)(6)(B)(iii)(I)) Also, the Secretary may not prescribe an amended or new standard if interested persons have established by a preponderance of the evidence that the standard is likely to result in the unavailability in the United States of any covered product type (or class) of performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as those generally available in the United States. (42 U.S.C. 6313(a)(6)(B)(iii)(II))

B. Background

1. Current Standards

In a final rule published on October 7, 2008 (73 FR 58772), DOE prescribed the current energy conservation standards for all standard size PTAC and PTHP equipment manufactured on or after September 30, 2012, and for all non-standard size PTAC and PTHP equipment manufactured on or after September 30, 2010. (42 U.S.C. 6313(a)(3)) The current energy conservation standards align with ANSI/ASHRAE/IES Standard 90.1–2010. These levels are expressed in energy efficiency ratio (EER) for the cooling mode and in coefficient of performance (COP) for the heating mode. EER is defined as ''the ratio of the produced cooling effect of an air conditioner or heat pump to its net work input, expressed in Btu/watt-hour.'' 10 CFR 431.92. COP is defined as ''the ratio of produced cooling effect of an air conditioner or heat pump (or its produced heating effect, depending on model operation) to its net work input, when both the cooling (or heating) effect and the net work input are expressed in identical units of measurement.'' 10 CFR 431.92.

The current standards for PTACs and PTHPs are set forth in Table II.1.

TABLE II.1—FEDERAL ENERGY EFFICIENCY STANDARDS FOR PTACS AND PTHPS

Equipment class			Efficiency level *
Equipment type	Sub-category	Cooling capacity	
PTAC	Standard Size **	<7,000 Btu/h	EER = 11.7.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 13.8 − (0.300 × Cap ††).
		>15,000 Btu/h	EER = 9.3.
	Non-Standard Size †	<7,000 Btu/h	EER = 9.4.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 10.9 − (0.213 × Cap ††).
		>15,000 Btu/h	EER = 7.7.
PTHP	Standard Size **	<7,000 Btu/h	EER = 11.9. COP = 3.3.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 14.0 − (0.300 × Cap ††). COP = 3.7 − (0.052 × Cap ††).
		>15,000 Btu/h	EER = 9.5. COP = 2.9.
	Non-Standard Size †	<7,000 Btu/h	EER = 9.3. COP = 2.7.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 10.8 − (0.213 × Cap ††). COP = 2.9 − (0.026 × Cap ††).
		>15,000 Btu/h	EER = 7.6. COP = 2.5.

* For equipment rated according to ARI standards, all EER values must be rated at 95 °F outdoor dry-bulb temperature for air-cooled products and evaporatively-cooled products and at 85 °F entering water temperature for water cooled products. All COP values must be rated at 47 °F outdoor dry-bulb temperature for air-cooled products, and at 70 °F entering water temperature for water-source heat pumps.

** Standard size refers to PTAC or PTHP equipment with wall sleeve dimensions greater than or equal to 16 inches high, or greater than or equal to 42 inches wide.

† Non-standard size refers to PTAC or PTHP equipment with wall sleeve dimensions less than 16 inches high and less than 42 inches wide. ASHRAE/IESNA Standard 90.1–1999 also includes a factory labeling requirement for non-standard size PTAC and PTHP equipment as follows: "MANUFACTURED FOR REPLACEMENT APPLICATIONS ONLY; NOT TO BE INSTALLED IN NEW CONSTRUCTION PROJECTS."

†† Cap means cooling capacity in kBtu/h at 95 °F outdoor dry-bulb temperature.

2. History of Standards Rulemaking for PTACs and PTHPs

On October 29, 1999, ASHRAE adopted ASHRAE/IESNA Standard 90.1–1999, ''Energy Standard for Buildings Except Low-Rise Residential Building,'' which included amended efficiency levels for PTACs and PTHPs. In amending the ASHRAE/IESNA Standard 90.1–1989 levels for PTACs and PTHPs, ASHRAE acknowledged the physical size constraints among the varying sleeve sizes on the market. Specifically, the wall sleeve dimensions of the PTAC and PTHP can limit the attainable energy efficiency of the equipment. Consequently, ASHRAE/IESNA Standard 90.1–1999 used the equipment classes defined by EPCA, which are distinguished by equipment type (*i.e.,* air conditioner or heat pump) and cooling capacity, and further separated these equipment classes by wall sleeve dimensions.[5] Table II.2 shows the efficiency levels in ASHRAE/IESNA Standard 90.1–1999 for PTACs and PTHPs.

TABLE II.2—ASHRAE/IESNA STANDARD 90.1–1999 ENERGY EFFICIENCY LEVELS FOR PTACS AND PTHPS

Equipment class			ASHRAE/IESNA Standard 90.1–1999 efficiency levels *
Equipment	Category	Cooling capacity	
PTAC	Standard Size **	<7,000 Btu/h	EER = 11.0.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 12.5 − (0.213 × Cap ††).
		>15,000 Btu/h	EER = 9.3.
	Non-Standard Size †	<7,000 Btu/h	EER = 9.4.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 10.9 − (0.213 × Cap ††).
		>15,000 Btu/h	EER = 7.7.
PTHP	Standard Size **	<7,000 Btu/h	EER = 10.8. COP = 3.0.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 12.3 − (0.213 × Cap ††). COP = 3.2 − (0.026 × Cap ††).
		>15,000 Btu/h	EER = 9.1. COP = 2.8.
	Non-Standard Size †	<7,000 Btu/h	EER = 9.3. COP = 2.7.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 10.8 − (0.213 × Cap ††). COP = 2.9 − (0.026 × Cap ††).

[5] Prior to 1999, ASHRAE/IESNA Standard 90.1 provided one efficiency standard for all PTAC and PTHP and did not have different standards by dimension. ASHRAE/IESNA Standard 90.1–1999 increased the standards for all classes and established more stringent standards for ''new construction'' than for ''replacements.'' DOE energy conservation standards for PTACs and PTHPs did not distinguish between wall sleeve dimensions for standard and non-standard size units until 2010 (for non-standard size) and 2012 (for standard size).

TABLE II.2—ASHRAE/IESNA STANDARD 90.1–1999 ENERGY EFFICIENCY LEVELS FOR PTACS AND PTHPS—Continued

Equipment class			ASHRAE/IESNA Standard 90.1–1999 efficiency levels *
Equipment	Category	Cooling capacity	
		>15,000 Btu/h	EER = 7.6. COP = 2.5.

* For equipment rated according to ARI standards, all EER values must be rated at 95 °F outdoor dry-bulb temperature for air-cooled products and evaporatively-cooled products and at 85 °F entering water temperature for water cooled products. All COP values must be rated at 47 °F outdoor dry-bulb temperature for air-cooled products, and at 70 °F entering water temperature for water-source heat pumps.

** Standard size refers to PTAC or PTHP equipment with wall sleeve dimensions greater than or equal to 16 inches high, or greater than or equal to 42 inches wide.

† Non-standard size refers to PTAC or PTHP equipment with wall sleeve dimensions less than 16 inches high and less than 42 inches wide. ASHRAE/IESNA Standard 90.1–1999 also includes a factory labeling requirement for non-standard size PTAC and PTHP equipment as follows: "MANUFACTURED FOR REPLACEMENT APPLICATIONS ONLY; NOT TO BE INSTALLED IN NEW CONSTRUCTION PROJECTS."

†† Cap means cooling capacity in kBtu/h at 95 °F outdoor dry-bulb temperature.

Following the publication of ASHRAE/IESNA Standard 90.1–1999, DOE analyzed whether more stringent levels would result in significant additional energy conservation of energy and be technologically feasible and economically justified. The report ''Screening Analysis for EPACT-Covered Commercial [Heating, Ventilating and Air-Conditioning] HVAC and Water-Heating Equipment'' (commonly referred to as the 2000 Screening Analysis) [6] summarizes this analysis. On January 12, 2001, DOE published a final rule for commercial HVAC and water heating equipment, which concluded that the 2000 Screening Analysis indicated a reasonable possibility of finding ''clear and convincing evidence'' that more stringent standards for PTACs and PTHPs ''would be technologically feasible and economically justified and would result in significant additional conservation of energy.'' 66 FR 3336, 3349. Under EPCA, these are the criteria for DOE adoption of standards more stringent than those found in ASHRAE/IESNA Standard 90.1. (42 U.S.C. 6313(a)(6)(A)(ii)(II))

In addition, on March 13, 2006, DOE issued a Notice of Availability (NOA), in which DOE revised the energy savings analysis from the 2000 Screening Analysis. 71 FR 12634. DOE stated that, even though the revised analysis reduced the potential energy savings for PTACs and PTHPs that might result from more stringent standards than the efficiency levels specified in ASHRAE/IESNA Standard 90.1–1999, there was a possibility that clear and convincing evidence would support more stringent standards. Therefore, DOE stated in the NOA that it was considering more stringent standard levels than the efficiency levels specified in ASHRAE/IESNA Standard 90.1–1999 for PTACs and PTHPs through a separate rulemaking. 71 FR 12639. On March 7, 2007, DOE issued a final rule stating that DOE had decided to explore more stringent efficiency levels than those in ASHRAE/IESNA Standard 90.1–1999 for PTACs and PTHPs through a separate rulemaking. 72 FR 10038, 10044.

In January 2008, ASHRAE published ANSI/ASHRAE/IESNA Standard 90.1–2007, which reaffirmed the definitions and efficiency levels for PTACs and PTHPs in ASHRAE/IESNA Standard 90.1–1999. On October 7, 2008, DOE published a final rule amending energy conservation standards for PTACs and PTHPs (2008 final rule). 73 FR 58772. The 2008 final rule divided PTACs and PTHPs into two equipment classes, standard size and non-standard size, based on the wall sleeve dimensions of the equipment. Prior DOE energy conservation standards for PTACs and PTHPs had not distinguished between standard and non-standard size units. Table II.1 shows the energy conservation standards for PTACs and PTHPs, as amended by the 2008 final rule. Compared to ASHRAE/IESNA Standard 90.1–1999, the standards in the 2008 final rule were identical for non-standard sized PTACs and PTHPs, were more stringent for standard-size PTACs and PTHPs (except for standard-size PTACs with capacity greater than 15,000 Btu/h, for which the standards in ASHRAE/IESNA Standard 90.1–1999 and the 2008 final rule were equivalent).

In October 2010, ASHRAE published ANSI/ASHRAE/IES Standard 90.1–2010, which reaffirmed the efficiency levels for non-standard size PTACs and PTHPs and increased the efficiency levels for standard size PTACs and PTHPs to match the DOE standards, effective as of October 8, 2012. Hence, DOE did not consider revision of PTAC and PTHP standards at that time.

On February 22, 2013, DOE published a notice of public meeting and availability of the framework document (''February 2013 Framework Document'') regarding energy conservation standards for PTACs and PTHPs. 78 FR 12252.

On October 9, 2013, ASHRAE published ANSI/ASHRAE/IES Standard 90.1–2013, which reaffirmed the efficiency levels for standard size PTHPs and for nonstandard size PTACs and PTHPs, and which increased the cooling efficiency levels for standard size PTACs to equal the cooling efficiency levels for standard size PTHPs, effective as of January 1, 2015. The issuance of ANSI/ASHRAE/IES 90.1–2013 triggered DOE's statutory obligation under 42 U.S.C. 6313(a)(6)(A) to promulgate an amended uniform national standard for PTACs at those levels unless DOE determined that there is clear and convincing evidence supporting the adoption of more-stringent energy conservation standards than the ASHRAE levels.

On September 16, 2014, DOE published a notice of proposed rulemaking (''September 2014 NOPR'') with proposed energy conservation standards for PTACs and PTHPs. 79 FR 55538. On October 29, 2014, DOE hosted a public meeting to discuss the proposed standards. DOE received a number of comments from interested parties; the parties are summarized in Table II.3. DOE considered these comments in the preparation of the final rule. Relevant comments, and DOE's responses, are provided in the appropriate sections of this document.

[6] ''Energy Conservation Program for Consumer Products: Screening Analysis for EPACT-Covered Commercial HVAC and Water-Heating Equipment Screening Analysis,'' U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy. April 2000.

TABLE II.3—INTERESTED PARTIES PROVIDING COMMENTS

Name	Abbreviation	Type *
Air-Conditioning, Heating and Refrigeration Institute	AHRI	IR
The U.S. Chamber of Commerce, the American Chemistry Council, the American Forest & Paper Association, the American Fuel & Petrochemical Manufacturers, the American Petroleum Institute, the Council of Industrial Boiler Owners, the National Association of Manufacturers, the National Mining Association, the National Oilseed Processors Association, and the Portland Cement Association.	The Associations	TA
Appliance Standards Awareness Project	ASAP	EA
Appliance Standards Awareness Project, Alliance to Save Energy, American Council for an Energy-Efficient Economy, Natural Resources Defense Council, Northwest Energy Efficiency Alliance.	ASAP *et al.*	EA
Edison Electric Institute	EEI	U
Environmental Defense Fund, Institute for Policy Integrity at New York University School of Law, Natural Resources Defense Council, Union of Concerned Scientists.	EDF *et al.*	EA
Environmental Investigation Agency International	EIAI	EA
General Electric	GE	M
Goodman Manufacturing Company, L.P	Goodman	M
Pacific Gas and Electric Company	PG&E	U
Pacific Gas and Electric Company, Southern California Gas Company, San Diego Gas and Electric, Southern California Edison.	CA IOUs	U
Southern Company Services	SCS	U

* IR: Industry Representative; M: Manufacturer; EA: Efficiency/Environmental Advocate; TA: Trade Association; U: Utility

III. General Discussion

A. Compliance Dates

ASHRAE adopted a revised ANSI/ASHRAE/IES Standard 90.1–2013, which increases minimum efficiency standards for PTACs. The revision of the ANSI/ASHRAE/IES standard requires that the Federal standard for PTAC equipment become effective on or after a date two years after the effective date of the applicable minimum energy efficiency requirement in the amended ANSI/ASHRAE/IES standard. (42 U.S.C. 6313(a)(6)(D)(i)) The effective date of the amended ANSI/ASHRAE/IES standards for PTACs is January 1, 2015. Therefore, PTAC equipment manufactured on or after January 1, 2017, will be required to meet the amended ANSI/ASHRAE/IES standard adopted as the Federal standard.

B. Equipment Classes and Scope of Coverage

When evaluating and establishing energy conservation standards, DOE divides covered equipment into equipment classes by the type of energy used or by capacity or other performance-related features that justifies a different standard. In making a determination whether a performance-related feature justifies a different standard, DOE must consider such factors as the utility to the consumer of the feature and other factors DOE determines are appropriate.

Existing energy conservation standards divide PTACs and PTHPs into twelve equipment classes based whether the equipment is an air conditioner or heat pump; the equipment's cooling capacity; and the equipment's wall sleeve dimensions, which fall into two categories:

• Standard size (PTAC or PTHP equipment with wall sleeve dimensions greater than or equal to 16 inches high, or greater than or equal to 42 inches wide)

• Non-standard size (PTAC or PTHP equipment with wall sleeve dimensions less than 16 inches high and less than 42 inches wide)

Goodman requested that DOE consider defining PTAC and PTHP equipment as ''space-constrained products'' in a manner similar to the current definition in 10 CFR 430.2. Goodman stated that the standard proposed in the September 2014 NOPR would likely not warrant an increase in the size of standard size PTACs and PTHPs. However, Goodman stated that if there is a continual increase in the energy conservation standard for PTACs and PTHPs, manufacturers likely would need to increase the physical size of the equipment, which would significantly impact consumer utility and/or the cost of installation. (Goodman, No. 31 at p. 2–3) [7] DOE understands that the current definition of PTAC and PTHP equipment does not place limits on the physical dimensions of PTAC and PTHP equipment. (42 U.S.C. 6311(10)) Over the past 25 years, the industry has settled on conventional wall sleeve dimensions for PTACs and PTHPs that are 16 inches high by 42 inches wide. The installation cost for equipment that exceeds the conventional cross section would be high, because installation could require alterations to existing wall sleeve openings in building structures. DOE accounts for installation costs in the life cycle cost and payback period analyses used to evaluate increased standard levels. These analyses would account for any increased installation costs resulting from manufacturers increasing the cross section of their equipment. Therefore, DOE does not define PTACs and PTHPs as space-constrained equipment.

DOE is not amending energy conservation standards for non-standard size PTAC and PTHP equipment in this rulemaking because this equipment class represents a small and declining portion of the market, and due to a lack of adequate information to analyze non-standard size units. The shipments analysis conducted for the 2008 final rule projected that shipments of non-standard size PTACs and PTHPs would decline from approximately 30,000 units in 2012 (6.6% of the entire PTAC and PTHP market) to approximately 16,000 units in 2042 (2.4% of the entire PTAC and PTHP market).[8]

[7] A notation in the form ''Goodman, No. 31 at p. 2–3'' identifies a written comment: (1) Made by Goodman Manufacturing Company (''Goodman''); (2) recorded in document number 31 that is filed in the docket of the PTAC energy conservation standards rulemaking (Docket No. EERE–2012–BT–STD–0029) and available for review at *www.regulations.gov;* and (3) which appears on page 2–3 of document number 31.

[8] See DOE's discussion regarding shipment projections for standard and non-standard PTAC and PTHP equipment and the results of shipment projections in the PTAC and PTHP energy conservation standard technical support document at: *http://www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/ptac_pthp_tsd/chapter_10.pdf* (Chapter 10, Section 10.5).

C. Test Procedure

DOE's current energy conservation standards for PTACs and PTHPs are expressed in terms of the energy efficiency ratio (EER, in Btu/Watt-hour) for cooling efficiency and coefficient of performance (COP, unitless) for heating efficiency.

DOE's test procedures for PTACs and PTHPs is codified at Title 10 of the Code of Federal Regulations (CFR), § 431.96. The test procedures were established on December 8, 2006 in a final rule that incorporated by reference the American National Standards Institute's (ANSI) and AHRI Standard 310/380–2004, ''Standard for Packaged Terminal Air-Conditioners and Heat Pumps'' (ANSI/AHRI Standard 310/380). 71 FR 71340, 71371. DOE amended the test procedures for PTACs and PTHPs on June 30, 2015 (80 FR 37136).

The test procedures applicable to PTAC and/or PTHP equipment are incorporated by reference at 10 CFR 431.95(a)(3). They include (1) AHRI Standard 310/380–2014, (2) ANSI/ASHRAE Standard 16–1983 (RA 2014), ''Method of Testing for Rating Room Air Conditioners and Packaged Terminal Air Conditioners'' (''ANSI/ASHRAE 16''); (2) ANSI/ASHRAE Standard 58–1986 (RA 2014), ''Method of Testing for Rating Room Air Conditioner and Packaged Terminal Air Conditioner Heating Capacity'' (''ANSI/ASHRAE 58''); and (3) ANSI/ASHRAE Standard 37–2009, ''Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment'' (''ANSI/ASHRAE 37'').

The California Utilities requested that the test procedure standard for PTAC and PTHP include testing of equipment in operation modes required by ASHRAE 90.1–2013. (CA IOUs, No. 33 at p. 5) The California Utilities also commented that that PTHP equipment listing a COP should certify that it meets the requirements of ASHRAE 90.1–2013 regarding control of the electric resistance strip heater during the ''quick heating'' mode. (CA IOUs, No. 33 at p. 4–5) Goodman commented regarding the test procedure NOPR for PTACs and PTHPs and requested that DOE maintain psychrometric testing as an option within the federal test procedures. (Goodman, No. 31 at p. 4). DOE responded to these comments in the rulemaking to amend the PTAC and PTHP test procedures. The docket Web page for the PTAC and PTHP test procedure rulemaking can be found at: *http://www.regulations.gov/#!docketDetail;D=EERE-2012-BT-TP-0032*.

D. Technological Feasibility

1. General

In each energy conservation standards rulemaking, DOE conducts a screening analysis based on information gathered on all current technology options and prototype designs that could improve the efficiency of the products or equipment that are the subject of the rulemaking. As the first step in such an analysis, DOE develops a list of technology options for consideration in consultation with manufacturers, design engineers, and other interested parties. DOE then determines which of those means for improving efficiency are technologically feasible. DOE considers technologies incorporated in commercially available equipment or in working prototypes to be technologically feasible. 10 CFR part 430, subpart C, appendix A, section 4(a)(4)(i).

After DOE has determined that particular technology options are technologically feasible, it further evaluates each technology option in light of the following additional screening criteria: (1) Practicability to manufacture, install, and service; (2) adverse impacts on equipment utility or availability; and (3) adverse impacts on health or safety. 10 CFR part 430, subpart C, appendix A, section 4(a)(4)(ii)–(iv). Section IV.B of this document discusses the results of the screening analysis for PTACs and PTHPs, particularly the designs DOE considered, those it screened out, and those that are the basis for the TSLs in this rulemaking. For further details on the screening analysis for this rulemaking, see chapter 4 of the final rule Technical Support Document (TSD).

2. Maximum Technologically Feasible Levels

When DOE adopts (or does not adopt) an amended energy conservation standard for a type or class of covered equipment, it must determine the maximum improvement in energy efficiency or maximum reduction in energy use that is technologically feasible for such equipment. DOE determined the maximum technologically feasible (''max-tech'') improvements in energy efficiency for PTACs and PTHPs in the engineering analysis using the design parameters that passed the screening analysis. The max-tech levels that DOE determined for this rulemaking are described in section IV.C.5 of this final rule and in chapter 5 of the final rule TSD.

E. Energy Savings

1. Determination of Savings

For each TSL, DOE projected energy savings from the equipment that is the subject of this rulemaking purchased in the 30-year period that begins in the year of compliance with any amended standards. The specific compliance years used in this analysis are discussed in section III.A of this final rule.[9] The savings are measured over the entire lifetime of equipment purchased in the 30-year analysis period. DOE quantified the energy savings attributable to each TSL as the difference in energy consumption between each standards case and the base case. The base case represents a projection of energy consumption in the absence of amended efficiency standards, and it considers market forces and policies that affect demand for more efficient equipment.

DOE uses its national impact analysis (NIA) spreadsheet models to estimate energy savings from amended standards for the equipment that is the subject of this rulemaking. The NIA spreadsheet model (described in section IV.H of this document) calculates energy savings in site energy, which is the energy directly consumed by equipment at the locations where they are used. For electricity, DOE calculates national energy savings in terms of primary energy savings, which is the savings in the energy that is used to generate and transmit the site electricity. For electricity and natural gas and oil, DOE also calculates full-fuel-cycle (FFC) energy savings. As discussed in DOE's statement of policy and notice of policy amendment, the FFC metric includes the energy consumed in extracting, processing, and transporting primary fuels (*i.e.,* coal, natural gas, petroleum fuels), and thus presents a more complete picture of the impacts of energy efficiency standards. 76 FR 51281 (August 18, 2011), as amended at 77 FR 49701 (August 17, 2012).

To calculate primary energy savings, DOE derives annual conversion factors from the model used to prepare the Energy Information Administration's (EIA) most recent *Annual Energy Outlook* (*AEO*). For FFC energy savings, DOE's approach is based on the calculation of an FFC multiplier for each of the energy types used by covered products or equipment. For more information, see section IV.H.

[9] DOE also presents a sensitivity analysis that considers impacts for equipment shipped in a 9-year period.

2. Significance of Savings

To adopt standards more stringent standards for PTACs and PTHPs than the amended levels in ASHRAE Standard 90.1, clear and convincing evidence must support a determination that the standards would result in significant additional energy savings. (42 U.S.C. 6313(a)(6)(A)(ii)(II)) This final rule does not adopt more stringent standards than the levels in ASHRAE Standard 90.1.

F. Economic Justification

1. Specific Criteria

EPCA provides seven factors to be evaluated in determining whether a more stringent standard for PTACs and PTHPs is economically justified. (42 U.S.C. 6313(a)(6)(B)(ii)) The following sections discuss how DOE has addressed each of those seven factors in this rulemaking.

a. Economic Impact on Manufacturers and Consumers

In determining the impacts of an amended standard on manufacturers, DOE conducts a manufacturer impact analysis (MIA), as discussed in section IV.J. DOE first uses an annual cash-flow approach to determine the quantitative impacts. This step includes both a short-term assessment—based on the cost and capital requirements during the period between when a regulation is issued and when entities must comply with the regulation—and a long-term assessment over a 30-year period. The industry-wide impacts analyzed include industry net present value (INPV), which values the industry on the basis of expected future cash flows; cash flows by year; changes in revenue and income; and other measures of impact, as appropriate. Second, DOE analyzes and reports the impacts on different types of manufacturers, including impacts on small manufacturers. Third, DOE considers the impact of standards on domestic manufacturer employment and manufacturing capacity, as well as the potential for standards to result in plant closures and loss of capital investment. Finally, DOE takes into account cumulative impacts of various DOE regulations and other regulatory requirements on manufacturers.

For individual consumers, measures of economic impact include the changes in LCC and payback period (PBP) associated with new or amended standards. These measures are discussed further in the following section. For consumers in the aggregate, DOE also calculates the national net present value of the economic impacts applicable to a particular rulemaking. DOE also evaluates the LCC impacts of potential standards on identifiable subgroups of consumers that may be affected disproportionately by a national standard.

b. Savings in Operating Costs Compared to Increase in Price

EPCA requires DOE to consider the savings in operating costs throughout the estimated average life of the covered equipment compared to any increase in the price of the covered product that are likely to result from a standard. (42 U.S.C. 6313(a)(6)(B)(ii)(II)) DOE conducts this comparison in its LCC and PBP analysis.

The LCC is the sum of the purchase price of a product (including its installation) and the operating expense (including energy, maintenance, and repair expenditures) discounted over the lifetime of the equipment. To account for uncertainty and variability in specific inputs, such as equipment lifetime and discount rate, DOE uses a distribution of values, with probabilities attached to each value. For its analysis, DOE assumes that consumers will purchase the covered equipment in the first year of compliance with amended standards.

The LCC savings and the PBP for the considered efficiency levels are calculated relative to a base case that reflects projected market trends in the absence of amended standards. DOE identifies the percentage of consumers estimated to receive LCC savings or experience an LCC increase, in addition to the average LCC savings associated with a particular standard level. DOE's LCC analysis is discussed in further detail in section IV.F.

c. Energy Savings

Although significant conservation of energy is a separate statutory requirement for imposing an energy conservation standard, EPCA requires DOE, in determining the economic justification of a standard, to consider the total projected energy savings that are expected to result directly from the standard. (42 U.S.C. 6313(a)(6)(B)(ii)(III)) As discussed in section IV.H, DOE uses the spreadsheet models to project national energy savings.

d. Lessening of Utility or Performance of Equipment

In establishing classes of equipment, and in evaluating design options and the impact of potential standard levels, DOE evaluates potential standards that would not lessen the utility or performance of the considered equipment. (42 U.S.C. 6295(o)(2)(B)(i)(IV)) Based on data available to DOE, the standards adopted in this final rule would not reduce the utility or performance of the equipment under consideration in this rulemaking.

e. Impact of Any Lessening of Competition

EPCA directs DOE to consider the impact of any lessening of competition that is likely to result from energy conservation standards. It also directs the Attorney General of the United States (Attorney General) to determine the impact, if any, of any lessening of competition likely to result from a standard and to transmit such determination to the Secretary within 60 days of the publication of a proposed rule, together with an analysis of the nature and extent of the impact. (42 U.S.C. 6313(a)(6)(B)(ii)(IV)) DOE transmitted a copy of its proposed rule to the Attorney General with a request that the Department of Justice (DOJ) provide its determination on this issue. DOE received no adverse comments from DOJ regarding the proposed rule.

f. Need for National Energy Conservation

DOE also considers the need for national energy conservation in determining whether a new or amended standard is economically justified. (42 U.S.C. 6313(a)(6)(B)(ii)(VI)) DOE expects that the energy savings from the amended standards are likely to provide improvements to the security and reliability of the nation's energy system. Reductions in the demand for electricity also may result in reduced costs for maintaining the reliability of the nation's electricity system. DOE conducts a utility impact analysis to estimate how standards may affect the nation's needed power generation capacity, as discussed in section IV.M.

Amended standards are also likely to result in environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases associated with energy production and use. DOE conducts an emissions analysis to estimate how standards may affect these emissions, as discussed in section IV.K. DOE reports the emissions impacts from each TSL it considered, in section V.B.6 of this document. DOE also reports estimates of the economic value of emissions reductions resulting from the considered TSLs, in section IV.L of this document.

g. Other Factors

EPCA allows the Secretary of Energy, in determining whether a standard is economically justified, to consider any other factors that the Secretary deems to be relevant. (42 U.S.C. 6295(o)(2)(B)(ii)(VII)) To the extent interested parties submit any relevant information regarding economic justification that does not fit into the other categories described above, DOE could consider such information under ''other factors.'' No other factors were considered in this rule.

2. Rebuttable Presumption

EPCA creates a rebuttable presumption that an energy conservation standard is economically justified if the additional cost to the consumer of a product that meets the standard is less than three times the value of the first year's energy savings resulting from the standard, as calculated under the applicable DOE test procedure. DOE's LCC and PBP analyses generate values used to calculate the effects that potential amended energy conservation standards would have on the payback period for consumers. These analyses include, but are not limited to, the 3-year payback period contemplated under the rebuttable-presumption test. In addition, DOE routinely conducts an economic analysis that considers the full range of impacts to consumers, manufacturers, the nation, and the environment. The results of this analysis serve as the basis for DOE's evaluation of the economic justification for a potential standard level (thereby supporting or rebutting the results of any preliminary determination of economic justification). The rebuttable presumption payback calculation is discussed in section V.B.1.c of this final rule.

G. Additional Comments

DOE received additional comments that are not classified in the discussion sections above. Responses to these additional comments are provided below.

AHRI commented that, by proposing energy conservation standards for PTACs and PTHPs above the levels presented in ANSI/ASHRAE/IES 90.1–2013, DOE failed to recognize the Congressional intent for commercial standards-making to rely on the ASHRAE process. (AHRI, No. 35 at p. 2) EPCA authorizes the adoption of an energy conservation standard above the levels adopted by ASHRAE if clear and convincing evidence shows that adoption of such a more stringent standard would result in significant additional conservation of energy and be technologically feasible and economically justified. 42 U.S.C. 6313(a)(6)(A)(ii)(II) AHRI commented that DOE's economic justification in the NOPR falls short of the elevated ''clear and convincing'' requirement of proof. AHRI further commented that DOE failed to show with clear and convincing evidence that significant energy savings will result directly from the more stringent levels. (AHRI, No. 35 at p. 2–4) Following the publication of the September 2014 NOPR, DOE revised its analysis to incorporate feedback received through stakeholder comments. Based on results of its revised analysis, DOE concludes that the trial standard levels above ASHRAE 90.1–2013 would not be economically justified. This final rule amends the energy conservation standards for PTACs to be equal to PTAC standard levels in ANSI/ASHRAE/IES 90.1–2013. (42 U.S.C. 6313(a)(6)(A)(ii)(I))

SCS commented that stakeholders should have an additional opportunity to comment on the analysis after DOE completes the analytical changes that SCS requested. SCS requested that DOE issue an SNOPR if ECS levels above the ASHRAE 90.1–2013 levels are selected. (SCS, No. 29 at p. 3) This final rule amends the energy conservation standards for PTACs to be equal to PTAC standard levels in ANSI/ASHRAE/IES 90.1–2013. (42 U.S.C. 6313(a)(6)(A)(ii)(I))

AHRI objects to the use by DOE of proprietary software such as Crystal Ball to conduct its analysis in a public notice and comment rulemaking with concerns that small businesses and consumer advocacy groups would find the software cost prohibitive and unable to evaluate the models DOE used for its analysis and assumptions. AHRI states that all of DOE's models, process and software used in rulemaking under the Administrative Procedure Act should be fully and reasonably accessible. (AHRI, No. 35 at p. 4) The documentation in the TSD concerning the methods, data inputs, and assumptions used to generate LCC and PBP results provides stakeholders with sufficient information to adequately review DOE's analysis. To make its analyses accessible, DOE will run Monte Carlo simulations with its LCC spreadsheets utilizing Crystal Ball and provide the results to any stakeholder interested in researching specific scenarios.

IV. Methodology and Discussion of Related Comments

This section addresses the analyses DOE has performed for this rulemaking with regard to PTAC and PTHP. Separate subsections address each component of DOE's analyses.

DOE used several analytical tools to estimate the impact of the standards considered in this document. The first tool is a spreadsheet that calculates the LCC and PBP of potential amended or new energy conservation standards. The national impacts analysis uses a second spreadsheet set that provides shipments forecasts and calculates national energy savings and net present value resulting from potential energy conservation standards. DOE uses the third spreadsheet tool, the Government Regulatory Impact Model (GRIM), to assess manufacturer impacts of potential standards. These three spreadsheet tools are available on the DOE docket Web page for this rulemaking: *http://www.regulations.gov/#!docketDetail;D=EERE-2012-BT-STD-0029.* Additionally, DOE used output from the latest version of EIA's *Annual Energy Outlook* (*AEO*), a widely known energy forecast for the United States, for the emissions and utility impact analyses.

A. Market and Technology Assessment

When beginning an energy conservation standards rulemaking, DOE develops information that provides an overall picture of the market for the equipment concerned, including the purpose of the equipment, the industry structure, and market characteristics. This activity includes both quantitative and qualitative assessments based primarily on publicly available information (*e.g.,* manufacturer specification sheets, industry publications) and data submitted by manufacturers, trade associations, and other stakeholders. The market and technology assessment presented in the September 2014 NOPR discussed scope of coverage, equipment classes, types of equipment sold and offered for sale, and technology options that could improve the energy efficiency of the equipment under examination. See chapter 3 of the final rule TSD for further discussion of the market and technology assessment. AHRI commented that it planned to provide PTAC and PTHP shipments by capacity level for 2008 through 2013. (AHRI, No. 35 at p. 8) DOE did not receive further comments or information regarding the equipment definitions or market assessments for PTACs and PTHP equipment.

GE commented that there are now PTACs on the market that incorporate a ventilation system attachment that takes in make-up air and provides supplemental conditioning for this make-up air: Dehumidification when outdoor humidity levels are high and also electric resistance heating when outdoor temperature is low. Admitting makeup air and provision of supplemental conditioning increases PTAC/PTHP energy use that is not captured in the current test procedures for PTACs and PTHPs. GE suggested that DOE address PTACs with add-on dehumidifiers as a separate equipment class. (GE, No. 34 at p. 1) DOE acknowledges that models with add-on or integrated dehumidification systems exist in the current market. DOE believes that PTAC and PTHP units with add-on or integrated dehumidification systems currently meet the definition of PTACs and PTHPs, respectively. Thus, models with add-on or integrated dehumidification systems should be tested using the current test procedure and should meet the current energy conservation standards. Currently, the DOE test procedure does not require that the dehumidification module on such models be energized during testing, so the energy use of the dehumidification system would not be measured or accounted for in the EER metric. If DOE considers future amendments to the test procedure to account for energy consumed by the dehumidification systems, then DOE could consider designating a separate equipment class for such equipment at that time.

The September 2014 NOPR listed all of the potential technology options that DOE considered for improving energy efficiency of PTACs and PTHPs. 79 FR at 55553 (September 16, 2014). These technology options are listed in Table IV.1.

TABLE IV.1—POTENTIAL TECHNOLOGY OPTIONS FOR IMPROVING ENERGY EFFICIENCY OF PTACS AND PTHPS

Compressor Improvements
• Scroll Compressors
• Variable-speed Compressors
• Higher Efficiency Compressors.
Complex Control Boards.
Condenser and evaporator fan and fan motor improvements:
• Higher Efficiency Fan Motors
• Clutched Motor Fans.
Microchannel Heat Exchangers.
Rifled Interior Heat Exchanger Tube Walls.
Increased Heat Exchanger Area.
Hydrophobic Material Treatment of Heat Exchangers.
Re-circuiting Heat Exchanger Coils.
Improved Air Flow and Fan Design.
Heat Pipes.
Corrosion Protection.
Thermostatic Expansion Valve.
Alternate Refrigerants (such as HCFC–32).

DOE received several comments regarding the technology options listed in Table IV.1, and these comments are addressed in the relevant sections of the screening analysis in section IV.B. DOE did not receive any comments regarding technology options not listed in Table IV.1.

B. Screening Analysis

After DOE identified the technologies that might improve the energy efficiency of PTACs and PTHPs, DOE conducted a screening analysis. The purpose of the screening analysis is to evaluate the technologies that improve equipment efficiency to determine which technologies to consider further and which to screen out. DOE uses four screening criteria to determine which design options are suitable for further consideration in a standards rulemaking. Namely, design options will be removed from consideration if they are not technologically feasible; are not practicable to manufacture, install, or service; have adverse impacts on product utility or product availability; or have adverse impacts on health or safety. (10 CFR part 430, subpart C, appendix A at 4(a)(4) and 5(b)) Details of the screening analysis are in chapter 4 of the final rule TSD.

Technologies that pass through the screening analysis are referred to as ''design options'' in the engineering analysis. These four screening criteria do not include the propriety status of design options. DOE will only consider efficiency levels achieved through the use of proprietary designs in the engineering analysis if they are not part of a unique path to achieve that efficiency level.

In view of the above factors, DOE screened out the following design options in the September 2014 NOPR: Scroll compressors, heat pipes, and alternate refrigerants. 79 FR at 55554 (September 16, 2014). DOE received comments regarding alternative refrigerants, but did not receive comments regarding scroll compressors or heat pipes.

Alternate Refrigerants

Nearly all PTAC and PTHP equipment is designed with R–410A as the refrigerant. The Environmental Protection Agency's (EPA's) Significant New Alternatives Policy (SNAP) Program evaluates and regulates substitutes for the ozone-depleting chemicals (such as air conditioning refrigerants) that are being phased out under the stratospheric ozone protection provisions of the Clean Air Act (CAA). (42 U.S.C. 7401 *et seq.*) [10]

On July 9, 2014, the EPA issued a notice of proposed rulemaking proposing to list three flammable refrigerants (HFC–32 (R–32), Propane (R–290), and R–441A) as new acceptable substitutes, subject to use conditions, for refrigerant in the Household and Light Commercial Air Conditioning class of equipment. 79 FR 38811 (July 9, 2014). EIAI commented to suggest that DOE delay this PTAC/PTHP standards rulemaking until the EPA finalizes its proposed rule. (EIAI, No. 32 at p. 1) On April 10, 2015, the EPA published its final rule that allows the use of R–32, R–290, and R–441A in limited amounts in PTAC and PTHP applications. 80 FR 19454 (April 10, 2015) EEI commented that the EPA's proposed rule would allow flammable refrigerants to be used in PTACs in a limited amount. (EEI, NOPR Public Meeting Transcript, No. 37 at p. 47–8) [11] EIAI commented citing several reports that favorably compare HC–290 to R–410A. (EIAI, No. 32 at p. 4) EIAI requested that DOE fully analyze the direct mitigation impacts and the energy efficiency savings that can be achieved by using R–290 and R–441A. (EIAI, No. 32 at p. 1) EIAI commented that the amended standards for PTACs and PTHPs will not be as effective as possible if they exclude the alternative refrigerants under consideration for SNAP approval. (EIAI, No. 32 at p. 5) DOE considered the possibility of using the alternative refrigerants that EPA approved for limited use in PTAC and PTHP applications. The EPA's final rule limits the maximum design charge amount of the alternative refrigerants in PTAC and PTHP applications. For instance, for a PTAC or PTHP with cooling capacity of 9,000 Btu/h, the EPA rule imposes a maximum design charge of 140 grams of R–290 or 160 grams of R–441A. 80 FR at 19500 (April 10, 2015) In comparison, DOE reverse engineered eleven units with cooling capacities around 9,000 Btu/h and found that these units had refrigerant charges ranging from 600 grams to 950 grams and all units used refrigerant R–410A. The refrigerant charges currently used in current PTAC and PTHP designs far exceed the maximum charges that are allowed for alternative refrigerants under EPA's final rule. DOE

[10] Additional information regarding EPA's SNAP Program is available online at: *http://www.epa.gov/ozone/snap/.*

[11] A notation in the form ''EEI, NOPR Public Meeting Transcript, No. 37 at p. 47–8'' identifies an oral comment that DOE received during the October 29, 2014, PTAC energy conservation standards NOPR public meeting, that was recorded in the public meeting transcript in the docket for the PTAC energy conservation standards rulemaking (Docket No. EERE–2012–BT–STD–0029), and is maintained in the Resource Room of the Building Technologies Program. This particular notation refers to a comment (1) made by EEI during the public meeting; (2) recorded in document number 37, which is the NOPR public meeting transcript that is filed in the docket of this energy conservation standards rulemaking; and (3) which appears on pages 47–8 of document number 37.

acknowledges that it might be possible to incorporate the new refrigerants under consideration into PTAC designs through the use of microchannel heat exchangers or tube and fin heat exchangers with smaller tube diameters than what is currently on the market. However, DOE has not seen evidence that such designs are technologically feasible. Therefore, DOE did not further consider the R–290 and R–441A substitutes proposed by EPA.

EIAI commented that DOE should include provisions in the rule that incentivize the use of HFC-free technologies that receive SNAP approval. (EIAI, No. 32 at p. 3) EPCA authorizes DOE to regulate the energy efficiency of certain equipment such as PTACs and PTHPs. (42 U.S.C. 6311–6317) EPCA does not authorize DOE to regulate or incentivize the use or substitution of alternative refrigerants.

The California Utilities stated that DOE should research potential efficiency improvements, for future years, that can be achieved through the use of alternative refrigerants. (CA IOUs, No. 33 at p. 4) EIAI commented that the proposed rule does not address the executive action announced on September 16, 2014, that encourages research and development of next generation cooling technologies, including alternatives to hydrofluorocarbon (HFC) refrigerants.[12] (EIAI, No. 32 at p. 1) DOE responds that the engineering analysis considers technology options that are technologically feasible. DOE considers technologies incorporated in commercially available equipment or in working prototypes to be technologically feasible. 10 CFR part 430, subpart C, appendix A, section 4(a)(4)(i). The research and development activities described by the California Utilities and EIAI do not include options that are technologically feasible at this time.

EIAI suggested that DOE evaluate the commercialized PTACs and PTHPs using alternative refrigerants currently available in international markets. (EIAI, No. 32 at p. 6) ASAP *et al.* commented that manufacturers may have the option of utilizing alternative refrigerants to improve efficiency, even though the engineering analysis does not include alternative refrigerants as a technology option. (ASAP *et al.,* No. 30 at p. 3) DOE is not aware of any PTAC or PTHP model that uses alternative refrigerants approved by the EPA SNAP Program and achieves higher efficiency than equipment using R–410A.

DOE is not aware of any SNAP-approved refrigerants, or any refrigerants that have been proposed for SNAP approval, that are known to enable better efficiency than R–410A for PTAC and PTHP equipment. Hence, DOE did not consider alternate refrigerants for further analysis.

Other Technologies Not Considered in the Engineering Analysis

Typically, energy-saving technologies that pass the screening analysis are evaluated in the engineering analysis. However, some technologies are not included in the analysis for other reasons, including: (1) Available data suggest that the efficiency benefits of the technology are negligible; or (2) data are not available to evaluate the energy efficiency characteristics of the technology. Accordingly, in the September 2014 NOPR, DOE eliminated the following technologies from consideration in the engineering analysis based upon these three additional considerations: re-circuiting heat exchanger coils, rifled interior tube walls, microchannel heat exchangers, variable speed compressors, complex control boards, corrosion protection, hydrophobic material treatment of heat exchangers, clutched motor fans, and thermostatic expansion valves. 79 FR at 55555 (September 16, 2014). DOE received a comment on variable speed compressors.

Variable Speed Compressors

SCS commented that variable speed operation would enable PTACs and PTHPs to provide better humidity control, and that the current efficiency measurement of EER does not provide incentive to go to variable speed operation. (SCS, NOPR Public Meeting Transcript, No. 37 at p. 164) While the efficiency measurement of EER would not capture the benefits of variable speed operation, the existing EER (full load) metric accurately reflects equipment efficiency during the year because PTACs and PTHPs are believed to more often operate at full load rather than part load conditions. Thus, DOE did not consider variable speed compressors further in this analysis.

The technologies that DOE identified for consideration in the engineering analysis are listed in Table IV.2 and described briefly below.

TABLE IV.2—DESIGN OPTIONS RETAINED FOR ENGINEERING ANALYSIS

Compressor Improvements.
• Higher Efficiency Compressors.[13]
Condenser and evaporator fan and fan motor improvements:
• Higher Efficiency Fan Motors.
Increased Heat Exchanger Area.
Improved Air Flow and Fan Design.

Higher Efficiency Compressors

Manufacturers can improve the energy efficiency of PTAC and PTHP units by incorporating more efficient components, such as high efficiency compressors, into their designs. Goodman commented to ask whether DOE included predictions of efficiency increases over time for compressors. (Goodman, NOPR Public Meeting Transcript, No. 37 at p. 28) DOE did not include predictions of compressor efficiency changes over time. DOE observed in reverse engineering analysis that PTAC and PTHP manufacturers use several different compressor models with a wide range of efficiency ratings. The capacities and efficiencies of the different compressors observed in the reverse engineering analysis are presented in the revised Tables 5.6.1 and 5.6.2 published in document 26 of the rulemaking docket at *http://www.regulations.gov/#!documentDetail;D=EERE-2012-BT-STD-0029-0026.* Manufacturers of PTACs and PTHPs may improve the unit efficiency of baseline models by selecting high efficiency compressors currently available in the market.

Higher Efficiency Fan Motors

Manufacturers of baseline PTACs and PTHPs use permanent split capacitor (PSC) fan motors due to their modest cost, compact design, and durability. DOE believes any further gains in PSC fan motor efficiency will be difficult to achieve, and has thus eliminated improvement of PSC fan motors as a potential avenue for efficiency improvement. PTAC and PTHP original equipment manufacturers (OEMs) can, however, use permanent magnet (PM) motors. Such motors typically offer higher efficiencies than PSC-based fan motors, but these improvements come with increased costs for the motor unit and control hardware. Several manufacturers use PM motors in their higher-efficiency PTAC and PTHP models.

[12] EIAI's comment referenced a White House fact sheet describing the Executive Action at: *http://www.whitehouse.gov/the-press-office/2014/09/16/fact-sheet-obama-administration-partners-private-sector-new-commitments.*

[13] Currently, all PTAC and PTHP manufacturers incorporate rotary compressors into their equipment designs. DOE is referring to rotary compressors throughout this document unless specifically noted.

Increased Heat Exchanger Area

Manufacturers of PTACs and PTHPs increase unit efficiency by increasing heat exchanger size, either through elongating the face of the heat exchanger or increasing the number of heat exchanger tube rows. Standard size PTACs are dimensionally constrained by the standard 16″ x 48″ wall opening in which they fit. This constraint limits the size of heat exchanger that can fit in the unit and thus limits the efficiency gains that may be achieved by increasing heat exchanger size. At least one manufacturer has incorporated bent heat exchanger coils to increase the heat exchanger face area while remaining inside the standard size unit constraints. AHRI commented that DOE did not account for the additional pressure drop from bent heat exchangers in the analysis. (AHRI, No. 35 at p. 12) DOE interprets this comment to mean that AHRI expects bent heat exchangers to increase the airside pressure drop across the heat exchangers leading to increased fan power consumption and lower unit efficiency. DOE considered any pressure drop impacts associated with bent heat exchangers. In its analysis, DOE considered at least three units that contained a bent heat exchanger. DOE based its analysis on the measured performance of these units (one of which performed at the max-tech efficiency level). The measured performance of these units includes the impact of additional pressure drop associated with the bent heat exchangers.

AHRI asked what the DOE analysis showed as the efficiency improvement from implementing improved air flow design and increased heat exchanger area. (AHRI, NOPR Public Meeting Transcript, No. 37 at p. 38) The combined efficiency level and cost assessment method used in this analysis does not separately evaluate the efficiency effects of individual design options. Among the units that DOE reverse engineered in the engineering analysis, the most efficient units had injection molded fan blades and volutes and achieved greater heat exchanger area within the constrained unit dimensions by incorporating a bent outdoor heat exchanger coil.

Improved Air Flow and Fan Design

Manufacturers of PTACs and PTHPs currently use several techniques to shape and direct airflow inside PTAC and PTHP units. Different equipment designs may have higher or lower resistance to air flow. Equipment designs with lower resistance to air flow will require lower fan power input, which would improve unit efficiency. Among the units that DOE reverse engineered in the engineering analysis, the most efficient units had injection molded fan blades and volutes to direct airflow. Manufacturers may improve unit efficiency improving fan blade designs, optimizing air paths, and optimizing fan selection.

Goodman commented that utilizing design features such as improved airflow and fan design would lead to redesigned products larger than the wall footprints for standard size PTACs and PTHPs. (Goodman, No. 31 at p. 3) In contrast, Ebm-papst commented in the framework phase that efficiency gains may result in existing units from optimizing the fan selection and design so that the fan's operational efficiency in the unit matches the fan's peak efficiency exactly. (Ebm-papst, No. 8 at p. 1) DOE's analysis did not consider any such larger PTAC/PTHP designs. Any improvement associated with improved airflow and fan design represented in the analysis is associated with the existing designs evaluated in the analysis, which conform to size of currently available PTACs and PTHPs.

Goodman commented that the technology options of bent heat exchangers [to increase heat exchanger area] and improved air flow are contradictory because bent heat exchangers will restrict air flow. (Goodman, NOPR Public Meeting Transcript, No. 37 at p. 82) DOE notes that, among the units that DOE reverse engineered in the engineering analysis, the most efficient units at both representative capacities of 9,000 Btu/h and 15,000 Btu/h incorporated a bent outdoor heat exchanger coil.

Based on all available information, DOE did not change the screening analysis between the September 2014 NOPR and this final rule. Additional detail on the screening analysis is contained in chapter 4 of the final rule TSD.

C. Engineering Analysis

The engineering analysis establishes the relationship between an increase in energy efficiency of the equipment and the increase in manufacturer selling price (MSP) associated with that efficiency increase. This relationship serves as the basis for cost-benefit calculations for individual consumers, manufacturers, and the nation. In determining the cost-efficiency relationship, DOE estimates the increase in manufacturer cost associated with increasing the efficiency of equipment above the baseline up to the max-tech efficiency level for each equipment class.

1. Methodology

DOE has identified three basic methods for developing cost-efficiency curves: (1) The design-option approach, which provides the incremental costs of adding design options to a baseline model that will improve its efficiency (*i.e.,* lower its energy use); (2) the efficiency-level approach, which provides the incremental costs of moving to higher energy efficiency levels, without regard to the particular design option(s) used to achieve such increases; and (3) the reverse-engineering (or cost-assessment) approach, which provides ''bottom-up'' manufacturing cost assessments for achieving various levels of increased efficiency, based on teardown analyses (or physical teardowns) providing detailed data on costs for parts and material, labor, shipping/packaging, and investment for models that operate at particular efficiency levels.

In the February 2013 Framework Document and the September 2014 NOPR, DOE described the approach for this engineering analysis that combines an efficiency-level approach with a cost-assessment approach to determine the relationship between cost and efficiency. 78 FR 12252 (February 22, 2013) and 79 FR at 55556–9 (September 14, 2014). The range of efficiency levels and costs considered were represented by the test data and/or ratings of specific PTAC and PTHP models available in the market that included different groups of design options.

DOE identified the efficiency levels for the analysis based on the range of rated efficiencies of PTAC and PTHP equipment in the AHRI database. DOE selected PTAC and PTHP equipment that was representative of the market at different efficiency levels, then purchased, tested, and reverse engineered the selected equipment. DOE used the cost-assessment approach to determine the manufacturing production costs (MPCs) for PTAC and PTHP equipment across a range of efficiencies from the baseline to max-tech efficiency levels. DOE observed that manufacturers used different approaches to improve unit energy efficiency. AHRI commented that it is not clear what efficiency gains the equipment will achieve based on implementing the technology options that DOE has considered. (AHRI, NOPR Public Meeting Transcript, No. 37 at p. 10) DOE notes that the combined efficiency level and cost-assessment approach does not separately evaluate the effects of individual design options and does not prescribe a particular set of design options for manufacturers to improve unit efficiency. Instead, it selects units spanning a range of efficiency levels, estimates MPCs for those units, and constructs a cost curve to define the relationship between energy efficiency and MPC.

Where feasible, DOE selected models for reverse engineering with low and high efficiencies from a given manufacturer, at both representative cooling capacity levels and for both PTACs and PTHPs. The methodology used to perform reverse engineering analysis and derive the cost-efficiency relationship is described in chapter 5 of the final rule TSD. ASAP *et al.* commented to express their support for DOE's approach to the engineering analysis. (ASAP *et al.,* No. 30 at p. 3)

2. Equipment Classes Analyzed

DOE developed its engineering analysis for the six equipment classes associated with standard-size PTACs and PTHPs. As discussed in section III.B of this final rule, DOE did not amend energy efficiency standards for non-standard size equipment classes because of their low and declining market share and because of a lack of adequate information to analyze these units.

For the PTAC and PTHP equipment classes with a cooling capacity greater than or equal to 7,000 Btu/h and less than or equal to 15,000 Btu/h, the energy efficiency equation characterizes the relationship between the EER of the equipment and cooling capacity (*i.e.,* EER is a function of the cooling capacity of the equipment) in which EER decreases as capacity increases. For all cooling capacities less than 7,000 Btu/h and all cooling capacities greater than 15,000 Btu/h, the EER is calculated based on the energy efficiency equation for 7,000 Btu/h or 15,000 Btu/h, respectively.

For PTACs and PTHPs, DOE focused its analysis on high-shipment-volume cooling capacities spanning the range of available equipment. Based on manufacturer interviews,[14] DOE found that the majority of shipments are in the classes with cooling capacity between 7,000 Btu/h to 15,000 Btu/h (see chapter 9 of the final rule TSD for more details on the shipments data). As described in the September 2014 NOPR, DOE selected two cooling capacities for analysis: 9,000 Btu/h and 15,000 Btu/h. 79 FR at 55557. DOE selected 9,000 Btu/h as a representative capacity because the AHRI Directory lists more PTAC models around the 9,000 Btu/h capacity level than any other capacity level. DOE selected 15,000 Btu/h as a representative capacity in response to manufacturer comments stating that it is technically challenging to achieve high efficiency in 15,000 Btu/h models and the analysis should explicitly analyze the 15,000 Btu/h capacity. AHRI commented that the two equipment sizes that DOE selected for testing and teardowns may not accurately represent the full capacity range of the product category. AHRI observed that a greater number of high-efficiency models are available at the 9,000 Btu/h capacity compared with other unit capacities. (AHRI, NOPR Public Meeting Transcript, No. 37 at p. 10) AHRI observation does not indicate that a cost/efficiency relationship determined based on the 9,000 Btu/h and 15,000 Btu/h capacities would not be representative of the full range of cooling capacities. The design changes that DOE observed in units at the representative capacities of 9,000 Btu/h and 15,000 Btu/h can be interpolated and extrapolated to include other common capacities (such as 7,000 Btu/h and 12,000 Btu/h) that were not directly analyzed in the reverse engineering analysis. It would not be feasible to conduct teardown analysis for every cooling capacity available in the market. DOE selected the representative cooling capacities of 9,000 and 15,000 Btu/h in response to comments from the framework stage of this rulemaking; available information indicates that these capacities accurately represent the markets for PTAC and PTHP equipment.

Using its analysis of two cooling capacities, DOE investigated the slope of the energy efficiency-capacity relationship. Further details on this relationship are provided in chapter 5 of the final rule TSD.

3. Cost Model

DOE developed a manufacturing cost model to estimate the MPCs of PTAC and PTHP units over a range of cooling efficiencies. The cost model is a spreadsheet model that converts the materials and components in the bills of materials for PTAC and PTHP equipment into dollar values based on the price of materials, average labor rates associated with fabrication and assembling, and the cost of overhead and depreciation, as determined based on manufacturer interviews and equipment cost information compiled by DOE. To convert the information in the bills of materials into dollar values, DOE collected information on labor rates, tooling costs, raw material prices, and other factors. For purchased parts, the cost model estimates the purchase price based on volume-variable price quotations and detailed discussions with manufacturers and component suppliers. For fabricated parts, the prices of raw metal materials (*e.g.,* tube, sheet metal) are estimates on the basis of five-year averages (from 2009 to 2014). DOE estimated the cost of transforming the raw materials into finished parts based on current industry pricing. Further details on the manufacturing cost analysis are provided in chapter 5 of the final rule TSD.

Developing the cost model involved disassembling PTACs and PTHPs at various efficiencies, analyzing the materials and manufacturing processes, and estimating the costs of purchased components. DOE also collected supplemental component cost data from manufacturers of PTAC and PTHP equipment. DOE reports the MPCs in aggregated form to maintain confidentiality of sensitive component data. DOE obtained input from stakeholders on the MPC estimates and assumptions to confirm accuracy. DOE used the cost model for all of the representative cooling capacities within the PTAC and PTHP equipment classes. Chapter 5 of the final rule TSD provides details and assumptions of the cost model.

4. Baseline Efficiency Level

The engineering analysis estimates the incremental costs for equipment with efficiency levels above the baseline in each equipment class. For the purpose of the engineering analysis, DOE used the engineering baseline EER as the starting point to build the cost efficiency curves. As discussed in section III.A, ANSI/ASHRAE/IES Standard 90.1–2013 was issued in the course of this rulemaking, and this revised standard amended minimum efficiency levels for PTACs, raising standards by 1.8% above the Federal minimum energy conservation standards for PTACs. DOE is obligated either to adopt those standards developed by ASHRAE or to adopt levels more stringent than the ASHRAE levels if there is clear and convincing evidence in support of doing so. (42 U.S.C. 6313(a)(6)(A)). For the purposes of calculating energy savings over the ANSI/ASHRAE/IES Standard 90.1–2013, DOE identified the ANSI/ASHRAE/IES Standard 90.1–2013 as the baseline efficiency level.[15] SCS agreed that it is correct to use ASHRAE 90.1–

[14] DOE conducted interviews with high- and low-volume PTAC and PTHP manufacturers, and collected information regarding shipments of PTACs and PTHPs at different cooling capacity levels.

[15] DOE's estimates of potential energy savings from an amended energy conservation standard are further discussed in section IV.H.

2013 as the baseline for analysis. (SCS, NOPR Public Meeting Transcript, No. 37 at p. 26–27)

The baseline efficiency levels for each equipment class are presented in Table IV.3.

TABLE IV.3—BASELINE EFFICIENCY LEVELS

Equipment type	Equipment class	Baseline efficiency equation	Cooling capacity	Baseline efficiency level
PTAC	Standard Size	EER = 14.0 − (0.300 × Cap †/1000)	9,000 Btu/h 15,000 Btu/h	11.3 EER. 9.5 EER.
PTHP	Standard Size	EER = 14.0 − (0.300 × Cap †/1000)	9,000 Btu/h 15,000 Btu/h	11.3 EER. 9.5 EER.

† Cap means cooling capacity in Btu/h at 95 °F outdoor dry-bulb temperature.

5. Incremental Efficiency Levels

DOE examined performance data of standard size PTACs and PTHPs published in the AHRI Directory and on manufacturers' Web sites to select efficiency levels for consideration in the rulemaking. DOE used Web site-published data as an initial screening mechanism to select units for reverse engineering; a third party test facility verified the actual performance of the units selected for analysis.

DOE analyzed the baseline efficiency level and efficiency levels that are 2.2%, 6.2%, 10.2%, 14.2%, and 16.2% more efficient than the ANSI/ASHRAE/IES Standard 90.1–2013 baseline.[16] The rated efficiencies of PTACs listed in the AHRI Directory extend up to 17.5% above the ANSI/ASHRAE/IES Standard 90.1–2013 baseline efficiency level. However, based on testing of individual units conducted for this rulemaking, DOE considered efficiencies up to only 16.2% above the baseline level. DOE expects that PTAC equipment without a reversing valve should be able to attain the cooling mode efficiencies as least as high as PTHPs. This is because the reversing valve of a PTHP, which allows for reverse cycle (heat pump) operation and is not required in a PTAC, imposes pressure drop which would reduce PTHP efficiency.

For the heating efficiency of PTHPs, DOE correlated the COP associated with each efficiency level with the efficiency level's EER based on COP and EER ratings from the AHRI database. DOE established a representative curve based on this data to obtain a relationship for COP in terms of EER. DOE used this relationship to select COP values corresponding to each efficiency level. This approach considers the fact that a PTHP's EER and COP are related and cannot be independently analyzed, while basing the analysis on a representative average relationship between the two efficiency metrics. To determine the typical relationship between EER and COP, DOE examined the entire database of rated equipment and determined a relationship based on the EER and COP ratings of the collective body of certified PTAC and PTHP equipment.

The efficiency levels for each equipment class that DOE considered are presented in Table IV.4. The percentages associated with efficiency levels (ELs) indicate the percentage above the baseline level for PTACs and PTHPs. In the September 2014 NOPR, DOE presented efficiency levels using percentages relative to the current Federal standard for PTACs. 79 FR at 55559. This method of presentation caused confusion among stakeholders. AHRI and SCS commented presenting efficiency increases as a percentage above current Federal minimum standards for PTACs was confusing. (AHRI, NOPR Public Meeting Transcript, No. 37 at p. 77; SCS, NOPR Public Meeting Transcript, No. 37 at p. 78) In response to these comments, DOE has changed the base value used in determining the percentage increase of EER so that the percentages represents increases above the ASHRAE 90.1–2013 efficiency level rather than increases above the current DOE standard. The EER values for this baseline are equal to those for the DOE PTHP standards and the ASHRAE 90.1–2013 PTHP standards. Table IV.4 presents percentages relative to the new baseline level, which is the same for PTACs and PTHPs.

TABLE IV.4—INCREMENTAL EFFICIENCY LEVELS FOR STANDARD SIZE PTACS AND PTHPS

Equipment type	Cooling capacity	Efficiency levels (percentages relative to baseline)						
		Current Federal PTAC ECS *	EL1, Baseline **	EL2, 2.2%	EL3, 6.2%	EL4, 10.2%	EL5, 14.2%	EL6, 16.2% (MaxTech)
PTAC	All, EER	13.8 − (0.300 × Cap †).	14.0 − (0.300 × Cap †).	14.4 − (0.312 × Cap †).	14.9 − (0.324 × Cap †).	15.5 − (0.336 × Cap †).	16.0 − (0.348 × Cap †).	16.3 − (0.354 × Cap †)
	9,000 Btu/h	11.1 EER	11.3 EER	11.5 EER	12.0 EER	12.4 EER	12.9 EER	13.1 EER
	15,000 Btu/h	9.3 EER	9.5 EER	9.7 EER	10.0 EER	10.4 EER	10.8 EER	11.0 EER
Equipment type	Cooling capacity	N/A	Baseline **	EL1, 2.2%	EL2, 6.2%	EL3, 10.2%	EL4, 14.2%	EL5, 16.2% (MaxTech)
PTHP	All, EER	N/A	14.0 − (0.300 × Cap †).	14.4 − (0.312 × Cap †).	14.9 − (0.324 × Cap †).	15.5 − (0.336 × Cap †).	16.0 − (0.348 × Cap †).	16.3 − (0.354 × Cap †)
	All, COP	N/A	3.7 − (0.052 × Cap †).	3.8 − (0.058 × Cap †).	4.0 − (0.064 × Cap †).	4.1 − (0.068 × Cap †).	4.2 − (0.070 × Cap †).	4.3 − (0.073 × Cap †)
	9,000 Btu/h	N/A	11.3 EER 3.2 COP	11.5 EER 3.3 COP	12.0 EER 3.4 COP	12.4 EER 3.5 COP	12.9 EER 3.6 COP	13.1 EER 3.6 COP

[16] DOE notes that these efficiency levels are 4%, 8%, 12%, 16%, and 18% more efficient than the amended PTAC standards that became effective on October 8, 2012.

TABLE IV.4—INCREMENTAL EFFICIENCY LEVELS FOR STANDARD SIZE PTACS AND PTHPS—Continued

Equipment type	Cooling capacity	Efficiency levels (percentages relative to baseline)						
		Current Federal PTAC ECS *	EL1, Baseline **	EL2, 2.2%	EL3, 6.2%	EL4, 10.2%	EL5, 14.2%	EL6, 16.2% (MaxTech)
	15,000 Btu/h	N/A	9.5 EER .... 2.9 COP	9.7 EER .... 2.9 COP	10.0 EER .... 3.0 COP	10.4 EER .... 3.1 COP	10.8 EER .... 3.2 COP	11.0 EER 3.2 COP

* This level represents the current Federal minimum for PTAC equipment.
** This level represents the ANSI/ASHRAE/IES Standard 90.1–2013 minimum for PTAC and PTHP equipment. This level is used as the Baseline for PTAC and PTHP equipment since DOE is required to, at a minimum, adopt the ASHRAE levels as the Federal standard. (42 U.S.C. 6313(a)(6)(A)(ii)(I)). DOE notes that the Baseline level is 1.8% higher than current Federal ECS for PTAC equipment, but is equivalent to current Federal ECS for PTHP equipment. For PTAC equipment, the Baseline level is also termed EL1, and is compared to current Federal ECS in the energy savings analysis in section V.B.3.a.
† Cap means cooling capacity in thousand Btu/h at 95°F outdoor dry-bulb temperature.

6. Equipment Testing and Reverse Engineering

As discussed above, for the engineering analysis, DOE specifically analyzed representative capacities of 9,000 Btu/h and 15,000 Btu/h to develop incremental cost-efficiency relationships. DOE selected twenty different models representing PTAC and PTHP equipment types at 9,000 Btu/h and 15,000 Btu/h capacities. DOE selected the models as a representative sample of the market at different efficiency levels. DOE based the selection of units for testing and reverse engineering on the efficiency data available in the AHRI certification database. Details of the key features of the tested units are presented in chapter 5 of the final rule TSD.

DOE conducted testing on each unit according to the DOE test procedure outlined at 10 CFR 431.96. At the time of testing, the DOE test procedure incorporated by reference AHRI Standard 310/380–2004, which itself incorporates ANSI/ASHRAE 16, ANSI/ASHRAE 37, and ANSI/ASHRAE 58. In June, 2015, DOE revised the test procedure to incorporate by reference AHRI Standard 310/380–2014. The amendments adopted in the revised test procedure do not affect measured energy use. DOE then conducted physical teardowns on each test unit to develop a manufacturing cost model and to evaluate key design features (*e.g.,* improved heat exchangers, compressors, fans/fan motors).

7. Cost-Efficiency Results

The results of the engineering analysis are reported as a set of cost-efficiency data (or ‘‘curves’’) in the form of MPC (in dollars) versus EER, which form the basis for other analyses in the final rule. DOE created cost-efficiency curves for the two representative cooling capacities within the two standard-size equipment classes of PTACs and PTHPs, as discussed in section IV.C.3. DOE developed the incremental cost-efficiency results shown in Table IV.5 for each representative cooling capacity. These cost results are incremented from a baseline efficiency level equivalent to the ANSI/ASHRAE/IES Standard 90.1–2013. Details of the cost-efficiency analysis are presented in chapter 5 of the final rule TSD.

TABLE IV.5—INCREMENTAL MANUFACTURING PRODUCTION COSTS (MPC) FOR STANDARD SIZE PTACS AND PTHPS

Equipment type	Cooling capacity	Efficiency levels					
		EL1, baseline *	EL2	EL3	EL4	EL5	EL6
PTAC	9,000 Btu/h .... 15,000 Btu/h	$0.00 0.00	$4.44 4.26	$13.08 15.93	$22.41 30.97	$32.45 49.38	$37.73 59.86
		Baseline *	EL1	EL2	EL3	EL4	EL5
PTHP	9,000 Btu/h .... 15,000 Btu/h	$0.00 0.00	$4.44 4.26	$13.08 15.93	$22.41 30.97	$32.45 49.38	$37.73 59.86

* This level represents the ANSI/ASHRAE/IES Standard 90.1–2013 minimum for PTAC and PTHP equipment. This level is used as the Baseline since DOE is required to, at a minimum, adopt the ASHRAE levels as the Federal standard. (42 U.S.C. 6313(a)(6)(A)(ii)(I)). DOE notes that the Baseline level is 1.8% higher than current Federal ECS for PTAC equipment, but is equivalent to current Federal ECS for PTHP equipment. For PTAC equipment, the Baseline level is also termed EL1.

AHRI commented that DOE should publish the design options associated with different energy efficiency levels. (AHRI, NOPR Public Meeting Transcript, No. 37 at p. 85) Goodman requested that DOE clarify exactly what designs can help achieve the energy savings associated with higher efficiency levels. (Goodman, NOPR Public Meeting Transcript, No. 37 at p. 82) Goodman also commented that DOE should publish the efficiency improvements associated with individual design options, as DOE has done for previous rulemakings. (Goodman, NOPR Public Meeting Transcript, No. 37 at p. 86–87) For this rulemaking, DOE used a combined efficiency level and reverse engineering approach. This approach is unlike the design option approach in that it does not specify the options that manufacturers may use to achieve different efficiency levels. During the teardown analysis, DOE observed that different manufacturers use different design options to improve unit efficiency, and there is no single path to improved efficiency. Stakeholders interested in the specific design options used in different units should refer to chapter 5 of the final rule TSD, where DOE published the design options for each unit observed in the teardown analysis in Tables 5.6.1 and 5.6.2.

Goodman commented that the analysis did not capture the design changes that manufacturers made to increase from the current Federal minimum to the minimum level in ANSI/ASHRAE/IES Standard 90.1–2013, which for PTAC equipment is 1.8% more stringent than the current Federal minimum. (Goodman NOPR Public Meeting Transcript, No. 37 at p. 28) The efficiency level approach used in this analysis does capture the design changes that manufacturers used to increase equipment efficiency from the current Federal minimum up to the ANSI/ASHRAE/IES Standard 90.1 level. Because DOE used an efficiency level approach rather than a design option approach, however, the design options used to attain the initial efficiency improvement are not specified in the analysis. DOE did examine units with efficiency levels above and below the ANSI/ASHRAE/IES Standard 90.1 level. DOE based its cost analysis on the observed differences in designs between these units. The engineering analysis does not account for the incremental manufacturing costs associated with an increase from the current Federal minimum up to the ANSI/ASHRAE/IES Standard 90.1-level. The analysis did not intend to capture these costs because DOE is required to, at a minimum, adopt the ANSI/ASHRAE/IES Standard 90.1 level as the Federal standard. (42 U.S.C. 6313(a)(6)(A)(ii)(I)) DOE investigated what efficiency levels higher than the ASHRAE 90.1 level are cost effective, rather than evaluating whether the ASHRAE 90.1 level is cost effective as a step above the current DOE PTAC standard. DOE revised the MIA analysis in section IV.J to include an additional set of product conversion costs intended to capture the R&D and testing and certification burden of meeting amended ASHRAE standards in 2015. The results of the MIA analysis can be found in chapter 12 of the final rule TSD.

To convert the MPCs into manufacturer selling prices (MSPs), DOE applied non-production cost markups to the MPCs estimated in the engineering analysis for each equipment class and efficiency level. Based on publicly-available financial information for manufacturers of PTACs and PTHPs as well as feedback received from manufacturers during interviews, DOE assumed the average non-production cost baseline markup—which includes SG&A expenses, R&D expenses, interest, and profit—to be 1.27 for all PTAC and PTHP equipment classes. As part of its manufacturer impact analysis, DOE then modeled multiple markup scenarios to capture a range of potential impacts on manufacturers following implementation of amended energy conservation standards. These scenarios lead to different markup values, which, when applied to MPCs, result in varying revenue and cash flow impacts. Further details on manufacturer markups can be found in section IV.J.2 and in chapter 12 of the final rule TSD.

D. Markups To Determine Equipment Price

The markups analysis develops appropriate markups in the distribution chain to convert the estimates of manufacturer selling price to consumer prices. (''Consumer'' refers to purchasers of the equipment being regulated.) DOE calculates overall baseline and incremental markups based on the equipment markups at each step in the distribution chain. The incremental markup relates the change in the manufacturer sales price of higher efficiency models (the incremental cost increase) to the change in the consumer price.

DOE developed supply chain markups in the form of multipliers that represent increases above MSP and include distribution costs. DOE applied these markups to the MSPs it developed in the engineering analysis, and then added sales taxes to arrive at the equipment prices for baseline and higher efficiency equipment. See chapter 6 of the final rule TSD for additional details on markups.

DOE identified and used four distribution channels for PTACs and PTHPs to describe how the equipment passes from the manufacturer to the consumer. Equipment is distributed to two end-use applications: New construction and replacement. In the new construction market, the manufacturer sells the equipment directly to the consumer through a national account. In the replacement market, the manufacturer sells to a wholesaler, who sells to a mechanical contractor, who in turn sells the equipment to the consumer or end user. In the third distribution channel, used in both the new construction and replacement markets, the manufacturer sells the equipment to a wholesaler. The wholesaler sells the equipment to a mechanical contractor, who sells it to a general contractor, who in turn sells the equipment to the consumer or end user. In the fourth distribution channel, also used in both the new construction and replacement markets, the manufacturer sells the equipment to a wholesaler, who directly sells to the purchaser.

TABLE IV.6—DISTRIBUTION CHANNELS FOR PTAC AND PTHP EQUIPMENT

Channel 1	Channel 2	Channel 3	Channel 4
Manufacturer (through national accounts).	Manufacturer	Manufacturer	Manufacturer.
	Wholesaler	Wholesaler	Wholesaler.
		Mechanical Contractor	Mechanical Contractor.
			General Contractor.
Consumer	Consumer	Consumer	Consumer.

DOE also estimated percentages of the total sales in the new construction and replacement markets for each of the four distribution channels, as shown in Table IV.7.

TABLE IV.7—SHARE OF MARKET BY DISTRIBUTION CHANNEL FOR PTAC AND PTHP EQUIPMENT

Distribution channel	New construction (%)	Replacement (%)
Wholesaler-Consumer	30	15
Wholesaler-Mech Contractor-Consumer	0	25
Wholesaler-Mech Contractor-General Contractor-Consumer	38	60
National Account	32	0
Total	100	100

For each of the steps in the distribution channels presented above, DOE estimated a baseline markup and an incremental markup. DOE defines a baseline markup as a multiplier that converts the MSP of equipment with baseline efficiency to the consumer purchase price for that equipment. An incremental markup is defined as the multiplier to convert the incremental increase in MSP of higher efficiency equipment to the incremental consumer purchase price for that equipment. Both baseline and incremental markups are independent of the efficiency levels of the PTACs and PTHPs.

DOE developed the markups for each step of the distribution channels based on available financial data. DOE utilized updated versions of the following data sources: (1) The Heating, Air Conditioning & Refrigeration Distributors International *2012 Profit Report* [17] to develop wholesaler markups; (2) the Air Conditioning Contractors of America's (ACCA) *2005 Financial Analysis for the HVACR Contracting Industry* [18] and U.S. Census Bureau economic data [19] to develop mechanical contractor markups; and (3) U.S. Census Bureau economic data for the commercial and institutional building construction industry to develop general contractor markups.[20] DOE estimated an average markup for sales through national accounts to be one-half of the markup for the wholesaler-to-consumer distribution channel. DOE determined this markup for national accounts on an assumption that the resulting national account equipment price must fall somewhere between the MSP (*i.e.,* a markup of 1.0) and the consumer price under a typical chain of distribution (*i.e.,* a markup of wholesaler, mechanical contractor, or general contractor).

The overall markup is the product of all the markups (baseline or incremental markups) for the different steps within a distribution channel. Replacement channels include sales taxes, which were calculated based on State sales tax data reported by the Sales Tax Clearinghouse.

DOE requested comment regarding the selected channels and distribution of shipments through the channels in the NOPR. AHRI stated that some national accounts purchase replacements through direct sales. (AHRI, No. 35 at p. 14) DOE did not find any data to indicate the magnitude of PTAC/PTHP replacement sales through national accounts. However, DOE understands that in general replacement purchases of PTACs and PTHPs are not in large volume as one would expect in national accounts. Thus, DOE believes that this channel is likely to be a minimal part of the market. DOE therefore retained the set of markups used in the September 2014 NOPR.

E. Energy Use Analysis

The energy use analysis provides estimates of the annual unit energy consumption (UEC) of PTAC and PTHP equipment at the considered efficiency levels. The annual UECs are used in subsequent analyses.

DOE adjusted the UECs for each equipment class of PTAC and PTHP from the 2008 standards rulemaking. 73 FR 58772. DOE began with the cooling UECs for PTACs and the combined cooling and heating UECs for PTHPs utilized in the 2008 standards rulemaking. 73 FR 58772. The cooling and heating UECs for PTHPs were split, assuming equal cooling energy use for PTACs and PTHPs. In addition, DOE adjusted the base-year UECs to account for changes in climate (*i.e.,* heating degree-days and cooling degree-days) between 2008 and 2013, based on a typical meteorological year (TMY) hourly weather data set (referred to as TMY2) and an updated TMY3 data set.

Where identical efficiency levels and cooling capacities were available, DOE used the cooling or heating UEC directly from the previous rulemaking. For additional efficiency levels, DOE scaled the cooling UECs based on interpolations between EERs and scaled the heating UECs based on interpolations between COPs, both at a constant cooling capacity. Likewise, for additional cooling capacities, DOE scaled the UECs based on interpolations between cooling capacities at a constant EER.

SCS expressed concern that DOE's adjustments to UEC estimates for higher efficiency levels are based on sensible heat only. SCS recommended that the energy modeling be based on compliance with ASHRAE 62.1–2010 ventilation standard. (SCS, No. 29 at p. 2) DOE notes that UEC estimates for higher efficiency levels include latent heat because the UECs upon which estimates are based include latent heat. DOE appreciates SCS's recommendation to comply with ventilation requirements in the simulation to ASHRAE 62.1–2010. As the simulations exceed the ventilation requirements of ASHRAE 62.1–2010, DOE does not intend to make modifications. SCS also suggested that DOE examine the occupancy rates for buildings where PTACs and PTHPs would be installed, since that would affect their operating hours. (SCS, NOPR Public Meeting Transcript, No. 37 at p. 103) The simulations account for variations in occupancy rates.

AHRI asked why DOE included the space conditioning load of lobby and lounge spaces, which are typically not conditioned by PTACs and PTHPs, in the building load of the energy simulations, suggesting that this is something that DOE should correct. (AHRI, No. 35 at p. 8) While DOE's whole-building simulations did include the energy consumption from the equipment conditioning the lobby and lounge zones, the per-unit energy consumption excluded from its total energy use the energy of such spaces prior to dividing by the number of PTAC or PTHP equipment conditioning the guest rooms.

AHRI suggested that DOE account for changes to ASHRAE 90.1 in its energy use analysis, incorporating at a minimum the following control-related provisions from ASHRAE 90.1–2013: manual changeover or dual setpoint thermostat; controls that prevent supplemental electric resistance strip heating when the heating load can be met; and zone thermostatic controls for off-hour, automatic shutdown, and setback. (AHRI, No. 35 at p. 7; AHRI, NOPR Public Meeting Transcript, No. 37 at p. 102) Similarly, SCS and Goodman stated that DOE did not include the control requirements from ASHRAE Standard 90.1–2013 and thus modifications to the simulations would ultimately reduce the UEC of PTACs and PTHPs. (SCS, No. 29 at p. 1; Goodman, No. 31 at p. 5) The control provisions of ASHRAE Standard 90.1–2013 would in certain situations save energy and were included in the energy use simulations performed for the 2008 PTAC and PTHP final rule, which were in turn the basis for this analysis. PG&E also asked whether energy from defrost and from electric resistance heating below 40 °F was included in the simulations. (PG&E, NOPR Public Meeting Transcript, No. 37 at pp. 103–105) DOE notes that energy from defrost and from electric resistance heating below 40 °F were included in the energy use analysis.

[17] ''2012 Profit Report,'' Heating Air Conditioning & Refrigeration Distributors International. February 2012. Available online at: *www.hardinet.org/Profit-Report.*

[18] ''2005 Financial Analysis for the HVACR Contracting Industry,'' Air Conditioning Contractors of America. 2005.

[19] ''Plumbing, Heating, and Air-Conditioning Contractors. Sector 23: 238220. Construction: Industry Series, Preliminary Detailed Statistics for Establishments, 2007,'' U.S. Census Bureau. 2007.

[20] ''2007 Economic Census, Construction Industry Series and Wholesale Trade Subject Series,'' U.S. Census Bureau. Available online at *https://www.census.gov/newsroom/releases/archives/construction_industries/2009-07-27_economic_census.html.*

For the LCC and PBP analyses, UECs were determined for the representative cooling capacities of 9,000 Btu/h and 15,000 Btu/h for which cost-efficiency curves were developed, as discussed in section IV.C.7. For the NIA, UECs were determined for the cooling capacities of 7,000 Btu/h, 9,000 Btu/h, and 15,000 Btu/h for which aggregate shipments were provided by AHRI, as highlighted in section IV.G. National UEC estimates for PTACs and PTHPs for the above analyses are described in detail in chapter 8 of the final rule TSD.

AHRI asked why national UEC estimates for PTACs are lower in the ASHRAE Standard 90.1–2013 notice of data availability and request for public comment (ASHRAE Standard 90.1–2013 NODA) (79 FR 20114) than in the September 2014 NOPR. (AHRI, No. 35 at p. 9) For the analysis in the ASHRAE Standard 90.1–2013 NODA, DOE did not use a multiplier to account for the weather as the data were not finalized at the time. Taking these multipliers into account, energy use increased in the UECs submitted for the September 2014 NOPR.

In the framework stage of this rulemaking, AHRI and Goodman commented that new requirements for minimum air filter effectiveness finalized in 2013 for ASHRAE Standard 62.1 would increase pressure drop and increase fan power. (AHRI, No. 11 at p. 4; Goodman, No. 13 at p. 6) In the September 2014 NOPR, DOE cited a study [21] that found the extent of the impact on energy consumption due to the change in filter effectiveness at the levels finalized in ASHRAE Standard 62.1 is less than 1%. Based on this finding, DOE concluded that the change in ASHRAE Standard 62.1 minimum air filter effectiveness requirements would not significantly impact the energy use outputs. 79 FR at 55561 (September 16, 2014). AHRI commented that the study cited by DOE was for residential products and stated that the results showing negligible impact cannot be extrapolated to commercial equipment. As such, AHRI stated that DOE must consider the energy and monetary implications for manufacturers to comply with the increased filtration requirement. (AHRI, No. 35 at p. 14) DOE understands that manufacturers have thus far not used filters rated with a Minimum Efficiency Reporting Value (MERV) filters in their PTAC equipment, and there is no reason to believe that they will begin using MERV-rated filters in the near term. Thus, the shift in ASHRAE 62.1 from requiring MERV 6 filter to requiring MERV 8 filters would not impact the operation or energy use of PTAC equipment. The change in ASHRAE 62.1 filtration requirements would also not affect the certification of PTAC equipment, since the PTAC and PTHP test procedures specify that equipment is to be tested using the filter that ships with it (or using a MERV 1 filter, if the equipment is shipped without a filter).

F. Life Cycle Cost and Payback Period Analyses

The purpose of the LCC and PBP analysis is to analyze the effects of potential amended energy conservation standards on consumers of PTAC and PTHP equipment by determining how a potential amended standard affects their operating expenses (usually decreased) and their total installed costs (usually increased).

The LCC is the total consumer expense over the life of the equipment, consisting of equipment and installation costs plus operating costs over the lifetime of the equipment (expenses for energy use, maintenance, and repair). DOE discounts future operating costs to the time of purchase using consumer discount rates. The PBP is the estimated amount of time (in years) it takes consumers to recover the increased total installed cost (including equipment and installation costs) of a more efficient type of equipment through lower operating costs. DOE calculates the PBP by dividing the change in total installed cost (normally higher) due to a standard by the change in annual operating cost (normally lower) that results from the standard.

For any given efficiency level, DOE analyzed these impacts for PTAC and PTHP equipment starting in the compliance years as set forth in section V.B.1.a by calculating the change in consumer LCCs likely to result from higher efficiency levels compared with the ASHRAE baseline efficiency levels for the PTAC and PTHP equipment classes discussed in the engineering analysis.

DOE conducted the LCC and PBP analyses for the PTAC and PTHP equipment classes using a spreadsheet model developed in Microsoft Excel. When combined with Crystal Ball (a commercially available software program), the LCC and PBP model generates a Monte Carlo simulation to perform the analyses by incorporating uncertainty and variability considerations in certain of the key parameters as discussed below. Inputs to the LCC and PBP analysis are categorized as: (1) Inputs for establishing the total installed cost and (2) inputs for calculating the operating expense. Results of the LCC and PBP analyses were applied to other equipment classes through linear scaling of the results by the cooling capacity of the equipment class.

The following sections contain brief discussions of comments on the inputs and key assumptions of DOE's LCC and PBP analysis. They are also described in detail in chapter 8 of the final rule TSD.

1. Equipment and Installation Costs

The equipment costs faced by purchasers of PTAC and PTHP equipment are derived from the MSPs estimated in the engineering analysis and the markups estimated in the markups analysis.

To develop an equipment price trend for the September 2014 NOPR, DOE derived an inflation-adjusted index of the producer price index (PPI) for ''all other miscellaneous refrigeration and air-conditioning equipment'' from 1990–2014.[22] Although the inflation-adjusted index shows a declining trend from 1990 to 2004, and a rising trend from 2004–2008, data since 2008 have shown a flat-to-slightly rising trend. Given the uncertainty as to which of the trends will prevail in coming years, DOE applied a constant price trend (2014 levels) for each efficiency level in each equipment class for the September 2014 NOPR.

AHRI stated that DOE should utilize a trend based on the steady and significant price increase since 2004, a trend that has not been affected by the slowdown in activity since 2008. (AHRI, No. 35 at p. 5) While the historical data show an increasing price from 2004–2008, the data show a decreasing price trend from 1990 to 2004 and several years of constant prices after the economic slowdown. It is not clear if a new upward trend has been established. Given such uncertainty, DOE maintained its approach in the September 2014 NOPR to use a constant price assumption to project future PTAC and PTHP equipment prices.

For installation costs, DOE used a specific cost from RS Means [23] for PTACs and PTHPs and linearly scaled the cost according to the cooling capacities of the equipment classes.

2. Unit Energy Consumption

The calculation of annual per-unit energy consumption at each considered

[21] Walker, I.S., et al., ''System Effects of High Efficiency Filters in Homes,'' Lawrence Berkeley National Laboratory, LBNL–6144E, 2013.

[22] ''Producer Price Indexes,'' Bureau of Labor Statistics (BLS). 2014. Available online at *www.bls.gov/ppi/.*

[23] RS Means Company, Inc. *RS Means Mechanical Cost Data 2013.* 2013. Kingston, MA.

efficiency level and capacity is described in section IV.E.

3. Electricity Prices and Electricity Price Trends

DOE determined electricity prices for PTAC and PTHP users based on tariffs from a representative sample of electric utilities. Since air-conditioning loads are strongly peak-coincident, regional marginal prices were developed from the tariff data and then scaled to approximate 2014 prices. This approach calculates energy expenses based on actual commercial building marginal electricity prices that consumers are paying.[24]

The Commercial Buildings Energy Consumption Survey completed in 1992 (CBECS 1992) and in 1995 (CBECS 1995) provides monthly electricity consumption and demand for a large sample of buildings. DOE used these values to help develop usage patterns associated with various building types. Using these monthly values in conjunction with the tariff data, DOE calculated monthly electricity bills for each building. The average price of electricity is defined as the total electricity bill divided by total electricity consumption. From this average price, the marginal price for electricity consumption was determined by applying a 5 percent decrement to the average CBECS consumption data and recalculating the electricity bill. Using building location and the prices derived from the above method, a marginal price was determined for each region of the U.S.

The tariff-based prices were updated to 2013 using the commercial electricity price index published in the *AEO* and then adjusted to 2014$. An examination of data published by the Edison Electric Institute[25] indicates that the rate of increase of marginal and average prices is not significantly different, so the same factor was used for both pricing estimates. DOE projected future electricity prices using trends in average U.S. commercial electricity price from *AEO 2014*.[26] More information can be found in chapter 8 of the final rule TSD.

4. Repair Costs

Repair costs are associated with repairing or replacing components that have failed. In the September 2014 NOPR, DOE determined the cost of repair costs by annualizing warranty contract's prices and linearly scaling by cooling capacity and MSP to cover the equipment classes and considered efficiency levels.

DOE received comments regarding repair costs. AHRI stated that repair costs are significantly more expensive after the warranty has expired and that DOE should account for repair costs after five years. (AHRI, No. 35 at p. 13; AHRI, NOPR Public Meeting Transcript, No. 37 at p. 154) Goodman recommended that DOE reevaluate the repair cost amounts specified in the NOPR TSD, adding that equipment lifetime can be substantially longer than the typical equipment warranty and that using warranty costs as a proxy for lifetime repair prices understates average annual repair costs. Goodman also recommended that DOE survey contractors to determine average labor costs associated with repair work. (Goodman, No. 31 at pp. 3–4)

In response to these comments, DOE reevaluated the repair costs it had proposed in the September 2014 NOPR. For the final rule, DOE used the material and labor costs associated with repair of equipment components covered and not covered by a standard manufacturer warranty. Based on a report of component failure probability and warranty terms, and on component material and labor costs from RS Means data,[27] DOE determined the expected value of the total cost of a repair and annualized it to determine the annual repair cost. Similar to the approach used in the September 2014 NOPR, DOE scaled by cooling capacity and MSP to determine repair costs for the equipment classes and considered efficiency levels.

5. Maintenance Costs

Maintenance costs are costs associated with general maintenance of the equipment (*e.g.,* checking and maintaining refrigerant charge levels and cleaning heat-exchanger coils). In the September 2014 NOPR, DOE utilized estimates of annual maintenance cost from the previous rulemaking with the values adjusted to current material and labor rates to estimate maintenance cost for PTACs. For PTHPs, DOE scaled the adjusted estimate of PTAC maintenance costs with the ratio of PTHP to PTAC annualized maintenance costs from RS Means data.[28] Since maintenance tasks do not change with efficiency level, DOE does not expect maintenance costs to scale with efficiency level. Maintenance costs were linearly scaled by cooling capacity to all equipment classes. For the final rule, DOE adopted the approach used in the September 2014 NOPR to determine maintenance costs for PTAC and PTHP equipment.

6. Lifetime

Equipment lifetime is the age at which the equipment is retired from service. In the September 2014 NOPR, DOE used a median equipment lifetime of 10 years with a maximum lifetime of 20 years. AHRI reminded DOE that ASHRAE had recommended the 15-year service life estimate based on a survey conducted in 1976 be used with caution. (AHRI, No. 35 at p. 7) AHRI questioned DOE's use of ''time-to-failure'' instead of ''service life'' and thereby urged DOE to recalibrate the Weibull distribution to have a mean of 5 years and a maximum of 12 years. (AHRI, No. 35 at p. 7) SCS commented that many hotel chains remodel their rooms and replace PTAC/PTHP equipment every seven to ten years. SCS believes that DOE is using a longer equipment lifetime than is applicable in real world use. (SCS, NOPR Public Meeting Transcript, No. 37 at pp. 123–124)

The comments of manufacturers, prevalent practice of lodging business operators, observations of lenders to hotel real estate, and expert insight have led DOE to recognize that major renovations of lodging businesses occur on a seven to ten year cycle and consist of replacing, adding, removing, or altering fixed assets. As capital investments ultimately shorten equipment lifetime, the distribution of businesses that renovate within a cycle form the basis for the mean lifetime. The distribution of businesses that do not renovate within one cycle, performing belated renovations or observing eventual equipment failure at the actual maximum lifetime of the equipment, form the basis of the maximum lifetime. Based on these distributions, DOE used a mean of 8 years and a maximum of 15 years in its analyses for the final rule. See chapter 8 of the final rule TSD for further discussion.

7. Discount Rate

The discount rate is the rate at which future expenditures are discounted to estimate their present value. The cost of

[24] Coughlin, K., C. Bolduc, R. Van Buskirk, G. Rosenquist and J. E. McMahon, ''Tariff-based Analysis of Commercial Building Electricity Prices.'' Lawrence Berkeley National Laboratory. LBNL–55551. 2008.

[25] ''EEI Typical Bills and Average Rates Report (bi-annual, 2007–2012),'' Edison Electric Institute, Washington, DC. 2012.

[26] ''Annual Energy Outlook 2014,'' U.S. Energy Information Administration. May, 2014. Available online at *http://www.eia.gov/forecasts/aeo/.*

[27] RS Means Company, Inc. ''RSMeans Facilities Maintenance & Repair Cost Data,'' 2013.

[28] RS Means Company, Inc. *RSMeans Online.* (Last accessed March 26, 2013.) *http://www.rsmeansonline.com.*

capital commonly is used to estimate the present value of cash flows to be derived from a typical company project or investment. Most companies use both debt and equity capital to fund investments, so the cost of capital is the weighted-average cost to the firm of equity and debt financing. DOE uses the capital asset pricing model (CAPM) to calculate the equity capital component, and financial data sources to calculate the cost of debt financing.

DOE estimated the cost of capital of companies that purchase PTAC and PTHP equipment. The types of companies that DOE used are large hotel/motel chains, independent hotel/motel, assisted living/health care, and small office. More details regarding DOE's estimates of consumer discount rates are provided in chapter 8 of the final rule TSD.

8. Base Case Efficiency Distribution

For the LCC analysis, DOE analyzes the considered efficiency levels relative to a base case (*i.e.,* the case without amended energy efficiency standards). This analysis requires an estimate of the distribution of equipment efficiencies in the base case (*i.e.,* what consumers would have purchased in the compliance year in the absence of amended standards). DOE refers to this distribution of equipment energy efficiencies as the base case efficiency distribution.

In the September 2014 NOPR, DOE reviewed the AHRI certified products directory [29] for relevant equipment classes to determine the distribution of efficiency levels for commercially-available models within each equipment class analyzed. DOE bundled the efficiency levels into efficiency ranges and determined the percentage of models within each range. To estimate the change between the present and the compliance year, DOE applied a slightly increasing efficiency trend, as explained in section IV.H. For the final rule, DOE adopted the approach used in the September 2014 NOPR to determine the base case efficiency distribution for PTAC and PTHP equipment.

The distribution of efficiencies in the base case for each equipment class can be found in Table IV.8 and Table IV.9.

TABLE IV.8—COMPLIANCE YEAR BASE CASE EFFICIENCY MARKET SHARES FOR PACKAGED TERMINAL AIR CONDITIONING EQUIPMENT

PTAC <12,000 Btu/h cooling capacity		PTAC ≥12,000 Btu/h cooling capacity	
EER	Market share (%)	EER	Market share (%)
11.1–11.29	0.0	9.3–9.49	0.0
11.3–11.49	43.6	9.5–9.69	25.8
11.5–11.99	24.3	9.7–9.99	34.8
12.0–12.39	29.5	10.0–10.39	34.7
12.4–12.89	2.1	10.4–10.79	2.7
12.9–13.09	0.5	10.8–10.99	1.4
≥13.1	0.0	≥11.0	0.7

TABLE IV.9—COMPLIANCE YEAR BASE CASE EFFICIENCY MARKET SHARES FOR PACKAGED TERMINAL HEAT PUMP EQUIPMENT

PTHP <12,000 Btu/h cooling capacity		PTHP ≥12,000 Btu/h cooling capacity	
EER	Market share (%)	EER	Market share (%)
11.3–11.49	52.5	9.5–9.69	63.1
11.5–11.99	8.9	9.7–9.99	0.0
12.0–12.39	26.1	10.0–10.39	28.4
12.4–12.89	12.4	10.4–10.79	7.2
12.9–13.09	0.0	10.8–10.99	1.4
≥13.1	0.0	≥11.0	0.0

9. Payback Period Inputs

The payback period is the amount of time it takes the consumer to recover the additional installed cost of more efficient equipment, compared to baseline equipment, through energy cost savings. Payback periods are expressed in years. Payback periods that exceed the life of the equipment mean that the increased total installed cost is not recovered in reduced operating expenses.

The inputs to the PBP calculation are the increase in the total installed cost of the equipment to the consumer for each efficiency level and the annual operating cost savings for each efficiency level. The PBP calculation uses the same inputs as the LCC analysis, except that discount rates are not needed.

10. Rebuttable-Presumption Payback Period

EPCA establishes a rebuttable presumption that a standard is economically justified if the Secretary finds that the additional cost to the consumer of purchasing a product complying with an energy conservation standard level will be less than three times the value of the energy (and, as applicable, water) savings during the first year that the consumer will receive as a result of the standard, as calculated under the test procedure in place for that standard. (42 U.S.C. 6295(o)(2)(B)(iii) and 42 U.S.C. 6316(a)) For each considered efficiency level, DOE determines the value of the first year's energy savings by calculating the quantity of those savings in accordance with the applicable DOE test procedure, and multiplying that amount by the

[29] See *www.ahridirectory.org/ahriDirectory/pages/home.aspx.*

average energy price forecast for the year in which compliance with the amended standards would be required.

G. Shipments Analysis

DOE uses projections of shipments for PTACs and PTHPs together to calculate equipment stock over the course of the analysis period, which in turn is used to determine the impacts of potential amended standards on national energy savings, net present value, and future manufacturer cash flows. DOE developed shipment projections based on historical data and an analysis of key market drivers for this equipment. Historical shipments data are used to build up an equipment stock and also to calibrate the shipments model. DOE separately calculated shipments intended for new construction and replacement applications. The sum of new construction and replacement shipments is the total shipments.

New construction shipments were calculated using projected new construction floor space of healthcare, lodging, and small office buildings from *AEO 2014* and historical PTAC and PTHP saturation in new buildings, which was estimated by dividing historical shipments by historical new construction floor space. Due to unrepresentative market conditions during the recession of 2008–2010, DOE used historical data from the analysis of the 2008 final rule to determine the value for the PTAC and PTHP saturation, which was used for each year of the analysis period. DOE then projected shipments based on the product of the saturation and AEO's projected new floor space.

Replacement shipments equal the number of units that fail in a given year. DOE used a retirement function in the form of a Weibull distribution with inputs based on lifetime values from the LCC analysis to estimate the number of units of a given age that fail in each year. When a unit fails, it is removed from the stock and a new unit is introduced in its stead. Replacement shipments account for the largest portion of total shipments.

DOE determined the distribution of total shipments among the equipment classes using shipments data by equipment class provided by AHRI for the previous PTAC and PTHP rulemaking. 73 FR 58772. For the NIA, DOE considered the following equipment classes for which it received shipments data:

- PTAC: <7,000 Btu/h cooling capacity, ≥7000 and ≤15000 Btu/h cooling capacity, and ≥15000 Btu/h cooling capacity; and
- PTHP: <7,000 Btu/h cooling capacity, ≥7000 and ≤15000 Btu/h cooling capacity, and ≥15000 Btu/h cooling capacity.

For further information on the shipments analysis, see chapter 9 of the final rule TSD.

H. National Impact Analysis

The NIA assesses the national energy savings (NES) and the national net present value (NPV) from a national perspective of total consumer costs and savings that would be expected to result from new or amended standards at specific efficiency levels. (''Consumer'' in this context refers to consumers of the equipment being regulated.) DOE calculates the NES and NPV based on projections of annual equipment shipments, along with the annual energy consumption and total installed cost data from the energy use and LCC analyses.[30]

DOE evaluates the impacts of new and amended standards by comparing a base-case projection with standards-case projections. The base-case projection characterizes energy use and consumer costs for each equipment class in the absence of new or amended energy conservation standards. For the base-case projection, DOE considers historical trends in efficiency and various forces that are likely to affect the mix of efficiencies over time. DOE compares the base-case projection with projections characterizing the market for each equipment class if DOE adopted new or amended standards at specific energy efficiency levels (*i.e.,* the TSLs or standards cases) for that class. For the standards cases, DOE considers how a given standard would likely affect the market shares of equipment with efficiencies greater than the standard.

DOE uses a spreadsheet model to calculate the energy savings and the national consumer costs and savings from each TSL. Interested parties can review DOE's analyses by changing various input quantities within the spreadsheet. The NIA spreadsheet model uses typical values (as opposed to probability distributions) as inputs.

To develop the NES, DOE calculates annual energy consumption for the base case and the standards cases. DOE calculates the annual energy consumption using per-unit annual energy use data multiplied by projected shipments. DOE calculated energy savings for TSLs more stringent than the levels specified by ANSI/ASHRAE/IES Standard 90.1–2013 in each year relative to a base case, defined as DOE adoption of the efficiency levels specified by ANSI/ASHRAE/IES Standard 90.1–2013.

The inputs for determining the NPV of the total costs and benefits experienced by consumers are: (1) Total annual installed cost; (2) total annual savings in operating costs; and (3) a discount factor to calculate the present value of costs and savings. DOE calculates net savings each year as the difference between the base case and each standards case in terms of total savings in operating costs versus total increases in installed costs. DOE calculates operating cost savings over the lifetime of each product shipped during the forecast period. DOE used a discount factor based on real discount rates of 3 percent and 7 percent to discount future costs and savings to present values.

As discussed in section IV.F.1, DOE applied a constant price trend (2014 levels) for each efficiency level in each equipment class.

A key component of the NIA is the equipment energy efficiency forecasted over time for the base case and for each of the standards cases. To estimate a base-case efficiency trend, DOE started with the base-case efficiency distribution described in section IV.F.8. For the equipment classes that were not covered in the LCC analysis, DOE used the same source (*i.e.,* the AHRI Directory) to estimate the base-case efficiency distribution.

The base case efficiency distributions are set forth in Table IV.10 and Table IV.11.

[30] For the NIA, DOE adjusts the installed cost data from the LCC analysis to exclude sales tax, which is a transfer.

TABLE IV.10—BASE CASE EFFICIENCY MARKET SHARES IN COMPLIANCE YEAR FOR PACKAGED TERMINAL AIR CONDITIONING EQUIPMENT

PTAC <7000 Btu/h cooling capacity		PTAC ≥7000 to ≤15000 Btu/h cooling capacity		PTAC ≥15000 Btu/h cooling capacity	
EER	Market share (%)	EER	Market share (%)	EER	Market share (%)
11.7	0	11.1	0	9.3	0
11.9	0	11.3	38	9.5	65
12.2	63	11.5	29	9.7	17
12.6	37	12.0	29	10.0	18
13.1	0	12.4	3	10.4	0
13.6	0	12.9	1	10.8	0
13.8	0	13.1	0	11.0	0

TABLE IV.11—BASE CASE EFFICIENCY MARKET SHARES IN COMPLIANCE YEAR FOR PACKAGED TERMINAL HEAT PUMP EQUIPMENT

PTHP <7000 Btu/h cooling capacity		PTHP ≥7000 to ≤15000 Btu/h cooling capacity		PTHP ≥15000 Btu/h cooling capacity	
EER	Market share (%)	EER	Market share (%)	EER	Market share (%)
11.9	72	11.3	56	9.5	72
12.2	14	11.5	8	9.7	3
12.6	14	12.0	26	10.0	25
13.1	0	12.4	9	10.4	0
13.6	0	12.9	1	10.8	0
13.8	0	13.1	0	11.0	0

For years after the compliance year, DOE applied a trend largely based on the trend from 2012 to 2035 that was used in the 2004 commercial unitary air conditioner Advance Notice of Proposed Rulemaking (ANOPR), which estimated an increase of approximately 1 EER every 35 years.[31] 69 FR 45460 (July 29, 2004). DOE adjusted this trend for PTACs by assuming that a gradual replacement of equipment at the Federal minimum with equipment at the ASHRAE standard occurs over 10 years after the first year of expected compliance.

To estimate the impact that amended energy conservation standards may have in the first year of compliance, DOE typically uses a ''roll-up'' scenario in its standards rulemakings. Under the ''roll-up'' scenario, DOE assumes equipment efficiencies in the base case that do not meet the new or amended standard level under consideration would ''roll up'' to meet that standard level, and equipment shipments at efficiencies above the standard level under consideration would not be affected. AHRI asked how roll-up was possible if 100% of the market was already above a certain TSL, citing the example of the PTACs <7,000 Btu/h equipment class that was already above TSL 3, as noted in the ASHRAE Standard 90.1–2013 NODA. (AHRI, No. 35 at p. 8) For those cases where the market share is entirely at or above a given potential standard level, DOE did not perform a roll-up operation.

After the compliance year, DOE applied the same rate of efficiency growth in the standards cases as in the base case.

Using the distribution of efficiencies in the base case and in the standards cases for each equipment class analyzed, DOE calculated market-weighted average efficiency values for each year. The market-weighted average efficiency value represents the average efficiency of the total units shipped at a specified potential standard level. The market-weighted average efficiency values for the base case and the standards cases for each efficiency level analyzed for each equipment class is provided in chapter 10 of the final rule TSD.

DOE converted the site electricity consumption and savings to primary energy (power sector energy consumption) using annual conversion factors derived from the *AEO 2014* version of the National Energy Modeling System (NEMS). Cumulative energy savings are the sum of the NES for each year in which equipment shipped during the analysis period continues to operate.

In 2011, in response to the recommendations of a committee on ''Point-of-Use and Full-Fuel-Cycle Measurement Approaches to Energy Efficiency Standards'' appointed by the National Academy of Sciences, DOE announced its intention to use full-fuel-cycle (FFC) measures of energy use and greenhouse gas and other emissions in the national impact analyses and emissions analyses included in future energy conservation standards rulemakings. 76 FR 51281 (August 18, 2011). After evaluating the approaches discussed in the August 18, 2011 document, DOE published a statement of amended policy in which DOE explained its determination that EIA's NEMS is the most appropriate tool for its FFC analysis and its intention to use NEMS for that purpose. 77 FR 49701 (August 17, 2012). NEMS is a public domain, multi-sector, partial equilibrium model of the U.S. energy sector[32] that EIA uses to prepare its *Annual Energy Outlook.* The approach used for deriving FFC measures of energy use and emissions is described in appendix 10–B of the final rule TSD.

I. Consumer Subgroup Analysis

In analyzing the potential impacts of new or amended standards on commercial consumers, DOE evaluates impacts on identifiable groups (*i.e.,* subgroups) of consumers that may be disproportionately affected by a national standard. For the September 2014

[31] See DOE's technical support document underlying DOE's July 29, 2004 ANOPR. (Available at: *http://www.regulations.gov/#!documentDetail;D=EERE-2006-STD-0103-0078*).

[32] For more information on NEMS, refer to *The National Energy Modeling System: An Overview,* DOE/EIA–0581 (98) (Feb.1998) (Available at: *http://www.eia.gov/oiaf/aeo/overview/*).

NOPR, DOE evaluated impacts on a subgroup consisting of independently-operating lodging businesses using the LCC and PBP spreadsheet model. To the extent possible, it utilized inputs appropriate for this subgroup.

SCS stated that consumers in the northern region of the U.S. should be considered as a separate subgroup because they may be disproportionally impacted by the proposed standard. SCS reasoned that the proportion of consumers using heat pumps is much less than in the southern U.S. (SCS, No. 29 at p. 3) DOE does not have sufficient information for PTAC and PTHP equipment to define a separate subgroup for consumers in the northern region. However, the distribution of LCC and PBP results reflects the impacts for consumers located in different regions.

The commercial consumer subgroup analysis is discussed in chapter 11 of the final rule TSD.

J. Manufacturer Impact Analysis

1. Overview

DOE performed an MIA to estimate the financial impact of amended energy conservation standards on manufacturers of PTACs and PTHPs, and to calculate the potential impact of such standards on employment and manufacturing capacity. The MIA has both quantitative and qualitative aspects. The quantitative part of the MIA primarily relies on the Government Regulatory Impact Model (GRIM), an industry cash-flow model with inputs specific to this rulemaking. The key GRIM inputs are data on the industry cost structure, equipment costs, shipments, and assumptions about markups and conversion expenditures. The key output is the industry net present value (INPV). Different sets of assumptions (markup scenarios) will produce different results. The qualitative part of the MIA addresses factors such as equipment characteristics, impacts on particular subgroups of firms, and important market and equipment trends. The complete MIA is outlined in chapter 12 of the final rule TSD.

DOE conducted the MIA for this rulemaking in three phases. In Phase 1 of the MIA, DOE conducted interviews with a representative cross-section of manufacturers and prepared a profile of the PTAC and PTHP industry. During manufacturer interviews, DOE discussed engineering, manufacturing, procurement, and financial topics to identify key issues or concerns and to inform and validate assumptions used in the GRIM. See section IV.J.2 for a description of the key issues manufacturers raised during the interviews.

DOE used information obtained during these interviews to prepare a profile of the PTAC and PTHP industry, including a manufacturer cost analysis. Drawing on financial analysis performed as part of the 2008 energy conservation standard for PTACs and PTHPs as well as feedback obtained from manufacturers, DOE derived financial inputs for the GRIM (*e.g.,* sales, general, and administration (SG&A) expenses; research and development (R&D) expenses; and tax rates). DOE also used public sources of information, including company SEC 10–K filings,[33] corporate annual reports, the U.S. Census Bureau's Economic Census,[34] and Hoover's reports,[35] to develop the industry profile.

In Phase 2 of the MIA, DOE prepared an industry cash-flow analysis to quantify the potential impacts of an amended energy conservation standard on manufacturers of PTACs and PTHPs. In general, energy conservation standards can affect manufacturer cash flow in three distinct ways: (1) Create a need for increased investment; (2) raise production costs per unit; and (3) alter revenue due to higher per-unit prices and possible changes in sales volumes. To quantify these impacts, DOE used the GRIM to perform a cash-flow analysis for the PTAC and PTHP industry using financial values derived during Phase 1.

In Phase 3 of the MIA, DOE evaluated subgroups of manufacturers that may be disproportionately impacted by amended energy conservation standards or that may not be represented accurately by the average cost assumptions used to develop the industry cash-flow analysis. For example, small manufacturers, niche players, or manufacturers exhibiting a cost structure that largely differs from the industry average could be more negatively affected. DOE identified two subgroups for separate impact analyses: (1) Manufacturers with production assets; and (2) small businesses.

DOE initially identified 22 companies that sell PTAC and PTHP equipment in the U.S. However, most companies selling in the U.S. market do not own production assets; rather, they import and distribute PTACs and PTHPs manufactured overseas, primarily in China. DOE identified a subgroup of three U.S. manufacturers that own production assets. Together, these three manufacturers account for approximately 80 percent of the domestic PTAC and PTHP market. Because manufacturers with production assets will incur different costs to comply with amended energy conservation standards compared to their competitors who do not own production assets, DOE conducted a separate subgroup analysis to evaluate the potential impacts of amended energy conservation standards on manufacturers with production assets. The subgroup analysis of PTAC and PTHP manufacturers with production assets is discussed in chapter 12 of the final rule TSD and in section V.B.2 of this document.

For the small businesses subgroup analysis, DOE applied the small business size standards published by the Small Business Administration (SBA) to determine whether a company is considered a small business. *See* 13 CFR part 121. To be categorized as a small business under North American Industry Classification System (NAICS) code 333415, ''Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing,'' a PTAC and PTHP manufacturer and its affiliates may employ a maximum of 750 employees. The 750-employee threshold includes all employees in a business's parent company and any other subsidiaries. Based on this classification, DOE identified 12 manufacturers that qualify as small businesses. The PTAC and PTHP small manufacturer subgroup is discussed in chapter 12 of the final rule TSD and in section VI.B of this document.

2. Government Regulatory Impact Model

DOE uses the GRIM to quantify the changes in cash flow due to amended standards that result in a higher or lower industry value. The GRIM analysis uses a standard, annual cash-flow analysis that incorporates manufacturer costs, markups, shipments, and industry financial information as inputs. The GRIM models changes in costs, distribution of shipments, investments, and manufacturer margins that could result from an amended energy conservation standard. The GRIM spreadsheet uses the inputs to arrive at a series of annual cash flows, beginning in 2015 (the base year of the analysis) and continuing for a 30-year period that begins in the compliance year for each equipment

[33] U.S. Securities and Exchange Commission. *Annual 10–K Reports.* Various Years. <*http://www.sec.gov*>.

[34] ''Annual Survey of Manufacturers: General Statistics: Statistics for Industry Groups and Industries.'' U.S. Census Bureau. 2014. Available at: *http://factfinder2.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t.*

[35] Hoovers, Inc. *Company Profiles.* Various Companies. <*http://www.hoovers.com*>.

class. DOE calculated INPVs by summing the stream of annual discounted cash flows during this period. DOE used a real discount rate of 8.5 percent, which was derived from industry financials and then modified according to feedback received during manufacturer interviews.

The GRIM calculates cash flows using standard accounting principles and compares changes in INPV between a base case and each standards case. The difference in INPV between the base case and a standards case represents the financial impact of the amended energy conservation standard on manufacturers.

DOE collected information on critical GRIM inputs from a number of sources, including publicly available data and interviews with manufacturers (described in the next section). The GRIM results are shown in section V.B.2. Additional details about the GRIM, the discount rate, and other financial parameters can be found in chapter 12 of the final rule TSD.

a. Government Regulatory Impact Model Key Inputs

Manufacturer Production Costs

Manufacturing more efficient equipment is typically more expensive than manufacturing baseline equipment due to the use of more complex components, which are typically more costly than baseline components. The changes in the MPCs of the analyzed equipment can affect the revenues, gross margins, and cash flow of the industry, making these equipment cost data key GRIM inputs for DOE's analysis.

In the MIA, DOE used the MPCs for each considered efficiency level calculated in the engineering analysis, as described in section IV.C and further detailed in chapter 5 of the final rule TSD. In addition, DOE used information from its teardown analysis, described in chapter 5 of the final rule TSD, to disaggregate the MPCs into material, labor, and overhead costs. To calculate the MPCs for equipment above the baseline, DOE added the incremental material, labor, and overhead costs from the engineering cost-efficiency curves to the baseline MPCs. These cost breakdowns and equipment markups were validated and revised with manufacturers during manufacturer interviews.

Shipments Forecasts

The GRIM estimates manufacturer revenues based on total unit shipment forecasts and the distribution of these values by efficiency level. Changes in sales volumes and efficiency mix over time can significantly affect manufacturer finances. For this analysis, the GRIM uses the NIA's annual shipment forecasts derived from the shipments analysis. See section IV.G above and chapter 10 of the final rule TSD for additional details.

Product and Capital Conversion Costs

An amended energy conservation standard would cause manufacturers to incur conversion costs to bring their production facilities and equipment designs into compliance. DOE evaluated the level of conversion-related expenditures that would be needed to comply with each considered efficiency level in each equipment class. For the MIA, DOE classified these conversion costs into two major groups: (1) Product conversion costs; and (2) capital conversion costs. Product conversion costs are investments in research, development, testing, marketing, and other non-capitalized costs necessary to make equipment designs comply with the amended energy conservation standard. Capital conversion costs are investments in property, plant, and equipment necessary to adapt or change existing production facilities such that new compliant equipment designs can be fabricated and assembled.

To evaluate the level of capital conversion expenditures manufacturers would likely incur to comply with amended energy conservation standards, DOE used manufacturer interviews to gather data on the anticipated level of capital investment that would be required at each efficiency level. DOE validated manufacturer comments through estimates of capital expenditure requirements derived from the equipment teardown analysis and engineering analysis described in chapter 5 of the final rule TSD.

DOE assessed the product conversion costs at each considered efficiency level by integrating data from quantitative and qualitative sources. DOE considered market-share-weighted feedback regarding the potential costs of each efficiency level from multiple manufacturers to estimate product conversion costs and validated those numbers against engineering estimates of redesign efforts.

In general, DOE assumes that all conversion-related investments occur between the year of publication of the final rule and the year by which manufacturers must comply with the new standard. The conversion cost figures used in the GRIM can be found in section V.B.2 of this document. For additional information on the estimated product and capital conversion costs, see chapter 12 of the final rule TSD.

b. Government Regulatory Impact Model Scenarios

Markup Scenarios

Manufacturer selling prices (MSPs) include direct manufacturing production costs (*i.e.,* labor, materials, and overhead estimated in DOE's MPCs) and all non-production costs (*i.e.,* SG&A, R&D, and interest), along with profit. To calculate the MSPs in the GRIM, DOE applied non-production cost markups to the MPCs estimated in the engineering analysis for each equipment class and efficiency level. Modifying these markups in the standards case yields different sets of impacts on manufacturers. For the MIA, DOE modeled two standards-case markup scenarios to represent the uncertainty regarding the potential impacts on prices and profitability for manufacturers following the implementation of amended energy conservation standards: (1) A preservation of gross margin percentage markup scenario; and (2) a preservation of per unit operating profit markup scenario. These scenarios lead to different markup values that, when applied to the inputted MPCs, result in varying revenue and cash flow impacts.

Under the preservation of gross margin percentage scenario, DOE applied a single uniform ''gross margin percentage'' markup across all efficiency levels, which assumes that manufacturers would be able to maintain the same amount of profit as a percentage of revenues at all efficiency levels within an equipment class. As production costs increase with efficiency, this scenario implies that the absolute dollar markup will increase as well. Based on publicly-available financial information for manufacturers of PTACs and PTHPs as well as comments from manufacturer interviews, DOE assumed the average non-production cost markup—which includes SG&A expenses, R&D expenses, interest, and profit—to be 1.27 for all PTAC and PTHP equipment classes.

Because this markup scenario assumes that manufacturers would be able to maintain their gross margin percentage markups as production costs increase in response to an amended energy conservation standard, it represents a high bound to industry profitability.

In the preservation of per unit operating profit scenario, manufacturer markups are set so that operating profit one year after the compliance date of the amended energy conservation standard is the same as in the base case on a per unit basis. Under this scenario, as the costs of production increase under an amended standards case, manufacturers are generally required to reduce their markups to a level that maintains base-case operating profit per unit. The implicit assumption behind this markup scenario is that the industry can only maintain its operating profit in absolute dollars per unit after compliance with the new standard is required. Therefore, operating margin in percentage terms is reduced between the base case and standards case. DOE adjusted the manufacturer markups in the GRIM at each TSL to yield approximately the same earnings before interest and taxes in the standards case as in the base case. This markup scenario represents a low bound to industry profitability under an amended energy conservation standard.

c. Manufacturer Interviews

As part of the MIA, DOE discussed the potential impacts of amended energy conservation standards with manufacturers of PTACs and PTHPs. DOE interviewed manufacturers representing approximately 90 percent of the market by revenue. Information gathered during these interviews enabled DOE to tailor the GRIM to reflect the unique financial characteristics of the industry.

3. Discussion of Comments

During the NOPR public comment period, interested parties commented on assumptions and results described in the September 2014 NOPR and accompanying TSD. Comments address several topics related to manufacturer impacts. These include: Multiple redesign cycles due to ASHRAE; conversion costs; impacts on the subgroup of manufacturers with production assets; and cumulative regulatory burden.

a. Multiple Redesign Cycles

AHRI and Goodman commented that DOE's EPCA baseline analysis should account for the financial impacts on manufacturers of multiple redesign cycles, the first to comply with amended ASHRAE standards (2015) and the second to comply with amended federal energy conservation standards (2019). (AHRI, No. 35 at pp. 6 and 11; Goodman, No. 31 at pp. 1–2) Southern Company Services (SCS) also commented that the proposed level would entail an undue burden on manufacturers by requiring them to undertake multiple redesign cycles. (SCS, No. 29 at p. 2) To better account for the impacts of multiple redesign cycles on manufacturers, DOE revised its EPCA baseline analysis to include an additional set of product conversion costs intended to capture the R&D and testing and certification burden of meeting amended ASHRAE standards in 2015. See chapter 12 of the final rule TSD for more information on the EPCA baseline analysis.

b. Conversion Costs

AHRI commented that DOE underestimated the product conversion costs industry would incur to comply with amended standards. AHRI stated that DOE underestimated the number of PTAC and PTHP models that would require redesign and suggested that DOE should not assign one set of R&D costs to similar models of PTACs and PTHPs. (AHRI, No. 35 at pp. 9–11) DOE clarifies that it assigned separate product conversion costs for PTACs and PTHPs. DOE also based its product conversion cost model on the number of equipment platforms that would require redesign as opposed to the number of individual equipment listings, where equipment platforms were defined based on cooling capacity within a given equipment class. DOE assumed R&D costs ranging from $50,000 to $200,000 per platform based on the complexity of the redesign anticipated at each TSL. DOE further clarifies that it validated its conversion cost estimates against feedback received from manufacturers during interviews.

c. Impacts on the Subgroup of Manufacturers With Production Assets

EEI and AHRI expressed concern that the subgroup of three manufacturers with production assets would bear a disproportionate share of the costs associated with the proposed rule. (EEI, No. 37 at pp. 180–181; AHRI, NOPR Public Meeting Transcript, No. 37 at pp. 183) Goodman also commented that this subgroup appears to be at a significant competitive disadvantage and further stated that this subgroup would have to absorb 90 percent of the industry's conversion costs while producing only 40 percent of equipment. Goodman referred to Chapter 16 of the NOPR TSD for the 40 percent figure. (Goodman, No. 31 at pp. 4–5)

To clarify, the subgroup of manufacturers with production assets evaluated as part of the MIA encompasses three U.S.-headquartered manufacturers that own PTAC and PTHP production facilities and tooling. These three companies' production assets may be located within the U.S. or in other countries. At standard levels more stringent than ASHRAE, these manufacturers would be expected to incur capital conversion costs that their competitors who strictly import and/or private label would not. As described in section V.B.2.d of this document and Chapter 12 of the final rule TSD, DOE estimates that these three manufacturers account for 80 percent of PTAC and PTHP production. Under the standard proposed in the September 2014 NOPR, this subgroup would have incurred an estimated 89 percent of total industry conversion costs and experienced more severe INPV impacts than the industry as a whole, as commenters noted; this discrepancy in conversion costs and related INPV impacts was DOE's reason for analyzing the subgroup as distinct from the industry as a whole. However, in this final rule, DOE is adopting standards for PTACs and PTHPs equivalent to those set forth in ANSI/ASHRAE/IES Standard 90.1–2013. DOE is required to adopt minimum efficiency standards either equivalent to or more stringent than those set forth by ASHRAE. Because this rule adopts the baseline as the standards level, DOE's modeling does not show any negative financial impacts on industry, including manufacturers with production assets, as a direct result of the standard.

d. Cumulative Regulatory Burden

Goodman stated that EPA's refrigerant regulations contribute to manufacturers' cumulative regulatory burden and urged DOE to account for refrigerant regulations in both its INPV analysis and its discussion of cumulative regulatory burden. (Goodman, No. 37 at pp. 46–47) SCS also stated that this rule combined with other pending rulemakings would pose an undue burden on manufacturers and could constrain capacity at testing and certification facilities. (SCS, No. 29 at p. 2) DOE is required to adopt PTAC and PTHP standards as set forth in ASHRAE 90.1–2013. DOE has added a discussion of EPA's SNAP Program to its analysis of cumulative regulatory burden found in section V.B.2.e of this document.

K. Emissions Analysis

In the emissions analysis, DOE estimated the change in power sector emissions of carbon dioxide (CO_2), nitrogen oxides (NO_X), sulfur dioxide (SO_2), and mercury (Hg) from potential energy conservation standards for PTAC and PTHP equipment. In addition, DOE estimated emissions impacts in production activities (extracting, processing, and transporting fuels) that provide the energy inputs to power plants. These are referred to as ''upstream'' emissions. Together, these emissions account for the full-fuel-cycle (FFC). In accordance with DOE's FFC Statement of Policy (76 FR 51281

(August 18, 2011), as amended at 77 FR 49701 (August 17, 2012)), the FFC analysis includes impacts on emissions of methane (CH_4) and nitrous oxide (N_2O), both of which are recognized as greenhouse gases.

DOE primarily conducted the emissions analysis using emissions factors for CO_2 and most of the other gases derived from data in *AEO 2014.* Combustion emissions of CH_4 and N_2O were estimated using emissions intensity factors published by the Environmental Protection Agency (EPA) in its GHG Emissions Factors Hub.[36] DOE developed separate emissions factors for power sector emissions and upstream emissions. The method that DOE used to derive emissions factors is described in chapter 13 of the final rule TSD.

For CH_4 and N_2O, DOE calculated emissions reduction in tons and also in terms of units of carbon dioxide equivalent (CO_2eq). Gases are converted to CO_2eq by multiplying each ton of gas by the gas' global warming potential (GWP) over a 100-year time horizon. Based on the Fifth Assessment Report of the Intergovernmental Panel on Climate Change,[37] DOE used GWP values of 28 for CH_4 and 265 for N_2O.

Each *Annual Energy Outlook* incorporates the projected impacts of existing air quality regulations on emissions. *AEO 2014* generally represents current legislation and environmental regulations, including recent government actions, for which implementing regulations were available as of October 31, 2013. Key regulations are discussed below.

SO_2 emissions from affected electric generating units (EGUs) are subject to nationwide and regional emissions cap-and-trade programs. Title IV of the Clean Air Act sets an annual emissions cap on SO_2 for affected EGUs in the 48 contiguous States and the District of Columbia (DC). (42 U.S.C. 7651 *et seq.*) SO_2 emissions from 28 eastern States and DC were also limited under the Clean Air Interstate Rule (CAIR). 70 FR 25162 (May 12, 2005). CAIR created an allowance-based trading program that operates along with the Title IV program. In 2008, CAIR was remanded to EPA by the U.S. Court of Appeals for the District of Columbia Circuit, but it remained in effect.[38] In 2011, EPA issued a replacement for CAIR, the Cross-State Air Pollution Rule (CSAPR). 76 FR 48208 (August 8, 2011). On August 21, 2012, the D.C. Circuit issued a decision to vacate CSAPR,[39] and the court ordered EPA to continue administering CAIR. On April 29, 2014, the U.S. Supreme Court reversed the judgment of the D.C. Circuit and remanded the case for further proceedings consistent with the Supreme Court's opinion.[40] On October 23, 2014, the D.C. Circuit lifted the stay of CSAPR.[41] Pursuant to this action, CSAPR went into effect (and CAIR ceased to be in effect) as of January 1, 2015.

Because *AEO 2014* was prepared prior to the Supreme Court's opinion, it assumed that CAIR remains a binding regulation through 2040. Thus, DOE's analysis used emissions factors that assume that CAIR, not CSAPR, is the regulation in force. However, the difference between CAIR and CSAPR is not relevant for the purpose of DOE's analysis of emissions impacts from energy conservation standards.

The attainment of emissions caps is typically flexible among EGUs and is enforced through the use of emissions allowances and tradable permits. Under existing EPA regulations, any excess SO_2 emissions allowances resulting from the lower electricity demand caused by the adoption of an efficiency standard could be used to permit offsetting increases in SO_2 emissions by any regulated EGU. In past rulemakings, DOE recognized that there was uncertainty about the effects of efficiency standards on SO_2 emissions covered by the existing cap-and-trade system, but it concluded that negligible reductions in power sector SO_2 emissions would occur as a result of standards.

Beginning in 2016, however, SO_2 emissions will fall as a result of the Mercury and Air Toxics Standards (MATS) for power plants. 77 FR 9304 (Feb. 16, 2012). In the MATS rule, EPA established a standard for hydrogen chloride as a surrogate for acid gas hazardous air pollutants (HAP), and also established a standard for SO_2 (a non-HAP acid gas) as an alternative equivalent surrogate standard for acid gas HAP. The same controls are used to reduce HAP and non-HAP acid gas; thus, SO_2 emissions will be reduced as a result of the control technologies installed on coal-fired power plants to comply with the MATS requirements for acid gas. *AEO 2014* assumes that, in order to continue operating, coal plants must have either flue gas desulfurization or dry sorbent injection systems installed by 2016. Both technologies, which are used to reduce acid gas emissions, also reduce SO_2 emissions. Under the MATS, emissions will be far below the cap established by CAIR, so it is unlikely that excess SO_2 emissions allowances resulting from the lower electricity demand would be needed or used to permit offsetting increases in SO_2 emissions by any regulated EGU. Therefore, DOE believes that energy conservation standards will generally reduce SO_2 emissions in 2016 and beyond.

CAIR established a cap on NO_X emissions in 28 eastern States and the District of Columbia.[42] Energy conservation standards are expected to have little effect on NO_X emissions in those States covered by CAIR because excess NO_X emissions allowances resulting from the lower electricity demand could be used to permit offsetting increases in NO_X emissions. However, standards would be expected to reduce NO_X emissions in the States not affected by the caps, so DOE estimated NO_X emissions reductions from the standards considered in this final rule for these States.

The MATS limit mercury emissions from power plants, but they do not include emissions caps and, as such, DOE's energy conservation standards would likely reduce Hg emissions. DOE estimated mercury emissions reduction using emissions factors based on *AEO 2014,* which incorporates the MATS.

EEI commented that things are changing dramatically in the power sector; new rules are changing the amount of emissions that power producers are allowed to emit, and DOE should include these changes in its analysis. (EEI, NOPR Public Meeting Transcript, No. 37 at pp. 196–197) SCS commented that DOE is likely overestimating the amount of emissions

[36] See *http://www.epa.gov/climateleadership/inventory/ghg-emissions.html.*

[37] IPCC, 2013: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Chapter 8.

[38] See *North Carolina* v. *EPA,* 550 F.3d 1176 (D.C. Cir. 2008); *North Carolina* v. *EPA,* 531 F.3d 896 (D.C. Cir. 2008).

[39] See *EME Homer City Generation, LP* v. *EPA,* 696 F.3d 7, 38 (D.C. Cir. 2012), *cert. granted,* 81 U.S.L.W. 3567, 81 U.S.L.W. 3696, 81 U.S.L.W. 3702 (U.S. June 24, 2013) (No. 12–1182).

[40] *See EPA* v. *EME Homer City Generation,* 134 S.Ct. 1584, 1610 (U.S. 2014). The Supreme Court held in part that EPA's methodology for quantifying emissions that must be eliminated in certain States due to their impacts in other downwind States was based on a permissible, workable, and equitable interpretation of the Clean Air Act provision that provides statutory authority for CSAPR.

[41] *See Georgia* v. *EPA,* Order *(D.C. Cir. filed October 23, 2014)* (*No. 11–1302).*

[42] CSAPR also applies to NO_X and it would supersede the regulation of NO_X under CAIR. As stated previously, the current analysis assumes that CAIR, not CSAPR, is the regulation in force. The difference between CAIR and CSAPR with regard to DOE's analysis of NO_X emissions is slight.

reductions by not accounting for the anticipated effects of new emissions rules that are currently under consideration. (SCS, NOPR Public Meeting Transcript, No. 37 at pp. 197–198) It would not be appropriate for DOE to account for regulations that are under consideration, because whether they will be adopted and their final form are matters of speculation at this time.

L. Monetizing Carbon Dioxide and Other Emissions Impacts

As part of the development of this rule, DOE considered the estimated monetary benefits from the reduced emissions of CO_2 and NO_X that are expected to result from each of the TSLs considered. In order to make this calculation analogous to the calculation of the NPV of consumer benefit, DOE considered the reduced emissions expected to result over the lifetime of equipment shipped in the forecast period for each TSL. This section summarizes the basis for the monetary values used for each of these emissions and presents the values considered in this final rule.

For this final rule, DOE relied on a set of values for the social cost of carbon (SCC) that was developed by a Federal interagency process. The basis for these values is summarized in the next section, and a more detailed description of the methodologies used is provided as an appendix to chapter 14 of the final rule TSD.

1. Social Cost of Carbon

The SCC is an estimate of the monetized damages associated with an incremental increase in carbon emissions in a given year. It is intended to include (but is not limited to) changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services. Estimates of the SCC are provided in dollars per metric ton of CO_2. A domestic SCC value is meant to reflect the value of damages in the United States resulting from a unit change in CO_2 emissions, while a global SCC value is meant to reflect the value of damages worldwide.

Under section 1(b) of Executive Order 12866, ''Regulatory Planning and Review,'' 58 FR 51735 (Oct. 4, 1993), agencies must, to the extent permitted by law, ''assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs.'' The purpose of the SCC estimates presented here is to allow agencies to incorporate the monetized social benefits of reducing CO_2 emissions into cost-benefit analyses of regulatory actions. The estimates are presented with an acknowledgement of the many uncertainties involved and with a clear understanding that they should be updated over time to reflect increasing knowledge of the science and economics of climate impacts.

As part of the interagency process that developed these SCC estimates, technical experts from numerous agencies met on a regular basis to consider public comments, explore the technical literature in relevant fields, and discuss key model inputs and assumptions. The main objective of this process was to develop a range of SCC values using a defensible set of input assumptions grounded in the existing scientific and economic literatures. In this way, key uncertainties and model differences transparently and consistently inform the range of SCC estimates used in the rulemaking process.

a. Monetizing Carbon Dioxide Emissions

When attempting to assess the incremental economic impacts of CO_2 emissions, the analyst faces a number of challenges. A report from the National Research Council [43] points out that any assessment will suffer from uncertainty, speculation, and lack of information about: (1) Future emissions of GHGs; (2) the effects of past and future emissions on the climate system; (3) the impact of changes in climate on the physical and biological environment; and (4) the translation of these environmental impacts into economic damages. As a result, any effort to quantify and monetize the harms associated with climate change will raise questions of science, economics, and ethics and should be viewed as provisional.

Despite the limits of both quantification and monetization, SCC estimates can be useful in estimating the social benefits of reducing CO_2 emissions. The agency can estimate the benefits from reduced (or costs from increased) emissions in any future year by multiplying the change in emissions in that year by the SCC values appropriate for that year. The NPV of the benefits can then be calculated by multiplying each of these future benefits by an appropriate discount factor and summing across all affected years.

It is important to emphasize that the interagency process is committed to updating these estimates as the science and economic understanding of climate change and its impacts on society improves over time. In the meantime, the interagency group will continue to explore the issues raised by this analysis and consider public comments as part of the ongoing interagency process.

b. Development of Social Cost of Carbon Values

In 2009, an interagency process was initiated to offer a preliminary assessment of how best to quantify the benefits from reducing carbon dioxide emissions. To ensure consistency in how benefits are evaluated across Federal agencies, the Administration sought to develop a transparent and defensible method, specifically designed for the rulemaking process, to quantify avoided climate change damages from reduced CO_2 emissions. The interagency group did not undertake any original analysis. Instead, it combined SCC estimates from the existing literature to use as interim values until a more comprehensive analysis could be conducted. The outcome of the preliminary assessment by the interagency group was a set of five interim values: Global SCC estimates for 2007 (in 2006$) of $55, $33, $19, $10, and $5 per metric ton of CO_2. These interim values represented the first sustained interagency effort within the U.S. government to develop an SCC for use in regulatory analysis. The results of this preliminary effort were presented in several proposed and final rules.

c. Current Approach and Key Assumptions

After the release of the interim values, the interagency group reconvened on a regular basis to generate improved SCC estimates. Specially, the group considered public comments and further explored the technical literature in relevant fields. The interagency group relied on three integrated assessment models commonly used to estimate the SCC: The FUND, DICE, and PAGE models. These models are frequently cited in the peer-reviewed literature and were used in the last assessment of the Intergovernmental Panel on Climate Change (IPCC). Each model was given equal weight in the SCC values that were developed.

Each model takes a slightly different approach to model how changes in emissions result in changes in economic damages. A key objective of the interagency process was to enable a consistent exploration of the three models, while respecting the different approaches to quantifying damages

[43] National Research Council, *Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use,* National Academies Press: Washington, DC (2009).

taken by the key modelers in the field. An extensive review of the literature was conducted to select three sets of input parameters for these models: Climate sensitivity, socio-economic and emissions trajectories, and discount rates. A probability distribution for climate sensitivity was specified as an input into all three models. In addition, the interagency group used a range of scenarios for the socio-economic parameters and a range of values for the discount rate. All other model features were left unchanged, relying on the model developers' best estimates and judgments.

In 2010, the interagency group selected four sets of SCC values for use in regulatory analyses. Three sets of values are based on the average SCC from the three integrated assessment models, at discount rates of 2.5, 3, and 5 percent. The fourth set, which represents the 95th percentile SCC estimate across all three models at a 3-percent discount rate, was included to represent higher-than-expected impacts from climate change further out in the tails of the SCC distribution. The values grow in real terms over time. Additionally, the interagency group determined that a range of values from 7 percent to 23 percent should be used to adjust the global SCC to calculate domestic effects,[44] although preference is given to consideration of the global benefits of reducing CO_2 emissions. Table IV.12 presents the values in the 2010 interagency group report,[45] which is reproduced in appendix 14A of the final rule TSD.

TABLE IV.12—ANNUAL SCC VALUES FROM 2010 INTERAGENCY REPORT, 2010–2050

[2007$ per metric ton CO_2]

Year	Discount rate			
	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile
2010	4.7	21.4	35.1	64.9
2015	5.7	23.8	38.4	72.8
2020	6.8	26.3	41.7	80.7
2025	8.2	29.6	45.9	90.4
2030	9.7	32.8	50.0	100.0
2035	11.2	36.0	54.2	109.7
2040	12.7	39.2	58.4	119.3
2045	14.2	42.1	61.7	127.8
2050	15.7	44.9	65.0	136.2

The SCC values used for this document were generated using the most recent versions of the three integrated assessment models that have been published in the peer-reviewed literature.[46]

Table IV.13 shows the updated sets of SCC estimates from the 2013 interagency update in 5-year increments from 2010 to 2050. The full set of annual SCC estimates between 2010 and 2050 is reported in appendix 14B of the final rule TSD. The central value that emerges is the average SCC across models at the 3-percent discount rate. However, for purposes of capturing the uncertainties involved in regulatory impact analysis, the interagency group emphasizes the importance of including all four sets of SCC values.

TABLE IV.13—ANNUAL SCC VALUES FROM 2013 INTERAGENCY REPORT, 2010–2050

[2007$ per metric ton CO_2]

Year	Discount rate			
	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile
2010	11	32	51	89
2015	11	37	57	109
2020	12	43	64	128
2025	14	47	69	143
2030	16	52	75	159
2035	19	56	80	175
2040	21	61	86	191
2045	24	66	92	206
2050	26	71	97	220

[44] It is recognized that this calculation for domestic values is approximate, provisional, and highly speculative. There is no *a priori* reason why domestic benefits should be a constant fraction of net global damages over time.

[45] *Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866.* Interagency Working Group on Social Cost of Carbon, United States Government (February 2010) (Available at: *www.whitehouse.gov/sites/default/files/omb/inforeg/for-agencies/Social-Cost-of-Carbon-for-RIA.pdf*).

[46] *Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866,* Interagency Working Group on Social Cost of Carbon, United States Government (May 2013; revised November 2013) (Available at: *http://www.whitehouse.gov/sites/default/files/omb/assets/inforeg/technical-update-social-cost-of-carbon-for-regulator-impact-analysis.pdf*).

It is important to recognize that a number of key uncertainties remain, and that current SCC estimates should be treated as provisional and revisable because they will evolve with improved scientific and economic understanding. The interagency group also recognizes that the existing models are imperfect and incomplete. The National Research Council report mentioned previously points out that there is tension between the goal of producing quantified estimates of the economic damages from an incremental ton of carbon and the limits of existing efforts to model these effects. There are a number of analytical challenges that are being addressed by the research community, including research programs housed in many of the Federal agencies participating in the interagency process to estimate the SCC. The interagency group intends to periodically review and reconsider those estimates to reflect increasing knowledge of the science and economics of climate impacts, as well as improvements in modeling.

In summary, in considering the potential global benefits resulting from reduced CO_2 emissions, DOE used the values from the 2013 interagency report adjusted to 2014$ using the implicit price deflator for gross domestic product (GDP) from the Bureau of Economic Analysis. For each of the four sets of SCC cases specified, the values for emissions in 2015 were $12.2, $41.2, $63.4, and $121 per metric ton avoided (values expressed in 2014$). DOE derived values after 2050 using the relevant growth rates for the 2040–2050 period in the interagency update.

DOE multiplied the CO_2 emissions reduction estimated for each year by the SCC value for that year in each of the four cases. To calculate a present value of the stream of monetary values, DOE discounted the values in each of the four cases using the specific discount rate that had been used to obtain the SCC values in each case.

2. Social Cost of Other Air Pollutants

As noted previously, DOE has taken into account how considered energy conservation standards would reduce site NO_X emissions nationwide and decrease power sector NO_X emissions in those 22 States not affected by the CAIR. DOE estimated the monetized value of net NO_X emissions reductions resulting from each of the TSLs considered for this final rule based on estimates found in the an OMB report to Congress.[47] DOE calculated monetary benefits using an average value for reducing NO_X from stationary sources of $2,727 per ton (in 2014$), and real discount rates of 3 percent and 7 percent.

DOE is evaluating appropriate monetization of avoided SO_2 and Hg emissions in energy conservation standards rulemakings. DOE has not included monetization of those emissions in the current analysis.

In responding to the September 2014 NOPR, AHRI, Goodman, and the Associations stated that DOE should refrain from using SCC values to establish monetary figures for emissions reductions until the SCC undergoes a more rigorous notice, review, and comment process. (AHRI, No. 35 at p. 14; Goodman, No. 31 at p. 6; The Associations, No. 28 at p. 3) AHRI and Goodman cited several reasons why the SCC estimates should be withdrawn and not used in any rulemaking: (1) The SCC estimates fail in terms of process and transparency; (2) the modeling systems used for the SCC estimates and the subsequent analyses were not subject to peer review as appropriate; (3) the modeling conducted in this effort does not offer a reasonably acceptable range of accuracy for use in policymaking; (4) the Federal interagency working group has failed to disclose and quantify key uncertainties; and (5) by presenting only global SCC estimates and downplaying domestic SCC estimates, the interagency working group has severely limited the utility of the SCC for use in benefit-cost analysis and policymaking. (AHRI, No. 35 at pp. 14–15; Goodman, No. 31 at p. 6)

In contrast, EDF *et al.* stated that the current SCC values are sufficiently robust and accurate to continue to be the basis for regulatory analysis going forward. They contended that current values are likely significant underestimates of the SCC. They stated that the interagency working group's analytic process was science-based, open, and transparent, and that the SCC is an important and accepted tool for regulatory policy-making, based on well-established law and fundamental economics. (EDF *et al.,* No. 22 at pp. 1–12)

In conducting the interagency process that developed the SCC values, technical experts from numerous agencies met on a regular basis to consider public comments, explore the technical literature in relevant fields, and discuss key model inputs and assumptions. Key uncertainties and model differences transparently and consistently inform the range of SCC estimates. These uncertainties and model differences are discussed in the interagency working group's reports, which are reproduced in appendix 14A and 14B of the final rule TSD, as are the major assumptions. Specifically, uncertainties in the assumptions regarding climate sensitivity, as well as other model inputs such as economic growth and emissions trajectories, are discussed and the reasons for the specific input assumptions chosen are explained. However, the three integrated assessment models used to estimate the SCC are frequently cited in the peer-reviewed literature and were used in the last assessment of the IPCC. In addition, new versions of the models that were used in 2013 to estimate revised SCC values were published in the peer-reviewed literature (see appendix 14B of the final rule TSD for discussion). Although uncertainties remain, the revised estimates that were issued in November, 2013 are based on the best available scientific information on the impacts of climate change. The current estimates of the SCC have been developed over many years, using the best science available, and with input from the public. In November 2013, OMB announced a new opportunity for public comment on the interagency technical support document underlying the revised SCC estimates. See 78 FR 70586. The comment period for the OMB announcement closed on February 26, 2014. OMB is currently reviewing comments and considering whether further revisions to the 2013 SCC estimates are warranted. DOE stands ready to work with OMB and the other members of the interagency working group on further review and revision of the SCC estimates as appropriate.

AHRI and Goodman also stated that DOE does not conduct the cost-benefit analysis for NPV and SCC values over the same time frame and within the same scope, an important principle of cost-benefit analysis. They criticized DOE's use of global rather than domestic SCC values. (AHRI, No. 35 at p. 15; Goodman, No. 31 at p. 6)

For the analysis of national impacts of standards, DOE considers the lifetime impacts of equipment shipped in a 30-year period. With respect to energy and energy cost savings, impacts continue past 30 years until all of the equipment shipped in the 30-year period is retired. With respect to the valuation of CO_2 emissions reductions, the SCC estimates developed by the interagency working group are meant to represent the full discounted value (using an appropriate range of discount rates) of emissions

[47] U.S. Office of Management and Budget, Office of Information and Regulatory Affairs, *2006 Report to Congress on the Costs and Benefits of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities* (2006) (Available at: *www.whitehouse.gov/sites/default/files/omb/assets/omb/inforeg/2006_cb/2006_cb_final_report.pdf*).

reductions occurring in a given year. DOE is thus comparing the costs of achieving the emissions reductions in each year of the analysis, with the carbon reduction value of the emissions reductions in those same years. DOE's analysis estimates both global and domestic benefits of CO_2 emissions reductions. The September 2014 NOPR and this final rule focus on a global measure of SCC. The issue of global versus domestic measures of the SCC is discussed in appendix 14A of the final rule TSD.

AHRI and Goodman also stated that DOE fails to take into consideration EPA regulations on greenhouse gas emissions from power plants, which would affect the SCC values. (AHRI, No. 35 at pp. 15–16; Goodman, No. 31 at p. 7)

The SCC values are based on projections of global GHG emissions over many decades. Such projections are influenced by many factors, particularly economic growth rates and prices of different energy sources. In the context of these projections, the proposed EPA regulations of greenhouse gas emissions from new power plants are a minor factor. In any case, it would not be appropriate for DOE to account for regulations that are not currently in effect, because whether such regulations will be adopted and their final form are matters of speculation at this time.

M. Utility Impact Analysis

The utility impact analysis estimates several effects on the electric power industry that would result from the adoption of new or amended energy conservation standards. In the utility impact analysis, DOE analyzes the changes in installed electrical capacity and generation that would result for each trial standard level. The analysis is based on published output from NEMS, which is updated annually to produce the *AEO* Reference case, as well as a number of side cases that estimate the economy-wide impacts of changes to energy supply and demand. DOE uses published side cases that incorporate efficiency-related policies to estimate the marginal impacts of reduced energy demand on the utility sector. The output of this analysis is a set of time-dependent coefficients that capture the change in electricity generation, primary fuel consumption, installed capacity and power sector emissions due to a unit reduction in demand for a given end use. These coefficients are multiplied by the stream of electricity savings calculated in the NIA to provide estimates of selected utility impacts of new or amended energy conservation standards. Chapter 15 of the final rule TSD describes the utility impact analysis in further detail.

N. Employment Impact Analysis

DOE considers employment impacts in the domestic economy as one factor in selecting a standard. Employment impacts from new or amended energy conservation standards include both direct and indirect impacts. Direct employment impacts are any changes in the number of employees of manufacturers of the equipment subject to standards, their suppliers, and related service firms. The MIA addresses those impacts. Indirect employment impacts are changes in national employment that occur due to the shift in expenditures and capital investment caused by the purchase and operation of more-efficient appliances. Indirect employment impacts from standards consist of the net jobs created or eliminated in the national economy, other than in the manufacturing sector being regulated, caused by: (1) Reduced spending by end users on energy; (2) reduced spending on new energy supply by the utility industry; (3) increased consumer spending on new equipment to which the new standards apply; and (4) the effects of those three factors throughout the economy.

One method for assessing the possible effects on the demand for labor of such shifts in economic activity is to compare sector employment statistics developed by the Labor Department's Bureau of Labor Statistics (BLS).[48] BLS regularly publishes its estimates of the number of jobs per million dollars of economic activity in different sectors of the economy, as well as the jobs created elsewhere in the economy by this same economic activity. Data from BLS indicate that expenditures in the utility sector generally create fewer jobs (both directly and indirectly) than expenditures in other sectors of the economy.[49] There are many reasons for these differences, including wage differences and the fact that the utility sector is more capital-intensive and less labor-intensive than other sectors. Energy conservation standards have the effect of reducing consumer utility bills. Because reduced consumer expenditures for energy likely lead to increased expenditures in other sectors of the economy, the general effect of efficiency standards is to shift economic activity from a less labor-intensive sector (*i.e.,* the utility sector) to more labor-intensive sectors (*e.g.,* the retail and service sectors). Thus, based on the BLS data alone, DOE believes net national employment may increase due to shifts in economic activity resulting from energy conservation standards.

DOE estimated indirect national employment impacts for the standard levels considered in this final rule using an input/output model of the U.S. economy called Impact of Sector Energy Technologies version 3.1.1 (ImSET).[50] ImSET is a special-purpose version of the ''U.S. Benchmark National Input-Output'' (I–O) model, which was designed to estimate the national employment and income effects of energy-saving technologies. The ImSET software includes a computer-based I–O model having structural coefficients that characterize economic flows among 187 sectors most relevant to industrial, commercial, and residential building energy use.

DOE notes that ImSET is not a general equilibrium forecasting model, and understands the uncertainties involved in projecting employment impacts, especially changes in the later years of the analysis. Because ImSET does not incorporate price changes, the employment effects predicted by ImSET may over-estimate actual job impacts over the long run for this rule. Therefore, DOE generated results for near-term timeframes, where these uncertainties are reduced. For more details on the employment impact analysis, see chapter 16 of the final rule TSD.

V. Analytical Results

The following section addresses the results from DOE's analyses with respect to the considered energy conservation standards for PTAC and PTHP equipment. It addresses the TSLs examined by DOE and the projected impacts of each of these levels if adopted as energy conservation standards for PTAC and PTHP equipment. Additional details regarding DOE's analyses are contained in the final rule TSD supporting this document.

A. Trial Standard Levels

In the September 2014 NOPR, DOE selected five TSLs above the baseline level for the PTAC and PTHP equipment

[48] Data on industry employment, hours, labor compensation, value of production, and the implicit price deflator for output for these industries are available upon request by calling the Division of Industry Productivity Studies (202–691–5618) or by sending a request by email to *dipsweb@bls.gov.*

[49] See Bureau of Economic Analysis, *Regional Multipliers: A User Handbook for the Regional Input-Output Modeling System (RIMS II),* U.S. Department of Commerce (1992).

[50] J.M. Roop, M.J. Scott, and R.W. Schultz, *ImSET 3.1: Impact of Sector Energy Technologies,* PNNL–18412, Pacific Northwest National Laboratory (2009) (Available at: *www.pnl.gov/main/publications/external/technical_reports/PNNL-18412.pdf*).

classes. 79 FR at 55573–73 The baseline level in this final rule corresponds to the energy efficiency equations in ANSI/ASHRAE/IES Standard 90.1–2013 for PTACs and PTHPs. The TSL 1, 2, 3, 4 efficiency levels represent matched pairs of efficiency levels at 2.2%, 6.2%, 10.2%, and 14.2% above the baseline level. TSL 5, at 16.2% above the baseline level, represents the maximum technologically feasible (''max tech'') level for each class of equipment in DOE's analysis, as discussed in section IV.C.5.

In developing the TSLs, DOE used the same EERs for PTAC and PTHP. EEI supported setting PTAC and PTHP standards at the same level, and said that approach will lead to economies of scale and will align with the approach taken by ASHRAE and other DOE standards. (EEI, NOPR Public Meeting Transcript, No. 37 at p. 206–7) AHRI commented that certain PTACs and PTHPs may have unequal efficiency levels because the suction gas reheat provided by the reversing valve for PTHPs enables gain of evaporating capacity without added input power. (AHRI, No. 35 at p. 12) On the other hand, the California IOUs commented that PTACs should be held to higher standards than PTHPs for cooling efficiency, due to inherent mechanical advantages resulting from not having a reverse cycle valve. (CA IOUs, No. 33 at p. 3)

DOE notes that the pressure drop associated with the reversing valve in a PTHP (and the associated lost energy that could have been used for space conditioning), a component not present in a PTAC, makes achieving high efficiency levels more challenging for a heat pump than for an air conditioner. The AHRI comment indicates that suction heating achieved in the reversing valve of a PTHP will improve efficiency; however, in cooling mode, the refrigerant flows passing through the reversing valve are the compressor discharge, which flows to the outdoor coil, and the suction gas, which approaches the valve from the indoor coil and passes to the compressor suction. AHRI's comment does not explain how thermal exchange between compressor discharge and suction flows can improve efficiency. The additional pressure drop of the reversing valve reduces heat pump efficiency, and the potential thermal exchange between the refrigerant flows passing through the valve would also reduce efficiency. However, the operation of a heat pump both in summer for cooling and in winter for heating leads to a far greater number of operating hours for heat pumps as compared to air conditioners. The greater operating hours mean that both energy use and potential savings are higher for heat pumps. Consequently, higher efficiency levels can often be more cost effective in heat pumps than in air conditioners, since the higher purchase cost can be recovered more rapidly in a heat pump. DOE considered both the technical and economic factors in selecting the efficiency level differential between PTACs and PTHPs, one which would suggest higher EER for PTHPs, the other lower EER. Based on the selection of equal EERs for the different equipment in addendum BK to ASHRAE 90.1–2010, much of which was adopted in ASHRAE 90.1–2013, DOE considered equal EERs for these equipment classes in the framework document. DOE sought comments on this issue, and AHRI commented that if DOE raises the standards for PTACs, then they should be equal to the efficiency level of PTHPs. (AHRI, Framework Public Meeting Transcript, No. 7 at p. 50)

Table V.1 shows the mapping between TSLs and efficiency levels in each TSL. DOE notes that the baseline level is 1.8 percent higher than current Federal standards for PTAC equipment, but is equivalent to current Federal standards for PTHP equipment.

TABLE V.1—MAPPING BETWEEN TSLS AND EFFICIENCY LEVELS

Equipment class	Baseline (ANSI/ASHRAE/IES Standard 90.1–2013) *	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5 Max-Tech
PTAC Efficiency Level	EL1	EL2	EL3	EL4	EL5	EL6
PTHP Efficiency Level	Current Federal ECS	EL1	EL2	EL3	EL4	EL5

* This level represents the ANSI/ASHRAE/IES Standard 90.1–2013 minimum for PTAC and PTHP equipment. This level is used as the Baseline since DOE is required to, at a minimum, adopt the ASHRAE levels as the Federal standard. (42 U.S.C. 6313(a)(6)(A)(ii)(I)) DOE notes that the Baseline level is 1.8% higher than current Federal ECS for PTAC equipment, but is equivalent to current Federal ECS for PTHP equipment. For PTAC equipment, the Baseline level is also termed EL1.

Current Federal energy conservation standards and the efficiency levels specified by ANSI/ASHRAE/IES Standard 90.1–2013 for PTACs and PTHPs are a function of the equipment's cooling capacity. Both the Federal energy conservation standards and the efficiency standards in ANSI/ASHRAE/IES Standard 90.1–2013 are based on equations to calculate the efficiency levels for PTACs and PTHPs with a cooling capacity greater than or equal to 7,000 Btu/h and less than or equal to 15,000 Btu/h for each equipment class. To derive the standards (*i.e.,* efficiency level as a function of cooling capacity), DOE plotted the representative cooling capacities and the corresponding efficiency levels for each TSL. DOE then calculated the equation of the line passing through the EER values for 9,000 Btu/h and 15,000 Btu/h for standard size PTACs and PTHPs. Table V.2 and Table V.3 identify the energy efficiency equations for each TSL for standard size PTACs and PTHPs.

TABLE V.2—ENERGY-EFFICIENCY EQUATIONS (EER AS A FUNCTION OF COOLING CAPACITY) BY TSL FOR STANDARD SIZE PTACS

Standard size ** PTACs	Energy efficiency equation *
Baseline *** (ANSI/ASHRAE/IES Standard 90.1–2013)	EER = 14.0 − (0.300 × Cap †/1000).
TSL 1	EER = 14.4 − (0.312 × Cap †/1000).
TSL 2	EER = 14.9 − (0.324 × Cap †/1000).
TSL 3	EER = 15.5 − (0.336 × Cap †/1000).

TABLE V.2—ENERGY-EFFICIENCY EQUATIONS (EER AS A FUNCTION OF COOLING CAPACITY) BY TSL FOR STANDARD SIZE PTACS—Continued

Standard size ** PTACs	Energy efficiency equation *
TSL 4	EER = 16.0 − (0.348 × Cap †/1000).
TSL 5—MaxTech	EER = 16.3 − (0.354 × Cap †/1000).

* For equipment rated according to the DOE test procedure, all EER values must be rated at 95 °F outdoor dry-bulb temperature for air-cooled products and evaporatively-cooled products and at 85 °F entering water temperature for water cooled products.
** Standard size refers to PTAC or PTHP equipment with wall sleeve dimensions greater than or equal to 16 inches high, or greater than or equal to 42 inches wide.
*** This level represents the ANSI/ASHRAE/IES Standard 90.1–2013 minimum for PTAC and PTHP equipment. This level is used as the Baseline since DOE is required to, at a minimum, adopt the ASHRAE levels as the Federal standard. (42 U.S.C. 6313(a)(6)(A)(ii)(I)).
† Cap means cooling capacity in Btu/h at 95 °F outdoor dry-bulb temperature.

TABLE V.3—ENERGY-EFFICIENCY EQUATIONS (EER AND COP AS A FUNCTION OF COOLING CAPACITY) BY TSL FOR STANDARD SIZE PTHPS

Standard size ** PTHPs	Energy efficiency equation *
Baseline *** (ANSI/ASHRAE/IES Standard 90.1–2013)	EER = 14.0 − (0.300 × Cap †/1000). COP = 3.7 − (0.052 × Cap †/1000).
TSL 1	EER = 14.4 − (0.312 × Cap †/1000). COP = 3.8 − (0.058 × Cap †/1000).
TSL 2	EER = 14.9 − (0.324 × Cap †/1000). COP = 4.0 − (0.064 × Cap †/1000).
TSL 3	EER = 15.5 − (0.336 × Cap †/1000). COP = 4.1 − (0.068 × Cap †/1000).
TSL 4	EER = 16.0 − (0.348 × Cap †/1000). COP = 4.2 − (0.070 × Cap †/1000).
TSL 5—MaxTech	EER = 16.3 − (0.354 × Cap †/1000). COP = 4.3 − (0.073 × Cap †/1000).

* For equipment rated according to the DOE test procedure, all EER values must be rated at 95 °F outdoor dry-bulb temperature for air-cooled products and evaporatively-cooled products and at 85 °F entering water temperature for water cooled products. All COP values must be rated at 47 °F outdoor dry-bulb temperature for air-cooled products, and at 70 °F entering water temperature for water-source heat pumps.
** Standard size refers to PTAC or PTHP equipment with wall sleeve dimensions greater than or equal to 16 inches high, or greater than or equal to 42 inches wide.
*** This level represents the ANSI/ASHRAE/IES Standard 90.1–2013 minimum for PTAC and PTHP equipment. This level is used as the Baseline since DOE is required to, at a minimum, adopt the ASHRAE levels as the Federal standard. (42 U.S.C. 6313(a)(6)(A)(ii)(I))
† Cap means cooling capacity in Btu/h at 95 °F outdoor dry-bulb temperature.

For PTACs and PTHPs with cooling capacity less than 7,000 Btu/h, DOE determined the EERs using a cooling capacity of 7,000 Btu/h in the efficiency-capacity equations. For PTACs and PTHPs with a cooling capacity greater than 15,000 Btu/h cooling capacity, DOE determined the EERs using a cooling capacity of 15,000 Btu/h in the efficiency-capacity equations. This is the same method established in the Energy Policy Act of 1992 and provided in ANSI/ASHRAE/IES Standard 90.1–2013 for calculating the EER and COP of equipment with cooling capacities smaller than 7,000 Btu/h and larger than 15,000 Btu/h. (42 U.S.C. 6313(a)(3)(A))

In the September 2014 NOPR, DOE proposed the adoption of TSL 2, which would have raised efficiency levels for PTAC and PTHP equipment 6.2% above the ANSI/ASHRAE/IES Standard 90.1–2013 baseline levels. 79 FR at 55589–90. Stakeholders had mixed comments regarding the availability of models that meet the proposed TSL 2 across the range of cooling capacities. ASAP *et al.* commented to state their support for proposed standards and indicate that there are PTACs and PTHPs available today across the range of cooling capacities with efficiency levels that significantly exceed the proposed standard. (ASAP *et al.,* No. 30 at p. 1–2) The CA IOUs commented that several products from a variety of manufacturers and across the range of capacities (at capacities of 7, 9, 12, and 14 kBtu/h) meet or comfortably exceed the proposed standard levels. (CA IOUs, No. 33 at p. 1–2) Goodman commented that some cooling capacities, such as 12,000 Btu/h, do not have product offerings that meet TSL 2. (Goodman, NOPR Public Meeting Transcript, No. 37 at p.55) AHRI commented that the cooling capacities of 9 kBtu/h and 15 kBtu/h are the only PTAC capacities with models available now that meet the proposed TSL 2, based on data from the AHRI Directory. (AHRI, NOPR Public Meeting Transcript, No. 37 at p. 14) In this final rule, DOE adopts the less stringent baseline level for PTAC and PTHP equipment. DOE determined that 82% of the standard size PTAC models listed in the AHRI Directory will meet the baseline efficiency level for PTACs adopted in this rule.

B. Economic Justification and Energy Savings

As discussed in section II.A, EPCA provides seven factors to be evaluated in determining whether a more stringent standard for PTACs and PTHPs is economically justified. (42 U.S.C. 6313(a)(6)(B)(ii)) The following sections generally discuss how DOE has addressed each of those factors in this rulemaking.

1. Economic Impacts on Commercial Consumers

DOE analyzed the economic impacts on PTAC and PTHP equipment consumers by looking at the effects that amended standards would have on the LCC and PBP. DOE also examined the impacts of potential standards on consumer subgroups. These analyses are discussed below.

a. Life-Cycle Cost and Payback Period

In general, higher-efficiency equipment affects consumers in two ways: (1) Purchase price increases, and (2) annual operating costs decrease. Inputs used for calculating the LCC and PBP include total installed costs (*i.e.,* equipment price plus installation costs), and operating costs (*i.e.,* annual energy use, energy prices, energy price trends, repair costs, and maintenance costs). The LCC calculation also uses equipment lifetime and a discount rate. Chapter 8 of the final rule TSD provides detailed information on the LCC and PBP analyses.

Table V.4 through Table V.7 show the LCC and PBP results for the TSL efficiency levels considered for each PTAC and PTHP equipment class. In the first of each pair of tables, the simple payback is measured relative to the baseline equipment. In the second table, the LCC savings are measured relative to the base-case efficiency distribution in the compliance year (see section IV.F.8 of this document).

TABLE V.4—AVERAGE LCC AND PBP RESULTS FOR STANDARD SIZE EQUIPMENT <12,000 Btu/h COOLING CAPACITY

[9,000 Btu/h cooling capacity]

TSL	Efficiency level (PTAC)	Efficiency level (PTHP)	Average costs (2014$)				Simple payback (years)	Average lifetime (years)
			Installed cost	First year's operating cost	Lifetime operating cost	LCC		
1	2	1	$1,492	$253	$1,546	$3,038	5.0	8
2	3	2	1,509	251	1,534	3,043	5.6	
3	4	3	1,528	249	1,523	3,050	6.0	
4	5	4	1,548	247	1,511	3,059	6.3	
5	6	5	1,558	246	1,506	3,064	6.4	

Note: The results for each TSL are calculated assuming that all consumers use equipment with that efficiency level. The PBP is measured relative to the baseline equipment.

TABLE V.5—LCC SAVINGS RELATIVE TO THE BASE CASE EFFICIENCY DISTRIBUTION FOR STANDARD SIZE EQUIPMENT <12,000 Btu/h COOLING CAPACITY

[9,000 Btu/h cooling capacity]

TSL	Efficiency level (PTAC)	Efficiency level (PTHP)	Life-cycle cost savings	
			Percentage of consumers that experience net cost **	Average savings (2014$) *
1	2	1	27	$0.17
2	3	2	50	($3.26)
3	4	3	78	($9.85)
4	5	4	87	($18.50)
5	6	5	88	($23.50)

* Parentheses indicate negative values.
** The calculation includes consumers with zero LCC savings (no impact).

TABLE V.6—AVERAGE LCC AND PBP RESULTS FOR STANDARD SIZE EQUIPMENT ≥12,000 Btu/h COOLING CAPACITY

[9,000 Btu/h cooling capacity]

TSL	Efficiency level (PTAC)	Efficiency level (PTHP)	Average costs (2014$)				Simple payback (years)	Average lifetime (years)
			Installed cost	First year's operating cost	Lifetime operating cost	LCC		
1	2	1	$1,747	$316	$1,931	$3,678	6.0	8
2	3	2	1,770	314	1,915	3,685	6.6	
3	4	3	1,800	311	1,899	3,700	7.5	
4	5	4	1,837	309	1,884	3,721	8.5	
5	6	5	1,858	307	1,877	3,735	9.0	

Note: The results for each TSL are calculated assuming that all consumers use equipment with that efficiency level. The PBP is measured relative to the baseline equipment.

TABLE V.7—SAVINGS RELATIVE TO THE BASE CASE EFFICIENCY DISTRIBUTION FOR STANDARD SIZE EQUIPMENT ≥12,000 Btu/h COOLING CAPACITY

[15,000 Btu/h cooling capacity]

TSL	Efficiency level (PTAC)	Efficiency level (PTHP)	Life-cycle cost savings	
			Percentage of consumers that experience net cost **	Average savings (2014$) *
1	2	1	34	($0.95)
2	3	2	51	($5.51)
3	4	3	85	($19.24)
4	5	4	93	($40.53)
5	6	5	95	($54.01)

* Parentheses indicate negative values.
** The calculation includes consumers with zero LCC savings (no impact).

For PTACs and PTHPs with a cooling capacity less than 7,000 Btu/h, DOE established the proposed energy conservation standards using a cooling capacity of 7,000 Btu/h in the proposed efficiency-capacity equation. DOE believes the LCC and PBP impacts for equipment in this category will be similar to the impacts of the 9,000 Btu/h units because the MSP and usage characteristics are in a similar range. Similarly, for PTACs and PTHPs with a cooling capacity greater than 15,000 Btu/h, DOE established the proposed energy conservation standards using a cooling capacity of 15,000 Btu/h in the proposed efficiency-capacity equation. DOE believes the impacts for equipment in this category will be similar to units with a cooling capacity of 15,000 Btu/h.

b. Consumer Subgroup Analysis

As described in section IV.I of this document, DOE estimated the impact of the considered TSLs on independently-operating lodging businesses. Table V.8 shows the average LCC savings from potential energy conservation standards, and Table V.9 shows the simple payback period for this subgroup. In most cases, the average LCC savings and PBP for the subgroup at the considered efficiency levels are not substantially different from the average for all businesses. Chapter 11 of the final rule TSD presents the complete LCC and PBP results for the subgroup.

TABLE V.8—MEAN LIFE-CYCLE COST SAVINGS FOR PTAC AND PTHP EQUIPMENT PURCHASED BY THE CONSIDERED SUBGROUP

[2014$]

Equipment class (cooling capacity)	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5
Standard Size Equipment <12,000 Btu/h Cooling Capacity (9,000 Btu/h Cooling Capacity)	($0.14)	($4.12)	($11.46)	($20.89)	($26.28)
Standard Size Equipment ≥12,000 Btu/h Cooling Capacity (15,000 Btu/h Cooling Capacity)	($1.14)	($6.38)	($21.10)	($43.42)	($57.41)

* Parentheses indicate negative values.

Note: The LCC savings for each TSL are calculated relative to the base case efficiency distribution. The calculation includes consumers with zero LCC savings (no impact).

TABLE V.9—SIMPLE PAYBACK PERIOD FOR PTAC AND PTHP EQUIPMENT PURCHASED BY THE CONSIDERED SUBGROUP

[Years]

Equipment class (cooling capacity)	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5
Standard Size Equipment <12,000 Btu/h Cooling Capacity (9,000 Btu/h Cooling Capacity)	5.0	5.6	6.0	6.3	6.4
Standard Size Equipment ≥12,000 Btu/h Cooling Capacity (15,000 Btu/h Cooling Capacity)	6.0	6.6	7.5	8.5	9.0

Note: The simple payback period is calculated only for affected establishments. Establishments with no impact have an undefined payback period, and are therefore not included in calculating the median PBP.

For PTACs and PTHPs with a cooling capacity less than 7,000 Btu/h, DOE believes that the subgroup LCC and PBP impacts will be similar to the impacts of the 9,000 Btu/h units because the MSP and usage characteristics are in a similar range. Similarly, for PTACs and PTHPs with a cooling capacity greater than 15,000 Btu/h, DOE believes the impacts will be similar to units with a cooling capacity of 15,000 Btu/h.

c. Rebuttable Presumption Payback

As discussed above, EPCA establishes a rebuttable presumption that an energy conservation standard is economically justified if the increased purchase cost for equipment that meets the standard is less than three times the value of the first-year energy savings resulting from the standard. In calculating a rebuttable presumption payback period for each of the considered TSLs, DOE used discrete values rather than distributions for input values, and, as required by EPCA, based the energy use calculation on the DOE test procedures for PTAC and PTHP equipment. As a result, DOE calculated a single rebuttable presumption payback value, and not a distribution of payback periods, for each efficiency level. Table V.10 presents the rebuttable-presumption payback periods for the considered TSLs. While DOE examined the rebuttable-presumption criterion, it considered whether the standard levels considered for this rule are economically justified through a more detailed analysis of the economic impacts of those levels, pursuant to 42 U.S.C. 6295(o)(2)(B)(i), that considers the full range of impacts to the consumer, manufacturer, nation, and environment. The results of that analysis serve as the basis for DOE to evaluate the economic justification for a potential standard level, thereby supporting or rebutting the results of any preliminary determination of economic justification. Table V.10 shows the rebuttable presumption PBPs for the considered TSLs for PTAC and PTHP equipment.

TABLE V.10—REBUTTABLE-PRESUMPTION PAYBACK PERIOD (YEARS) FOR PTAC AND PTHP EQUIPMENT

	Trial standard level				
	1	2	3	4	5
Standard Size Equipment (9,000 Btu/h)	5.0	5.6	6.0	6.3	6.4
Standard Size Equipment (15,000 Btu/h)	6.0	6.6	7.5	8.5	9.0

2. Economic Impacts on Manufacturers

DOE performed a manufacturer impact analysis (MIA) to estimate the impact of amended energy conservation standards on PTAC and PTHP manufacturers. The following section describes the expected impacts on manufacturers at each considered TSL. Chapter 12 of the final rule TSD explains the analysis in further detail.

a. Industry Cash Flow Analysis Results

Table V.11 depicts the estimated financial impacts (represented by changes in industry net present value, or INPV) of amended energy conservation standards on manufacturers of PTACs and PTHPs, as well as the conversion costs that DOE expects manufacturers would incur for all equipment classes at each TSL.

As discussed in section IV.J.2, DOE modeled two different markup scenarios to evaluate the range of cash flow impacts on the PTAC and PTHP industry: (1) The preservation of gross margin percentage markup scenario; and (2) the preservation of per unit operating profit markup scenario.

To assess the less severe end of the range of potential impacts, DOE modeled a preservation of gross margin percentage markup scenario, in which a uniform ''gross margin percentage'' markup is applied across all potential efficiency levels. In this scenario, DOE assumed that a manufacturer's absolute dollar markup would increase as production costs increase in the standards case.

To assess the more severe end of the range of potential impacts, DOE modeled the preservation of per unit operating profit markup scenario, which reflects manufacturer concerns surrounding their inability to maintain margins as manufacturing production costs increase to meet more stringent efficiency levels. In this scenario, as manufacturers make the necessary investments required to convert their facilities to produce new standards-compliant equipment and incur higher costs of goods sold, their percentage markup decreases. Operating profit does not change in absolute dollars but decreases as a percentage of revenue.

Each of the modeled scenarios results in a unique set of cash flows and corresponding industry values at each TSL. In the following discussion, the INPV results refer to the difference in industry value between the base case and each standards case that result from the sum of discounted cash flows from the base year (2015) through the end of the analysis period, which varies by equipment class and standard level. To provide perspective on the short-run cash flow impact, DOE includes in the discussion of results a comparison of free cash flow between the base case and the standards case at each TSL in the year before amended standards would take effect. This figure provides an understanding of the magnitude of the required conversion costs relative to the cash flow generated by the industry in the base case.

The tables below present results for both the preservation of gross margin percentage markup scenario and the preservation of per-unit operating profit markup scenario. As noted, the preservation of operating profit scenario accounts for the more severe impacts presented.

TABLE V.11—MANUFACTURER IMPACT ANALYSIS RESULTS FOR PTACS AND PTHPS, GROSS MARGIN PERCENTAGE MARKUP SCENARIO

	Units	Base case	Trial standard level *				
			1	2	3	4	5
INPV	2014$M	62.2	61.1	63.1	61.9	63.1	60.3
Change in INPV	2014$M		(1.1)	0.8	(0.3)	0.8	(1.9)
	% Change		(1.8)	1.3	(0.5)	1.4	(3.1)
Product Conversion Costs	2014$M		2.2	4.8	7.3	8.6	13.7
Capital Conversion Costs	2014$M		2.3	2.9	7.2	7.2	7.5
Total Conversion Costs	2014$M		4.5	7.7	14.5	15.8	21.2
Free Cash Flow **	2014$M	3.9	2.3	1.4	(1.3)	(1.7)	(3.4)
	% Change		(40.6)	(64.9)	(133.2)	(144.5)	(188.5)

* Parentheses indicate negative values.
** DOE presents free cash flow impacts in 2018, the year before the 2019 compliance date for PTACs in the standards case. DOE estimates free cash flow impacts in the standards case will be most severe in 2018 and therefore presents those impacts here.

TABLE V.12—MANUFACTURER IMPACT ANALYSIS RESULTS FOR PTACS AND PTHPS, PRESERVATION OF OPERATING PROFIT MARKUP SCENARIO

	Units	Base case	Trial standard level *				
			1	2	3	4	5
INPV	2014$M	62.2	60.7	61.8	59.3	58.9	55.6
Change in INPV	2014$M		(1.5)	(0.5)	(3.0)	(3.4)	(6.7)
	% Change		(2.4)	(0.8)	(4.8)	(5.4)	(10.7)
Product Conversion Costs	2014$M		2.2	4.8	7.3	8.6	13.7

TABLE V.12—MANUFACTURER IMPACT ANALYSIS RESULTS FOR PTACS AND PTHPS, PRESERVATION OF OPERATING PROFIT MARKUP SCENARIO—Continued

	Units	Base case	Trial standard level *				
			1	2	3	4	5
Capital Conversion Costs	2014$M		2.3	2.9	7.2	7.2	7.5
Total Conversion Costs	2014$M		4.5	7.7	14.5	15.8	21.2
Free Cash Flow	2014$M	3.9	2.3	1.3	(1.4)	(1.9)	(3.6)
	% Change		(41.1)	(66.2)	(135.6)	(148.3)	(192.8)

* Parentheses indicate negative values.
** DOE presents free cash flow impacts in 2018, the year before the 2019 compliance date for PTACs in the standards case. DOE estimates free cash flow impacts in the standards case will be most severe in 2018 and therefore presents those impacts here.

At TSL 1, DOE estimates the impacts on INPV to range from −$1.5 million to −$1.1 million, or a change of −2.4 percent to −1.8 percent. Industry free cash flow is estimated to decrease by as much as $1.6 million, or a change of 41.1 percent compared to the base-case value of $3.9 million in the year before the compliance date (2018). At TSL 1, DOE estimates industry conversion costs of $4.5 million.

At TSL 2, DOE estimates impacts on INPV to range from −$0.5 million to $0.8 million, or a change in INPV of −0.8 percent to 1.3 percent. At this level, industry free cash flow is estimated to decrease by as much as $2.6 million, or a change of 66.2 percent compared to the base-case value of $3.9 million in the year before the compliance date (2018). DOE expects conversion costs at this level to increase to $7.7 million, reflecting the need for additional motor and control changes as well as a more significant R&D and testing burden. The INPV impacts at TSL 2 are slightly less severe than those at TSL 1 due to the interplay of conversion costs, manufacturer selling prices, and shipments. Specifically, the anticipated increase in per-unit purchase price at this level combined with steady shipments is expected to dampen the effects of conversion costs on INPV.

At TSL 3, DOE estimates impacts on INPV to range from −$3.0 million to −$0.3 million, or a change in INPV of −4.8 percent to −0.5 percent. At this level, industry free cash flow is estimated to decrease by as much as $5.2 million, or a change of 135.6 percent compared to the base-case value of $3.9 million in the year before the compliance date (2018). DOE estimates conversion costs at TSL 3 would increase to $14.5 million, nearly double the expected conversion costs at TSL 2. Anticipated conversion costs at this level include investing in new tooling and redesigning equipment to incorporate additional coils and/or formed coils.

At TSL 4, DOE estimates impacts on INPV to range from −$3.4 million to $0.8 million, or a change in INPV of −5.4 percent to 1.4 percent. At this level, industry free cash flow is estimated to decrease by as much as $5.7 million, or a change of 148.3 percent compared to the base-case value of $3.9 million in the year before the compliance date (2018). DOE estimates conversion costs at TSL 4 would increase to $15.8 million. At this level, however, DOE does not anticipate capital conversion costs beyond those required at TSL 3. Rather, product conversion costs account for the full increase. Similar to TSL 2, the INPV impacts at TSL 4 are slightly less severe than those at TSL 3 due to the interplay of conversion costs, manufacturer selling prices, and shipments. The anticipated increase in per-unit purchase price at this level combined with steady shipments is expected to dampen the effects of conversion costs on INPV.

TSL 5 represents the use of max-tech design options for each equipment class. At this level, DOE estimates impacts on INPV to range from −$6.7 million to −$1.9 million, or a change in INPV of −10.7 percent to −3.1 percent. Industry free cash flow is estimated to decrease by $7.5 million, or a change of 192.8 percent compared to the base-case value of $3.9 million in the year before the compliance date (2018). At this level, DOE estimates conversion costs would increase to a $21.2 million.

b. Direct Impacts on Employment

To quantitatively assess the potential impacts of amended energy conservation standards on direct employment, DOE used the GRIM to estimate the domestic labor expenditures and number of direct employees in the base case and at each TSL from 2015 through 2048. DOE used statistical data from the U.S. Census Bureau's 2011 Annual Survey of Manufacturers,[51] the results of the engineering analysis, and interviews with manufacturers to determine the inputs necessary to calculate industry-wide labor expenditures and domestic direct employment levels. Labor expenditures related to producing the equipment are a function of the labor intensity of producing the equipment, the sales volume, and an assumption that wages remain fixed in real terms over time. The total labor expenditures in each year are calculated by multiplying the MPCs by the labor percentage of MPCs. DOE estimates that 50 percent of PTAC and PTHP units are produced domestically.

The total labor expenditures in the GRIM were then converted to domestic production employment levels by dividing production labor expenditures by the annual payment per production worker (production worker hours times the labor rate found in the U.S. Census Bureau's 2011 Annual Survey of Manufacturers). The production worker estimates in this section only cover workers up to the line-supervisor level who are directly involved in fabricating and assembling a product within an OEM facility. Workers performing services that are closely associated with production operations, such as materials handling tasks using forklifts, are also included as production labor. DOE's estimates only account for production workers who manufacture the specific equipment covered by this rulemaking.

To estimate an upper bound to employment change, DOE assumes all domestic manufacturers would choose to continue producing equipment in the U.S. and would not move production to foreign countries. To estimate a lower bound to employment, DOE estimates the maximum portion of the industry that would choose to leave the industry or relocate production overseas rather than make the necessary conversions at

[51] ''Annual Survey of Manufacturers: General Statistics: Statistics for Industry Groups and Industries,'' U.S. Census Bureau, 2011. Available at *www.census.gov/manufacturing/asm/index.html.*

domestic production facilities. A complete description of the assumptions used to generate these upper and lower bounds can be found in chapter 12 of the final rule TSD.

As noted above, DOE estimates that 50 percent of PTAC and PTHP units sold in the United States are manufactured domestically. In the absence of amended energy conservation standards, DOE estimates that the PTAC and PTHP industry would employ 175 domestic production workers in 2019.

Table V.13 shows the range of impacts of potential amended energy conservation standards on U.S. production workers of PTACs and PTHPs. The potential changes to direct employment in the standards case suggest that the PTAC and PTHP industry could experience anything from a slight gain in domestic direct employment to a loss of all domestic direct employment. However, since this rule maintains the standard at baseline (*i.e.,* ASHRAE), DOE does not expect any loss in domestic direct employment.

TABLE V.13—POTENTIAL CHANGES IN THE TOTAL NUMBER OF STANDARD SIZE PTAC AND PTHP PRODUCTION WORKERS IN 2019

	Trial standard level *					
	Base case †	1	2	3	4	5
Potential Changes in Domestic Production Workers in 2019		(175) to 4	(175) to 10	(175) to 17	(175) to 22	(175) to 24

* Parentheses indicate negative values.
† Base case assumes 175 domestic production workers in the PTAC and PTHP industry in 2019.

The upper end of the range estimates the maximum increase in the number of production workers in the PTAC and PTHP industry after implementation of an amended energy conservation standard. It assumes manufacturers would continue to produce the same scope of covered equipment within the United States and would require some additional labor to produce more efficient equipment.

The lower end of the range represents the maximum decrease in total number of U.S. production workers that could result from an amended energy conservation standard. Throughout interviews, manufacturers stated their concerns about increasing offshore competition entering the market. If the cost of complying with amended standards significantly erodes the profitability of domestic manufacturers relative to their competitors who manufacture and/or import PTACs and PTHPs from overseas, manufacturers with domestic production could decide to exit the PTAC and PTHP market and/or shift their production facilities offshore. The lower bound of direct employment impacts therefore assumes domestic production of PTACs and PTHPs ceases, as domestic manufacturers either exit the market or shift production overseas in search of reduced manufacturing costs.

This conclusion is independent of any conclusions regarding indirect employment impacts in the broader United States economy, which are documented in chapter 15 of the final rule TSD.

c. Impacts on Manufacturing Capacity

According to PTAC and PTHP manufacturers interviewed, amended energy conservation standards would not significantly constrain manufacturing production capacity. Among manufacturers with production assets, some indicated that more stringent energy conservation standards could reduce sales volumes, thereby resulting in excess capacity. Among importers and distributors, amended energy conservation standards would not likely impact capacity. Since this rule maintains the standard at baseline (*i.e.,* ASHRAE), DOE does not expect any change in production capacity as a result of this rule.

d. Impacts on Subgroups of Manufacturers

As discussed above, using average cost assumptions to develop an industry cash flow estimate is not adequate for assessing differential impacts among subgroups of manufacturers. Small manufacturers, niche players, or manufacturers exhibiting a cost structure that differs largely from the industry average could be affected differently. DOE used the results of the industry characterization to group manufacturers exhibiting similar characteristics. Specifically, DOE identified two subgroups of manufacturers for separate impact analyses: Manufacturers with production assets and small business manufacturers.

DOE initially identified 22 companies that sell PTAC and PTHP equipment in the U.S. Among U.S. companies, few own production assets; rather, they import and distribute PTACs and PTHPs manufactured overseas, primarily in China. DOE identified a subgroup of three U.S.-headquartered manufacturers that own production assets. These manufacturers own tooling or manufacturing assets either in the U.S. or in foreign countries. Together, these three manufacturers account for approximately 80 percent of the domestic PTAC and PTHP market. Because manufacturers with production assets will incur different conversion costs to comply with amended energy conservation standards compared to their competitors who do not own production assets, DOE conducted a separate analysis to evaluate the potential impacts of an amended standard on this subgroup.

As with the overall industry analysis, DOE modeled two different markup scenarios to evaluate the range of cash flow impacts on manufacturers with production assets: (1) The preservation of gross margin percentage markup scenario; and (2) the preservation of per unit operating profit markup scenario. See section IV.J.2 for a complete description of markup scenarios.

Each of the modeled scenarios results in a unique set of cash flows and corresponding INPV values at each TSL. In the following discussion, the INPV results refer to the difference in value of manufacturers with production assets between the base case and standards cases as represented by the sum of discounted cash flows from the base year (2015) through, the end of the analysis period, which varies by equipment class and standard level. To provide perspective on the short-run cash flow impact, DOE includes in the discussion of results a comparison of free cash flow between the base case and the standards case at each TSL in the year before amended standards would take effect. This figure provides an understanding of the magnitude of the required conversion costs relative to the cash flow generated by manufacturers with production assets in the base case.

The tables below present a range of results reflecting both the preservation of gross margin percentage markup scenario and the preservation of per unit operating profit markup scenario. As discussed in section IV.J.B, the preservation of operating profit scenario accounts for the more severe impacts presented. Estimated conversion costs do not vary with the markup scenario.

TABLE V.14—MANUFACTURER IMPACT ANALYSIS RESULTS FOR THE SUBGROUP OF PTAC AND PTHP MANUFACTURERS WITH PRODUCTION ASSETS, GROSS MARGIN PERCENTAGE MARKUP SCENARIO

	Units	Base case	Trial standard level *				
			1	2	3	4	5
INPV	2014$M	49.8	48.7	49.9	48.1	48.9	46.0
Change in INPV	2014$M		(1.1)	0.1	(1.7)	(0.9)	(3.8)
	% Change		(2.1)	0.3	(3.4)	(1.8)	(7.5)
Product Conversion Costs	2014$M		1.4	4.0	6.5	7.8	12.8
Capital Conversion Costs	2014$M		2.3	2.9	7.2	7.2	7.5
Total Conversion Costs	2014$M		3.7	6.9	13.7	15.0	20.4
Free Cash Flow **	2014$M	3.1	1.7	0.8	(1.9)	(2.3)	(4.0)
	% Change		(43.7)	(74.7)	(160.1)	(173.8)	(228.3)

* Parentheses indicate negative values.

** DOE presents free cash flow impacts in 2018, the year before the 2019 compliance date for PTACs in the standards case. As described in section IV.J.2, the base case (*i.e.,* ASHRAE) compliance date for PTACs is 2017, and the compliance date for PTHPs in both the base case and the standards case is 2018. DOE estimates free cash flow impacts in the standards case will be most severe in 2018 and therefore presents those impacts here.

TABLE V.15—MANUFACTURER IMPACT ANALYSIS RESULTS FOR THE SUBGROUP OF PTAC AND PTHP MANUFACTURERS WITH PRODUCTION ASSETS, PRESERVATION OF OPERATING PROFIT MARKUP SCENARIO

	Units	Base case	Trial standard level *				
			1	2	3	4	5
INPV	2014$M	49.8	48.5	48.9	46.0	45.5	42.3
Change in INPV	2014$M		(1.3)	(0.9)	(3.8)	(4.3)	(7.5)
	% Change		(2.7)	(1.8)	(7.7)	(8.6)	(15.1)
Product Conversion Costs	2014$M		1.4	4.0	6.5	7.8	12.8
Capital Conversion Costs	2014$M		2.3	2.9	7.2	7.2	7.5
Total Conversion Costs	2014$M		3.7	6.9	13.7	15.0	20.4
Free Cash Flow **	2014$M	3.1	1.7	0.7	(1.9)	(2.4)	(4.1)
	% Change		(44.2)	(76.0)	(162.6)	(177.7)	(232.6)

* Parentheses indicate negative values.

** DOE presents free cash flow impacts in 2018, the year before the 2019 compliance date for PTACs in the standards case. As described in section IV.J.2, the base case (*i.e.,* ASHRAE) compliance date for PTACs is 2017, and the compliance date for PTHPs in both the base case and the standards case is 2018. DOE estimates free cash flow impacts in the standards case will be most severe in 2018 and therefore presents those impacts here.

In the standards case, manufacturers with production assets experience financial impacts more negative than those facing the industry as a whole, discussed in section V.B.2.a. These impacts derive primarily from the conversion costs manufacturers with production assets would incur to comply with an amended standard. In particular, manufacturers with production assets would face capital conversion costs not shared by their competitors who import and distribute PTACs and PTHPs and do not require tooling investments. In interviews, manufacturers with production assets indicated that more stringent standards could require significant investment in new tooling to support new coil designs. In addition, manufacturers with production assets would face product conversion costs in the form of design engineering, product development, testing, certification, marketing, and related costs. Because this rule maintains the standard at baseline (*i.e.,* ASHRAE), DOE's modeling does not show any negative financial impacts on industry, including manufacturers with production assets, as a direct result of the standard.

For the small business subgroup analysis, DOE applied the small business size standards published by the Small Business Administration (SBA) to determine whether a company is considered a small business. 65 FR 30836, 30848 (May 15, 2000), as amended at 65 FR 53533, 53544 (September 5, 2000) and codified at 13 CFR part 121. To be categorized as a small business under North American Industry Classification System (NAICS) code 333415, ''Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing,'' a PTAC and PTHP manufacturer and its affiliates may employ a maximum of 750 employees. The 750-employee threshold includes all employees in a business's parent company and any other subsidiaries. Based on this classification, DOE identified 12 manufacturers that qualify as small businesses. The PTAC and PTHP small business subgroup analysis is discussed in chapter 12 of the final rule TSD and in section VI.B of this document.

e. Cumulative Regulatory Burden

While any one regulation may not impose a significant burden on manufacturers, the combined effects of several impending regulations may have serious consequences for some manufacturers, groups of manufacturers, or an entire industry. Assessing the impact of a single regulation may overlook this cumulative regulatory burden. Multiple regulations affecting the same manufacturer can strain profits and can lead companies to abandon product lines or markets with lower expected future returns than competing products. For these reasons, DOE conducts an analysis of cumulative regulatory burden as part of its rulemakings pertaining to appliance efficiency.

For the cumulative regulatory burden analysis, DOE looks at other regulations that could affect PTAC and PTHP manufacturers that will take effect approximately three years before or after the 2017 compliance date of this final rule. In interviews, manufacturers cited federal regulations on equipment other than PTACs and PTHPs that contribute to their cumulative regulatory burden. The compliance years and expected industry conversion costs of relevant amended energy conservation standards are indicated in the table below:

TABLE V.16—COMPLIANCE DATES AND EXPECTED CONVERSION EXPENSES OF FEDERAL ENERGY CONSERVATION STANDARDS AFFECTING PTAC AND PTHP MANUFACTURERS

Federal energy conservation standards	Approximate compliance date	Estimated total industry conversion expense
2011 Room Air Conditioners:		
76 FR 22454 (April 21, 2011); 76 FR 52854 (August 24, 2011)	2014	$171M (2009$)
2007 Residential Furnaces & Boilers:		
72 FR 65136 (November 19, 2007)	2015	$88M (2006$) *
2011 Residential Furnaces:		
76 FR 37408 (June 27, 2011); 76 FR 67037 (October 31, 2011)	2015	$2.5M (2009$) **
2011 Residential Central Air Conditioners and Heat Pumps:		
76 FR 37408 (June 27, 2011); 76 FR 67037 (October 31, 2011)	2015	$26.0M (2009$) **
2010 Gas Fired and Electric Storage Water Heaters:		
75 FR 20112 (April 16, 2010)	2015	$95.4M (2009$)
Dishwashers ***	2018	TBD
Commercial Packaged Air-Conditioning and Heating Equipment: ***		
79 FR 58948 (September 30, 2014)	2018	$226.4M (2013$)
Commercial Warm-Air Furnaces ***	2018	$19.9M (2013$)
Furnace Fans:		
79 FR 38129 (July 3, 2014)	2019	$40.6M (2013$)
Miscellaneous Residential Refrigeration ***	2019	TBD
Single Packaged Vertical Units:		
79 FR 78614 (December 30, 2014)	2019	$16.1M (2013$)
Commercial Water Heaters ***	2019	TBD
Commercial Packaged Boilers ***	2020	TBD

* Conversion expenses for manufacturers of oil-fired furnaces and gas-fired and oil-fired boilers associated with the November 2007 final rule for residential furnaces and boilers are excluded from this figure. The 2011 direct final rule for residential furnaces sets a higher standard and earlier compliance date for oil-fired furnaces than the 2007 final rule. As a result, manufacturers will be required to design to the 2011 direct final rule standard. The conversion costs associated with the 2011 direct final rule are listed separately in this table. EISA 2007 legislated more stringent standards and earlier compliance dates for residential boilers than were required by the November 2007 final rule. As a result, gas-fired and oil-fired boiler manufacturers were required to design to the EISA 2007 standard beginning in 2012. The conversion costs listed for residential gas-fired and oil-fired boilers in the November 2007 residential furnaces and boilers final rule analysis are not included in this figure.

** Estimated industry conversion expense and approximate compliance date reflect a court-ordered April 24, 2014 remand of the residential non-weatherized and mobile home gas furnaces standards set in the 2011 Energy Conservation Standards for Residential Furnaces and Residential Central Air Conditioners and Heat Pumps. The costs associated with this rule reflect implementation of the amended standards for the remaining furnace product classes (*i.e.,* oil-fired furnaces).

*** The final rule for this energy conservation standard has not been published. The compliance date and analysis of conversion costs have not been finalized at this time. (If a value is provided for total industry conversion expense, this value represents an estimate from the September 2014 NOPR.)

Additionally, manufacturers cited increasing ENERGY STAR [52] standards for room air conditioners and ductless heating and cooling systems as a source of regulatory burden. However, DOE does not consider ENERGY STAR in its presentation of cumulative regulatory burden, because ENERGY STAR is a voluntary program and is not federally mandated.

Manufacturers also cited the U.S. EPA SNAP Program as a source of regulatory burden. The SNAP Program evaluates and regulates substitutes for ozone-depleting chemicals (such as air conditioning refrigerants) that are being phased out under the stratospheric ozone protection provisions of the CAA. On July 9, 2014, the EPA issued a notice of proposed rulemaking proposing to list three flammable refrigerants (HFC–32 (R–32), Propane (R–290), and R–441A) as new acceptable substitutes, subject to use conditions, for refrigerant in the Household and Light Commercial Air Conditioning class of equipment. 79 FR 38811 (July 9, 2014). On April 10, 2015, the EPA published its final rule that allows the use of R–32, R–290, and R–441A in limited amounts in PTAC and PTHP applications. 80 FR 19454 (April 10, 2015) EIAI commented that R–410A is a candidate for delisting in some sectors under the EPA's SNAP program. (EIAI, No. 32 at p. 3) SCS commented that, with the anti-backsliding rule, it is critical to not set a standard level so high that it may not be technically possible to meet the standard in the future with a change such as delisting refrigerants. (SCS, NOPR Public Meeting Transcript, No. 37 at p. 42) DOE notes that the EPA did not delist R–410A for use in new production in the Household and Light Commercial Air Conditioning class of equipment (which includes PTAC and PTHP equipment). DOE also notes that the use of alternate refrigerants by manufacturers of PTACs and PTHPs would not be required as a direct result of this rule. As a result, alternate

[52] ENERGY STAR is a U.S. EPA voluntary program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. For more information on the ENERGY STAR program, please visit *www.energystar.gov.*

refrigerants were not considered in this analysis.

3. National Impact Analysis

a. Significance of Energy Savings

For each TSL, DOE projected energy savings for PTAC and PTHP equipment purchased in the respective 30-year period that begins in the year of anticipated compliance with amended standards. The savings are measured over the entire lifetime of equipment purchased in the 30-year period. DOE quantified the energy savings attributable to each TSL as the difference in energy consumption between each standards case and the base case represented by ANSI/ASHRAE/IES Standard 90.1–2013. DOE also determined energy savings for PTAC equipment with the ANSI/ASHRAE/IES Standard 90.1–2013 minimum efficiency level by comparing with the energy consumption of PTAC equipment meeting the Federal minimum efficiency level. Table V.17 shows the estimated primary energy savings for PTACs and PTHPs at each of the TSLs, and Table V.18 presents the estimated full-fuel-cycle energy savings for each TSL. The approach for estimating national energy savings is further described in section IV.H.

TABLE V.17—CUMULATIVE PRIMARY ENERGY SAVINGS FOR PTAC SOLD FROM 2019 TO 2048 AND PTHP SOLD FROM 2018 TO 2047

	ASHRAE Standard 90.1–2013 *	Trial standard level				
		1	2	3	4	5
	(*quads*)					
Standard Size Equipment, 7,000 Btu/h	0.000	0.000	0.002	0.004	0.006	0.006
Standard Size Equipment, 9,000 Btu/h	0.000	0.012	0.044	0.087	0.110	0.113
Standard Size Equipment, 15,000 Btu/h	0.001	0.001	0.005	0.009	0.011	0.011
Total All Classes	0.001	0.013	0.052	0.100	0.127	0.130

* Energy savings determined from comparing PTAC energy consumption at the ANSI/ASHRAE/IES Standard 90.1–2013 efficiency level to that at the Federal minimum efficiency level.

Note: Values of 0.000 represent non-zero energy savings but is as appears due to rounding.

TABLE V.18—CUMULATIVE FULL-FUEL-CYCLE ENERGY SAVINGS FOR PTAC SOLD FROM 2019 TO 2048 AND PTHP SOLD FROM 2018 TO 2047

	ASHRAE Standard 90.1–2013 *	Trial standard level				
		1	2	3	4	5
	(*quads*)					
Standard Size Equipment, 7,000 Btu/h	0.000	0.000	0.002	0.005	0.006	0.006
Standard Size Equipment, 9,000 Btu/h	0.000	0.012	0.045	0.088	0.112	0.115
Standard Size Equipment, 15,000 Btu/h	0.001	0.001	0.005	0.009	0.011	0.011
Total All Classes	0.001	0.014	0.052	0.102	0.129	0.133

* Energy savings determined from comparing PTAC energy consumption at the ANSI/ASHRAE/IES Standard 90.1–2013 efficiency level to that at the Federal minimum efficiency level.

Note: Values of 0.000 represent non-zero energy savings but is as appears due to rounding.

Each TSL that is more stringent than the corresponding levels in ANSI/ASHRAE/IES Standard 90.1–2013 results in additional energy savings.

OMB Circular A–4 [53] requires agencies to present analytical results, including separate schedules of the monetized benefits and costs that show the type and timing of benefits and costs. Circular A–4 also directs agencies to consider the variability of key elements underlying the estimates of benefits and costs. For this rulemaking, DOE also undertook a sensitivity analysis using nine rather than 30 years of equipment shipments. The choice of a nine-year period is a proxy for the timeline in EPCA for the review of certain energy conservation standards and potential revision of and compliance with such revised standards.[54] The review timeframe established in EPCA is generally not synchronized with the equipment lifetime, equipment manufacturing cycles, or other factors specific to PTACs and PTHPs. Thus, such results are presented for informational purposes only and are not indicative of any change in DOE's analytical methodology. The NES results based on a 9-year analytical period are presented in Table V.19.

[53] ''Circular A–4: Regulatory Analysis,'' U.S. Office of Management and Budget, September, 2003. Available at: *www.whitehouse.gov/omb/circulars_a004_a-4/*.

[54] EPCA requires DOE to review its standards at least once every 6 years, and requires, for certain equipment, a 3-year period after any new standard is promulgated before compliance is required, except that in no case may any new standards be required within 6 years of the compliance date of the previous standards. (42 U.S.C. 6313(a)(6)(C)(i)) While adding a 6-year review to the 3-year compliance period adds up to 9 years, DOE notes that it may undertake reviews at any time within the 6 year period and that the 3-year compliance date may yield to the 6-year backstop.

TABLE V.19—CUMULATIVE PRIMARY ENERGY SAVINGS FOR PTAC SOLD IN 2019–2027 AND PTHP SOLD IN 2018–2026

	ASHRAE Standard 90.1–2013 *	Trial standard level				
		1	2	3	4	5
	(*quads*)					
Standard Size Equipment, 7,000 Btu/h ...	0.000	0.000	0.001	0.001	0.002	0.002
Standard Size Equipment, 9,000 Btu/h ...	0.000	0.004	0.013	0.026	0.040	0.043
Standard Size Equipment, 15,000 Btu/h	0.000	0.000	0.001	0.003	0.004	0.004
Total All Classes	0.000	0.004	0.015	0.030	0.046	0.049

* Energy savings determined from comparing PTAC energy consumption at the ANSI/ASHRAE/IES Standard 90.1–2013 efficiency level to that at the Federal minimum efficiency level.

Note: Values of 0.000 represent non-zero energy savings but is as appears due to rounding.

b. Net Present Value of Consumer Costs and Benefits

DOE estimated the cumulative NPV of the total costs and savings for consumers that would result from the TSLs considered for PTAC and PTHP equipment. In accordance with OMB's guidelines on regulatory analysis,[55] DOE calculated the NPV using both a 7-percent and a 3-percent real discount rate.

Table V.20 shows the NPV results for each TSL considered for PTAC and PTHP equipment.

TABLE V.20—NET PRESENT VALUE OF CONSUMER BENEFITS FOR PTAC SOLD IN 2019–2048 AND PTHP SOLD IN 2018–2047

Equipment class	Discount rate	Trial standard level * (millions 2014$)				
		1	2	3	4	5
<7,000 Btu/h	3%	0.1	(1.7)	(5.4)	(8.3)	(8.8)
7,000–15,000 Btu/h		6.4	0.9	(20.6)	(43.0)	(47.6)
>15,000 Btu/h		(0.6)	(5.2)	(13.7)	(20.2)	(21.4)
Total—All Classes	....	5.9	(6.0)	(39.7)	(71.5)	(77.7)
<7,000 Btu/h	7%	(0.1)	(1.5)	(4.1)	(6.4)	(6.9)
7,000–15,000 Btu/h		0.6	(12.0)	(36.3)	(60.1)	(65.3)
>15,000 Btu/h		(0.6)	(3.9)	(9.7)	(14.9)	(16.0)
Total—All Classes	....	(0.1)	(17.3)	(50.2)	(81.4)	(88.1)

* Parentheses indicate negative values.

Note: Values of 0.0 represent a non-zero NPV that cannot be displayed due to rounding. Numbers may not sum to total due to rounding.

The NPV results based on the aforementioned nine-year analytical period are presented in Table V.21. As mentioned previously, this information is presented for informational purposes only and is not indicative of any change in DOE's analytical methodology or decision criteria.

TABLE V.21—NET PRESENT VALUE OF CONSUMER BENEFITS FOR PTAC SOLD IN 2019–2027AND PTHP SOLD IN 2018–2026

Equipment class	Discount rate	Trial standard level * (millions 2013$)				
		1	2	3	4	5
<7,000 Btu/h	3%	0.1	(0.3)	(1.5)	(3.0)	(3.5)
7,000–15,000 Btu/h		6.1	6.8	1.8	(9.2)	(13.7)
>15,000 Btu/h		0.1	(0.4)	(2.6)	(6.7)	(7.8)
Total–All Classes	....	6.3	6.2	(2.4)	(18.9)	(25.1)
<7,000 Btu/h	7%	0.0	(0.5)	(1.8)	(3.2)	(3.6)
7,000–15,000 Btu/h		2.3	(2.2)	(12.4)	(27.2)	(32.4)
>15,000 Btu/h		(0.1)	(1.0)	(3.4)	(7.0)	(8.1)
Total—All Classes	....	2.2	(3.7)	(17.6)	(37.4)	(44.1)

* Parentheses indicate negative values.

Note: Values of 0.0 represent a non-zero NPV that cannot be displayed due to rounding. Numbers may not sum to total due to rounding.

[55] ''OMB Circular A–4, section E,'' U.S. Office of Management and Budget, September, 2003. Available online at *http://www.whitehouse.gov/omb/circulars_a004_a-4*.

c. Indirect Impacts on Employment

As described in section IV.N, DOE used an input/output model of the U.S. economy to estimate indirect employment impacts of the TSLs that DOE considered in this rulemaking. DOE understands that there are uncertainties involved in projecting employment impacts, especially changes in the later years of the analysis. Therefore, DOE generated results for near-term time frames (2019–2024), where these uncertainties are reduced.

The results suggest that the adopted standards are likely to have negligible impact on the net demand for labor in the economy. The net change in jobs is so small that it would be imperceptible in national labor statistics and might be offset by other, unanticipated effects on employment. Chapter 16 of the final rule TSD presents detailed results regarding anticipated indirect employment impacts.

4. Impact on Utility or Performance of Equipment

In performing the engineering analysis, DOE considered efficiency levels that may be achieved using design options that would not lessen the utility or performance of the individual classes of equipment. (42 U.S.C. 6313(a)(6)(B)(ii)(IV)) As presented in section III.C of this document, DOE concluded that the efficiency levels proposed for standard size equipment in this document are technologically feasible and would not reduce the utility or performance of PTACs and PTHPs. PTAC and PTHP manufacturers currently offer equipment that meet or exceed the amended standard levels.

5. Impact of Any Lessening of Competition

EPCA directs DOE to consider any lessening of competition that is likely to result from standards. It also directs the Attorney General of the United States (Attorney General) to determine the impact, if any, of any lessening of competition likely to result from a proposed standard and to transmit such determination in writing to the Secretary within 60 days of the publication of a proposed rule, together with an analysis of the nature and extent of the impact.

To assist the Attorney General in making such determination, DOE provided the Department of Justice (DOJ) with copies of the September 2014 NOPR and the accompanying TSD for review. In its assessment letter responding to DOE, DOJ concluded that the proposed energy conservation standards for PTAC and PTHP equipment are unlikely to have a significant adverse impact on competition. DOE is publishing the Attorney General's assessment at the end of this final rule.

6. Need of the Nation To Conserve Energy

Enhanced energy efficiency, where economically justified, improves the nation's energy security, strengthens the economy, and reduces the environmental impacts or costs of energy production. Reduced electricity demand due to energy conservation standards is also likely to reduce the cost of maintaining the reliability of the electricity system, particularly during peak-load periods. As a measure of this reduced demand, chapter 15 of the final rule TSD presents the estimated reduction in generating capacity for the TSLs that DOE considered in this rulemaking.

Energy savings from amended standards for PTAC and PTHP equipment may yield environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases. Table V.22 provides DOE's estimate of cumulative emissions reductions expected to result from the TSLs considered in this rulemaking. The table includes both power sector emissions and upstream emissions. The emissions were calculated using the multipliers discussed in section IV.K. DOE reports annual emissions reductions for each TSL in chapter 13 of the final rule TSD.

TABLE V.22—SUMMARY OF EMISSIONS REDUCTIONS FOR PTAC SOLD FROM 2019 TO 2048 AND PTHP SOLD FROM 2018 TO 2047

	Trial standard level					
	ASHRAE **	1	2	3	4	5
Power Sector Emissions						
CO_2 (million metric tons)	0.05	0.79	3.04	5.90	7.57	7.80
SO_2 (thousand tons)	0.04	0.65	2.50	4.85	6.28	6.50
NO_X (thousand tons)	0.04	0.61	2.34	4.53	5.84	6.03
Hg (tons)	0.00	0.00	0.01	0.01	0.02	0.02
N_2O (thousand tons)	0.00	0.01	0.04	0.08	0.10	0.11
CH_4 (thousand tons)	0.00	0.08	0.30	0.58	0.73	0.75
Upstream Emissions						
CO_2 (million metric tons)	0.00	0.04	0.17	0.34	0.42	0.44
SO_2 (thousand tons)	0.00	0.01	0.03	0.06	0.08	0.08
NO_X (thousand tons)	0.04	0.64	2.47	4.79	6.04	6.20
Hg (tons)	0.00	0.00	0.00	0.00	0.00	0.00
N_2O (thousand tons)	0.00	0.00	0.00	0.00	0.00	0.00
CH_4 (thousand tons)	0.22	3.70	14.39	27.88	35.17	36.09
Total FFC Emissions						
CO_2 (million metric tons)	0.05	0.83	3.21	6.24	7.99	8.24
SO_2 (thousand tons)	0.04	0.66	2.53	4.91	6.36	6.58
NO_X (thousand tons)	0.08	1.24	4.81	9.32	11.87	12.23
Hg (tons)	0.00	0.00	0.01	0.02	0.02	0.02

TABLE V.22—SUMMARY OF EMISSIONS REDUCTIONS FOR PTAC SOLD FROM 2019 TO 2048 AND PTHP SOLD FROM 2018 TO 2047—Continued

	Trial standard level					
	ASHRAE **	1	2	3	4	5
N_2O (thousand tons)	0.00	0.01	0.04	0.09	0.11	0.11
N_2O (thousand tons CO_2eq) *	0.18	3.01	11.66	22.61	28.71	29.52
CH_4 (thousand tons)	0.23	3.78	14.69	28.46	35.90	36.84
CH_4 (million tons CO_2eq) *	6.42	105.87	411.21	796.84	1005.20	1031.56

* CO_2eq is the quantity of CO_2 that would have the same global warming potential (GWP) as the subject emission.
** Emissions reductions determined from comparing PTAC emissions at the ANSI/ASHRAE/IES Standard 90.1–2013 efficiency level to that at the Federal minimum efficiency level.
Note: Values of 0.00 represent non-zero emissions savings but is as appears due to rounding.

As part of the analysis for this rule, DOE estimated monetary benefits likely to result from the reduced emissions of CO_2 and NO_X that DOE estimated for each of the considered TSLs for PTAC and PTHP equipment. As discussed in section IV.L of this document, for CO_2, DOE used the most recent values for the SCC developed by an interagency process. The four sets of SCC values for CO_2 emissions reductions in 2015 resulting from that process (expressed in 2014$) are represented by $12.2/metric ton (the average value from a distribution that uses a 5-percent discount rate), $41.2/metric ton (the average value from a distribution that uses a 3-percent discount rate), $63.4/metric ton (the average value from a distribution that uses a 2.5-percent discount rate), and $121/metric ton (the 95th-percentile value from a distribution that uses a 3-percent discount rate). The values for later years are higher due to increasing damages (public health, economic and environmental) as the projected magnitude of climate change increases.

Table V.23 presents the global value of CO_2 emissions reductions at each TSL. For each of the four cases, DOE calculated a present value of the stream of annual values using the same discount rate as was used in the studies upon which the dollar-per-ton values are based. DOE calculated domestic values as a range from 7 percent to 23 percent of the global values, and these results are presented in chapter 14 of the final rule TSD.

TABLE V.23—ESTIMATES OF GLOBAL PRESENT VALUE OF CO_2 EMISSIONS REDUCTION UNDER PTAC AND PTHP TRIAL STANDARD LEVELS

TSL	SCC Case * *(million 2014$)*			
	5% Discount rate, average *	3% Discount rate, average *	2.5% Discount rate, average *	3% Discount rate, 95th percentile *
Power Sector Emissions				
1	5.60	25.65	40.71	79.28
2	21.36	98.34	156.20	304.08
3	41.70	191.50	304.04	592.22
4	55.18	249.89	395.67	771.97
5	57.33	258.78	409.48	799.04
Upstream Emissions				
1	0.31	1.43	2.28	4.44
2	1.19	5.54	8.81	17.14
3	2.32	10.77	17.13	33.34
4	3.02	13.84	21.95	42.80
5	3.12	14.25	22.60	44.08
Total FFC Emissions				
1	5.91	27.09	42.99	83.71
2	22.55	103.87	165.01	321.22
3	44.02	202.27	321.17	625.56
4	58.20	263.72	417.62	814.77
5	60.46	273.03	432.09	843.12

* For each of the four cases, the corresponding SCC value for emissions in 2015 is $12.2, $41.2, $63.4, and $121 per metric ton (2014$). The values are for CO_2 only (*i.e.,* not CO_{2eq} of other greenhouse gases).

DOE is well aware that scientific and economic knowledge about the contribution of CO_2 and other GHG emissions to changes in the future global climate and the potential resulting damages to the world economy continues to evolve rapidly. Thus, any value placed on reduced CO_2 emissions in this rulemaking is subject to change. DOE, together with other Federal agencies, will continue to review various methodologies for estimating the monetary value of reductions in CO_2 and other GHG emissions. This ongoing review will consider the comments on this subject that are part of the public record for this and other rulemakings, as well as other methodological assumptions and issues. However, consistent with DOE's legal obligations, and taking into account the uncertainty involved with this particular issue, DOE has included in this rule the most recent values and analyses resulting from the interagency review process.

DOE also estimated the cumulative monetary value of the economic benefits associated with NO_X emissions reductions anticipated to result from amended standards for PTACs and PTHPs. The dollar-per-ton values that DOE used are discussed in section IV.L.1. Table V.24 presents the cumulative present values for NO_X emissions for each TSL calculated using the average dollar-per-ton value and 7-percent and 3-percent discount rates.

TABLE V.24—ESTIMATES OF PRESENT VALUE OF NO_X EMISSIONS REDUCTION FOR PTAC SOLD FROM 2019 TO 2048 AND PTHP SOLD FROM 2018 TO 2047

TSL	(Million 2014$)	
	3% Discount rate	7% Discount rate
Power Sector Emissions		
1	0.87	0.43
2	3.30	1.58
3	6.45	3.11
4	8.63	4.34
5	9.01	4.60
Upstream Emissions		
1	0.87	0.40
2	3.34	1.51
3	6.53	2.97
4	8.56	4.07
5	8.87	4.27
Total FFC Emissions		
1	1.74	0.83
2	6.64	3.10
3	12.97	6.08
4	17.20	8.42
5	17.88	8.87

7. Other Factors

The Secretary of Energy, in determining whether a standard is economically justified, may consider any other factors that the Secretary deems to be relevant. (42 U.S.C. 6313(a)(6)(B)(ii)(VII)) No other factors were considered in this analysis.

8. Summary of National Economic Impacts

The NPV of the monetized benefits associated with emissions reductions can be viewed as a complement to the NPV of the consumer savings calculated for each TSL considered in this rulemaking. Table V.25 presents the NPV values that result from adding the estimates of the potential economic benefits resulting from reduced CO_2 and NO_X emissions in each of four valuation scenarios to the NPV of consumer savings calculated for each TSL considered in this rulemaking, at both a 7-percent and 3-percent discount rate. The CO_2 values used in the columns of each table correspond to the four sets of SCC values discussed above.

TABLE V.25—NET PRESENT VALUE OF CONSUMER SAVINGS COMBINED WITH PRESENT VALUE OF MONETIZED BENEFITS FROM CO_2 AND NO_X EMISSIONS REDUCTIONS

TSL	million 2014$			
	SCC Case $12.2/metric ton and medium NO_X value	SCC Case $41.2/metric ton and medium NO_X value	SCC Case $63.4/metric ton and medium NO_X value	SCC Case $121/metric ton and medium NO_X value
Consumer NPV at 3% Discount Rate added with:				
1	13.5	34.7	50.6	91.4
2	23.2	104.5	165.7	321.9
3	17.3	175.6	294.5	598.8
4	3.9	209.4	363.3	760.4
5	0.6	213.2	372.2	783.3
Consumer NPV at 7% Discount Rate added with:				
1	6.7	27.8	43.7	84.5
2	8.3	89.6	150.8	307.0
3	(0.1)	158.2	277.1	581.5
4	(14.8)	190.7	344.6	741.8
5	(18.8)	193.8	352.8	763.9

*These label values represent the global SCC in 2015, in 2014$.

Although adding the value of consumer savings to the values of emission reductions provides a valuable perspective, two issues should be considered. First, the national operating cost savings are domestic U.S. monetary savings that occur as a result of market transactions, while the value of CO_2 reductions is based on a global value. Second, the assessments of operating cost savings and the SCC are performed with different methods that use different time frames for analysis. The national operating cost savings is measured for the lifetime of equipment shipped in 2019 to 2048. Because CO_2 emissions have a very long residence time in the atmosphere,[56] the SCC values in future years reflect future climate-related impacts resulting from the emission of CO_2 that continue beyond 2100.

[56] The atmospheric lifetime of CO_2 is estimated of the order of 30–95 years. Jacobson, MZ, ''Correction to 'Control of fossil-fuel particulate black carbon and organic matter, possibly the most effective method of slowing global warming,''' *J. Geophys. Res.* 110. pp. D14105 (2005).

C. Conclusions

Any new or amended energy conservation standard for any class of PTAC and PTHP equipment must demonstrate that adoption of a uniform national standard more stringent than the amended ASHRAE/IES Standard 90.1 for PTAC and PTHP equipment would result in significant additional conservation of energy, is technologically feasible and economically justified, and is supported by clear and convincing evidence. (42 U.S.C. 6313(a)(6)(A)(i)(II)) In determining whether a standard is economically justified, the Secretary must determine whether the benefits of the standard exceed its burdens, considering, to the greatest extent practicable, the seven statutory factors discussed previously. (42 U.S.C. 6313(a)(6)(B)(ii))

DOE considered the impacts of potential standards at each TSL, beginning with the maximum technologically feasible level, to determine whether that level met the evaluation criteria. If the max-tech level was not justified, DOE then considered the next most-efficient level and undertook the same evaluation until it reached the highest efficiency level that is both technologically feasible and economically justified, results in significant additional conservation of energy, and is supported by clear and convincing evidence.

To aid the reader in understanding the benefits and/or burdens of each TSL, Table V.26 and Table V.27 summarize the quantitative impacts estimated for each TSL for PTAC and PTHP equipment, based on the assumptions and methodology discussed herein. The national impacts are measured over the lifetime of PTAC and PTHP equipment purchased in the 30-year period that begins in the anticipated year of compliance with amended standards. The energy savings, emissions reductions, and value of emissions reductions refer to full-fuel-cycle results. The efficiency levels contained in each TSL are described in section V.A. In addition to the quantitative results presented in the tables, DOE also considers other burdens and benefits that affect economic justification. These include the impacts on identifiable subgroups of consumers that may be disproportionately affected by a national standard (see section V.B.1.b), and impacts on employment. DOE discusses the impacts on employment in PTAC and PTHP manufacturing in section V.B.2, and discusses the indirect employment impacts in section V.B.3.c.

TABLE V.26—SUMMARY OF ANALYTICAL RESULTS FOR PTAC AND PTHP EQUIPMENT: NATIONAL IMPACTS

Category	ASHRAE †	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5
Cumulative National FFC Energy Savings (*quads*)	0.001	0.014	0.052	0.102	0.129	0.133
NPV of Consumer Costs and Benefits *** (*2014$ million*):						
3% discount rate	....	5.9	(6.0)	(39.7)	(71.5)	(77.7)
7% discount rate	....	(0.1)	(17.3)	(50.2)	(81.4)	(88.1)
Cumulative Emissions Reduction (Total FFC Emissions):						
CO_2 *million metric tons*	0.05	0.83	3.21	6.24	7.99	8.24
SO_2 *thousand tons*	0.04	0.66	2.53	4.91	6.36	6.58
NO_X *thousand tons*	0.08	1.24	4.81	9.32	11.87	12.23
Hg *tons*	0.00	0.00	0.01	0.02	0.02	0.02
N_2O *thousand tons*	0.00	0.01	0.04	0.09	0.11	0.11
N_2O *thousand tons CO_2eq* *	0.18	3.01	11.66	22.61	28.71	29.52
CH_4 *thousand tons*	0.23	3.78	14.69	28.46	35.90	36.84
CH_4 *thousand tons CO_2eq* *	6.42	105.87	411.21	796.84	1005.20	1031.56
Value of Emissions Reduction (Total FFC Emissions):						
CO_2 *2014$ million* **		5.9 to 83.7	22.5 to 321.2	44.0 to 625.6	58.2 to 814.8	60.5 to 843.1
NO_X—3% discount rate *2014$ million*		1.74	6.64	12.97	17.20	17.88
NO_X—7% discount rate *2014$ million*		0.83	3.10	6.08	8.42	8.87

* CO_2eq is the quantity of CO_2 that would have the same global warming potential (GWP) as the subject emission.
** Range of the economic value of CO_2 reductions is based on estimates of the global benefit of reduced CO_2 emissions.
*** Parentheses indicate negative values.
† Energy and emissions savings determined from comparing PTAC energy consumption and emissions at the ANSI/ASHRAE/IES Standard 90.1–2013 efficiency level to that at the Federal minimum efficiency level.
Note: Values of 0.00 represent non-zero emissions savings but is as appears due to rounding.

TABLE V.27—SUMMARY OF ANALYTICAL RESULTS FOR PTAC AND PTHP EQUIPMENT: MANUFACTURER AND CONSUMER IMPACTS

Category	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5
Industry Impacts ***					
Change in Industry NPV (2013$M)	(1.5) to (1.1)	(0.5) to 0.8	(3.0) to (0.3)	(3.4) to 0.8	(6.7) to (1.9)
Industry NPV (% Change)	(2.4) to (1.8)	(0.8) to 1.3	(4.8) to (0.5)	(5.4) to 1.4	(10.7) to (3.1)
Consumer Mean LCC Savings *** (*2014$*)					
Standard Size Equipment, 9,000 Btu/h	0.17	(3.26)	(9.85)	(18.50)	(23.50)
Standard Size Equipment, 15,000 Btu/h	(0.95)	(5.51)	(19.24)	(40.53)	(54.02)
Weighted Average *	0.09	(3.43)	(10.52)	(20.08)	(25.69)
Consumer Median PBP (*years*)					
Standard Size Equipment, 9,000 Btu/h	7.67	8.84	9.84	10.53	10.87
Standard Size Equipment, 15,000 Btu/h	9.69	10.49	12.30	14.07	14.98
Weighted Average *	7.62	8.65	9.19	0.00	0.00
Standard Size Equipment 9,000 Btu/h **					
Consumers with Net Cost %	27	50	78	87	88

TABLE V.27—SUMMARY OF ANALYTICAL RESULTS FOR PTAC AND PTHP EQUIPMENT: MANUFACTURER AND CONSUMER IMPACTS—Continued

Category	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5
Consumers with No Impact %	52	34	7	0	0
Consumers with Net Benefit %	21	16	15	13	12
Standard Size Equipment 15,000 Btu/h **					
Consumers with Net Cost %	34	51	85	93	95
Consumers with No Impact %	58	39	7	2	0
Consumers with Net Benefit %	8	10	9	5	4
Weighted Average **					
Consumers with Net Cost %	28	50	79	87	89
Consumers with No Impact %	9	2	1	1	1
Consumers with Net Benefit %	17	21	37	46	65

* Weighted by shares of each equipment class in total projected shipments in 2019 for PTAC and 2018 for PTHP.
** Rounding may cause some items to not total 100 percent.
*** Parentheses indicate negative values.

DOE first considered TSL 5, which represents the max-tech efficiency levels. TSL 5 would save 0.13 quads of energy, an amount DOE considers significant. Under TSL 5, the NPV of consumer benefit would be negative $88.1 million using a discount rate of 7 percent, and negative $77.7 million using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 5 are 8.2 Mt of CO_2, 6.6 thousand tons of SO_2, 12.2 thousand tons of NO_X, 36.8 thousand tons of CH_4, and 0.1 thousand tons of N_2O. The estimated monetary value of the CO_2 emissions reduction at TSL 5 ranges from $61 million to $843 million.

At TSL 5, the weighted-average LCC impact is an expenditure (*i.e.,* negative savings) of $25.68 for purchasers of PTAC and PTHP equipment. For these purchasers, the simple payback period is 6.6 years. The fraction of consumers experiencing a net LCC cost is 89 percent.

At TSL 5, the projected change in INPV ranges from a decrease of $6.7 million to a decrease of $1.9 million, which correspond to decreases of 10.7 percent and 3.1 percent, respectively. Currently, there is only one PTHP equipment line being manufactured at TSL 5 efficiency levels. Available information indicates that PTAC and PTHP manufacturers would be able to design and produce equipment at TSL 5, based on the existence of a unit that achieves TSL 5 levels without the use of proprietary technologies.

The Secretary concluded that at TSL 5 for PTAC and PTHP equipment, the benefits of energy savings, emission reductions, and the estimated monetary value of the emissions reductions would be outweighed by the negative NPV of consumer benefits, the economic burden on many consumers, and the impacts on manufacturers, including the conversion costs and profit margin impacts that could result in a large reduction in INPV. Consequently, the Secretary has concluded that TSL 5 is not economically justified.

DOE then considered TSL 4, which would save an estimated 0.13 quads of energy, an amount DOE considers significant. Under TSL 4, the NPV of consumer benefit would be negative $81.4 million using a discount rate of 7 percent, and negative $71.5 million using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 4 are 8.0 Mt of CO_2, 6.4 thousand tons of SO_2, 11.9 thousand tons of NO_X, 35.9 thousand tons of CH_4, and 0.1 thousand tons of N_2O. The estimated monetary value of the CO_2 emissions reduction at TSL 4 ranges from $58 million to $815 million.

At TSL 4, the weighted-average LCC impact is an expenditure of $20.07 for purchasers of PTAC and PTHP equipment. For these purchasers, the simple payback period is 6.4 years. The fraction of consumers experiencing a net LCC cost is 87 percent.

At TSL 4, the projected change in INPV ranges from a decrease of $3.4 million to an increase of $0.8 million, which represent a decrease of 5.4 percent and an increase of 1.4 percent, respectively.

The Secretary concluded that at TSL 4 for PTAC and PTHP equipment, the benefits of energy savings, emission reductions, and the estimated monetary value of the emissions reductions would be outweighed by the negative NPV of consumer benefits, economic burden on many consumers, and the impacts on manufacturers, including the conversion costs and profit margin impacts that could result in a large reduction in INPV. Consequently, the Secretary has concluded that TSL 4 is not economically justified.

DOE then considered TSL 3, which would save an estimated 0.10 quads of energy, an amount DOE considers significant. Under TSL 3, the NPV of consumer benefit would be negative $50.2 million using a discount rate of 7 percent, and negative $39.7 million using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 6.2 Mt of CO_2, 4.9 thousand tons of SO_2, 9.3 thousand tons of NO_X, 28.5 thousand tons of CH_4, and 0.1 thousand tons of N_2O. The estimated monetary value of the CO_2 emissions reduction at TSL 3 ranges from $44 million to $626 million.

At TSL 3, the weighted-average LCC impact is an expenditure of $10.52 for purchasers of PTAC and PTHP equipment. For these purchasers, the simple payback period is 6.1 years. The fraction of consumers experiencing a net LCC cost is 79 percent.

At TSL 3, the projected change in INPV ranges from a decrease of $3.0 million to a decrease of $0.3 million, which represent decreases of 4.8 percent and 0.5 percent, respectively.

The Secretary concluded that at TSL 3 for PTAC and PTHP equipment, the benefits of energy savings, emission reductions, and the estimated monetary value of the emissions reductions would be outweighed by the negative NPV of consumer benefits, economic burden on many consumers, and the impacts on manufacturers, including the conversion costs and profit margin impacts that could result in a large reduction in INPV. Consequently, the Secretary has concluded that TSL 3 is not economically justified.

DOE then considered TSL 2, which would save an estimated 0.05 quads of energy, an amount DOE considers significant. Under TSL 2, the NPV of consumer benefit would be negative $17.3 million using a discount rate of 7 percent, and negative $6.0 million using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 2 are 3.2 Mt of CO_2, 2.5 thousand tons of SO_2, 4.8 thousand tons of NO_X, and 14.7 thousand tons of CH_4. The estimated monetary value of the CO_2 emissions reduction at TSL 2 ranges from $23 million to $321 million.

At TSL 2, the weighted-average LCC impact is an expenditure of $3.43 for purchasers of PTAC and PTHP equipment. For these purchasers, the simple payback period is 5.7 years. The fraction of consumers experiencing a net LCC cost is 50 percent.

At TSL 2, the projected change in INPV ranges from a decrease of $0.5 million to an increase of $0.8 million, which represent a decrease of 0.8 percent and an increase of 1.3 percent, respectively.

The Secretary concluded that at TSL 2 for PTAC and PTHP equipment, the benefits of energy savings, emission reductions, and the estimated monetary value of the emissions reductions would be outweighed by the negative NPV of consumer benefits, economic burden on some consumers, and the impacts on manufacturers, including the conversion costs and profit margin impacts that could result in a large reduction in INPV. Consequently, the Secretary has concluded that TSL 2 is not economically justified.

DOE then considered TSL 1, which would save an estimated 0.01 quads of energy, an amount DOE considers significant. Under TSL 1, the NPV of consumer benefit would be negative $0.1 million using a discount rate of 7 percent, and $5.9 million using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 1 are 0.8 Mt of CO_2, 0.7 thousand tons of SO_2, 1.2 thousand tons of NO_X, and 3.8 thousand tons of CH_4. The estimated monetary value of the CO_2 emissions reduction at TSL 1 ranges from $6 million to $84 million.

At TSL 1, the weighted-average LCC impact is a savings of $0.09 for purchasers of PTAC and PTHP equipment. For these purchasers, the simple payback period is 5.1 years. The fraction of consumers experiencing a net LCC cost is 28 percent.

At TSL 1, the projected change in INPV ranges from a decrease of $1.1 million to a decrease of $1.5 million, which represent decreases of 1.8 percent and 2.4 percent, respectively.

The Secretary concluded that at TSL 1 for PTAC and PTHP equipment, the benefits of energy savings, emission reductions, estimated monetary value of the emissions reductions, and the economic benefit for some consumers would be outweighed by the negative NPV of consumer benefits at 7-percent discount rate, the negative average LCC savings for standard size equipment, 15,000 Btu/h, and the negative impacts on manufacturers, including the conversion costs and profit margin impacts that could result in a large reduction in INPV. Consequently, the Secretary has concluded that TSL 1 is not economically justified.

Therefore, based on the above considerations, DOE is not able to show with clear and convincing evidence that energy conservation standards for PTAC and PTHP equipment based on any of the considered TSLs are economically justified. Therefore, pursuant to 42 U.S.C. 6313(6)(A)(ii)(I), which states that unless adoption of a uniform national standard more stringent than the amended ASHRAE/IES Standard 90.1 for the equipment would result in significant additional conservation of energy and is technologically feasible and economically justified and is supported by clear and convincing evidence, DOE is establishing amended energy efficiency standards for PTAC equipment at the minimum efficiency level specified in the ANSI/ASHRAE/IES Standard 90.1–2013 for PTAC equipment. The amended energy conservation standards for PTAC equipment are shown in Table V.28. The standards for PTHP equipment remain unchanged.

TABLE V.28—AMENDED ENERGY CONSERVATION STANDARDS FOR STANDARD SIZE PTAC EQUIPMENT

Equipment type	Cooling capacity	Efficiency level	Compliance date: Products manufactured on and after . . .
PTAC	<7,000 Btu/h	EER = 11.9	January 1, 2017.
	≥7,000 Btu/h and ≤15,000 Btu/h	EER = 14.0 − (0.3 × Cap [1]).	
	>15,000 Btu/h	EER = 9.5	

[1] Cap means cooling capacity in thousand British thermal units per hour (Btu/h) at 95 °F outdoor dry-bulb temperature.

VI. Procedural Issues and Regulatory Review

A. Review Under Executive Orders 12866 and 13563

Section 1(b)(1) of Executive Order 12866, ''Regulatory Planning and Review,'' 58 FR 51735 (Oct. 4, 1993), requires each agency to identify the problem that it intends to address, including, where applicable, the failures of private markets or public institutions that warrant new agency action, as well as to assess the significance of that problem. This final rule addresses the following problems:

(1) Insufficient information and the high costs of gathering and analyzing relevant information leads some consumers to miss opportunities to make cost-effective investments in energy efficiency.

(2) In some cases the benefits of more efficient equipment are not realized due to misaligned incentives between purchasers and users. An example of such a case is when the equipment purchase decision is made by a building contractor or building owner who does not pay the energy costs.

(3) There are external benefits resulting from improved energy efficiency of equipment that are not captured by the users of such equipment. These benefits include externalities related to public health, environmental protection and national energy security that are not reflected in energy prices, such as reduced emissions of air pollutants and greenhouse gases that impact human health and global warming. DOE attempts to qualify some of the external benefits through use of social cost of carbon values.

In addition, DOE has determined that this regulatory action is not a ''significant regulatory action'' under section 3(f) of Executive Order 12866. Section 6(a)(3)(A) of the Executive Order states that absent a material change in the development of the planned regulatory action, regulatory action not designated as significant will not be subject to review under the aforementioned section unless, within 10 working days of receipt of DOE's list of planned regulatory actions, the Administrator of OIRA notifies the agency that OIRA has determined that a planned regulation is a significant regulatory action within the meaning of the Executive order.

DOE has also reviewed this regulation pursuant to Executive Order 13563, issued on January 18, 2011. 76 FR 3281 (Jan. 21, 2011). EO 13563 is supplemental to and explicitly reaffirms the principles, structures, and definitions governing regulatory review established in Executive Order 12866. To the extent permitted by law, agencies are required by Executive Order 13563 to: (1) Propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify); (2) tailor regulations to impose the least burden on society, consistent with obtaining regulatory objectives, taking into account, among other things, and to the extent practicable, the costs of cumulative regulations; (3) select, in choosing among alternative regulatory approaches, those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity); (4) to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt; and (5) identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public.

DOE emphasizes as well that Executive Order 13563 requires agencies to use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible. In its guidance, OIRA has emphasized that such techniques may include identifying changing future compliance costs that might result from technological innovation or anticipated behavioral changes. For the reasons stated in the preamble, DOE believes that this final rule is consistent with these principles, including the requirement that, to the extent permitted by law, benefits justify costs and that net benefits are maximized.

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of a regulatory flexibility analysis for any rule that by law must be proposed for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by Executive Order 13272, ''Proper Consideration of Small Entities in Agency Rulemaking,'' 67 FR 53461 (August 16, 2002), DOE published procedures and policies on February 19, 2003, to ensure that the potential impacts of its rules on small entities are properly considered during the rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel's Web site (*http://energy.gov/gc/office-general-counsel*).

1. Description and Estimated Number of Small Entities Regulated

a. Methodology for Estimating the Number of Small Entities

For manufacturers of PTACs and PTHPs, the Small Business Administration (SBA) has set a size threshold, which defines those entities classified as ''small businesses'' for the purposes of the statute. DOE used the SBA's small business size standards to determine whether any small entities would be subject to the requirements of the rule. *See* 13 CFR part 121. The size standards are listed by North American Industry Classification System (NAICS) code and industry description and are available at *http://www.sba.gov/sites/default/files/files/Size_Standards_Table.pdf.* PTAC and PTHP manufacturing is classified under NAICS 333415, ''Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing.'' The SBA sets a threshold of 750 employees or less for an entity to be considered as a small business for this category.

DOE reviewed the potential standard levels considered in this final rule under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. DOE conducted a market survey to determine whether any companies could be small business manufacturers of equipment covered by this rulemaking. DOE used available public information to identify potential small manufacturers. DOE's research involved industry trade association membership directories (*e.g.,* AHRI), information from previous rulemakings, individual company Web sites, and market research tools (*e.g.,* Hoover's reports) to create a list of companies that manufacture or sell PTAC and PTHP equipment covered by this rulemaking. DOE also asked stakeholders and industry representatives if they were aware of any additional small manufacturers during manufacturer interviews and at DOE public meetings. DOE reviewed publicly available data and contacted various companies on its list of manufacturers, as necessary, to determine whether they met the SBA's definition of a small business manufacturer. DOE screened out companies that do not offer equipment impacted by this rulemaking, do not meet the definition of a ''small business,'' or are foreign owned and operated.

DOE initially identified 22 companies that sell PTAC and PTHP equipment that would be affected by this proposal. Of these 22 companies, DOE identified 12 as small businesses.

b. Manufacturer Participation

DOE contacted the identified small businesses to invite them to take part in a manufacturer impact analysis interview. Of the 12 small businesses contacted, DOE was able to reach and discuss potential standards with two. DOE also obtained information about small businesses and potential impacts on small businesses while interviewing large manufacturers.

c. PTAC and PTHP Industry Structure and Nature of Competition

Three major manufacturers supply approximately 80 percent of the U.S. market for standard-size PTACs and PTHPs. DOE estimates that the remaining 20 percent of the market is served by a combination of small businesses and large businesses that are foreign owned and operated. None of the major manufacturers of PTACs and PTHPs affected by this rulemaking is a domestic small business.

Further, the small businesses identified are not original equipment manufacturers of standard-size PTACs and PTHPs affected by this rulemaking. Rather, they import, rebrand, and distribute PTACs and PTHPs manufactured overseas by foreign companies. Some small businesses identified are original equipment manufacturers of non-standard size PTACs and PTHPs. However, energy conservation standards for non-standard units are not being amended by this rulemaking. As a result, manufacturers of non-standard equipment are not considered in this small business analysis.

2. Description and Estimate of Compliance Requirements

In this rule, DOE is adopting amended energy conservation standards for PTAC equipment that are equivalent to the standards set forth in ANSI/ASHRAE/IES Standard 90.1–2013. In line with ANSI/ASHRAE/IES Standard 90.1–2013, DOE is not amending energy conservation standards for PTHP equipment. DOE is required to adopt minimum efficiency standards either equivalent to or more stringent than those set forth by ASHRAE.

Since this rule adopts the baseline as the standards level, DOE's modeling does not show any negative financial impacts on industry, including small manufacturers, as a direct result of the standard.

3. Duplication, Overlap, and Conflict With Other Rules and Regulations

DOE is not aware of any rules or regulations that duplicate, overlap, or conflict with this final rule.

4. Significant Alternatives to the Rule

The discussion above analyzes impacts on small businesses that would result from DOE's rule adopting the ASHRAE levels. EPCA requires DOE to adopt the levels adopted by ASHRAE unless clear and convincing evidence supports adopting a higher standard. Therefore, in reviewing alternatives to the proposed rule, DOE considered the ASHRAE levels and levels above those adopted by ASHRAE. After considering comments on the proposal, DOE determined that it did not have clear and convincing evidence that levels above those adopted by ASHRAE were economically justified, and so DOE is adopting the ASHRAE levels in this final rule.

In addition to the other TSLs being considered, the final rule TSD includes a regulatory impact analysis (RIA). For PTAC and PTHP equipment, the RIA discusses the following policy alternatives: (1) No change in standard; (2) consumer rebates; (3) consumer tax credits; (4) manufacturer tax credits; (5) voluntary energy efficiency targets; and (6) bulk government purchases. While these alternatives may mitigate to some varying extent the economic impacts on small entities compared to the adopted standards, DOE does not intend to consider these alternatives further because in several cases, they would not be feasible to implement without authority and funding from Congress, and in all cases, DOE has determined that the energy savings of these alternatives are significantly smaller than those that would be expected to result from adoption of the standards (ranging from approximately 1 percent to 22 percent of the energy savings from the adopted standards). Accordingly, DOE is declining to adopt any of these alternatives and is adopting the standards set forth in this rulemaking. (See chapter 17 of the final rule TSD for further detail on the policy alternatives DOE considered.)

Additional compliance flexibilities may be available through other means. EPCA provides that a manufacturer whose annual gross revenue from all of its operations does not exceed $8,000,000 may apply for an exemption from all or part of an energy conservation standard for a period not longer than 24 months after the effective date of a final rule establishing the standard. Additionally, Section 504 of the Department of Energy Organization Act, 42 U.S.C. 7194, provides authority for the Secretary to adjust a rule issued under EPCA in order to prevent ''special hardship, inequity, or unfair distribution of burdens'' that may be imposed on that manufacturer as a result of such rule.

C. Review Under the Paperwork Reduction Act

Manufacturers of PTACs and PTHPs must certify to DOE that their equipment complies with any applicable energy conservation standards. In certifying compliance, manufacturers must test their equipment according to the DOE test procedures for PTACs and PTHPs, including any amendments adopted for those test procedures. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including PTACs and PTHPs. See generally 10 CFR part 429. The collection-of-information requirement for the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (PRA). This requirement has been approved by OMB under OMB control number 1910–1400. Public reporting burden for the certification is estimated to average 30 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the PRA, unless that collection of information displays a currently valid OMB Control Number.

D. Review Under the National Environmental Policy Act of 1969

Pursuant to the National Environmental Policy Act (NEPA) of 1969, DOE has determined that the rule fits within the category of actions included in Categorical Exclusion (CX) B5.1 and otherwise meets the requirements for application of a CX. See 10 CFR part 1021, appendix B, B5.1(b); 1021.410(b) and appendix B, B(1)–(5). The rule fits within the category of actions because it is a rulemaking that establishes energy conservation standards for consumer products or industrial equipment, and for which none of the exceptions identified in CX B5.1(b) apply. Therefore, DOE has made a CX determination for this rulemaking, and DOE does not need to prepare an Environmental Assessment or Environmental Impact Statement for this rule. DOE's CX determination for this rule is available at *http://cxnepa.energy.gov/.*

E. Review Under Executive Order 13132

Executive Order 13132, ''Federalism.'' 64 FR 43255 (August 10, 1999) imposes certain requirements on Federal agencies formulating and implementing policies or regulations that preempt State law or that have Federalism implications. The Executive Order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The Executive Order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have Federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. DOE has examined this rule and has determined that it would not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the equipment that are the subject of this final rule. States can petition DOE for exemption from such preemption to the extent, and based on criteria, set forth in EPCA. (42 U.S.C. 6297) Therefore, no further action is required by Executive Order 13132.

F. Review Under Executive Order 12988

With respect to the review of existing regulations and the promulgation of new regulations, section 3(a) of Executive Order 12988, ''Civil Justice Reform,'' imposes on Federal agencies the general duty to adhere to the following requirements: (1) Eliminate drafting errors and ambiguity; (2) write regulations to minimize litigation; (3) provide a clear legal standard for affected conduct rather than a general standard; and (4) promote simplification and burden reduction. 61 FR 4729 (Feb. 7, 1996). Regarding the review required by section 3(a), section 3(b) of Executive

Order 12988 specifically requires that Executive agencies make every reasonable effort to ensure that the regulation: (1) Clearly specifies the preemptive effect, if any; (2) clearly specifies any effect on existing Federal law or regulation; (3) provides a clear legal standard for affected conduct while promoting simplification and burden reduction; (4) specifies the retroactive effect, if any; (5) adequately defines key terms; and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. Section 3(c) of Executive Order 12988 requires Executive agencies to review regulations in light of applicable standards in section 3(a) and section 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the extent permitted by law, this final rule meets the relevant standards of Executive Order 12988.

G. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA) requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. Public Law 104–4, sec. 201 (codified at 2 U.S.C. 1531). For a regulatory action likely to result in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of $100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a ''significant intergovernmental mandate,'' and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect them. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820. DOE's policy statement is also available at *http://energy.gov/sites/prod/files/gcprod/documents/umra_97.pdf.*

DOE has concluded that this final rule is not expected to require expenditures of $100 million or more on the private sector. As a result, the analytical requirements of UMRA described above are not applicable.

H. Review Under the Treasury and General Government Appropriations Act, 1999

Section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105–277) requires Federal agencies to issue a Family Policymaking Assessment for any rule that may affect family well-being. This rule would not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

I. Review Under Executive Order 12630

Pursuant to Executive Order 12630, ''Governmental Actions and Interference with Constitutionally Protected Property Rights'' 53 FR 8859 (March 18, 1988), DOE has determined that this rule would not result in any takings that might require compensation under the Fifth Amendment to the U.S. Constitution.

J. Review Under the Treasury and General Government Appropriations Act, 2001

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516, note) provides for Federal agencies to review most disseminations of information to the public under information quality guidelines established by each agency pursuant to general guidelines issued by OMB. OMB's guidelines were published at 67 FR 8452 (February 22, 2002), and DOE's guidelines were published at 67 FR 62446 (October 7, 2002). DOE has reviewed this final rule under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

K. Review Under Executive Order 13211

Executive Order 13211, ''Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use'' 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to OIRA at OMB, a Statement of Energy Effects for any significant energy action. A ''significant energy action'' is defined as any action by an agency that promulgates or is expected to lead to promulgation of a final rule, and that: (1) Is a significant regulatory action under Executive Order 12866, or any successor order; and (2) is likely to have a significant adverse effect on the supply, distribution, or use of energy, or (3) is designated by the Administrator of OIRA as a significant energy action. For any significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use should the proposal be implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

DOE has concluded that this regulatory action, which sets forth amended energy conservation standards for PTAC and PTHP equipment, is not a significant energy action because the standards are not likely to have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as such by the Administrator at OIRA. Accordingly, DOE has not prepared a Statement of Energy Effects on this final rule.

L. Review Under the Information Quality Bulletin for Peer Review

On December 16, 2004, OMB, in consultation with the Office of Science and Technology Policy (OSTP), issued its Final Information Quality Bulletin for Peer Review (the Bulletin). 70 FR 2664 (January 14, 2005). The Bulletin establishes that certain scientific information shall be peer reviewed by qualified specialists before it is disseminated by the Federal Government, including influential scientific information related to agency regulatory actions. The purpose of the bulletin is to enhance the quality and credibility of the Government's scientific information. Under the Bulletin, the energy conservation standards rulemaking analyses are ''influential scientific information,'' which the Bulletin defines as ''scientific information the agency reasonably can determine will have, or does have, a clear and substantial impact on important public policies or private sector decisions.'' Id. at FR 2667.

In response to OMB's Bulletin, DOE conducted formal in-progress peer reviews of the energy conservation standards development process and analyses and has prepared a Peer Review Report pertaining to the energy conservation standards rulemaking analyses. Generation of this report involved a rigorous, formal, and documented evaluation using objective criteria and qualified and independent reviewers to make a judgment as to the technical/scientific/business merit, the actual or anticipated results, and the productivity and management effectiveness of programs and/or projects. The ''Energy Conservation Standards Rulemaking Peer Review Report'' dated February 2007 has been disseminated and is available at the following Web site:

www1.eere.energy.gov/buildings/appliance_standards/peer_review.html.

M. Congressional Notification

As required by 5 U.S.C. 801, DOE will report to Congress on the promulgation of this rule prior to its effective date. The report will state that it has been determined that the rule is not a ''major rule'' as defined by 5 U.S.C. 804(2).

VII. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this final rule.

List of Subjects in 10 CFR Part 431

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Imports, Intergovernmental relations, Reporting and recordkeeping requirements, Small businesses.

Issued in Washington, DC, on June 30, 2015.

David T. Danielson,

Assistant Secretary, Energy Efficiency and Renewable Energy.

For the reasons set forth in the preamble, DOE amends part 431 of chapter II, subchapter D, of title 10 of the Code of Federal Regulations as set forth below:

PART 431—ENERGY EFFICIENCY PROGRAM FOR CERTAIN COMMERCIAL AND INDUSTRIAL EQUIPMENT

■ 1. The authority citation for part 431 continues to read as follows:

Authority: 42 U.S.C. 6291–6317.

■ 2. Amend § 431.97 by revising paragraph (c) to read as follows:

§ 431.97 Energy efficiency standards and their compliance dates.

* * * * *

(c) Each non-standard size packaged terminal air conditioner (PTAC) and packaged terminal heat pump (PTHP) manufactured on or after October 7, 2010 must meet the applicable minimum energy efficiency standard level(s) set forth in Table 4 of this section. Each standard size PTAC manufactured on or after October 8, 2012, and before January 1, 2017 must meet the applicable minimum energy efficiency standard level(s) set forth in Table 4 of this section. Each standard size PTHP manufactured on or after October 8, 2012 must meet the applicable minimum energy efficiency standard level(s) set forth in Table 4 of this section. Each standard size PTAC manufactured on or after January 1, 2017 must meet the applicable minimum energy efficiency standard level(s) set forth in Table 5 of this section.

TABLE 4 TO § 431.97—MINIMUM EFFICIENCY STANDARDS FOR PTAC AND PTHP

Equipment type	Category	Cooling capacity	Efficiency level	Compliance date: products manufactured on and after . . .
PTAC	Standard Size.	<7,000 Btu/h	EER = 11.7	October 8, 2012.[2]
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 13.8 − (0.3 × Cap [1])	October 8, 2012.[2]
		>15,000 Btu/h	EER = 9.3	October 8, 2012.[2]
	Non-Standard Size.	<7,000 Btu/h	EER = 9.4	October 7, 2010.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 10.9 − (0.213 × Cap [1])	October 7, 2010.
		>15,000 Btu/h	EER = 7.7	October 7, 2010.
PTHP	Standard Size.	<7,000 Btu/h	EER = 11.9 COP = 3.3	October 8, 2012.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 14.0 − (0.3 × Cap [1]) COP = 3.7 − (0.052 × Cap [1])	October 8, 2012.
		>15,000 Btu/h	EER = 9.5 COP = 2.9	October 8, 2012.
	Non-Standard Size.	<7,000 Btu/h	EER = 9.3 COP = 2.7	October 7, 2010.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 10.8 − (0.213 × Cap [1]) COP = 2.9 − (0.026 × Cap [1])	October 7, 2010.
		>15,000 Btu/h	EER = 7.6 COP = 2.5	October 7, 2010.

[1] ''Cap'' means cooling capacity in thousand Btu/h at 95 °F outdoor dry-bulb temperature.
[2] And manufactured before January 1, 2017. See Table 5 of this section for updated efficiency standards that apply to this category of equipment manufactured on and after January 1, 2017.

TABLE 5 TO § 431.97—UPDATED MINIMUM EFFICIENCY STANDARDS FOR PTAC

Equipment type	Category	Cooling capacity	Efficiency level	Compliance date: products manufactured on and after . . .
PTAC	Standard Size.	<7,000 Btu/h	EER = 11.9	January 1, 2017.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 14.0 − (0.3 × Cap [1])	January 1, 2017.
		>15,000 Btu/h	EER = 9.5	January 1, 2017.

[1] ''Cap'' means cooling capacity in thousand Btu/h at 95 °F outdoor dry-bulb temperature.

* * * * *

Note: The following letter will not appear in the Code of Federal Regulations.

May 15, 2015
Anne Harkavy
Deputy General Counsel

For Litigation, Regulation and Enforcement
Department of Energy
Washington, DC 20585

Dear Deputy General Counsel Harkavy:

I am responding to your letter of March seeking the views of the Attorney General about the potential impact on competition of proposed amended energy conservation standards for standard-size packaged terminal air conditioners and standard-size packaged terminal heat pumps. Your request was submitted under Section (o)(2)(B)(i)(V) of the Energy Policy and Conservation Act, as amended (EPCA), 42 U.S.C. 6295(o)(2)(B)(i)(V), which requires the Attorney General to make a determination of the impact of any lessening of competition that is likely to result from the imposition of proposed energy conservation standards. The Attorney General's responsibility for responding to requests from other departments about the effect of a program on competition has been delegated to the Assistant Attorney General for the Antitrust Division in 28 CFR 0.40(g).

In conducting its analysis, the Antitrust Division examines whether a proposed standard may lessen competition, for example, by substantially limiting consumer choice or increasing industry concentration. A lessening of competition could result in higher Prices to manufacturers and consumers.

We have reviewed the proposed standards contained in the Notice of Proposed Rulemaking published in the **Federal Register** (79 FR at 55538–55601, September 2014) (NOPR). We have also reviewed supplementary information submitted to the Attorney General by the Department of Energy, including the Technical Support Document, and reviewed industry source material. Based on this review, our conclusion is that the proposed amended energy conservation standards set forth in the NOPR for standard-size packaged terminal air conditioners and standard-size packaged terminal heat pumps are unlikely to have a significant adverse impact on competition.

Sincerely,

William J. Baer

[FR Doc. 2015–16897 Filed 7–20–15; 8:45 am]

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