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Part IV

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10 CFR Part 430
Energy Conservation Program: Energy Conservation Standards for Residential Dishwashers; Proposed Rule

DEPARTMENT OF ENERGY

10 CFR Part 430

[Docket Number EERE–2014–BT–STD–0021]

RIN 1904–AD24

Energy Conservation Program: Energy Conservation Standards for Residential Dishwashers

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

ACTION: Notice of proposed rulemaking (NOPR) and public meeting.

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 residential dishwashers. EPCA also requires the U.S. Department of Energy (DOE) to determine whether amended standards would be technologically feasible and economically justified, and would save a significant amount of energy. In this notice, DOE proposes amended energy conservation standards for residential dishwashers. The notice also announces a public meeting to receive comment on these proposed standards and associated analyses and results.

DATES: DOE will accept comments, data, and information regarding this notice of proposed rulemaking (NOPR) before and after the public meeting, but no later than February 17, 2015. See section VII Public Participation for details.

DOE will hold a public meeting on Thursday, February 5, 2015, from 9 a.m. to 4 p.m., in Washington, DC. The meeting will also be broadcast as a webinar. See section VII Public Participation for webinar registration information, participant instructions, and information about the capabilities available to webinar participants.

ADDRESSES: The public meeting will be held at the U.S. Department of Energy, Forrestal Building, Room 8E–089, 1000 Independence Avenue SW., Washington, DC 20585. To attend, please notify Ms. Brenda Edwards at (202) 586–2945. Please note that foreign nationals participating in the public meeting are subject to advance security screening procedures which require advance notice prior to attendance at the public meeting. If a foreign national wishes to participate in the public meeting, please inform DOE as soon as possible by contacting Ms. Regina Washington at (202) 586–1214 or by email: *foreignvisit@ee.doe.gov* so that the necessary procedures can be completed. Please also note that those wishing to bring laptops into the Forrestal Building will be required to obtain a property pass. Visitors should avoid bringing laptops, or allow an extra 45 minutes. Persons can attend the public meeting via webinar. For more information, refer to section VII of this document (Public Participation).

Any comments submitted must identify the NOPR for Energy Conservation Standards for residential dishwashers, and provide docket number EERE–2014–BT–STD–0021 and/or regulatory information number (RIN) number 1904–AD24. Comments may be submitted using any of the following methods:

1. *Federal eRulemaking Portal: www.regulations.gov*. Follow the instructions for submitting comments.

2. *Email: ResDishwashers2014STD0021@ee.doe.gov*. Include the docket number and/or RIN in the subject line of the message.

3. *Mail:* Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, Mailstop EE–5B, 1000 Independence Avenue SW., Washington, DC, 20585–0121. If possible, please submit all items on a CD. It is not necessary to include printed copies.

4. *Hand Delivery/Courier:* Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, 950 L'Enfant Plaza, SW., Suite 600, Washington, DC, 20024. Telephone: (202) 586–2945. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

Written comments regarding the burden-hour estimates or other aspects of the collection-of-information requirements contained in this proposed rule may be submitted to Office of Energy Efficiency and Renewable Energy through the methods listed above and by email to *Chad_S_Whiteman@omb.eop.gov*.

For detailed instructions on submitting comments and additional information on the rulemaking process, see section VII of this document (Public Participation).

Docket: 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-2014-BT-STD-0021. This Web page will contain a link to the docket for this notice on the regulations.gov site. The regulations.gov Web page will contain simple instructions on how to access all documents, including public comments, in the docket. See section VII for further information on how to submit comments through *www.regulations.gov*.

For further information on how to submit a comment, review other public comments and the docket, or participate in the public meeting, contact Ms. Brenda Edwards at (202) 586–2945 or by email: *Brenda.Edwards@ee.doe.gov*.

FOR FURTHER INFORMATION CONTACT:

Mr. Bryan Berringer, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, EE–5B, 1000 Independence Avenue SW., Washington, DC 20585–0121. Telephone: (202) 586–0371. Email: *dishwashers@ee.Doe.Gov*.

Elizabeth Kohl, U.S. Department of Energy, Office of the General Counsel, GC–33, 1000 Independence Avenue SW., Washington, DC 20585–0121. Telephone: (202) 202–586–7796. Email: *Elizabeth.Kohl@hq.doe.gov*.

SUPPLEMENTARY INFORMATION:

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I. Summary of the Proposed Rule

Title III, Part B [1] of the Energy Policy and Conservation Act of 1975 (EPCA or the Act), established the Energy Conservation Program for Consumer Products Other Than Automobiles. Public Law 94–163 (as codified in 42 U.S.C. 6291–6309).[2] These products include residential dishwashers, the subject of today's notice.

Pursuant to EPCA, any new or amended energy conservation standard must be designed to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A)) Furthermore, the new or amended standard must result in a significant conservation of energy. (42 U.S.C. 6295(o)(3)(B)) In accordance with these and other statutory provisions discussed in this notice, DOE proposes amended energy conservation standards for residential dishwashers. The proposed standards, which are the maximum annual energy use and maximum per-cycle water consumption for each product class, are shown in Table I.1. These proposed standards, if adopted, would apply to all products listed in Table I.1 and manufactured in, or imported into, the United States on or after the date 3 years after the publication of any final rule for this rulemaking. For purposes of the analysis conducted in support of this proposed rule, DOE used 2016 as the expected year of publication of any final standards.

TABLE I.1—PROPOSED ENERGY CONSERVATION STANDARDS FOR RESIDENTIAL DISHWASHERS

[Compliance Starting 2019]

Product class	Maximum annual energy use*	Maximum per-cycle water consumption
1. Standard (≥8 place settings plus 6 serving pieces).	234 kilowatt-hours per year (kWh/year).	3.1 gallons per cycle (gal/cycle).
2. Compact (<8 place settings plus 6 serving pieces).	203 kWh/year.	3.1 gal/cycle.

* Annual energy use, expressed in kilowatt-hours (kWh) per year, is calculated as: The sum of the annual standby electrical energy in kWh and the product of (1) the representative average dishwasher use cycles per year and (2) the sum of machine electrical energy consumption per cycle in kWh, the total water energy consumption per cycle in kWh, and, for dishwashers having a truncated normal cycle, the drying energy consumption divided by 2 in kWh. A truncated normal cycle is defined as the normal cycle interrupted to eliminate the power-dry feature after the termination of the last rinse option.

A. Benefits and Costs to Consumers

Table I.2 presents DOE's evaluation of the economic impacts of the proposed standards on consumers of residential dishwashers, as measured by the average life-cycle cost (LCC) savings and the simple payback period (PBP).[3] The average LCC savings are positive for both the standard and compact product classes. The PBP for both product classes are also less than the projected

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

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

[3] The average LCC savings are measured relative to the base-case efficiency distribution, which depicts the dishwasher market in the compliance year (see section IV.F.9). The simple PBP, which is designed to compare specific dishwasher efficiency levels, is measured relative to the baseline dishwasher (see section IV.C.1.a).

average lifetime of this product of approximately 15 years.

TABLE I.2—IMPACTS OF PROPOSED ENERGY CONSERVATION STANDARDS ON CONSUMERS OF RESIDENTIAL DISHWASHERS

Product class	Average LCC savings (2013$)	Simple payback period (years)
Standard	21	9.0
Compact	8	4.5

B. Impact on Manufacturers

The industry net present value (INPV) is the sum of the discounted cash flows to the industry from the base year through the end of the analysis period (2014 to 2048). Using a real discount rate of 8.5 percent, DOE estimates that the INPV for manufacturers of residential dishwashers is $586.6 million in 2013$. Under the proposed standards, DOE expects that manufacturers may lose up to 34.7 percent of their INPV, which is approximately $203.7 million. Additionally, based on its analysis of available information, DOE does not expect any plant closings or significant loss of employment.

C. National Benefits [4]

DOE's analyses indicate that the proposed standards would save a significant amount of energy. The lifetime savings for residential dishwashers purchased in the 30-year period that begins in the year of compliance with amended standards (2019–2048) amount to 1.06 quadrillion Btu (quads) [5] and 0.24 trillion gallons of water. This is a savings of 12 percent relative to the energy use of this product in the base case.[6]

The cumulative net present value (NPV) of total consumer costs and savings of the proposed standards for residential dishwashers ranges from $0.23 billion (at a 7-percent discount rate) to $ 2.14 billion (at a 3-percent discount rate). This NPV expresses the estimated total value of future operating-cost savings minus the estimated increased product costs for products purchased in 2019–2048.

In addition, the proposed standards would have significant environmental benefits. The energy savings described above would result in cumulative emission reductions (over the same period as for energy savings) of 61.9 million metric tons (Mt) [7] of carbon dioxide (CO_2), 345.1 thousand tons of methane, 42.9 thousand tons of sulfur dioxide (SO_2), 126.7 thousand tons of nitrogen oxides (NO_X), 0.7 thousand tons of nitrous oxide (N_2O), and 0.1 tons of mercury (Hg).[8] The cumulative reduction in CO_2 emissions through 2030 amounts to 14.6 Mt.

The value of the CO_2 reductions is calculated using a range of values per metric ton of CO_2 (otherwise known as the Social Cost of Carbon, or SCC) developed by a recent Federal interagency process.[9] The derivation of the SCC values is discussed in section IV.L of this notice. Using discount rates appropriate for each set of SCC values, DOE estimates the present monetary value of the CO_2 emissions reduction described above is between $0.4 billion and $6.1 billion. DOE also estimates the present monetary value of the NO_X emissions reduction is $0.08 billion at a 7-percent discount rate and $0.17 billion at a 3-percent discount rate.[10]

Table I.3 summarizes the national economic costs and benefits expected to result from the proposed standards for residential dishwashers.

TABLE I.3—SUMMARY OF NATIONAL ECONOMIC BENEFITS AND COSTS OF PROPOSED ENERGY CONSERVATION STANDARDS FOR RESIDENTIAL DISHWASHERS *

Category	Present value billion 2013$	Discount rate
Benefits		
Operating Cost Savings	4.1	7%
	9.2	3%
CO_2 Reduction Monetized Value ($12.0/t case) **	0.4	5%
CO_2 Reduction Monetized Value ($40.5/t case) **	2.0	3%
CO_2 Reduction Monetized Value ($62.4/t case) **	3.1	2.5%
CO_2 Reduction Monetized Value ($119/t case) **	6.1	3%
NO_X Reduction Monetized Value (at $2,684/ton)	0.1	7%
	0.2	3%
Total Benefits †	6.2	7%
	11.4	3%
Costs		
	3.9	7%
Incremental Installed Costs	7.1	3%
Total Net Benefits		
	2.3	7%
Including Emissions Reduction Monetized Value †	4.3	3%

* This table presents the costs and benefits associated with residential dishwashers shipped in 2019 − 2048. These results include benefits to consumers which accrue after 2048 from the products purchased in 2019 − 2048. The results account for the incremental variable and fixed costs incurred by manufacturers due to the standard, some of which may be incurred in preparation for the rule.

[4] All monetary values in this section are expressed in 2013 dollars and are discounted to 2014.

[5] A quad is equal to 10^{15} British thermal units (Btu).

[6] The base case assumptions are described in section IV.G.

[7] A metric ton is equivalent to 1.1 short tons. Results for emissions other than CO_2 are presented in short tons.

[8] DOE calculated emissions reductions relative to the *Annual Energy Outlook 2014* (*AEO 2014*) Reference case, which generally represents current legislation and environmental regulations for which implementing regulations were available as of October 31, 2013.

[9] *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. *http://www.whitehouse.gov/sites/default/files/omb/assets/inforeg/technical-update-social-cost-of-carbon-for-regulator-impact-analysis.pdf.*

[10] DOE is currently investigating valuation of avoided Hg and SO_2 emissions.

** The CO_2 values represent global monetized values of the SCC, in 2013$, in 2015 under several scenarios of the updated SCC values. The first three cases use the averages of SCC distributions calculated using 5%, 3%, and 2.5% discount rates, respectively. The fourth case represents the 95th percentile of the SCC distribution calculated using a 3% discount rate. The SCC time series used by DOE incorporate an escalation factor.

† Total Benefits for both the 3% and 7% cases are derived using the series corresponding to average SCC with 3-percent discount rate.

The benefits and costs of today's proposed standards, for products sold in 2019–2048, can also be expressed in terms of annualized values. The annualized monetary values are the sum of (1) the annualized national economic value of the benefits from consumer operation of products that meet the new or amended standards (consisting primarily of operating cost savings from using less energy, minus increases in equipment purchase and installation costs, which is another way of representing consumer NPV), and (2) the annualized monetary value of the benefits of emission reductions, including CO_2 emission reductions.[11]

Although combining the values of operating savings and CO_2 emission reductions provides a useful perspective, two issues should be considered. First, the national operating savings are domestic U.S. consumer monetary savings that occur as a result of market transactions, whereas the value of CO_2 reductions is based on a global value. Second, the assessments of operating cost savings and CO_2 savings are performed with different methods that use different time frames for analysis. The national operating cost savings is measured for the lifetime of residential dishwashers shipped in 2019–2048. The SCC values, on the other hand, reflect the present value of some future climate-related impacts resulting from the emission of one ton of carbon dioxide in each year. These impacts continue well beyond 2100.

Estimates of annualized benefits and costs of the proposed standards are shown in Table I.4. The results under the primary estimate are as follows. Using a 7-percent discount rate for benefits and costs other than CO_2 reduction, for which DOE used a 3-percent discount rate along with the average SCC series that has a value of $40.5/t in 2015, the cost of the standards proposed in today's rule is $413million per year in increased equipment costs, while the benefits are $437 million per year in reduced equipment operating costs, $113 million in CO_2 reductions, and $8.37 million in reduced NO_X emissions. In this case, the net benefit amounts to $146 million per year. Using a 3-percent discount rate for all benefits and costs and the average SCC series that has a value of $40.5/t in 2015, the cost of the standards proposed in today's rule is $406 million per year in increased equipment costs, while the benefits are $529 million per year in reduced operating costs, $113 million in CO_2 reductions, and $9.95 million in reduced NO_X emissions. In this case, the net benefit amounts to $246 million per year.

TABLE I.4—ANNUALIZED BENEFITS AND COSTS OF PROPOSED ENERGY CONSERVATION STANDARDS FOR RESIDENTIAL DISHWASHERS

	Discount rate	Million 2013$/year		
		Primary estimate *	Low net benefits estimate *	High net benefits estimate *
Benefits				
Operating Cost Savings	7%	437	388	506.
	3%	529	462	624.
CO_2 Reduction Monetized Value ($12.0/t case)*.	5%	34	30	39.
CO_2 Reduction Monetized Value ($40.5/t case)*.	3%	113	100	131.
CO_2 Reduction Monetized Value ($62.4/t case)*.	2.5%	165	146	191.
CO_2 Reduction Monetized Value ($119/t case)*.	3%	351	311	406.
NO_X Reduction Monetized Value (at $2,684/ton).	7%	8.37	7.53	9.49.
	3%	9.95	8.86	11.43.
Total Benefits †	7% plus CO_2 range	479 to 796	425 to 706	555 to 921.
	7%	558	496	647.
	3% plus CO_2 range	572 to 890	501 to 782	674 to 1,041.
	3%	652	572	766.
Costs				
Consumer Incremental Product Costs	7%	413	468	371.
	3%	406	465	361.

[11] To convert the time-series of costs and benefits into annualized values, DOE calculated a present value in 2014, the year used for discounting the NPV of total consumer costs and savings. For the benefits, DOE calculated a present value associated with each year's shipments in the year in which the shipments occur (*e.g.,* 2020 or 2030), and then discounted the present value from each year to 2014. The calculation uses discount rates of 3 and 7 percent for all costs and benefits except for the value of CO_2 reductions, for which DOE used case-specific discount rates, as shown in Table I.3. Using the present value, DOE then calculated the fixed annual payment over a 30-year period, starting in the compliance year, that yields the same present value.

TABLE I.4—ANNUALIZED BENEFITS AND COSTS OF PROPOSED ENERGY CONSERVATION STANDARDS FOR RESIDENTIAL DISHWASHERS—Continued

	Discount rate	Million 2013$/year		
		Primary estimate *	Low net benefits estimate *	High net benefits estimate *
Net Benefits				
Total†	7% plus CO_2 range	66 to 383	−43 to 238	183 to 550.
	7%	146	28	275.
	3% plus CO_2 range	167 to 484	36 to 317	313 to 680.
	3%	246	106	405.

* This table presents the annualized costs and benefits associated with residential dishwashers shipped in 2019 − 2048. These results include benefits to consumers which accrue after 2048 from the products purchased in 2019 − 2048. The results account for the incremental variable and fixed costs incurred by manufacturers due to the standard, some of which may be incurred in preparation for the rule. The Primary, Low Benefits, and High Benefits Estimates utilize projections of energy prices from the *AEO 2014* Reference case, Low Estimate, and High Estimate, respectively. In addition, incremental product costs reflect a medium decline rate for projected product prices in the Primary Estimate, a low decline rate for projected product prices in the Low Benefits Estimate, and a high decline rate for projected product prices in the High Benefits Estimate. The methods used to derive projected price trends are explained in section IV.H.2 of this notice.

** The CO_2 values represent global monetized values of the SCC, in 2013$, in 2015 under several scenarios of the updated SCC values. The first three cases use the averages of SCC distributions calculated using 5%, 3%, and 2.5% discount rates, respectively. The fourth case represents the 95th percentile of the SCC distribution calculated using a 3% discount rate. The SCC time series used by DOE incorporate an escalation factor.

† Total Benefits for both the 3% and 7% cases are derived using the series corresponding to the average SCC with 3-percent discount rate. In the rows labeled ''7% plus CO_2 range'' and ''3% plus CO_2 range,'' the operating cost and NO_X benefits are calculated using the labeled discount rate, and those values are added to the full range of CO_2 values.

DOE has tentatively concluded that the proposed standards represent the maximum improvement in energy efficiency that is technologically feasible and economically justified, and would result in the significant conservation of energy. DOE further notes that products achieving these standard levels are already commercially available for the product classes covered by today's proposal.[12] See chapter 10, section 10.2 for more discussion of the base case efficiency distribution. Based on the analyses described above, DOE has tentatively concluded that the benefits of the proposed standards to the nation (energy savings, positive NPV of consumer benefits, consumer LCC savings, and emission reductions) would outweigh the burdens (loss of INPV for manufacturers and LCC increases for some consumers).

DOE also considered more and less stringent energy efficiency levels as trial standard levels, and is still considering them in this rulemaking. However, DOE has tentatively concluded that the proposed standard level achieves the maximum improvement in energy efficiency that is technologically feasible and economically justified. Based on consideration of the public comments DOE receives in response to this notice and related information collected and analyzed during the course of this rulemaking effort, DOE may adopt energy efficiency levels presented in this notice that are either higher or lower than the proposed standards, or some combination of level(s) that incorporate the proposed standards in part.

[12] Currently 12.1 percent of the standard product class and 48.1 percent of the compact product class are at the minimum efficiency level.

II. Introduction

The following section briefly discusses the statutory authority underlying today's proposal, as well as some of the relevant historical background related to the establishment of standards for residential dishwashers.

A. Authority

Title III, Part B of the Energy Policy and Conservation Act of 1975 (EPCA or the Act), established the Energy Conservation Program for Consumer Products Other Than Automobiles. Public Law 94–163 (as codified in 42 U.S.C. 6291–6309). The program covers most major household appliances (collectively referred to as ''covered products''), which includes the types of residential dishwashers that are the subject of this rulemaking. (42 U.S.C. 6292(a)(6)) EPCA prescribed energy conservation standards for these products (42 U.S.C. 6295(g)(1) and (10)(A)), and directed DOE to conduct further rulemakings to determine whether to amend these standards. (42 U.S.C. 6295(g)(4) and (10)(B)) In addition, the agency must periodically review its already established energy conservation standards for a covered product. (42 U.S.C. 6295(m)) Under this requirement, the next review that DOE would need to conduct must occur no later than six years from the issuance of any final rule establishing or amending a standard for a covered product.

Pursuant to EPCA, DOE's energy conservation program for covered products consists essentially of four parts: (1) Testing; (2) labeling; (3) the establishment of Federal energy conservation standards; and (4) certification and enforcement procedures. The Federal Trade Commission (FTC) is primarily responsible for labeling, and DOE implements the remainder of the program. Subject to certain criteria and conditions, DOE is required to develop test procedures to measure the energy efficiency, energy use, or estimated annual operating cost of each covered product. (42 U.S.C. 6293) Manufacturers of covered products must use the prescribed DOE test procedure as the basis for certifying to DOE that their products comply with the applicable energy conservation standards adopted under EPCA and when making representations to the public regarding the energy use or efficiency of those products. (42 U.S.C. 6293(c) and 6295(s)) Similarly, DOE must use these test procedures to determine whether the products comply with standards adopted pursuant to EPCA. *Id.* The DOE test procedures for residential dishwashers currently appear at title 10 of the Code of Federal Regulations (CFR) part 430, subpart B, appendix C1 (appendix C1).

DOE must follow specific statutory criteria for prescribing amended standards for covered products. As indicated above, any amended standard for a covered product must be designed to achieve the maximum improvement in energy efficiency that is technologically feasible and

economically justified. (42 U.S.C. 6295(o)(2)(A)) Furthermore, DOE may not adopt any standard that would not result in the significant conservation of energy. (42 U.S.C. 6295(o)(3)) Moreover, DOE may not prescribe a standard: (1) For certain products, including residential dishwashers, if no test procedure has been established for the product, or (2) if DOE determines by rule that the proposed standard is not technologically feasible or economically justified. (42 U.S.C. 6295(o)(3)(A)–(B)) In deciding whether a proposed standard is economically justified, DOE must determine whether the benefits of the standard exceed its burdens. (42 U.S.C. 6295(o)(2)(B)(i)) DOE must make this determination after receiving comments on the proposed standard, and by considering, to the greatest 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 covered products in the type (or class) compared to any increase in the price, initial charges, or maintenance expenses for the covered products that are likely to result from the imposition of the standard;

3. The total projected amount of energy, or as applicable, water, savings likely to result directly from the imposition of the standard;

4. Any lessening of the utility or the performance of the covered products likely to result from the imposition of the standard;

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

6. The need for national energy and water conservation; and

7. Other factors the Secretary of Energy (Secretary) considers relevant. (42 U.S.C. 6295(o)(2)(B)(i)(I)–(VII))

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. 6295(o)(1)) 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. 6295(o)(4))

Further, EPCA, as codified, 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 savings during the first year that the consumer will receive as a result of the standard, as calculated under the applicable test procedure. (42 U.S.C. 6295(o)(2)(B)(iii))

Additionally, EPCA specifies requirements when promulgating a standard for a type or class of covered product that has two or more subcategories. (42 U.S.C. 6295(q)(1)) DOE must specify a different standard level than that which applies generally to such type or class of products for any group of covered products that have the same function or intended use if DOE determines that products within such group (A) consume a different kind of energy from that consumed by other covered products within such type (or class); or (B) have a capacity or other performance-related feature which other products within such type (or class) do not have and such feature justifies a higher or lower standard. (42 U.S.C. 6294(q)(1)) In determining whether a performance-related feature justifies a different standard for a group of products, DOE must consider such factors as the utility to the consumer of the feature and other factors DOE deems appropriate. *Id.* Any rule prescribing such a standard must include an explanation of the basis on which such higher or lower level was established. (42 U.S.C. 6295(q)(2))

Federal energy conservation requirements generally supersede State laws or regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6297(a)–(c)) DOE may, however, grant waivers of Federal preemption for particular State laws or regulations, in accordance with the procedures and other provisions set forth under EPCA. (42 U.S.C. 6297(d))

Any final rule for new or amended energy conservation standards promulgated after July 1, 2010 must also address standby mode and off mode energy use. (42 U.S.C. 6295(gg)(3)) Specifically, when DOE adopts a standard for a covered product after that date, it must, if justified by the criteria for adoption of standards under EPCA (42 U.S.C. 6295(o)), incorporate standby mode and off mode energy use into the standard, or, if that is not feasible, adopt a separate standard for such energy use for that product. (42 U.S.C. 6295(gg)(3)(A)–(B)) DOE's current test procedures and standards for residential dishwashers address standby mode and off mode energy use. In this rulemaking, DOE intends to incorporate such energy use into any amended energy conservation standards it adopts in the final rule.

DOE has also reviewed this regulation pursuant to Executive Order (E.O.) 13563, issued on January 18, 2011. 76 FR 3281 (Jan. 21, 2011). E.O. 13563 is supplemental to and explicitly reaffirms the principles, structures, and definitions governing regulatory review established in E.O. 12866. To the extent permitted by law, agencies are required by E.O. 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 E.O. 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, the Office of Information and Regulatory Affairs 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 today's NOPR is consistent with these principles, including the requirement that, to the extent permitted by law, benefits justify costs and that net benefits are maximized. Consistent with E.O. 13563, and the range of impacts analyzed in this rulemaking, the energy efficiency

standards proposed herein by DOE achieve maximum net benefits.

B. Background

1. Current Standards

In a direct final rule published on May 30, 2012 (hereinafter the ''May 2012 direct final rule''), DOE prescribed the current energy conservation standards for residential dishwashers manufactured on or after May 30, 2013. 77 FR 31918. The current standards are set forth in Table II.1.

TABLE II.1—FEDERAL ENERGY EFFICIENCY STANDARDS FOR RESIDENTIAL DISHWASHERS

Product class	Annual energy use *(kWh/year)*	Per-cycle water consumption *(gal/cycle)*
Standard	307	5.0
Compact	222	3.5

2. History of Standards Rulemaking for Residential Dishwashers

The National Appliance Energy Conservation Act of 1987 (NAECA), Pub. L. 100–12 (March 17, 1989), amended EPCA and required that residential dishwashers be equipped with an option to dry without heat. NAECA further required that DOE conduct two cycles of rulemakings to determine if amended standards are justified. (42 U.S.C. 6295(g)(1) and (4))

On May 14, 1991, DOE issued a final rule establishing performance standards for residential dishwashers to complete the first required rulemaking cycle. 56 FR 22250. Compliance with the new standards, codified at 10 CFR 430.32(f), was required on May 14, 1994.

DOE then conducted a second standards rulemaking for residential dishwashers. DOE issued an advance notice of proposed rulemaking (ANOPR) on November 14, 1994 to consider amending the energy conservation standards for residential clothes washers, dishwashers, and clothes dryers. 59 FR 56423. Subsequently, DOE published a Notice of Availability of the ''Rulemaking Framework for Commercial Clothes Washers and Residential Dishwashers, Dehumidifiers, and Cooking Products.'' 71 FR 15059 (Mar. 27, 2006). On November 15, 2007, DOE published a second ANOPR addressing energy conservation standards for these products. 72 FR 64432. On December 19, 2007, Congress enacted EISA 2007, which, among other things, established maximum energy and water use levels for residential dishwashers manufactured on or after January 1, 2010. (42 U.S.C. 6295(g)(10)) DOE codified the statutory standards for these products in a final rule published March 23, 2009. 74 FR 12058.

The current energy conservation standards for residential dishwashers were submitted to DOE by groups representing manufacturers, energy and environmental advocates, and consumer groups on September 25, 2010. This collective set of comments, titled ''Agreement on Minimum Federal Efficiency Standards, Smart Appliances, Federal Incentives and Related Matters for Specified Appliances'' (the ''Joint Petition'' [13]), recommended specific energy conservation standards for residential dishwashers that, in the commenters' view, would satisfy the EPCA requirements. (42 U.S.C. 6295(o)) DOE conducted its rulemaking analyses on multiple residential dishwasher efficiency levels, including those suggested in the Joint Petition. In the May 2012 direct final rule, DOE established energy conservation standards for residential dishwashers manufactured on or after May 30, 2013, consistent with the levels suggested in the Joint Petition. 77 FR 31918 (May 30, 2012).

DOE is conducting the current energy conservation standards rulemaking pursuant to 42 U.S.C. 6295(m), which requires that within 6 years of issuing any final rule establishing or amending a standard, DOE shall publish either a notice of determination that amended standards are not needed or a NOPR including new proposed standards. Because the current standards were established in the final rule issued on May 12, 2012, publication of this notice within the 6-year timeframe satisfies these requirements. The rulemaking will consider any information not available at the time of the May 2012 direct final rule. The definition of the TSLs considered in this NOPR is discussed in section V.A of this notice.

3. Residential Dishwasher Test Procedure History

DOE originally established its test procedure for residential dishwashers at Title 10 of CFR, part 430, subpart B, appendix C (appendix C) in 1977. 42 FR 39964 (Aug. 8, 1977). In 1983, DOE amended the test procedure to revise the representative average-use cycles to more accurately reflect consumer use and to address products that use 120 degrees Fahrenheit (°F) inlet water. 48 FR 9202 (Mar. 3, 1983). DOE amended the test procedure again in 1984 to redefine the term ''water heating dishwasher.'' 49 FR 46533 (Nov. 27, 1984). In 1987, DOE amended the test procedure to address models that use 50°F inlet water. 52 FR 47549 (Dec. 15, 1987).

In 2001, DOE revised the test procedure's testing specifications to improve testing repeatability, changed the definitions of ''compact dishwasher'' and ''standard dishwasher,'' and reduced the average number of use cycles per year from 322 to 264. 66 FR 65091, 65095–97 (Dec. 18, 2001).

In 2003, DOE again revised the test procedure to more accurately measure residential dishwasher efficiency, energy use, and water use. The 2003 residential dishwasher test procedure amendments included the following revisions: (1) The addition of a method to rate the efficiency of soil-sensing products; (2) the addition of a method to measure standby power; and (3) a reduction in the average-use cycles per year from 264 to 215. 68 FR 51887, 51899–903 (Aug. 29, 2003).

In 2012, DOE established a new test procedure for residential dishwashers in appendix C1. Appendix C1 follows the same general procedures as those included in the previously used appendix C, with updates to: (1) Revise the provisions for measuring energy consumption in standby mode or off mode; (2) add requirements for residential dishwashers with water softeners to account for regeneration cycles; (3) require an additional preconditioning cycle; (4) include clarifications regarding certain definitions, test conditions, and test setup; and (5) replace obsolete test load items and soils. 77 FR 65942, 65982–65987 (Oct. 31, 2012).

[13] DOE Docket No. EERE–2011–BT–STD–0060, Comment 1.

The current version of the test procedure at 10 CFR 430.23(c) includes provisions for determining estimated annual energy use (EAEU), estimated annual operating cost (EAOC), and water consumption expressed in gal/cycle. Because appendix C is now obsolete, DOE proposes to delete it in this rulemaking and re-designate appendix C1 as appendix C.

III. General Discussion

A. Product Classes and Scope of Coverage

When evaluating and establishing energy conservation standards, DOE divides covered products into product 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. (42 U.S.C. 6295(q))

Existing energy conservation standards divide residential dishwashers into two product classes based on capacity (*i.e.,* the number of place settings and serving pieces that can be loaded in the product as specified in American National Standards Institute (ANSI)/Association of Home Appliance Manufacturers (AHAM) Standard DW–1–2010, *Household Electric Dishwashers*):

- Standard (capacity equal to or greater than eight place settings plus six serving pieces); and
- Compact (capacity less than eight place settings plus six serving pieces).

In this NOPR, DOE proposes to maintain the existing standard and compact product classes for residential dishwashers. Based on a survey of products available on the market, DOE determined that compact residential dishwashers provide unique utility by means of their countertop or drawer configurations.

B. 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 working 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. As defined in 10 CFR part 430, subpart C, appendix A, section 4(a)(4)(i), DOE considers technologies incorporated in commercially available products or in working prototypes to be technologically feasible.

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 product 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 NOPR discusses the results of the screening analysis for residential dishwashers, 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 NOPR Technical Support Document (TSD).

2. Maximum Technologically Feasible Levels

When DOE proposes to adopt an amended standard for a type or class of covered product, it must determine the maximum improvement in energy efficiency or maximum reduction in energy use that is technologically feasible for such product. (42 U.S.C. 6295(p)(1)) Accordingly, in the engineering analysis, DOE determined the maximum technologically feasible (''max-tech'') improvements in energy efficiency for residential dishwashers, using the design parameters for the most efficient products available on the market or in working prototypes. (See chapter 5 of the NOPR TSD.) The max-tech levels that DOE determined for this rulemaking are described in section IV.C.1.b of this proposed rule.

C. Energy Savings

1. Determination of Savings

For each TSL, DOE projected energy savings from the residential dishwashers that are the subject of this rulemaking purchased in the 30-year period that begins in the expected year of compliance with any amended standards (2019–2048).[14] The savings are measured over the entire lifetime of residential dishwashers purchased in the 30-year analysis period.[15] 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 mandatory efficiency standards, and it considers market forces and policies that affect demand for more efficient products.

DOE used its national impact analysis (NIA) spreadsheet model to estimate energy savings from amended standards for the products that are the subject of this rulemaking. The NIA spreadsheet model (described in section IV.H of this NOPR) calculates energy savings in site energy, which is the energy directly consumed by products at the locations where they are used. For electricity, DOE reports national energy savings in terms of the savings in the energy that is used to generate and transmit the site electricity. To calculate this quantity, DOE derives annual conversion factors from the model used to prepare the Energy Information Administration's (EIA) most recent *Annual Energy Outlook* (*AEO*). The *AEO* used for this rulemaking is *AEO 2014.*

DOE has begun to also estimate full-fuel-cycle (FFC) energy savings, as discussed in DOE's statement of policy and notice of policy amendment. 76 FR 51281 (Aug. 18, 2011), as amended at 77 FR 49701 (Aug. 17, 2012). 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. DOE's evaluation of FFC savings resulted in part by the National Academy of Science's (NAS) report on FFC measurement approaches for DOE's Appliance Standards Program.[16] The FFC methodology estimates how much additional energy, and in turn how many tons of emissions, may be displaced if the estimated quantity of energy was not consumed by the residential dishwashers covered in this rulemaking. For more information on

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

[15] In the past, DOE presented energy savings results for only the 30-year period that begins in the year of compliance. In the calculation of economic impacts, however, DOE considered operating cost savings measured over the entire lifetime of products purchased in the 30-year period. DOE has modified its presentation of national energy savings consistent with the approach used for its national economic analysis.

[16] ''Review of Site (Point-of-Use) and Full-Fuel-Cycle Measurement Approaches to DOE/EERE Building Appliance Energy- Efficiency Standards,'' (Academy report) was completed in May 2009 and included five recommendations. A copy of the study can be downloaded at: *http://www.nap.edu/catalog.php?record_id=12670.*

FFC energy savings, see section IV.H.1 of this NOPR.

2. Significance of Savings

To adopt more-stringent standards for a covered product, DOE must determine that such action would result in ''significant'' energy savings. (42 U.S.C. 6295(o)(3)(B)) Although the term ''significant'' is not defined in the Act, the U.S. Court of Appeals, in *Natural Resources Defense Council* v. *Herrington,* 768 F.2d 1355, 1373 (D.C. Cir. 1985), indicated that Congress intended ''significant'' energy savings in the context of EPCA to be savings that were not ''genuinely trivial.'' The energy savings for today's proposed standards (presented in section V.B.3.a of this notice) are nontrivial, and, therefore, DOE considers them ''significant'' within the meaning of section 325 of EPCA.

D. Economic Justification

1. Specific Criteria

EPCA provides seven factors to be evaluated in determining whether a potential energy conservation standard is economically justified. (42 U.S.C. 6295(o)(2)(B)(i)) 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 a potential amended standard on manufacturers, DOE conducts a manufacturer impact analysis (MIA), as discussed in section IV.J of this notice. 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 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 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.

a. 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 product compared to any increases in the price of the covered product that are likely to result from the imposition of the standard. (42 U.S.C. 6295(o)(2)(B)(i)(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 product. To account for uncertainty and variability in specific inputs, such as product 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 products in the first year of compliance with amended standards.

The LCC savings for the considered efficiency levels are calculated relative to a base case that reflects projected market trends in the absence of amended standards. DOE's LCC and PBP analysis is discussed in further detail in section IV.F of this NOPR.

b. Energy Savings

Although significant conservation of energy is a separate statutory requirement for adopting 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. 6295(o)(2)(B)(i)(III)) As discussed in section IV.H.1 of this NOPR, DOE uses the NIA spreadsheet to project national energy savings.

c. Lessening of Utility or Performance of Products

In establishing classes of products, and in evaluating design options and the impact of potential standard levels, DOE evaluates standards that would not lessen the utility or performance of the considered products. (42 U.S.C. 6295(o)(2)(B)(i)(IV)) Based on data from internal testing and the availability of products on the market, DOE has determined that the standards proposed in this NOPR would not reduce the utility or performance of the products under consideration in this rulemaking.

d. Impact of Any Lessening of Competition

EPCA directs DOE to consider the impact of any lessening of competition, as determined in writing by the Attorney General, that is likely to result from a proposed standard. (42 U.S.C. 6295(o)(2)(B)(i)(V)) It also directs the 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 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. 6295(o)(2)(B)(ii)) DOE will transmit a copy of this proposed rule to the Attorney General with a request that the Department of Justice (DOJ) provide its determination on this issue. DOE will address the Attorney General's determination in the final rule.

e. Need for National Energy Conservation

In evaluating the need for national energy conservation, DOE expects that the energy savings from the proposed 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.

The proposed standards also are likely to result in environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases associated with energy production. DOE reports the emissions impacts from today's standards, and from each TSL it considered, in section V.B.6 of this NOPR. DOE also reports estimates of the economic value of emissions reductions resulting from the considered TSLs, as discussed in section IV.L of this NOPR.

f. 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)(i)(VII))

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 savings in energy (and water, if applicable) resulting from the standard, as calculated under the applicable DOE test procedure. (42 U.S.C. 6295(o)(2)(B)(iii)) DOE's LCC and PBP analyses generate values used to calculate the effects that proposed 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 the required economic analysis that considers the full range of impacts to consumers, manufacturers, the nation, and the environment. (42 U.S.C. 6295(o)(2)(B)(i)) 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 IV.F.11 of this proposed rule.

IV. Methodology and Discussion

DOE used two spreadsheet tools to estimate the impact of this NOPR. The first spreadsheet calculates LCCs and PBPs of potential new energy conservation standards. The second provides shipments forecasts and then calculates impacts of potential energy efficiency standards on national energy savings and net present value. The two spreadsheets are available online at: *http://www1.eere.energy.gov/buildings/appliance_standards/rulemaking.aspx?ruleid=106*. The Department also assessed manufacturer impacts, largely through use of the Government Regulatory Impact Model (GRIM).

Additionally, DOE estimated the impacts on utilities and the environment of energy conservation standards for residential dishwashers. DOE used a version of EIA's National Energy Modeling System (NEMS) for the utility and environmental analyses. The NEMS model simulates the energy sector of the U.S. economy. EIA uses NEMS to prepare its *Annual Energy Outlook,* a widely known baseline energy forecast for the United States. 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/*.

The version of NEMS used for appliance standards analysis, which makes minor modifications to the *AEO* version, is called NEMS–BT.[17] NEMS–BT accounts for the interactions among the various energy supply and demand sectors and the economy as a whole.

A. Market and Technology Assessment

DOE develops information in the market and technology assessment that provides an overall picture of the market for the products concerned, including the purpose of the products, the industry structure, manufacturers, market characteristics, and technologies used in the products. This activity includes both quantitative and qualitative assessments, based primarily on publicly available information. The subjects addressed in the market and technology assessment for this residential dishwasher rulemaking include: (1) Scope and product classes; (2) manufacturers and industry structure; (3) existing efficiency programs; (4) shipments information; (5) market and industry trends; and (6) technologies that could improve the energy efficiency of residential dishwashers. The key findings of DOE's market assessment are summarized below. See chapter 3 of the NOPR TSD for further discussion of the market and technology assessment.

1. Scope and Product Classes

In 10 CFR 430.2, DOE defines dishwasher as ''a cabinet-like appliance which with the aid of water and detergent, washes, rinses, and dries (when a drying process is included) dishware, glassware, eating utensils, and most cooking utensils by chemical, mechanical and/or electrical means and discharges to the plumbing drainage system.''

When evaluating and establishing energy conservation standards, DOE divides covered products into product classes by the type of energy used or by capacity or other performance-related features that justify 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. (42 U.S.C. 6295(q)) For this rulemaking, DOE proposes to maintain the scope of coverage as defined by its current regulations for residential dishwashers, which include two product classes based on capacity as specified in ANSI/AHAM Standard DW–1–2010:

- Compact (capacity less than eight place settings plus six serving pieces); and
- Standard (capacity equal to or greater than eight place settings plus six serving pieces).

2. Technology Options

DOE identified 16 technology options that would be expected to improve the efficiency of residential dishwashers: condensation drying; control strategies; fan or jet drying; flow-through heating; improved fill control; finer filters; increased motor efficiency; optimized spray-arm geometry; increased insulation; low standby-loss electronic controls; microprocessor controls (including soil-sensing controls); modified sump geometry, with and without dual pumps; reduced inlet water temperature; supercritical carbon dioxide washing; ultrasonic washing; and variable washing pressures and flow rates.

After identifying all potential technology options for improving the efficiency of residential dishwashers, DOE performed the screening analysis (see section IV.B of this notice and chapter 4 of the NOPR TSD) on these technologies to determine which to consider further in the analysis and which to eliminate.

B. Screening Analysis

DOE uses the following four screening criteria to determine which technology options are suitable for further consideration in an energy conservation standards rulemaking:

1. *Technological feasibility.* Technologies that are not incorporated in commercial products or in working prototypes will not be considered further.

2. *Practicability to manufacture, install, and service.* If it is determined that mass production and reliable installation and servicing of a technology in commercial products could not be achieved on the scale necessary to serve the relevant market at the time of the compliance date of the standard, then that technology will not be considered further.

3. *Impacts on product utility or product availability.* If it is determined that a technology would have significant

[17] EIA approves the use of the name ''NEMS'' to describe only an *AEO* version of the model without any modification to code or data. Because the present analysis entails some minor code modifications and runs the model under various policy scenarios that deviate from *AEO* assumptions, the name ''NEMS–BT'' refers to the model as used here. (BT stands for DOE's Building Technologies Program.)

adverse impact on the utility of the product to significant subgroups of consumers or would result in the unavailability of any covered product type with performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as products generally available in the United States at the time, it will not be considered further.

4. *Adverse impacts on health or safety.* If it is determined that a technology would have significant adverse impacts on health or safety, it will not be considered further.

10 CFR part 430, subpart C, appendix A, 4(a)(4) and 5(b).

In sum, if DOE determines that a technology, or a combination of technologies, fails to meet one or more of the above four criteria, it will be excluded from further consideration in the engineering analysis. The reasons for eliminating any technology are discussed below.

1. Screened-Out Technologies

Reduced Inlet-Water Temperature

Reduced inlet-water temperature requires that residential dishwashers tap the cold water line for their water supply. Because most residential dishwashers in the United States tap the hot water line, this design option would require significant alteration of existing residential dishwasher installations to accommodate newly purchased units incorporating this design option. Therefore, DOE believes that it would not be practicable to install this technology on the scale necessary to serve the relevant market at the time of the effective date of an amended standard.

Supercritical Carbon Dioxide Washing

Supercritical carbon dioxide washing, which uses supercritical carbon dioxide instead of conventional detergent and water to wash dishes, has been researched but has not been implemented in commercially available dishwashers. Thus, DOE believes that it would not be practicable to manufacture, install and service this technology on the scale necessary to serve the relevant market at the time of the effective date of an amended standard. Furthermore, because this technology has not progressed beyond the research stage, it is not yet possible to assess whether it will have any adverse impacts on equipment utility to consumers or equipment availability, or any adverse impacts on consumers' health or safety.

Ultrasonic Washing

A residential dishwasher using ultrasonic waves to generate a cleaning mist was produced for the Japanese market in 2002. However, this model is no longer available on the market. Available information indicates that the use of a mist with ion generation instead of water with detergent would decrease cleaning performance, impacting consumer utility.

Ultrasonic dishwashing based upon soiled-dish immersion in a fluid that is then excited by ultrasonic waves has not been demonstrated. In an immersion-based ultrasonic dishwasher, standing ultrasonic waves within the washing cavity and the force of bubble cavitation implosion can damage fragile dishware. Because no manufacturers currently produce ultrasonic dishwashers, it is impossible to assess whether this design option would have any impacts on consumers' health or safety, or product availability.

2. Remaining Technologies

Through a review of each technology, DOE found that all of the other identified technologies met all four screening criteria to be examined further in DOE's analysis. In summary, DOE did not screen out the following technology options: condensation drying; control strategies; fan or jet drying; flow-through heating; improved fill control; finer filters; increased motor efficiency; optimized spray-arm geometry; increased insulation; low standby-loss electronic controls; microprocessor controls (including soil-sensing controls); modified sump geometry, with and without dual pumps; and variable washing pressures and flow rates.

All of these technology options are technologically feasible, given that the evaluated technologies are being used in commercially available products or working prototypes. Therefore, all of the energy conservation levels evaluated in this notice are technologically feasible. DOE also finds that all of the remaining technology options also meet the other screening criteria (*i.e.,* practicable to manufacture, install, and service and do not result in adverse impacts on consumer utility, product availability, health, or safety). For additional details, see chapter 4 of the NOPR TSD.

C. Engineering Analysis

In the engineering analysis DOE establishes the relationship between the manufacturer production cost (MPC) and improved residential dishwasher efficiency. This relationship serves as the basis for cost-benefit calculations for individual consumers, manufacturers, and the nation. DOE typically structures the engineering analysis using one of three approaches: (1) Design option; (2) efficiency level; or (3) reverse engineering (or cost assessment). The design-option approach involves adding the estimated cost and associated efficiency of various efficiency-improving design changes to the baseline to model different levels of efficiency. The efficiency-level approach uses estimates of costs and efficiencies of products available on the market at distinct efficiency levels to develop the cost-efficiency relationship. The reverse-engineering approach involves testing products for efficiency and determining cost from a detailed bill of materials (BOM) derived from reverse engineering representative products.

For this analysis, DOE relied on a hybrid approach of the three methods. DOE selected units available at each of the analyzed efficiency levels to develop a detailed BOM for each product, similar to the reverse-engineering approach. However, DOE did not assume the costs derived from the BOMs represented the MPC at each efficiency level. DOE used the design option approach to add features that can improve efficiency to the baseline BOM to estimate the MPC at higher efficiency levels, similar to the design-option approach. For residential dishwashers, it is difficult to assign a specific energy or water savings to a particular design option. DOE observed the sets of design options incorporated into units available on the market at each efficiency level to assign design options to each of the analyzed efficiency levels, similar to the efficiency-level approach. Using this hybrid approach, DOE developed the relationship between MPC and residential dishwasher efficiency.

This section provides more detail on how DOE selected the efficiency levels used for its analysis and developed the MPC at each efficiency level. Chapter 5 of the NOPR TSD contains further description of the engineering analysis.

1. Efficiency Levels

a. Baseline Efficiency Levels

A baseline unit is a unit that just meets current Federal energy conservation standards and provides basic consumer utility.[18] DOE identified products available on the market rated at the current energy conservation standards levels (see Table IV.1 below). Accordingly, DOE analyzed these

[18] The current Federal energy conservation standards went into effect on May 30, 2013.

products as baseline units. DOE uses the baseline unit for comparison in several phases of the NOPR analyses, including the engineering analysis, LCC analysis, PBP analysis, and NIA. To determine energy savings that will result from an amended energy conservation standard, DOE compares energy use at each of the higher energy efficiency levels to the energy consumption of the baseline unit. Similarly, to determine the changes in price to the consumer that will result from an amended energy conservation standard, DOE compares the price of a unit at each higher efficiency level to the price of a unit at the baseline. Additional details on the selection of baseline units may be found in chapter 5 of the NOPR TSD.

Table IV.1 presents the baseline levels identified for each residential dishwasher product class.

TABLE IV.1—BASELINE EFFICIENCY LEVELS

Product class	Annual energy use (*kWh/year*)	Per-cycle water consumption (*gal/cycle*)
Standard	307	5.0
Compact	222	3.5

b. Higher Energy Efficiency Levels

Table IV.2 shows the efficiency levels DOE selected for standard residential dishwashers in this NOPR analysis.

TABLE IV.2—RESIDENTIAL DISHWASHER EFFICIENCY LEVELS—STANDARD PRODUCT CLASS

Efficiency level	Annual energy use (*kWh/year*)	Per-cycle water consumption (*gal/cycle*)
0—Baseline	307	5.00
1	295	4.25
2	280	3.50
3	234	3.10
4—Max-Tech	180	2.22

For standard residential dishwashers, DOE selected efficiency levels according to key levels identified in other efficiency programs and based on availability of products on the market. Efficiency Level 1 corresponds to the existing ENERGY STAR [19] criteria for standard residential dishwashers. Efficiency Level 2 corresponds to potential ENERGY STAR criteria identified during the process of setting the current ENERGY STAR criteria. This level was included in the Draft 2 V5.0 Dishwashers Specification, released on February 3, 2011.[20] Efficiency Level 3 is a gap-fill level developed as described below. Efficiency Level 4 is the max-tech efficiency level, as defined by the maximum available technology that DOE identified on the market at the time of its analysis. DOE did not identify any working prototypes that were more efficient than this maximum available technology.[21]

To determine the appropriate Efficiency Level 3, DOE surveyed the products currently available on the market in the United States. DOE's Compliance Certification Database [22] contains standard residential dishwasher models with a range of rated annual energy consumption and per-cycle water consumption between the max-tech and baseline. However, after removing products certified using a cold-water connection, which DOE screened out as a technology option as discussed in section IV.B of this NOPR, DOE observed that very few products are available with rated annual energy consumption below 234 kWh/year and per-cycle water consumption below 3.1 gal/cycle. Figure IV.1 shows the distribution of standard residential dishwashers included in DOE's Compliance Certification Database, after removing models certified using a cold-water connection. DOE developed efficiency level 3 based on this distribution.

[19] Information on the ENERGY STAR program can be found at energystar.gov.

[20] The draft specification document is available at *https://www.energystar.gov/products/specs/sites/products/files/ES_Draft_2_V5.0_Dishwashers_Specification.pdf*. DOE notes that this level was removed from the Final V5.0 Dishwashers Specification, and subsequent specification versions 5.1 and 5.2; however, the energy and water consumption represent a technically feasible efficiency level beyond the current ENERGY STAR criteria.

[21] DOE notes that a standard residential dishwasher is available with rated annual energy consumption of 171 kWh/year and water consumption of 4.1 gal/cycle. These ratings are based on a cold-water connection, which DOE eliminated from consideration as a technology option in the screening analysis.

[22] DOE's Compliance Certification Database is accessible at *http://www.regulations.doe.gov/certification-data/*.

[23] Units certified using a cold-water connection removed. Database accessed on May 22, 2014.

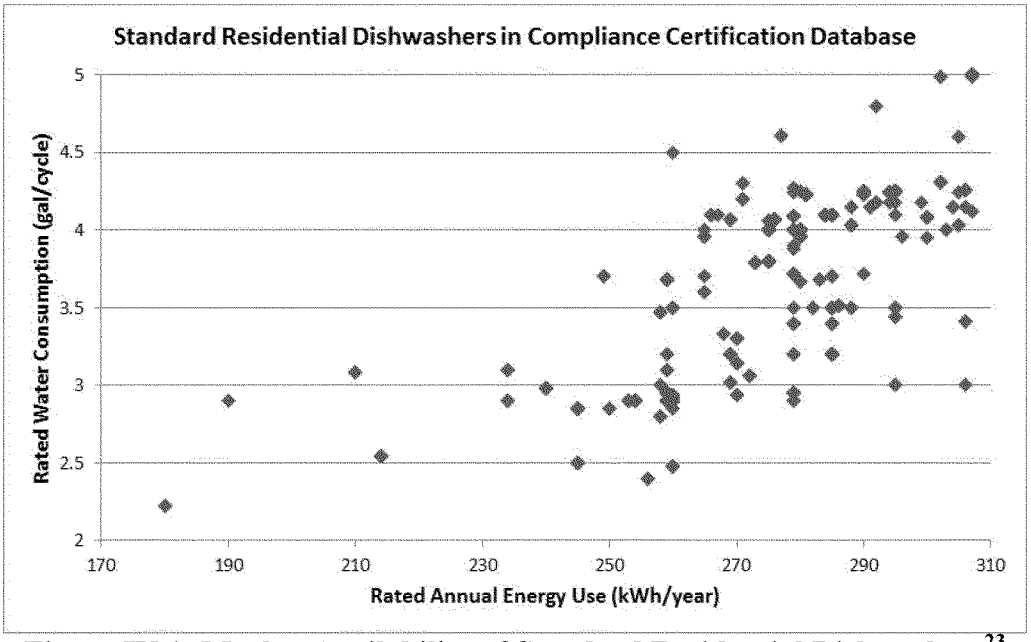

Figure IV.1: Market Availability of Standard Residential Dishwashers[23]

Table IV.3 shows the efficiency levels DOE considered for compact residential dishwashers in this NOPR analysis.

TABLE IV.3—RESIDENTIAL DISHWASHER EFFICIENCY LEVELS—COMPACT PRODUCT CLASS

Efficiency Level	Annual energy use (kWh/year)	Per-cycle water consumption (gal/cycle)
0—Baseline	222	3.50
1	203	3.10
2—Max-Tech	141	2.00

Based on basic model numbers listed in DOE's Compliance Certification Database, DOE expects that fewer than 10 individual compact basic models are currently available on the market. The majority of models included in the Compliance Certification Database are also rated either at the baseline or max-tech efficiency level. In the ENERGY STAR Draft 2 Version 6.0 Residential Dishwasher Specification [24], however, the Environmental Protection Agency proposed eligibility criteria for compact residential dishwashers consistent with Efficiency Level 1 shown in Table IV.3. As part of its proposal, ENERGY STAR discussed feasible energy and water improvements for compact products with manufacturers. ENERGY STAR's supporting analysis included the expected design options manufacturers would use to reach this intermediate efficiency level. Accordingly, DOE considered the proposed compact ENERGY STAR criteria as an efficiency level in this analysis. Efficiency Level 2 is the maximum available efficiency level, as defined by the maximum available technology that DOE could identify on the market at the time of its analysis. DOE did not identify any working prototypes that were more efficient than the maximum available technology.

2. Manufacturer Production Cost Estimates

Based on product teardowns and cost modeling, DOE developed overall cost-efficiency relationships for the standard and compact residential dishwasher product classes. DOE selected products covering the range of efficiencies available on the market for the teardown analysis. During the teardown process, DOE created detailed BOMs that included all components and processes used to manufacture the products. DOE used the BOMs from the teardowns as an input to a cost model, which was used to calculate the MPC for each product torn down.

As discussed earlier in this section, DOE used a hybrid approach of the design-option, efficiency-level, and reverse-engineering approaches in this engineering analysis. During the teardown process, DOE observed the combinations of design options manufacturers used to reach higher efficiency levels. Using the BOMs from the products torn down, DOE constructed typical BOMs for each efficiency level to estimate the MPC based on the expected combinations of design options at each efficiency level. Table IV.4 and Table IV.5 show the incremental MPCs for each of the analyzed residential dishwasher efficiency levels compared to the baseline efficiency level MPC. For additional details, see chapter 5 of the NOPR TSD.

TABLE IV.4—COST-EFFICIENCY RELATIONSHIP FOR STANDARD RESIDENTIAL DISHWASHERS

Efficiency level	Annual energy use (kWh/year)	Per-cycle water consumption (gal/cycle)	Incremental manufacturer production cost (2013$)
0—Baseline	307	5.00	$ -

[24] Information on the ENERGY STAR specification is available at: *https://www.energystar.gov/products/specs/residential_dishwasher_specification_version_6_0_pd.*

TABLE IV.4—COST-EFFICIENCY RELATIONSHIP FOR STANDARD RESIDENTIAL DISHWASHERS—Continued

Efficiency level	Annual energy use (kWh/year)	Per-cycle water consumption (gal/cycle)	Incremental manufacturer production cost (2013$)
1	295	4.25	$ 9.52
2	280	3.50	$ 36.53
3	234	3.10	$ 74.72
4—Max-Tech	180	2.22	$ 74.72

TABLE IV.5—COST-EFFICIENCY RELATIONSHIP FOR COMPACT RESIDENTIAL DISHWASHERS

Efficiency level	Annual energy use (kWh/year)	Per-Cycle Water Consumption (gal/cycle)	Incremental manufacturer production cost (2013$)
0—Baseline	222	3.50	$ -
1	203	3.10	$ 8.01
2—Max-Tech	141	2.00	$ 21.50

D. Markups Analysis

The markups analysis develops appropriate markups in the distribution chain to convert the MPC estimates derived in the engineering analysis to consumer prices. At each step in the distribution channel, companies mark up the price of the product to cover business costs and profit margin. For residential dishwashers, the main parties in the distribution chain are manufacturers and retailers.

The manufacturer markup converts MPC to manufacturer selling price (MSP). DOE developed an average manufacturer markup by examining the annual Securities and Exchange Commission (SEC) 10–K reports filed by publicly traded manufacturers primarily engaged in appliance manufacturing and whose combined product range includes residential dishwashers.

For retailers, DOE developed separate markups for baseline products (baseline markups) and for the incremental cost of more efficient products (incremental markups). Incremental markups are coefficients that relate the change in the MSP of higher-efficiency models to the change in the retailer sales price. DOE relied on economic data from the U.S. Census Bureau to estimate average baseline and incremental markups.[25]

Chapter 6 of the NOPR TSD provides details on DOE's development of markups for residential dishwashers.

E. Energy and Water Use Analysis

DOE's energy and water use analysis estimated the range of energy and water use of residential dishwashers in the field, *i.e.,* as they are actually used by consumers. The energy and water use analysis provided the basis for other analyses DOE performed, particularly assessments of the energy and water savings and the savings in consumer operating costs that could result from DOE's adoption of amended standards.

DOE determined a range of annual energy use and per-cycle water consumption of residential dishwashers by multiplying the per-cycle energy use and per-cycle water use of each considered design by the number of cycles per year in a representative sample of U.S. households.[26]

DOE analyzed per-cycle energy consumption based on two components: (1) Water-heating energy, and (2) machine (motor) and drying energy, values for which are taken from data developed by DOE in the engineering analysis. See chapter 5 of the NOPR TSD for more information. The largest component of residential dishwasher energy consumption is water-heating energy use, which is the energy required to heat the inlet water to the temperature for dishwashing. The machine energy consists of the motor energy (for water pumping and food disposal), and drying energy consists of heat to dry cleaned dishes.

DOE estimated the per-cycle water-heating energy consumption based on DOE's residential dishwasher test procedure (which refers to this quantity as ''water energy consumption''). DOE estimated this energy consumption for residential dishwashers that operate with a nominal inlet water temperature of 120 °F[27], the most common situation in U.S. homes. For a residential dishwasher using electrically heated water, the water-heating energy consumption, expressed in kWh per cycle, is equal to the water consumption per cycle times a nominal water heater temperature rise of 70 °F times the specific heat of water (0.0024 kWh per gallon per °F).[28] For a residential dishwasher using gas-heated or oil-heated water, the calculation is the same, but also incorporates a nominal water heater recovery efficiency of 0.80 for gas-fired water heating and 0.78 for oil-fired water heating.[29]

The energy used to operate the machine powers the motor (to pump water and dispose of food) and the heating element, which boosts the supplied water's temperature to the

[25] U.S. Census, 2007 Annual Retail Trade Survey (ARTS), Electronics and Appliance Stores sectors.

[26] For the dishwasher standards rulemaking, DOE estimated consumer usage (cycles per year) to establish dishwasher annual energy use within the life-cycle cost (LCC) and payback period (PBP) analysis. To estimate average dishwasher usage, DOE utilized a 2001 Arthur D. Little (ADL) report that focused solely on dishwashers. Information from the ADL report was used to determine an average usage of 215 cycles per year. DOE used the *Residential Energy Consumption Survey 2009* (*RECS 2009*) to characterize household variability of dishwasher usage.

[27] *Energy Conservation Program: Test Procedures for Residential Dishwashers, Dehumidifiers, and Conventional Cooking Products.* Available at *https://www.federalregister.gov/articles/2012/05/25/2012-11155/energy-conservation-program-test-procedures-for-residential-dishwashers-dehumidifiers-and#h-58.*

[28] The water heater temperature rise of 70 °F assumes an average water heater inlet temperature of 50 °F, as specified as the national average in the dishwasher test procedure.

[29] The recovery efficiency indicates how efficient a water heater is at heating water. The DOE test procedure for dishwashers specifies a recovery efficiency of 0.80 for gas-fired water heating and 0.78 for oil-fired water heating, which is representative of gas and oil water heaters currently in the housing stock.

required washing temperature. DOE estimated the per-cycle machine and drying energy consumption for representative units at each efficiency level by subtracting the per-cycle water-heating energy consumption from the per-cycle dishwasher energy consumption as determined in the engineering analysis.

Standby power is defined as a product's minimum power consumption while plugged in and not performing any active mode function.[30] DOE estimated the per-cycle energy use by subtracting the annual energy use associated with standby power from the total annual energy use and dividing the result by the national average number of residential dishwasher cycles per year. DOE used data provided by AHAM for the May 2012 direct final rule on the total annual residential dishwasher energy use and the standby power use for each considered efficiency level.[31]

DOE determined the standby annual energy consumption by multiplying the energy use in standby mode per hour by the hours the residential dishwasher is in standby mode, which is the difference between the number of hours in a year and the active hours, which is equal to the number of residential dishwasher cycles per year multiplied by cycle time, which is estimated to be 1 hour.[32]

DOE estimated the per-cycle water use by efficiency level in its engineering analysis, as described in chapter 5 of the NOPR TSD.

To estimate the number of cycles per year in a representative sample of U.S. households, DOE considered the following data sources. DOE analyzed data from the Energy Information Administration (EIA)'s *2009 Residential Energy Consumption Survey* (*RECS 2009*), which was the most recent such survey available at the time of DOE's analysis.[33] *RECS* is a national sample survey of housing units that collects statistical information on the consumption of and expenditures for energy in housing units along with data on energy-related characteristics of the housing units and occupants. Of the more than 12,000 households in *RECS,* almost 7,400 have residential dishwashers. For each household using a residential dishwasher, *RECS* provides data on the number of residential dishwasher cycles in the following bins: (1) Less than once per week, (2) once per week, (3) 2–3 times per week, (4) 4–6 times per week, (5) at least once per day. DOE converted the above information to annual values and created a triangular or uniform distribution for each bin. DOE randomly assigned a specific numerical value from within the appropriate bin to each household in the residential dishwasher sample. The average number of cycles per year derived from the *RECS 2009* data is 171.

While the *RECS* data represent the most recent nationally representative sample of dishwasher usage, the binning approach that the RECS survey uses to collect the data does not allow for the derivation of a point estimate to help determine annual energy and water use without making assumptions about the distribution of usage within bins. For example, of the 18% of national households that responded that they used their dishwashers at least once per day, it is not known what percentage of these households use their dishwashers more than once a day or if viewed weekly, more than 7 times a week. Because the *RECS* data do not include point estimates of usage, DOE relies on survey data it used to develop the 2003 residential dishwasher test procedure amendments and analyzed again during the 2012 standards rulemaking[34] to estimate the average number of residential dishwasher cycles per year. In the review, survey data on consumers' residential dishwasher usage habits from the 1990's were collected from a number of sources including several residential dishwasher manufacturers, detergent manufacturers, energy and consumer interest groups, independent researchers, and government agencies. This study provides a large data set of point estimates which DOE believes is the best source of information on usage rates at present. This survey review was used in the development of the 2003 residential dishwasher test procedure amendments to reduce the average cycles per year from 264 to 215, which DOE believed was more reflective of dishwasher use nation-wide at the time and was not inconsistent with the steady decrease over the previous 20 years in the average-use cycles for a dishwasher.[35] Because of the facts detailed above, DOE is proposing in this document to use an average usage of 215 cycles per year as the value for average residential dishwasher use instead of 171 cycles estimated from the RECS survey data. DOE notes that 215 cycles per year is the number of cycles required to be used to calculate energy usage in DOE's test procedure for residential dishwashers which is also the basis for the ENERGY GUIDE label administered by the Federal Trade Commission. DOE further notes that alternative analysis that relies on additional assumptions regarding use patterns within the ''binned'' RECS data could yield results similar to those from the earlier data, depending on the assumptions made for each of the bins. DOE does recognize that dishwasher usage data are a key input when calculating energy and water use and ultimately have a direct effect on the benefits derived from estimated energy and water use savings described by this proposed rulemaking. DOE is aware that a point estimate for the annual number of dishwasher cycles is subject to uncertainty given how data on this topic are collected. Given this uncertainty, DOE encourages the public to comment on its use of these surveys and the limitations of each.

DOE did not assume that all dishwashers are operated exactly at the average usage per year and used other survey data to characterize the variability in the usage. For purposes of conducting the LCC and PBP analysis, DOE characterized each usage bin with a probability distribution. To capture the uncertainty inherent to the usage response for each household in the RECS sample, DOE used a Monte Carlo

[30] Active mode includes the main functions of washing, rinsing, or drying (when a drying process is included), or is involved in functions necessary for these main functions, such as admitting water into the dishwasher, pumping water out of the dishwasher, circulating air, or regenerating an internal water softener. For more information, see the DOE dishwasher test procedure at 10 CFR part 430, subpart B, appendix C1.

[31] For more information, see chapter 7 of the NOPR TSD.

[32] The 1-hour cycle time is an estimate of the typical cycle time for a dishwasher. Actual cycle times vary based on wash selection, load, and model of dishwasher.

[33] Arthur D. Little. ''Review of Survey Data to Support Revisions to DOE's Dishwasher Test Procedure,'' December 18, 2001. Prepared for the U.S. Department of Energy by Arthur D. Little: Cambridge, MA. Available at: *http://www.regulations.gov/#!documentDetail;D=EERE-2014-BT-STD-0021-0001*.

[34] Arthur D. Little. ''Review of Survey Data to Support Revisions to DOE's Dishwasher Test Procedure,'' December 18, 2001. Prepared for the U.S. Department of Energy by Arthur D. Little: Cambridge, MA. Available at: *http://www.regulations.gov/#!documentDetail;D=EERE-2014-BT-STD-0021-0001*

Note that several of the surveys used in this review share the problem of defining a single value for a category (i.e, a point estimate), but to a much less extent than the RECS data. Generally the other surveys minimize this issue by including more categories, by better distributing categories, and by having more bounded categories.

[35] 68 FR 51887 (Aug. 29, 2003) and Arthur D. Little. ''Review of Survey Data to Support Revisions to DOE's Dishwasher Test Procedure,'' December 18, 2001. Prepared for the U.S. Department of Energy by Arthur D. Little: Cambridge, MA. Available at: *http://www.regulations.gov/#!documentDetail;D=EERE-2014-BT-STD-0021-0001*. The 215 value was based on the review's recommendation that the number of average-use cycles per year be reduced into the range of 200 to 233 cycles.

simulation in the LCC and PBP analysis that selects a value for usage within the distribution that is used to characterize each bin. The result of using probability distribution to characterize the RECS response bins provided a weighted-average dishwasher usage of 171 cycles per year.

Although DOE characterized the usage bins with probability distributions, it is certainly possible and equally likely that the weighted-average value is as low as 146 and as high as 453. This uncertainty led DOE to conclude that the ADL survey review, which focused more closely and solely on dishwasher usage habits, provided a more representative value for the average number of cycles per year that did the *RECS* survey. The sorting of user responses in RECS into usage frequency bins, however, allowed DOE to use *RECS 2009* to capture dishwasher usage variability from household to household (since not every household will run the average number of dishwasher cycles per year). The LCC and PBP analysis normalized the dishwasher usage by the ratio of 215-to-171 cycles per year. The resulting range of values used in the LCC analysis is consistent with the average use in the DOE residential dishwasher test procedure.

Table IV.6 and Table IV.7 show the estimated average annual energy and water use for each efficiency level analyzed for standard residential dishwashers.

TABLE IV.6—STANDARD RESIDENTIAL DISHWASHERS: AVERAGE ANNUAL ENERGY AND WATER USE BY EFFICIENCY LEVEL

Efficiency Level	Annual Energy Use				
	Water Heating*	Machine + Drying	Standby †	Total	
				kWh/year	kWh/year
Baseline	177.0	130.0	0.0	307	1,075.0
1	150.4	140.3	4.3	295	913.8
2	123.9	151.8	4.3	280	752.5
3	109.7	120.0	4.3	234	666.5
4	78.6	97.1	4.3	180	477.3

* Shown for the case of electrically heated water.
† Standby annual energy use based on a dishwasher cycle length of one hour. Standby hours = 8760 hours − (215 cycles × 1 hour) = 8545 hours.

TABLE IV.7—COMPACT RESIDENTIAL DISHWASHERS: AVERAGE ANNUAL ENERGY AND WATER USE BY EFFICIENCY LEVEL

Efficiency Level	Annual Energy Use				
	Water Heating*	Machine + Drying	Standby †	Total	
				kWh/year	kWh/year
Baseline	123.9	78.4	19.7	222	752.5
1	109.7	78.7	14.5	203	666.5
2	70.8	65.9	4.3	141	430.0

* Shown for the case of electrically heated water.
† Standby annual energy use based on a dishwasher cycle length of 1 hour. Standby hours = 8760 hours—(215 cycles × 1 hour) = 8545 hours.

Chapter 7 of the NOPR TSD provides details on DOE's energy and water use analysis for residential dishwashers.

F. Life-Cycle Cost and Payback Period Analysis

DOE conducted LCC and PBP analyses to evaluate the economic impacts on individual consumers of potential energy conservation standards for residential dishwashers. The LCC is the total consumer expense over the life of a product, consisting of purchase and installation costs plus operating costs (expenses for energy use, maintenance, and repair). To compute the operating costs, DOE discounts future operating costs to the time of purchase and sums them over the lifetime of the product. The PBP is the estimated amount of time (in years) it takes consumers to recover the increased purchase cost (including installation) of a more efficient product through lower operating costs. DOE calculates the PBP by dividing the change in purchase cost due to a more stringent standard by the change in annual operating cost for the year that new standards are assumed to take effect.

For any given efficiency level, DOE measures the change in LCC relative to an estimate of the base-case appliance efficiency distribution. The base-case estimate reflects the market in the absence of new or amended energy conservation standards, including the market for products that exceed the current energy conservation standards. In contrast, the PBP is measured relative to the baseline product.

For each considered efficiency level in each product class, DOE calculated the LCC and PBP for a nationally representative set of housing units. As stated previously, DOE developed household samples from the 2009 *RECS*. For each sample household, DOE determined the energy consumption for the residential dishwasher and the appropriate electricity price. By developing a representative sample of households, the analysis captured the variability in energy consumption and energy prices associated with the use of residential dishwashers.

Inputs to the calculation of total installed cost include the cost of the product—which includes MPCs, manufacturer markups, retailer and distributor markups, and sales taxes—and installation costs. Inputs to the calculation of operating expenses include annual energy consumption, energy and water prices and price projections, repair and maintenance costs, product lifetimes, discount rates, and the year that compliance with standards is required. DOE created distributions of values for product lifetime, discount rates, and sales taxes, with probabilities attached to each

value, to account for their uncertainty and variability.

The computer model DOE uses to calculate the LCC and PBP, which incorporates Crystal Ball™ (a commercially available software program), relies on a Monte Carlo simulation to incorporate uncertainty and variability into the analysis. The Monte Carlo simulations randomly sample input values from the probability distributions and residential dishwasher user samples. The model calculated the LCC and PBP for products at each efficiency level for 10,000 housing units per simulation run.

DOE calculated the LCC and PBP for all customers as if each were to purchase a new product in the year that compliance with any amended standards is expected to be required. Any amended standards would apply to residential dishwashers manufactured 3 years after the date on which any final amended standard is published. (42 U.S.C. 6295(g)(10)(B)) For today's NOPR, DOE estimates publication of any final standards in 2016. Therefore, for purposes of its analysis, DOE used 2019 as the first year of compliance with any amended standards.

Table IV.8 summarizes the approach and data DOE used to derive inputs to the LCC and PBP calculations. The subsections that follow provide further discussion. Details of the spreadsheet model, and of all the inputs to the LCC and PBP analyses, are contained in chapter 8 and its appendices of the NOPR TSD.

TABLE IV.8—SUMMARY OF INPUTS AND METHODS FOR THE LCC AND PBP ANALYSIS *

Inputs	Source/method
Product Cost	Derived by multiplying MPCs by manufacturer and retailer markups and sales tax, as appropriate. Used historical data to derive a price scaling index to forecast product costs.
Installation Costs	Baseline installation cost determined with data from RS Means. Assumed no change with efficiency level.
Annual Energy and Water Use	The sum of the total per-cycle annual energy and water use multiplied by the number of cycles per year and the standby annual energy use. Average number of cycles based on ADL field data. Variability: Based on the 2009 *RECS* normalized to the average number of cycles.
Energy and Water Prices	Electricity: Based on EIA's Form 861 data for 2012. Gas: Based on EIA's Natural Gas Navigator for 2012. LPG: Based on EIA's State Energy Consumption, Price and Expenditures Estimates for 2012. Variability: Regional energy prices determined for 27 regions. Water: Based on 2012 AWWA/Raftelis Survey. Variability: By census region.
Energy and Water Price Trends	Energy: Forecasted using *AEO 2014* price forecasts. Water: Forecasted using BLS historic water price index information.
Repair and Maintenance Costs	Assumed no change with efficiency level.
Product Lifetime	Estimated using survey results from *RECS* (1990, 1993, 1997, 2001, 2005, 2009) and the U.S. Census American Housing Survey (2005, 2007), along with historic data on appliance shipments. Variability: Characterized using Weibull probability distributions.
Discount Rates	Approach involves identifying all possible debt or asset classes that might be used to purchase the considered appliances, or might be affected indirectly. Primary data source was the Federal Reserve Board's SCF ** for 1989, 1992, 1995, 1998, 2001, 2004, 2007, and 2010.
Compliance Date	2019

* References for the data sources mentioned in this table are provided in the sections following the table or in chapter 8 of the NOPR TSD.
** Survey of Consumer Finances.

1. Product Cost

To calculate consumer product costs, DOE multiplied the MPCs developed in the engineering analysis by the supply-chain markups described above (along with sales taxes). DOE used different markups for baseline products and higher-efficiency products, because DOE applies an incremental markup to the increase in MSP associated with higher-efficiency products.

Economic literature and historical data suggest that the real costs of many products may trend downward over time according to ''learning'' or ''experience'' curves. Experience curve analysis focuses on entire industries (often operating globally) and aggregates over many causal factors that may not be well characterized. Experience curve analysis implicitly includes factors such as efficiencies in labor, capital investment, automation, materials prices, distribution, and economies of scale at an industry-wide level.[36]

For the default price trend for this NOPR, DOE estimated an experience rate for residential dishwashers based on an analysis of long-term historical data. Producer Price Index (PPI) data specific to residential dishwashers were not available. Instead, DOE derived a residential dishwasher price index from 1988 to 2013 using Producer Price Index (PPI) data for miscellaneous household appliances from the Bureau of Labor Statistics (BLS). An inflation-adjusted price index was calculated using the implicit price deflators for GDP for the same years. This proxy for historic price data was then regressed on the cumulative quantity of residential dishwashers produced, based on a corresponding series for total shipments of residential dishwashers.

To calculate an experience rate, a least-squares power-law fit was performed on the residential dishwasher price index versus cumulative shipments (including imports). DOE then derived a price factor index, with the price in 2013 equal to 1, to forecast prices in the year of compliance for amended energy conservation standards in the LCC and PBP analysis, and for the NIA, for each subsequent year through 2048. The index value in each year is a function of the experience rate and the cumulative production through that year. To derive the latter, DOE used projected shipments from the base-case projections made for the NIA (see section IV.G of this notice). The average annual rate of price decline in the default case is 1.33 percent.

2. Installation Cost

Installation cost includes labor, overhead, and any miscellaneous

[36] Taylor, M. and Fujita, K.S. *Accounting for Technological Change in Regulatory Impact Analyses: The Learning Curve Technique.* LBNL–6195E. Lawrence Berkeley National Laboratory, Berkeley, CA. April 2013. *http://escholarship.org/uc/item/3c8709p4#page-1.*

materials and parts needed to install the product. DOE used data from the 2013 RS Means Plumbing Cost data book [37] to estimate the baseline installation cost. DOE found no evidence that installation costs would be impacted with increased efficiency levels.

3. Annual Energy and Water Consumption

For each sampled household, DOE determined the energy and water consumption for a residential dishwasher at different efficiency levels using the approach described above in section IV.E of this notice.

4. Energy Prices

DOE derived average annual residential electricity prices for 27 geographic regions using data from EIA's Form EIA–861 database (based on ''Annual Electric Power Industry Report'').[38] DOE calculated an average annual regional residential price by: (1) Estimating an average residential price for each utility (by dividing the residential revenues by residential sales); and (2) weighting each utility by the number of residential consumers it served in that region. The NOPR analysis used the data for 2012.

DOE calculated average residential natural gas prices for each of the 27 geographic regions using data from EIA's ''Natural Gas Monthly.'' [39] DOE calculated average annual regional residential prices by: (1) Estimating an average residential price for each state; and (2) weighting each state by the number of residential consumers. The NOPR analysis used the data for 2012.

DOE calculated average residential LPG prices for each of the 27 geographic regions using data from EIA's ''State Energy Consumption, Price, and Expenditures Estimates (SEDS).'' [40] DOE calculated average annual regional residential prices by: (1) Estimating an average residential price for each State; and (2) weighting each State by the number of residential consumers. The NOPR analysis used the data for 2012.

To estimate energy prices in future years, DOE multiplied the average regional energy prices discussed in the preceding section by the forecast of annual national-average residential energy price changes in the Reference case from *AEO 2014,* which has an end year of 2040.[41] To estimate price trends after 2040, DOE used the average annual rate of change in prices from 2020 to 2040.

5. Water and Wastewater Prices

For today's NOPR, DOE obtained data on water and wastewater prices for 2012 from the Water and Wastewater Rate Survey conducted by Raftelis Financial Consultants and the water utility association, American Water Works Association. The survey, which analyzes each industry separately, covers approximately 290 water utilities and 214 wastewater utilities. The water survey includes, for each utility, the cost to consumers of purchasing a given volume of water or treating a given volume of wastewater. The data provide a division of the total consumer cost into fixed and volumetric charges. DOE's calculations use only the volumetric charge to calculate water and wastewater prices, because only this charge is affected by a change in water use. Average water and wastewater prices were estimated for each of four census regions. Each *RECS* household was assigned a water and wastewater price depending on its census region location.

To estimate the future trend for water and wastewater prices, DOE used data on the historic trend in the national water price index (U.S. city average) from 1970 through 2012, combined with the all-products CPI for this same period. It extrapolated a future trend based on the linear inflation-adjusted growth during the 1970 to 2012 period. DOE used the projected inflation-adjusted water price trend to forecast water and wastewater prices for residential dishwashers.

Chapter 8 of the NOPR TSD provides more detail about DOE's approach to developing water and wastewater prices.

6. Maintenance and Repair Costs

Repair costs are associated with repairing or replacing components that have failed in an appliance; maintenance costs are associated with maintaining the operation of the product. Typically, small incremental increases in product efficiency produce no, or only minor, changes in repair and maintenance costs compared to baseline efficiency products.

During the rulemaking for the May 2012 direct final rule, DOE requested information as to whether maintenance and repair costs are a function of efficiency level and product class. Manufacturers responded that these costs would not increase with efficiency. DOE does not expect repair costs to have changed since the last rulemaking; therefore, DOE did not assume that more efficient residential dishwashers would have greater repair or maintenance costs.

DOE did not have data showing how many households would repair rather than replace their dishwashers. The replacement frequency is determined by a survival function which is part of the shipments model. DOE used an accounting method that tracks the total stock of units by vintage. DOE estimated a stock of dishwashers by vintage by integrating historical shipments starting from 1972. Depending on the vintage, a certain percentage of units will fail and need to be replaced. To estimate how long a unit will function before failing, DOE used a survival function based on a product lifetime distribution having an average value of approximately 15 years. Because DOE assumed that a consumer's decision to replace or repair their dishwasher was not impacted by an increase in dishwasher efficiency, the replacement frequency was unaffected by the increased installed cost, the repair cost, and the energy costs savings associated with more efficient dishwashers.

7. Product Lifetime

Because the lifetime of appliances varies depending on utilization and other factors, DOE develops a distribution of lifetimes from which specific values are assigned to the appliances in the household sample. DOE conducted an analysis of residential dishwasher lifetimes in the field based on a combination of shipments data and *RECS* 2009 data on the ages of the residential dishwashers reported in the household stock. As described in chapter 8 of the NOPR TSD, the analysis yielded an estimate of mean age for residential dishwashers of approximately 15 years. It also yielded a survival function that DOE incorporated as a probability distribution in its LCC analysis. See chapter 8 of the NOPR TSD for further details on the method and sources DOE used to develop product lifetimes.

8. Discount Rates

In the calculation of LCC, DOE applies discount rates appropriate to households to estimate the present value of future operating costs. DOE estimated a distribution of residential discount rates for dishwashers based on consumer financing costs and opportunity cost of funds related to

[37] RS Means, *Residential Cost Data, 2013.*

[38] Available at: *www.eia.doe.gov/cneaf/electricity/page/eia861.html.*

[39] Available at: *http://www.eia.gov/oil_gas/natural_gas/data_publications/natural_gas_monthly/ngm.html.*

[40] Available at: *http://www.eia.gov/state/seds/seds-data-fuel.cfm?sid=US.*

[41] U.S. Department of Energy-Energy Information Administration, *Annual Energy Outlook 2013 with Projections to 2040* (Available at: *http://www.eia.gov/forecasts/aeo/*).

appliance energy cost savings and maintenance costs.

To establish residential discount rates for the LCC analysis, DOE's approach involved identifying all relevant household debt or asset classes in order to approximate a consumer's opportunity cost of funds related to appliance energy cost savings and maintenance costs. It estimated the average percentage shares of the various types of debt and equity by household income group using data from the Federal Reserve Board's Survey of Consumer Finances (SCF) for 1995, 1998, 2001, 2004, 2007, and 2010.[42] Using the SCF and other sources, DOE then developed a distribution of rates for each type of debt and asset by income group to represent the rates that may apply in the year in which amended standards would take effect. DOE assigned each sample household a specific discount rate drawn from one of the distributions. The average rate across all types of household debt and equity and income groups, weighted by the shares of each class, is 4.49 percent. See chapter 8 in the NOPR TSD for further details on the development of consumer discount rates.

9. Base-Case Efficiency Distribution

To accurately estimate the share of consumers that would be affected by a standard at a particular efficiency level, DOE's LCC analysis considered the projected distribution of product efficiencies that consumers purchase under the base case (*i.e.,* the case without new energy efficiency standards). DOE refers to this distribution of product of efficiencies as a base-case efficiency distribution.

To estimate the base-case efficiency distribution of standard residential dishwashers for 2019, DOE relied on data submitted by AHAM for the May 2012 direct final rule. These data provide shares of shipments by efficiency level for 2002–2005 and 2008–2010. These data show a significant increase in the share of ENERGY STAR products in both periods. To predict the market shares for each efficiency level in 2019, DOE conducted efficiency distribution analysis based on the DOE's Compliance Certification Database for standard residential dishwashers and considered the market trends present in the AHAM data, and assumed these trends would continue in a manner consistent with the decline in average energy use. This trend is described in chapter 10 of the NOPR TSD. DOE also conducted efficiency distribution analysis based on DOE's Compliance Certification Database for compact residential dishwashers.

The estimated shares for the base-case efficiency distribution for residential dishwashers are shown in Table IV–9. See chapter 8 of the NOPR TSD for further information on the derivation of the base-case efficiency distributions. For standard residential dishwashers, DOE also considered an alternative base-case efficiency distribution that uses a different set of historical data. This distribution is described in appendix 8–F of the NOPR TSD.

TABLE IV.9—RESIDENTIAL DISHWASHER BASE-CASE EFFICIENCY DISTRIBUTION BY PRODUCT CLASS IN 2013

Efficiency level	Standard		Compact	
	Annual energy use (kWh/year)	% of shipments	Annual energy use (kWh/year)	% of shipments
Baseline	307	12.1	222	48.1
1	295	43.9	203	14.8
2	234	3.2	141	37.0
3	180	0.4	.....	.....

10. Inputs to Payback Period Analysis

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

The inputs to the PBP calculation for each efficiency level are the change in total installed cost of the product and the change in the first-year annual operating expenditures relative to the baseline. The PBP calculation uses the same inputs as the LCC analysis, except that discount rates are not needed.

11. Rebuttable-Presumption Payback Period

As noted above, EPCA, as amended, 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)) For each considered efficiency level, DOE determined the value of the first year's energy and water savings by calculating the quantity of those savings in accordance with the applicable DOE test procedure, and multiplying that amount by the average energy and water price forecast for the year in which compliance with the amended standard would be required. The results of the rebuttable payback period analysis are summarized in section V.B.1.c of this NOPR.

G. Shipments

DOE uses forecasts of product shipments to calculate the national impacts of potential amended energy conservation standards on energy use, NPV, and future manufacturer cash flows. DOE develops shipment projections based on historical data and an analysis of key market drivers for residential dishwashers. In DOE's shipments model, shipments of products are driven by new construction and stock replacements. The shipments model takes an accounting approach, tracking market shares of each product class and the vintage of units in the existing stock. Stock accounting uses

[42] Note that two older versions of the SCF are also available (1989 and 1992); these surveys are not used in this analysis because they do not provide all of the necessary types of data (*e.g.,* credit card interest rates). DOE determines that the 15-year span covered by the six surveys included is sufficiently representative of recent debt and equity shares and interest rates.

product shipments as inputs to estimate the age distribution of in-service product stocks for all years. The age distribution of in-service product stocks is a key input to calculations of both the NES and NPV, because operating costs for any year depend on the age distribution of the stock. DOE also considers the impacts on shipments from changes in product purchase price and operating cost associated with higher energy efficiency levels.

New housing forecasts and residential dishwasher saturation data comprised the two primary inputs for DOE's estimates of new construction shipments. ''New housing'' includes newly-constructed single-family and multi-family units (referred to as ''new housing completions'') and mobile home placements. For new housing completions and mobile home placements, DOE used *AEO 2014* for forecasts of new housing, and adopted the projections from *AEO 2014* for later years.

DOE calibrated the shipments model against historical residential dishwasher shipments. In general, DOE estimated replacements using a product retirement function developed from product lifetime. DOE based the retirement function on a probability distribution for the product lifetime that was developed in the LCC analysis. The shipments model assumes that no units are retired below a minimum product lifetime and that all units are retired before exceeding a maximum product lifetime.

DOE applied a price elasticity parameter to estimate the effect of standards on residential dishwasher shipments. DOE estimated the price elasticity parameter from a regression analysis that used purchase price and efficiency data specific to several residential appliances during 1980–2002. The estimated ''relative price elasticity'' incorporates the impacts from purchase price, operating cost, and household income. Based on evidence that the price elasticity of demand is significantly different over the short run and long run for other consumer goods (*i.e.,* automobiles),[43] DOE assumed that the relative price elasticity declines over time. DOE estimated shipments in each standards case using the relative price elasticity along with the change in the relative price between a standards case and the base case. For details on the shipments analysis, see chapter 9 of the NOPR TSD.

H. National Impact Analysis

The NIA assesses the national energy savings (NES) and the national net present value NPV 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 product being regulated.) DOE calculates the NES and NPV based on projections of annual appliance shipments, along with the annual energy consumption and total installed cost data from the energy use and LCC analyses.[44] For the present analysis, DOE forecasted the energy savings, operating cost savings, product costs, and NPV of consumer benefits over the lifetime of products sold from 2019 through 2048.

DOE evaluates the impacts of new and amended standards by comparing base-case projections with standards-case projections. The base-case projections characterize energy use and consumer costs for each product class in the absence of new or amended energy conservation standards. DOE compares these projections with projections characterizing the market for each product 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 base-case forecast, DOE considers historical trends in efficiency and various forces that are likely to affect the mix of efficiencies over time. For the standards cases, DOE also considers how a given standard would likely affect the market shares of 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. The TSD that DOE provides during the rulemaking help explain the models and how to use them, and 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.

For the results presented in today's notice, DOE used projections of energy prices and housing starts from the *AEO 2014* Reference case. As part of the NIA, DOE analyzed scenarios that used inputs from the *AEO 2014* Low Economic Growth and High Economic Growth cases. Those cases have higher and lower energy price trends compared to the Reference case, as well as higher and lower housing starts, which result in higher and lower appliance shipments to new homes. NIA results based on these cases are presented in appendix 10–C of the NOPR TSD.

Table IV.10 summarizes the inputs and methods DOE used for the NIA analysis for the NOPR. Discussion of these inputs and methods follows the table. See chapter 10 of the NOPR TSD for further details.

TABLE IV.10—SUMMARY OF INPUTS AND METHODS FOR THE NATIONAL IMPACT ANALYSIS

Inputs	Method
Shipments	Annual shipments from shipments model.
Compliance Date of Standard	2019.
Base-Case Forecasted Efficiencies	Efficiency distributions are forecasted based on historical efficiency data.
Standards-Case Forecasted Efficiencies	Used a ''roll-up'' scenario.
Annual Energy Consumption per Unit	Annual weighted-average values are a function of energy use at each CSL.
Total Installed Cost per Unit	Annual weighted-average values are a function of cost at each CSL. Incorporates forecast of future product prices based on historical data.
Annual Energy Cost per Unit	Annual weighted-average values as a function of the annual energy consumption per unit and energy prices.
Repair and Maintenance Cost per Unit	Annual values do not change with efficiency level.
Energy Prices	*AEO 2014* forecasts (to 2040) and extrapolation through 2048.
Energy Site-to-Source Conversion Factor	Varies yearly and is generated by NEMS–BT.
Discount Rate	Three and seven percent real.
Present Year	Future expenses discounted to 2014, when the NOPR will be published.

[43] S. Hymans. Consumer Durable Spending: Explanation and Prediction, *Brookings Papers on Economic Activity,* 1971. Vol. 1971, No. 1, pp. 234–239.

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

1. National Energy and Water Savings

The national energy and water savings analysis involves a comparison of national energy and water consumption of the considered products in each potential standards case (TSL) with consumption in the base case with no new or amended energy and water conservation standards. DOE calculated the national energy consumption by multiplying the number of units (stock) of each product (by vintage or age) by the unit energy consumption (also by vintage). Vintage represents the age of the product. DOE calculated annual NES based on the difference in national energy consumption for the base case (without amended efficiency standards) and for each higher efficiency standard. DOE estimated energy consumption and savings based on site energy and converted the electricity consumption and savings to primary energy using annual conversion factors derived from the *AEO 2014* version of NEMS. Cumulative energy savings are the sum of the NES for each year over the timeframe of the analysis.

DOE has historically presented NES in terms of primary energy savings. In the case of electricity use and savings, this quantity includes the energy consumed by power plants to generate delivered (site) electricity.

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 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 (Aug. 18, 2011). After evaluating the approaches discussed in the August 18, 2011 notice, DOE published a statement of amended policy in the **Federal Register** in which DOE explained its determination that NEMS is the most appropriate tool for its FFC analysis and its intention to use NEMS for that purpose. 77 FR 49701 (Aug. 17, 2012).

a. Forecasted Efficiency in the Base Case and Standards Cases

A key component of the NIA is the trend in energy efficiency forecasted for the base case (without new or amended standards) and each of the standards cases. Section IV.F.9 of this notice describes how DOE developed a base-case energy efficiency distribution (which yields a shipment-weighted average efficiency) for each of the considered product classes for the first year of the forecast period. To project the trend in efficiency for standard residential dishwashers over the entire forecast period, DOE utilized the historical trend in shipment-weighted average efficiency from 2002 to 2010, as provided by AHAM, model-weighted data from the DOE's Compliance Certification Database and considered the potential effect of programs such as ENERGY STAR. The historical trend demonstrates that the shipment-weighted average annual energy use decreased by almost 75 percent from 2002 to 2010, reaching 309 kWh/year. DOE fit an exponential function to the 2002 to 2010 data that indicated that the base-case shipment-weighted average annual energy use will asymptotically approach a value of 280 kWh/year by 2048 and remain at that level. This trend is described in chapter 10 of the NOPR TSD.

DOE determined that a roll-up scenario is most appropriate to establish the distribution of efficiencies for the year that compliance with revised residential dishwasher standards would be required. Under the ''roll-up'' scenario, DOE assumes: (1) Product efficiencies in the base case that do not meet the standard level under consideration would ''roll-up'' to meet the new standard level; and (2) product efficiencies above the standard level under consideration would not be affected. The details of DOE's approach to forecast efficiency trends are described in chapter 10 of the NOPR TSD.

2. Net Present Value Analysis

The inputs for determining the NPV of the total costs and benefits experienced by consumers of considered appliances are: (1) Total annual installed cost, (2) total annual savings in operating costs, and (3) a discount factor. DOE calculates net savings each year as the difference between the base case and each standards case in total savings in operating costs and total increases in installed costs. DOE calculates operating cost savings over the life of each product shipped during the forecast period.

The operating cost savings are primarily energy cost savings. These are calculated using the estimated energy savings in each year and the projected price of the appropriate form of energy. To estimate energy prices in future years, DOE multiplied the average regional energy prices discussed in the preceding section by the forecast of annual national-average residential energy price changes in the Reference case from *AEO 2014,* which has an end year of 2040. To estimate price trends after 2040, DOE used the average annual rate of change in prices from 2020 to 2040.

In calculating the NPV, DOE multiplies the net savings in future years by a discount factor to determine their present value. For today's NOPR, DOE estimated the NPV of consumer benefits using both a 3-percent and a 7-percent real discount rate. DOE uses these discount rates in accordance with guidance provided by the Office of Management and Budget (OMB) to Federal agencies on the development of regulatory analysis.[45] The discount rates for the determination of NPV are in contrast to the discount rates used in the LCC analysis, which are designed to reflect a consumer's perspective. The 7-percent real value is an estimate of the average before-tax rate of return to private capital in the U.S. economy. The 3-percent real value represents the ''social rate of time preference,'' which is the rate at which society discounts future consumption flows to their present value.

a. Total Installed Cost per Unit

As discussed in section IV.F.1 of this NOPR, DOE developed a residential dishwasher price trend based on an experience rate for miscellaneous household appliances. It used this trend to forecast the prices of residential dishwashers sold in each year in the forecast period. DOE applied the same values to forecast prices for each product class at each considered efficiency level. By 2048, which is the end date of the forecast period, the price is forecasted to drop 37.4 percent relative to 2013. DOE's projection of product prices for residential dishwashers is described in further detail in appendix 10–C of the NOPR TSD.

To evaluate the effect of uncertainty regarding the price trend estimates, DOE investigated the impact of different product price forecasts on the consumer NPV for the considered TSLs for residential dishwashers. In addition to the default price trend, DOE considered two product price sensitivity cases: (1) A high price decline case based on an exponential fit using PPI data for 1988 to 2013; (2) a low price decline case based on an experience rate derived using PPI and shipments data for 1991 to 2000. The derivation of these price trends and the results of these sensitivity cases are described in

[45] OMB Circular A–4 (Sept. 17, 2003), section E, ''Identifying and Measuring Benefits and Costs. Available at: *www.whitehouse.gov/omb/memoranda/m03-21.html.*

appendix 10–C of the NOPR TSD. In the high price decline case, the NPV is significantly higher than in the default case. In the low price decline case, the NPV is slightly lower than in the default case. The rank order of the TSLs is the same in all of the cases.

I. Consumer Subgroup Analysis

In analyzing the potential impact of new or amended standards on consumers, DOE evaluates the impact on identifiable subgroups of consumers that may be disproportionately affected by a national standard. DOE evaluated impacts on particular subgroups of consumers by analyzing the LCC impacts and PBP for those particular consumers from alternative standard levels. For this rulemaking, DOE analyzed the impacts of the considered standard levels on low-income households and senior-only households. Chapter 11 in the NOPR TSD describes the consumer subgroup analysis.

J. Manufacturer Impact Analysis

The following sections address the various steps taken to analyze the impacts of the amended standards on manufacturers.

1. Overview

In determining whether an amended energy conservation standard for residential dishwashers is economically justified, DOE is required to consider ''the economic impact of the standard on the manufacturers and on the consumers of the products subject to such standard.'' (42 U.S.C. 6295(o)(2)(B)(i)(I)) The statute also calls for an assessment of the impact of any lessening of competition that is likely to result from the adoption of a standard as determined by the Attorney General. (42 U.S.C. 6295(o)(2)(B)(i)(V)) DOE conducted the MIA to estimate the financial impact of amended energy conservation standards on manufacturers, and to assess the impacts of such standards on employment and manufacturing capacity.

The MIA involves both quantitative analysis and qualitative evaluation. The quantitative elements of the MIA rely on the Government Regulatory Impact Model (GRIM), an industry cash-flow model customized for this rulemaking. See section IV.J.2 of this notice for details on the GRIM. The qualitative parts of the MIA address factors such as product characteristics, characteristics of particular firms, and market trends. The complete MIA is discussed in chapter 12 of the NOPR TSD. DOE conducted the MIA in the three phases described below.

a. Phase 1, Industry Profile

In Phase 1 of the MIA, DOE prepared a profile of the residential dishwasher manufacturing industry based on the market and technology assessment prepared for this rulemaking. Before initiating the detailed impact studies, DOE collected information on the present and past market structure and characteristics of the industry, tracking trends in market share data, product attributes, product shipments, manufacturer markups, and the cost structure for various manufacturers.

The profile also included an analysis of manufacturers in the industry using Security and Exchange Commission 10–K filings,[46] Standard & Poor's stock reports,[47] and corporate annual reports released by both public and privately held companies. DOE used this and other publicly available information to derive preliminary financial inputs for the GRIM including industry revenues, cost of goods sold, and depreciation, as well as selling, general, and administrative (SG&A), and research and development (R&D) expenses. Based on its analysis, DOE used the same industry average financial parameters developed in support of the May 2012 direct final rule.

b. Phase 2, Industry Cash Flow Analysis

Phase 2 focused on the financial impacts of potential amended energy conservation standards on the industry as a whole. Amended energy conservation standards can affect manufacturer cash flows in three distinct ways: (1) By creating a need for increased investment, (2) by raising production costs per unit, and (3) by altering revenue due to higher per-unit prices and/or possible changes in sales volumes. DOE used the GRIM to model these effects in a cash-flow analysis of the residential dishwasher manufacturing industry. In performing this analysis, DOE used the financial parameters from the 2012 residential dishwasher energy conservation standards rulemaking, the cost-efficiency curves from the engineering analysis, and the shipment assumptions from the NIA.

c. Phase 3, Sub-Group Impact Analysis

Using average cost assumptions to develop an industry-cash-flow estimate may not adequately assess differential impacts of amended energy conservation standards among manufacturer subgroups. For example, small businesses, manufacturers of niche products, or companies exhibiting a cost structure that differs significantly from the industry average could be more negatively affected. While DOE did not identify any other subgroup of manufacturers of residential dishwashers that would warrant a separate analysis, DOE specifically investigated impacts on small business manufacturers. See section VI.B of this notice for more information.

The MIA also addresses the direct impact on employment tied to the manufacturing of residential dishwashers. Using the GRIM, census data and information gained through manufacturer interviews conducted in support of the May 2012 direct final rule, DOE estimated the domestic labor expenditures and number of domestic production workers in the base case and at each TSL from 2014 to 2048.

2. GRIM

DOE uses the GRIM to quantify the changes in cash flow that alter industry value. The GRIM is a standard, discounted cash-flow model that incorporates manufacturer costs, markups, shipments, and industry financial information as inputs, and models changes in manufacturing costs, shipments, investments, and margins that may result from amended energy conservation standards. The GRIM uses these inputs to arrive at a series of annual cash flows, beginning with the base year of the analysis, 2014, and continuing to 2048. DOE uses the industry-average weighted-average cost of capital (WACC) of 8.5 percent, as this represents the minimum rate of return necessary to cover the debt and equity obligations manufacturers use to finance operations.

DOE used the GRIM to compare INPV in the base case with INPV at various TSLs (the standards cases). The difference in INPV between the base and standards cases represents the financial impact of the amended standard on manufacturers. Additional details about the GRIM can be found in chapter 12 of the NOPR TSD.

a. GRIM Key Inputs

Manufacturer Production Costs

Changes in the MPCs of residential dishwashers can affect revenues, gross margins, and cash flow of the industry, making product cost data key inputs for DOE's analysis. DOE estimated the MPCs for standard and compact product classes at the baseline and higher efficiency levels, as described in section IV.C of this notice. The cost model also disaggregated the MPCs into the cost of materials, labor, overhead, and

[46] Available online at *www.sec.gov*.

[47] Available online at *www.standardandpoors.com*.

depreciation. DOE used the MPCs and cost breakdowns as described in section IV.C of this NOPR, and further detailed in chapter 5 of the NOPR TSD, for each efficiency level analyzed in the GRIM.

Base-Case Shipments Forecast

The GRIM estimates manufacturer revenues in each year of the forecast based in part on total unit shipments and the distribution of these values by efficiency level and product class. Changes in the efficiency mix and total shipments at each standard level affect manufacturer finances. For this analysis, the GRIM uses the NIA shipments forecasts from 2013 to 2048, the end of the analysis period.

To calculate shipments, DOE developed a shipments model for each product class based on an analysis of key market drivers for residential dishwashers. For greater detail on the shipments analysis, see section IV.G of this NOPR and chapter 9 of the NOPR TSD.

Product and Capital Conversion Costs

Amended energy conservation standards may cause manufacturers to incur conversion costs to bring their production facilities and product designs into compliance. For the MIA, DOE classified these 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 focused on making product designs comply with the amended energy conservation standard. Capital conversion costs are investments in property, plant, and equipment needed to adapt or change existing production facilities so that new product designs can be fabricated and assembled.

DOE's estimates of the product and capital conversion costs for the residential dishwasher manufacturing industry can be found in section V.B.2 of this NOPR and in chapter 12 of the NOPR TSD.

b. GRIM Scenarios

Standards-Case Shipments Forecasts

The MIA results presented in section V.B.2 of this NOPR all use shipments from the NIA in the GRIM. For standards case shipments, DOE assumed that base-case shipments of products that did not meet the new standard would roll up to meet the standard in the compliance year. These forecasts also include the impact of relative price elasticity on shipment volumes. In this regard the balance of first costs and operating costs factor into the total shipments in the standards case. See section IV.G of this NOPR for a description of the standards-case efficiency distributions.

The NIA also used historical data to derive a price scaling index to forecast product costs. The MPCs and MSPs in the GRIM use the default price forecast for all scenarios. See section IV.F.1 of this notice for a discussion of DOE's price forecasting methodology.

Capital Conversion Cost Scenarios

DOE developed two model scenarios for the capital conversion costs required to meet each TSL. One scenario is based on the capital conversion costs developed for the energy conservation standards from the May 2012 direct final rule, scaled to reflect the new efficiency levels for each product class considered in this NOPR. Additionally, DOE developed a separate capital conversion cost scenario using the engineering cost model. For this estimate, DOE identified the design pathways considered in the engineering analysis, estimated the cost of the changes in production equipment to implement each design option, and aggregated these costs to reflect the industry-wide investment using market information about the number of platform and product families currently on the market from each manufacturer.

Markup Scenarios

MSP is equal to MPC times a manufacturer markup. The MSP includes direct manufacturing production costs (*i.e.,* labor, material, and overhead estimated in DOE's MPCs) and all non-production costs (*i.e.,* SG&A, R&D, and interest), along with profit. DOE used the baseline manufacturer markup, 1.24, developed for the May 2012 direct final rule for all products when modeling the base case in the GRIM.

For the standards case in the GRIM, DOE modeled two markup scenarios to represent the uncertainty regarding the potential impacts on prices and profitability for manufacturers following the implementation of amended energy conservation standards. For both GRIM markup scenarios, DOE placed no premium on higher efficiency products. This assumption is informed by a market structure in which 88 percent of product shipments currently adhere to ENERGY STAR standards, leaving little to no room for differentiation by efficiency level alone. The two standards-case markup scenarios are (1) a preservation of gross margin as a percentage of revenues markup scenario, and (2) a preservation of earnings before interest and taxes (EBIT) markup scenario. Modifying these markups from the base case to the standards cases yields different sets of impacts on industry revenues and cash flow.

The preservation of gross margin as a percentage of revenues markup scenario assumes that the baseline markup of 1.24 is maintained for all products in the standards case. This scenario represents the upper bound of industry profitability as manufacturers are able to fully pass through additional costs due to standards to their customers under this scenario.

The preservation of EBIT markup scenario is similar to the preservation of gross margin as a percentage of revenues markup scenario with the exception that in the standards case, minimally compliant products lose a fraction of the baseline markup. This scenario represents the lower bound profitability and a more substantial impact on the dishwasher industry as manufacturers accept a lower margin in an attempt to offer price competitive entry level products while maintaining the same level of EBIT they saw prior to amended standards.

3. Manufacturer Interviews

For this rulemaking, DOE relies on information gathered from manufacturer interviews conducted in support of the May 2012 direct final rule. For that rulemaking, DOE interviewed manufacturers representing more than 80 percent of residential dishwasher sales. These interviews were in addition to those DOE conducted as part of the engineering analysis for the May 2012 direct final rule. DOE used these interviews to tailor the GRIM for today's rule to incorporate unique financial characteristics of the industry. All interviews provided information that DOE used to evaluate the impacts of potential amended energy conservation standards on manufacturer cash flows, manufacturing capacities, and employment levels. See appendix 12–A of the NOPR TSD for additional information on the previous MIA interviews. The following sections describe the most significant issues identified by manufacturers during the interviews conducted in support of the May 2012 direct final rule.

a. Dishwasher Performance

All manufacturers interviewed expressed concerns about the potential impacts of amended standards on product performance, citing several adverse consequences of standards above those agreed upon in the Joint Petition. For higher efficiency standards, the performance metrics

manufacturers expected to be most severely impacted include wash performance, drying performance, cycle time, and the noise levels reached in operation. In considering these metrics, manufacturers anticipated negative reactions ranging from small but meaningful changes in consumer behavior to higher rates of service calls and returns. For efficiency standards well above those proposed in the Joint Petition, manufacturers expected blanket rejection of poorly performing products in the market. In considering impacts to wash performance, manufacturers cited an increase in unnecessary rinsing or washing of dishes prior to loading the dishwasher, switching to a more aggressive cycle, and running multiple cycles when dishes are not adequately cleaned in a single cycle as the most likely changes in consumer behavior. Manufacturers suggested that any of these changes would result in an increase in both energy and water consumption over that used by a dishwasher of satisfactory performance. To mitigate the impact of future standards on product performance, several manufacturers recommended the adoption of a performance metric into the test procedure and standard.

While all manufacturers suggested that the efficiency level specified in the Joint Petition would not likely have a substantial negative impact on wash performance, some manufacturers noted that standards above this level would result in a decrease in performance unless substantially higher-cost technology changes were implemented. The comments did not indicate the specific technology changes that would be required. Even without such technology changes, however, several manufacturers offer or have offered products at efficiency levels above those specified by the Joint Petition, including the max-tech efficiency level identified in today's proposed rule. Accordingly, DOE evaluated these higher efficiency levels as part of this rulemaking.

DOE conducted investigative testing to assess cleaning performance in support of this NOPR according to the ENERGY STAR Test Method for Determining Dishwasher Cleaning Performance (Cleaning Performance Test Method).[48] The testing included multiple units from different manufacturers at multiple efficiency levels. Based on this internal testing and the availability of products on the market, DOE determined that products from the baseline efficiency level to Efficiency Level 3 for standard residential dishwashers are able to maintain cleaning performance.

b. Test Procedures

During interviews conducted as part of the development of the May 2012 direct final rule for residential dishwashers, manufacturers raised concerns over the DOE dishwasher test procedure and the multitude of additional dishwasher test procedures in the field at that time. Several manufacturers suggested that the DOE test procedure did not accurately capture the energy used by dishwashers in the field. These manufacturers cited the single cycle specification and lack of performance metrics in the test procedure as providing an easy avenue for circumvention of the standards. In the scenario described, manufacturers could optimize a particular cycle to perform well on the DOE test procedure with the implicit understanding that this cycle will not meet customer expectations and thus will not be used in the field as customers opt for a different, more energy-intensive cycle.

In contrast, other manufacturers raised concerns over expanding the test procedure to cover multiple cycles, citing the additional testing burden this would generate. Similarly, some manufacturers raised concerns over how DOE would implement a performance test, noting that there already exist numerous performance tests in the industry including those developed by AHAM, IEC, and Consumer Reports and that each performance test procedure favors a different machine cycle algorithm.

As discussed in sections II.A and II.B.3 of this NOPR, the DOE test procedure for residential dishwashers is found at Title 10 of CFR part 430, subpart B, appendix C1 (proposed to be redesignated as appendix C in this rulemaking). Although appendix C1 does not include provisions for measuring cleaning performance, the ENERGY STAR program recently finalized the Cleaning Performance Test Method. The Cleaning Performance Test Method harmonizes with the procedures in appendix C1, requiring manufacturers to test on the same cycles. Appendix C1 also requires that testing be conducted on the cycles recommended for completely washing a full load of normally soiled dishes.

c. Increased Competition

During interviews conducted in support of the May 2012 direct final rule, manufacturers of both baseline and high efficiency products anticipated an increase in competition in industry stemming from amended standards. Manufacturers whose market share was largely attributed to baseline products expected to see either the removal of features from higher efficiency units as a means to cut costs to maintain a low-cost minimally-compliant product, or the disappearance of entry-level models as they are forced to add other features and cost in line with current higher efficiency products. If the latter approach prevails, manufacturers of higher efficiency products expected to see increased competition as manufacturers that previously focused on low efficiency products moved into their target segment of the market. As noted in section III.D.1.c of this NOPR, the Attorney General provides DOE with a determination and analysis of the impact of any lessening of competition that is likely to result from the imposition of the standard. (42 U.S.C. 6295(o)(2)(B)(i)(V) and (B)(ii))

d. Cumulative Regulatory Burden

During interviews conducted in support of the May 2012 direct final rule, several manufacturers noted that residential dishwashers are but one of a suite of appliances they produce and that the cumulative burden of research and development to meet standards, capital expenditures and retraining of staff to produce products at the new standards, and product testing to certify compliance of new products represent a significant burden when taken in combination across their various product lines. Manufacturers suggested that the ability to establish standards in a coordinated fashion by such vehicles as the Joint Petition and receiving adequate notice of DOE's plans for amended standards are both necessary elements in mitigating the cumulative burden and aligning changes in efficiency regulations with the product development cycle. Cumulative regulatory burden is discussed further in section V.B.2.e of this NOPR and chapter 12 of the NOPR TSD.

K. Emissions Analysis

In the emissions analysis, DOE estimates the reduction 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 residential dishwashers. In addition to estimating impacts of standards on power sector emissions, DOE estimates 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 FFC. In accordance with DOE's FFC

[48] * * *

Statement of Policy (76 FR 51281 (Aug. 18, 2011) as amended at 77 FR 49701 (August 17, 2012)), the FFC analysis also 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 Greenhouse Gas (GHG) Emissions Factors Hub.[49] 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 NOPR 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 the greenhouse gas by the gas's global warming potential (GWP) over a 100-year time horizon. Based on the Fifth Assessment Report of the Intergovernmental Panel on Climate Change,[50] DOE used GWP values of 28 for CH_4 and 265 for N_2O.

EIA prepares the *AEO* using NEMS. Each annual version of NEMS 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.

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). 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, which created an allowance-based trading program that operates along with the Title IV program, was remanded to the EPA by the U.S. Court of Appeals for the District of Columbia Circuit, but it remained in effect.[51] In 2011, EPA issued a replacement for CAIR, the Cross-State Air Pollution Rule (CSAPR). 76 FR 48208 (Aug. 8, 2011). On August 21, 2012, the DC Circuit issued a decision to vacate CSAPR.[52] The court ordered EPA to continue administering CAIR. The emissions factors used for today's NOPR, which are based on *AEO 2014,* assume that CAIR remains a binding regulation through 2040.[53]

The attainment of emissions caps is typically flexible among EGUs and is enforced through the use of emissions allowances and tradable permits. Beginning in 2016, however, SO_2 emissions will decline significantly as a result of the Mercury and Air Toxics Standards (MATS) for power plants. 77 FR 9304 (Feb. 16, 2012). In the final 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 efficiency standards will 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.[54] 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 today's NOPR for these States.

The MATS limit mercury emissions from power plants, but they do not include emissions caps. DOE estimated mercury emissions using emissions factors based on *AEO 2014,* which incorporates the MATS.

L. Monetizing Carbon Dioxide and Other Emissions Impacts

As part of the development of this proposed 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 NOPR.

For today's NOPR, DOE relied on a set of values for the SCC that was developed by a Federal interagency process. The basis for these values is summarized below, and a more detailed description of the methodologies used is provided as an appendix to chapter 14 of the NOPR 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

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

[50] 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.

[51] 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).

[52] 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).

[53] On April 29, 2014, the U.S. Supreme Court reversed the judgment of the DC Circuit and remanded the case for further proceedings consistent with the Supreme Court's opinion. 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. See *EPA* v. *EME Homer City Generation,* No 12–1182, slip op. at 32 (U.S. April 29, 2014). Because DOE is using emissions factors based on *AEO 2014* for today's NOPR, the NOPR assumes that CAIR, not CSAPR, is the regulation in force. The difference between CAIR and CSAPR is not relevant for the purpose of DOE's analysis of SO_2 emissions.

[54] 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 is slight.

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, 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 [55] 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 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.

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 temperature 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,[56] although preference is given to consideration of the global benefits of reducing CO_2 emissions. Table IV.11 presents the values in the 2010 interagency group report,[57] which is

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

[56] 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.

[57] *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:

Continued

reproduced in appendix 14–A of the NOPR TSD.

TABLE IV.11—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 today's notice were generated using the most recent versions of the three integrated assessment models that have been published in the peer-reviewed literature.[58]

Table IV.12 shows the updated sets of SCC estimates in 5-year increments from 2010 to 2050. The full set of annual SCC estimates between 2010 and 2050 is reported in appendix 14–B of the NOPR 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.12—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

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 2009 National Research Council report mentioned above 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 2013$ using the implicit price deflator for GDP from the Bureau of Economic Analysis. For each of the four sets of SCC values, the values for emissions in 2015 were $12.0, $40.5, $62.4, and $119 per metric ton avoided (values expressed in 2013$). 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

www.whitehouse.gov/sites/default/files/omb/inforeg/for-agencies/Social-Cost-of-Carbon-for-RIA.pdf).

[58] *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*).

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. Valuation of Other Emissions Reductions

As noted above, DOE has taken into account how amended energy conservation standards would reduce site NO_X emissions nationwide and increase 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 today's NOPR based on estimates found in the relevant scientific literature. Estimates of monetary value for reducing NO_X from stationary sources range from $476 to $4,893 per ton in 2013$.[59] DOE calculated monetary benefits using a medium value for NO_X emissions of $2,684 per short ton (in 2013$), 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.

M. Utility Impact Analysis

The utility impact analysis estimates several effects on the power generation 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 utility impact analysis is based on published output from NEMS, which is a public domain, multi-sectored, partial equilibrium model of the U.S. energy sector. Each year, NEMS is updated 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 those 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 energy savings calculated in the NIA to provide estimates of selected utility impacts of new or amended energy conservation standards. Chapter 15 of the NOPR 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 proposed standard. Employment impacts include both direct and indirect impacts. Direct employment impacts are any changes in the number of employees of manufacturers of the products subject to standards, their suppliers, and related service firms. The MIA addresses those impacts. 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 spending on new products 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).[60] The 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.[61] 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 will increase due to shifts in economic activity resulting from amended standards for residential dishwashers.

For the amended standard levels considered in this NOPR, DOE estimated indirect national employment impacts using an input/output model of the U.S. economy called Impact of Sector Energy Technologies version 3.1.1 (ImSET).[62] 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 rulemaking. Because ImSET predicts small job impacts resulting from this rulemaking, regardless of these uncertainties, the actual job impacts are likely to be negligible in the overall economy. For more details on the employment impact analysis, see chapter 16 of the NOPR TSD.

V. Analytical Results

The following section addresses the results from DOE's analyses with respect to potential energy conservation standards for residential dishwashers for both product classes. It addresses the TSLs examined by DOE and the projected impacts of each of these levels if adopted as energy conservation standards for residential dishwashers. Additional details regarding DOE's analyses are contained in the NOPR TSD supporting this notice.

[59] 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*).

[60] 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*. Available at: *www.bls.gov/news.release/prin1.nr0.htm*.

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

[62] 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*

A. Trial Standard Levels

DOE analyzed the benefits and burdens of three TSLs for residential dishwashers. These TSLs were developed using combinations of efficiency levels for the standard and compact product classes analyzed by DOE. DOE presents the results for those TSLs in today's rule. DOE presents the results for all efficiency levels that it analyzed in the NOPR TSD. Table V.1 presents the TSLs and the corresponding efficiency levels for residential dishwashers. TSL 3 represents the maximum technologically feasible (''max-tech'') improvements in energy efficiency for both standard and compact residential dishwashers. TSL 2 consists of the next efficiency level below the max-tech level for both standard and compact residential dishwashers. TSL 1 consists of the first efficiency level considered above the baseline for standard residential dishwashers, and the baseline level for compacts.

TABLE V.1—TRIAL STANDARD LEVELS FOR RESIDENTIAL DISHWASHERS

TSL	Standard		Compact	
	CSL	Annual energy use (*kWh*)	CSL	Annual energy use (*kWh*)
1	1	295	Baseline	222
2	3	234	1	203
3	4	180	2	141

B. Economic Justification and Energy Savings

1. Economic Impacts on Individual Consumers

DOE analyzed the economic impacts on residential dishwasher consumers by looking at the effects potential 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

To evaluate the net economic impact of potential amended energy conservation standards on consumers of residential dishwashers, DOE conducted LCC and PBP analyses for each TSL. In general, higher-efficiency products would affect consumers in two ways: (1) Purchase price would increase, and (2) annual operating costs would decrease. Inputs used for calculating the LCC and PBP include total installed costs (*i.e.,* product price plus installation costs), and operating costs (*i.e.,* annual energy savings, energy prices, energy price trends, repair costs, and maintenance costs). The LCC calculation also uses product lifetime and a discount rate.

Chapter 8 of the NOPR TSD provides detailed information on the LCC and PBP analyses.

Table V.2 through Table V.5 show the LCC and PBP results for all efficiency levels considered for both standard and compact residential dishwashers. In the first of each pair of tables, the simple payback is measured relative to the baseline product. In the second tables, the LCC savings are measured relative to the base-case efficiency distribution in the compliance year (see section IV.F.9 of this NOPR). No impacts occur when the base-case efficiency for a specific consumer equals or exceeds the efficiency at a given TSL; a standard would have no effect because the product installed would be at or above that standard level without amended standards.

TABLE V.2—AVERAGE LCC AND PBP RESULTS BY EFFICIENCY LEVEL FOR STANDARD RESIDENTIAL DISHWASHERS

TSL	Efficiency level	Average costs *2013$*				Simple payback *years*
		Installed cost	First year's operating cost	Lifetime operating cost	LCC	
—	0	483	45	518	1,000	—
1	1	495	43	492	987	6.1
—	2	531	40	462	993	10.8
2	3	582	34	387	970	9.0
3	4	582	26	296	879	5.3

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

TABLE V.3—AVERAGE LCC SAVINGS RELATIVE TO THE BASE-CASE EFFICIENCY DISTRIBUTION FOR STANDARD RESIDENTIAL DISHWASHERS

TSL	Efficiency level	Life-cycle cost savings	
		% of consumers that experience	Average savings *
		Net cost	*2013$*
1	1	6	2
—	2	39	−2
2	3	53	21

TABLE V.3—AVERAGE LCC SAVINGS RELATIVE TO THE BASE-CASE EFFICIENCY DISTRIBUTION FOR STANDARD RESIDENTIAL DISHWASHERS—Continued

TSL	Efficiency level	Life-cycle cost savings	
		% of consumers that experience	Average savings *
		Net cost	*2013$*
3	4	33	112

* The calculation includes households with zero LCC savings (no impact).

TABLE V.4—AVERAGE LCC AND PBP RESULTS BY EFFICIENCY LEVEL FOR COMPACT RESIDENTIAL DISHWASHERS

TSL	Efficiency level	Average costs *2013$*				Simple payback *years*
		Installed cost	First year's operating cost	Lifetime operating cost	LCC	
1	0	456	26	302	758	.....
2	1	467	24	274	741	4.5
3	2	485	16	188	673	2.9

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

TABLE V.5—AVERAGE LCC SAVINGS RELATIVE TO THE BASE-CASE EFFICIENCY DISTRIBUTION FOR COMPACT RESIDENTIAL DISHWASHERS

TSL	Efficiency level	Life-cycle cost savings	
		% of consumers that experience	Average savings *
		Net cost	*2013*
1	0	.....	.....
2	1	9	8
3	2	6	51

Note: The calculation includes households with zero LCC savings (no impact).

b. Consumer Subgroup Analysis

As described in section IV.I of this notice, DOE determined the impact of the considered TSLs on low-income households and senior-only households.[63] Table V.6 compares the average LCC savings at each efficiency level for the two consumer subgroups, along with the average LCC savings for the entire sample for each product class for residential dishwashers. The average LCC savings for low-income households and senior-only households at the considered efficiency levels are not substantially different from the average for all households. Chapter 11 of the NOPR TSD presents the complete LCC and PBP results for the two subgroups.

TABLE V.6—STANDARD RESIDENTIAL DISHWASHERS: COMPARISON OF AVERAGE LCC SAVINGS FOR CONSUMER SUBGROUPS AND ALL HOUSEHOLDS

TSL	Average life-cycle cost savings (*2013$*)			Simple payback period (*years*)		
	Low-income households	Senior-only households	All households	Low-income households	Senior-only households	All households
1	2	1	2	6.2	8.4	6.1
2	15	1	21	9.5	11.6	9.0
3	100	71	112	5.6	6.8	5.3

[63] DOE did not analyze subgroup impacts for compact dishwashers because the saturation of these products is extremely small.

c. Rebuttable Presumption Payback

As discussed above, EPCA provides a rebuttable presumption that an energy conservation standard is economically justified if the increased purchase cost for a product that meets the standard is less than three times the value of the first-year energy and water savings resulting from the standard. In calculating a rebuttable presumption payback period for the considered standard levels, DOE used discrete values rather than distributions for input values, and, as required by EPCA, based the energy and water use calculation on the DOE test procedures for residential dishwashers. As a result, DOE calculated a single rebuttable presumption payback value, and not a distribution of payback periods, for each efficiency level. Table V.7 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 proposed 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). 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.7—RESIDENTIAL DISHWASHERS: REBUTTABLE PBPS

Product class	Trial standard level		
	1	2	3
Standard (*years*)	3.9	7.1	4.2
Compact (*years*)	.....	3.1	2.0

2. Economic Impacts on Manufacturers

DOE performed an MIA to estimate the impact of amended energy conservation standards on manufacturers of residential dishwashers. The section below describes the expected impacts on manufacturers at each TSL. Chapter 12 of the NOPR TSD explains the analysis in further detail.

a. Industry Cash Flow Analysis Results

DOE modeled two scenarios using different markup assumptions and two scenarios using different conversion cost assumptions for a total of four different scenarios. Each scenario results in a unique set of cash flows and corresponding industry value at each TSL. These assumptions correspond to the bounds of a range of market responses that DOE anticipates could occur in the standards case. The tables below depict the financial impacts on manufacturers (represented by changes in INPV) and the conversion costs DOE estimates manufacturers would incur at each TSL. The first two tables correspond to the scenarios using scaled estimates of the capital conversion costs from the May 2012 direct final rule with the preservation of gross margin markups and the preservation of EBIT markups respectively. The third and fourth tables correspond to the scenarios using estimates of the capital conversion from the current engineering cost model, again with the preservation of gross margin markups and the preservation of EBIT markups respectively. Those scenarios with the preservation of gross margin markups reflect the lower (less severe) bound of impacts whereas the scenarios with the preservation of EBIT markups reflect the upper (more severe) bound of impacts.

The INPV results refer to the difference in industry value between the base case and the standards case, which DOE calculated by summing the discounted industry cash flows from the base year (2014) through the end of the analysis period (2048). The discussion also notes the difference in cash flow between the base case and the standards case in the year before the compliance date of potential amended energy conservation standards. This figure provides an estimate of the required conversion costs relative to the cash flow generated by the industry in the base case.

TABLE V.8—MANUFACTURER IMPACT ANALYSIS FOR RESIDENTIAL DISHWASHERS—SCALED CAPITAL CONVERSION COSTS FROM THE MAY 2012 DIRECT FINAL RULE WITH THE PRESERVATION OF GROSS MARGIN MARKUPS SCENARIO

	Units	Base case	Trial standard level		
			1	2	3
INPV	(*2013$ millions*)	586.6	507.3	483.0	426.0
Change in INPV	(*2013$ millions*)	.....	(79.2)	(103.6)	(160.5)
	(%)	.....	−13.5%	−17.7%	−27.4%
Product Conversion Costs	(*2013$ millions*)	.....	38.3	61.7	80.2
Capital Conversion Costs	(*2013$ millions*)	.....	79.2	172.0	236.7
Total Conversion Costs	(*2013$ millions*)	.....	117.5	233.7	316.9

TABLE V.9—MANUFACTURER IMPACT ANALYSIS FOR RESIDENTIAL DISHWASHERS—SCALED CAPITAL CONVERSION COSTS FROM THE MAY 2012 DIRECT FINAL RULE WITH THE PRESERVATION OF EBIT MARKUPS SCENARIO

	Units	Base case	Trial standard level		
			1	2	3
INPV	(*2013$ millions*)	586.6	506.1	404.2	346.8
Change in INPV	(*2013$ millions*)	.....	(80.5)	(182.3)	(239.8)
	(%)	.....	−13.7%	−31.1%	−40.9%
Product Conversion Costs	(*2013$ millions*)	.....	38.3	61.7	80.2

TABLE V.9—MANUFACTURER IMPACT ANALYSIS FOR RESIDENTIAL DISHWASHERS—SCALED CAPITAL CONVERSION COSTS FROM THE MAY 2012 DIRECT FINAL RULE WITH THE PRESERVATION OF EBIT MARKUPS SCENARIO—Continued

	Units	Base case	Trial standard level		
			1	2	3
Capital Conversion Costs	(*2013$ millions*)		79.2	172.0	236.7
Total Conversion Costs	(*2013$ millions*)		117.5	233.7	316.9

TABLE V.8—MANUFACTURER IMPACT ANALYSIS FOR RESIDENTIAL DISHWASHERS—CAPITAL CONVERSION COSTS FROM THE 2014 ENGINEERING COST MODEL WITH THE PRESERVATION OF GROSS MARGIN MARKUPS SCENARIO

	Units	Base case	Trial standard level		
			1	2	3
INPV	(*2013$ millions*)	586.6	543.1	465.2	445.5
Change in INPV	(*2013$ millions*)		(43.5)	(121.4)	(141.1)
	(*%*)		−7.4%	−20.7%	−24.0%
Product Conversion Costs	(*2013$ millions*)		38.3	61.7	80.2
Capital Conversion Costs	(*2013$ millions*)		35.4	219.7	236.1
Total Conversion Costs	(*2013$ millions*)		73.7	281.4	316.3

TABLE V.9—MANUFACTURER IMPACT ANALYSIS FOR RESIDENTIAL DISHWASHERS—CAPITAL CONVERSION COSTS FROM THE 2014 ENGINEERING COST MODEL WITH THE PRESERVATION OF EBIT MARKUPS SCENARIO

	Units	Base case	Trial standard level		
			1	2	3
INPV	(*2013$ millions*)	586.6	541.8	382.9	362.6
Change in INPV	(*2013$ millions*)		(44.7)	(203.7)	(224.0)
	(*%*)		−7.6%	−34.7%	−38.2%
Product Conversion Costs	(*2013$ millions*)		38.3	61.7	80.2
Capital Conversion Costs	(*2013$ millions*)		35.4	219.7	236.1
Total Conversion Costs	(*2013$ millions*)		73.7	281.4	316.3

Because standard residential dishwashers represent over 99 percent of shipments in the year leading up to amended standards, changes to this product class contribute the majority of impacts to INPV across all TSLs analyzed in this rulemaking.

At TSL 1, DOE estimates impacts on INPV to range from −$43.5 million to −$80.5 million, or a change in INPV of −7.4 percent to −13.7 percent. At this level, industry free cash flow is estimated to decrease by as much as 99.0 percent to $0.5 million, compared to the base-case value of $47.3 million in the year leading up to the amended energy conservation standards. As TSL 1 corresponds to the current ENERGY STAR criteria for standard residential dishwashers, and these products represent 88 percent of shipments in the year leading up to amended standards, only a small fraction of the market is affected at this efficiency level. In either markup scenario, the impact on INPV at TSL 1 stems largely from the conversion costs required to switch production lines from manufacturing baseline units to those meeting the standards set at Efficiency Level 1 for standard residential dishwashers.

As a large fraction of the energy used in dishwashing is associated with heating the wash water, the design options proposed to meet this efficiency level relate primarily to minimizing the amount of wash water through spray-arm optimization, filter improvements, and enabling greater control over the wash water temperature. Both of these practices are in common use in higher efficiency platforms across the industry and contribute to an MPC of $213.24 for standard dishwashers. Because the industry already produces a substantial number of products at this efficiency level, product and capital conversion costs are limited to $73.7 million based on the engineering cost model, or $117.5 million based on the scaled conversion costs taken from the May 2012 direct final rule.

At TSL 2, DOE estimates impacts on INPV to range from −$103.6 million to −$203.7 million, or a change in INPV of −17.7 percent to −34.7 percent. At this level, industry free cash flow is estimated to decrease by as much as 247.1 percent to −$69.6 million, compared to the base-case value of $47.3 million in the year leading up to the amended energy conservation standards.

DOE expects manufacturers would make more extensive improvements to meet TSL 2 compared to TSL 1. For standard dishwashers, these improvements include exchanging a heated drying system for a condensation drying system, further optimizing the hydraulic system (extending to a redesign of both the sump and water lines and further improvements to the filters), and incorporating a flow meter, temperature sensor, and soil sensor to finely tune water consumption, temperature, and the drying cycle. The component changes required to enable these improvements contribute to an MPC of $278.44 for standard dishwashers. For standard dishwashers, only 3.7 percent of shipments currently meet the standards specified at TSL 2. In contrast, 51.9 percent of shipments of compact dishwashers currently meet the standards specified at TSL 2. Because only a few standard residential

dishwashers currently employ these energy and water saving measures, the product and capital conversion costs for standard dishwashers rise to $223.9 million based on the scaled conversion costs taken from the May 2012 direct final rule, or $249.2 million based on the engineering cost model, as the production lines responsible for producing over 95 percent of standard product shipments would need retooling and upgrades. For manufacturers of compact dishwashers, these investments total $9.8 million based on the scaled conversion costs taken from the May 2012 direct final rule, or $32.2 million based on the engineering cost model. Accordingly, the conversion costs required to design and produce compliant standard dishwashers contribute to the majority of impacts on INPV at TSL 2.

At TSL 3, DOE estimates impacts on INPV to range from −141.1 million to −$239.8 million, or a change in INPV of −24.0 percent to −40.9 percent. At this level, industry free cash flow is estimated to decrease by as much as 274.7 percent to −$82.6 million, compared to the base-case value of $47.3 million in the year leading up to the amended energy conservation standards. The impact to INPV is most severe at TSL 3 as less than 1 percent of shipments in the year leading up to amended standards meet this efficiency level. Only 0.4 percent of standard dishwasher shipments and 37.0 percent of compact dishwasher shipments currently meet the standards specified at TSL 3. As such, standards at TSL 3 would affect nearly all platforms and will result in substantial capital conversion costs associated with improvements to nearly all production facilities. Because so few products exist at this level, nearly all manufacturers would face complete redesigns for products to meet this standard. Accordingly, the product conversion costs increase to reflect this substantial research effort. The capital and product conversion costs required to bring products into compliance rise to a total of $316.9 million based on the scaled conversion costs taken from the May 2012 direct final rule, or $316.3 million based on the engineering cost model. Production lines responsible for producing over 99 percent of product shipments would need retooling and upgrades at TSL 3. The conversion costs at TSL 3 stem from both the research programs needed to develop such optimized products and the capital investment required to change over production lines responsible for producing over 99 percent of product shipments.

DOE expects manufacturers of standard residential dishwashers would incorporate similar design options at TSL 3 as at TSL 2, extended to include more highly optimized control strategies that would further reduce the wash and rinse water temperatures. Although the component changes required to enable these improvements contribute to the same MPC of $278.44 for standard dishwashers at TSL 3 as for TSL 2, the levels specified at TSL 3 significantly impact INPV because of the larger conversion costs associated with developing and producing these highly optimized products. For compact residential dishwashers, moving from TSL 2 to TSL 3 would require significant changes to the portion of the market that is not currently at the max-tech efficiency level. These changes would result in a range of INPV impacts for compact manufacturers ranging from −241 percent to −1,262 percent. Because these impacts are attributed to manufacturers of baseline compact residential dishwashers in the countertop configuration, DOE expects that manufacturers would exit the market for these products at TSL 3.

b. Impacts on Employment

DOE used the GRIM to estimate the domestic labor expenditures and number of domestic production workers in the base case and at each TSL from 2014 to 2048. DOE used the labor content of each product and the MPCs from the engineering analysis to estimate the total annual labor expenditures associated with residential dishwashers sold in the United States. Using statistical data from the most recent U.S. Census Bureau's 2011 ''Annual Survey of Manufactures'' (ASM) and interviews with manufacturers from the May 2012 direct final rule, DOE estimates that 95 percent of residential dishwashers sold in the United States are manufactured domestically and hence that portion of total labor expenditures is attributable to domestic labor. Labor expenditures for the manufacture of a product are a function of the labor intensity of the product, the sales volume, and an assumption that wages in real terms remain constant.

Using the GRIM, DOE forecasts the domestic labor expenditure for residential dishwasher production labor in 2019 will be approximately $290.7 million. Using the $27.17 hourly wage rate including fringe benefits and 2,042 production hours per year per employee found in the 2011 *ASM,* DOE estimates there will be approximately 5,240 domestic production workers involved in manufacturing residential dishwashers in 2019, the year in which any amended standards would go into effect. In addition, DOE estimates that 1,250 non-production employees in the United States will support residential dishwasher production. The employment spreadsheet of the residential dishwasher GRIM shows the annual domestic employment impacts in further detail.

The production worker estimates in this section cover workers only up to the line-supervisor level who are directly involved in fabricating and assembling dishwashers within an Original Equipment Manufacturer (OEM) facility. Workers performing services that are closely associated with production operations, such as material handling with a forklift, are also included as production labor. Additionally, the employment impacts shown are independent of the employment impacts from the broader U.S. economy, which are documented in chapter 13 of the NOPR TSD.

Table V.10 depicts the potential levels of production employment that could result following amended energy conservation standards as calculated by the GRIM. The employment levels shown reflect the scenario in which manufacturers continue to produce the same scope of covered products in domestic facilities and domestic production is not shifted to lower-labor-cost countries. If all existing production were moved outside of the United States, the expected impact to domestic manufacturing employment would be a loss of 5,240 jobs, the equivalent of the total base-case domestic production employment. Because there is a risk of manufacturers evaluating sourcing decisions in response to amended energy conservation standards, the expected impact to domestic production employment falls between the potential increases as shown in Table V.10, and the levels of job loss associated with all domestic manufacturing of residential dishwashers moving outside of the United States. The discussion below includes a qualitative evaluation of the likelihood of negative domestic production employment impacts at the various TSLs.

TABLE V.10—TOTAL NUMBER OF DOMESTIC RESIDENTIAL DISHWASHER PRODUCTION WORKERS IN 2019

	Base case	Trial standard level		
		1	2	3
Total Number of Domestic Production Workers in 2019 (without changes in production locations)	5,240	5,252	5,426	5,485

The design options specified at some higher ELs increase the labor content (measured in dollars) of standard residential dishwashers by as much as 17 percent. All examined TSLs show modest gains in domestic manufacturing employment levels provided manufacturers do not relocate production facilities outside of the United States. However, at higher TSLs, some of the design options analyzed greatly impact the ability of manufacturers to make product changes within existing platforms. Because of the higher labor content, the very large upfront capital costs, and the fact that so few existing units meet the standards proposed in this NOPR, some manufacturers may consider relocating some or all of their domestic production of residential dishwashers to lower labor cost countries.

c. Impacts on Manufacturing Capacity

Less than 5 percent of shipments of residential dishwashers already comply with the amended energy conservation standards proposed in this rulemaking. Not every manufacturer that ships standard residential dishwashers offers products that meet these amended energy conservation standards. Because manufacturers would need to make substantial platform changes by the 2019 compliance date, many would have to run parallel production between the announcement of the final rule and the compliance date. This requirement may impact manufacturing capacity during this interim period. DOE seeks additional comment on the impact to manufacturing capacity between the issuance date and the compliance date of any amended energy conservation standards for residential dishwashers.

d. Impacts on Sub-Groups of Manufacturers

Using average cost assumptions to develop an industry cash-flow estimate may not be adequate for assessing differential impacts among manufacturer subgroups. Small manufacturers, niche equipment manufacturers, and manufacturers exhibiting a cost structure substantially different from the industry average could be affected disproportionately. DOE examined the potential for disproportionate impacts on small business manufacturers, as discussed in section VI.B of this NOPR. DOE did not identify any other manufacturer subgroups for this rulemaking.

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. In addition to energy conservation standards, other regulations can significantly affect manufacturers' financial operations. 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 energy conservation standards rulemakings.

In interviews conducted in support of the May 2012 direct final rule, manufacturers provided comments on some of these regulations. DOE summarized and addressed these comments in section IV.J.3 of this NOPR. For the cumulative regulatory burden, DOE attempts to quantify or describe the impacts of other Federal regulations that have a compliance date within approximately 3 years of the compliance date of this rulemaking. Most of the major regulations identified by DOE that meet this criterion are other energy conservation standards for products and equipment also made by manufacturers of residential dishwashers. See chapter 12 of the NOPR TSD for the results of DOE's analysis of the cumulative regulatory burden.

3. National Impact Analysis

a. Significance of Energy Savings

To estimate the energy savings attributable to potential standards for residential dishwashers, DOE compared the energy consumption of those products under the base case to their anticipated energy consumption under each TSL. Table V.11 presents DOE's projections of the national energy savings and national water savings for each TSL considered for residential dishwashers. The savings were calculated using the approach described in section IV.H.1 of this NOPR.

TABLE V.11—RESIDENTIAL DISHWASHERS (FOR STANDARD AND COMPACT PRODUCT CLASSES): CUMULATIVE NATIONAL ENERGY AND WATER SAVINGS (2019–2048)

Savings	Trial standard level		
	1	2	3
Source Energy Savings (*quads*)	0.00	1.00	2.39
FFC Energy Savings (*quads*)	0.01	1.06	2.53
Water Savings (*trillion gallons*)	0.03	0.24	0.99

OMB Circular A–4 [64] 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

[64] U.S. Office of Management and Budget, ''Circular A–4: Regulatory Analysis'' (Sept. 17, 2003) (Available at: *http://www.whitehouse.gov/omb/circulars_a004_a-4/*).

benefits and costs. For this rulemaking, DOE undertook a sensitivity analysis using 9, rather than 30, years of product shipments. The choice of a 9-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.[65] The review timeframe established in EPCA is generally not synchronized with the product lifetime, product manufacturing cycles, or other factors specific to residential dishwashers. Thus, such results are presented for informational purposes only and are not indicative of any change in DOE's analytical methodology. The NES sensitivity analysis results based on a 9-year analytical period are presented in Table V.12. The impacts are counted over the lifetime of residential dishwashers purchased in 2019–2027.

TABLE V.12—RESIDENTIAL DISHWASHERS (FOR STANDARD AND COMPACT PRODUCT CLASSES): CUMULATIVE NATIONAL ENERGY AND WATER SAVINGS FOR PRODUCTS SHIPPED IN 2019–2027

Savings	Trial standard level		
	1	2	3
Source Energy Savings (*quads*)	0.00	0.27	0.68
FFC Energy Savings (*quads*)	0.00	0.28	0.72
Water (*trillion gallons*)	0.01	0.05	0.27

b. Net Present Value of Consumer Costs and Benefits

DOE estimated the cumulative NPV to the nation of the total costs and savings for consumers that would result from particular standard levels for residential dishwashers. In accordance with the OMB's guidelines on regulatory analysis (OMB Circular A–4, section E, September 17, 2003), DOE calculated NPV using both a 7-percent and a 3-percent real discount rate.

Table V.13 shows the consumer NPV results for each TSL DOE considered for residential dishwashers. The impacts are counted over the lifetime of products purchased in 2019–2048.

TABLE V.13—RESIDENTIAL DISHWASHERS: CUMULATIVE NET PRESENT VALUE OF CONSUMER BENEFITS FOR PRODUCTS SHIPPED IN 2019–2048

Discount rate	Trial standard level		
	1	2	3
	Billion 2013$		
3 percent	0.15	2.14	15.7
7 percent	0.05	0.23	5.56

The NPV results based on the aforementioned 9-year analytical period are presented in Table V.14. The impacts are counted over the lifetime of products purchased in 2019–2027. As mentioned previously, such results are presented for informational purposes only and is not indicative of any change in DOE's analytical methodology or decision criteria.

TABLE V.14—RESIDENTIAL DISHWASHERS: CUMULATIVE NET PRESENT VALUE OF CONSUMER BENEFITS FOR PRODUCTS SHIPPED IN 2019–2027

Discount rate	Trial standard level		
	1	2	3
	Billion 2013$		
3 percent	0.06	0.13	4.96
7 percent	0.03	−0.14	2.43

The above results reflect the use of a default trend to estimate the change in price for residential dishwashers over the analysis period (see section IV.F.1 of this NOPR). DOE also conducted a sensitivity analysis that considered one scenario with a lower rate of price decline than the reference case and one scenario with a higher rate of price decline than the reference case. The results of these alternative cases are presented in appendix 10–C of the NOPR TSD.

[65] Section 325(m) of EPCA requires DOE to review its standards at least once every 6 years, and requires, for certain products, 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. 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. A 9-year analysis period may not be appropriate given the variability that occurs in the timing of standards reviews and the fact that for some consumer products, the compliance period is 5 years rather than 3 years.

c. Impacts on Employment

DOE develops estimates of the indirect employment impacts of potential standards on the economy in general. As discussed above, DOE expects energy conservation standards for residential dishwashers to reduce energy bills for consumers of those products, and the resulting net savings to be redirected to other forms of economic activity. These expected shifts in spending and economic activity could affect the demand for labor. As described in section IV.N of this NOPR, 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 timeframes, where these uncertainties are reduced.

The results suggest that today's 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 NOPR TSD presents detailed results.

4. Impact on Utility or Performance of Products

Based on testing conducted in support of this proposed rule, discussed in section IV.C.1.b, DOE concluded that the TSL proposed in this NOPR would not reduce the utility or performance of the residential dishwashers under consideration in this rulemaking. Manufacturers of these products currently offer units that meet or exceed today's standards. (42 U.S.C. 6295(o)(2)(B)(i)(IV))

5. Impact of Any Lessening of Competition

DOE has also considered any lessening of competition that is likely to result from amended standards. The Attorney General determines the impact, if any, of any lessening of competition likely to result from a proposed standard, and transmits such determination to DOE, together with an analysis of the nature and extent of such impact. (42 U.S.C. 6295(o)(2)(B)(i)(V) and (B)(ii))

DOE will transmit a copy of today's NOPR and the accompanying TSD to the Attorney General, requesting that the DOJ provide its determination on this issue. DOE will consider DOJ's comments on the proposed rule in determining whether to proceed with the proposed energy conservation standards. DOE will also publish and respond to DOJ's comments in the **Federal Register** in a separate notice.

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 in the NOPR TSD presents the estimated reduction in generating capacity for the TSLs that DOE considered in this rulemaking.

Energy savings from amended standards for residential dishwashers could also produce environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases associated with electricity production. Table V.15 provides DOE's estimate of cumulative emissions reductions to result from the TSLs considered in this rulemaking. DOE reports annual CO_2, NO_X, and Hg emissions reductions for each TSL in chapter 13 of the NOPR TSD.

TABLE V.15—CUMULATIVE EMISSIONS REDUCTION ESTIMATED FOR RESIDENTIAL DISHWASHER TRIAL STANDARD LEVELS FOR PRODUCTS SHIPPED IN 2019–2048

	Trial standard level		
	1	2	3
Power Sector and Site Emissions			
CO_2 (*million metric tons*)	0.2	57.9	137.5
SO_2 (*thousand tons*)	−0.4	42.4	98.1
NO_X (*thousand tons*)	2.3	68.9	171.0
Hg (*tons*)	0.0	0.1	0.3
N_2O (*thousand tons*)	0.0	0.7	1.7
CH_4 (*thousand tons*)	0.0	5.0	11.7
Upstream Emissions			
CO_2 (*million metric tons*)	0.1	4.0	9.7
SO_2 (*thousand tons*)	0.0	0.5	1.2
NO_X (*thousand tons*)	1.2	57.8	141.6
Hg (*tons*)	0.0	0.0	0.0
N_2O (*thousand tons*)	0.0	0.0	0.1
CH_4 (*thousand tons*)	7.1	340.1	834.5
Total FFC Emissions			
CO_2 (*million metric tons*)	0.3	61.9	147.2
SO_2 (*thousand tons*)	−0.4	42.9	99.4
NO_X (*thousand tons*)	3.4	126.7	312.6
Hg (*tons*)	0.0	0.1	0.3
N_2O (*thousand tons*)	0.0	0.7	1.7
N_2O (*thousand tons CO_2eq*)*	−1.2	196.9	462.3
CH_4 (*thousand tons*)	7.0	345.1	846.2

TABLE V.15—CUMULATIVE EMISSIONS REDUCTION ESTIMATED FOR RESIDENTIAL DISHWASHER TRIAL STANDARD LEVELS FOR PRODUCTS SHIPPED IN 2019–2048—Continued

	Trial standard level		
	1	2	3
CH_4 (*thousand tons CO_2eq*)*	197.3	9,663.4	23,693.2

* CO_2eq is the quantity of CO_2 that would have the same GWP.
Negative values refer to an increase in emissions.

As part of the analysis for this proposed 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 TSLs considered for residential dishwashers. As discussed in section IV.L of this notice, 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 2013$) are represented by $12.0/metric ton (the average value from a distribution that uses a 5-percent discount rate), $40.5/metric ton (the average value from a distribution that uses a 3-percent discount rate), $62.4/metric ton (the average value from a distribution that uses a 2.5-percent discount rate), and $119/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 (emissions-related costs) as the projected magnitude of climate change increases.

Table V.16 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 NOPR TSD.

TABLE V.16—ESTIMATES OF GLOBAL PRESENT VALUE OF CO_2 EMISSIONS REDUCTION FOR RESIDENTIAL DISHWASHER TRIAL STANDARD LEVELS

TSL	SCC Case*			
	5% discount rate, average	3% discount rate, average	2.5% discount rate, average	3% discount rate, 95th percentile
	Million 2013$			
Site and Power Sector Emissions				
1	1.7	7.7	12.1	23.9
2	400.3	1,849.1	2,936.9	5,724.7
3	901.5	4,245.7	6,772.6	13,138.4
Upstream Emissions				
1	0.5	2.4	3.8	7.4
2	27.1	125.8	200.0	389.8
3	62.4	296.1	473.1	917.1
Total FFC Emissions				
1	2.3	10.1	15.9	31.3
2	427.4	1,974.9	3,136.9	6,114.5
3	963.8	4,541.8	7,245.7	14,056.0

* For each of the four cases, the corresponding SCC value for emissions in 2015 is $12.0, $40.5, $62.4, and $119 per metric ton (2013$).

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 reducing 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 proposed rule the most recent values and analyses resulting from the interagency 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 residential dishwashers. The dollar-per-ton values that DOE used are discussed in section IV.L of this notice. Table V.17 presents the cumulative present values for each TSL calculated using 7-percent and 3-percent discount rates.

TABLE V.17—ESTIMATES OF PRESENT VALUE OF NO_X EMISSIONS REDUCTION UNDER RESIDENTIAL DISHWASHERS TRIAL STANDARD LEVELS

TSL	3% discount rate	7% discount rate
	Million 2013$ *	
Power Sector and Site Emissions		
1	3.2	1.6
2	95.5	44.4
3	221.4	98.5
Upstream Emissions		
1	1.7	0.8
2	77.9	34.8
3	178.9	76.9
Total FFC Emissions		
1	4.9	2.4
2	173.3	79.2
3	400.3	175.4

* Negative values refer to an increase in emissions.

7. 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 customer savings calculated for each TSL considered in this rulemaking. Table V.18 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 customer 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.18—NET PRESENT VALUE OF CUSTOMER SAVINGS COMBINED WITH PRESENT VALUE OF MONETIZED BENEFITS FROM CO_2 AND NO_X EMISSIONS REDUCTIONS

TSL	Customer NPV at 3% discount rate added with:			
	SCC case $12.0/metric ton CO_2* and medium value for NO_X	SCC case $40.5/metric ton CO_2* and medium value for NO_X	SCC case $62.4/metric ton CO_2* and medium value for NO_X	SCC case $119/metric ton CO_2* and medium value for NO_X
	Billion 2013$			
1	0.2	0.2	0.2	0.2
2	2.7	4.3	5.5	8.4
3	17.1	20.6	23.3	30.2
TSL	Customer NPV at 7% discount rate added with:			
	SCC case $12.0/metric ton CO_2* and medium value for NO_X	SCC case $40.5/metric ton CO_2* and medium value for NO_X	SCC case $62.4/metric ton CO_2* and medium value for NO_X	SCC case $119/metric ton CO_2* and medium value for NO_X
	Billion 2013$			
1	0.1	0.1	0.1	0.1
2	0.7	2.3	3.4	6.4
3	6.7	10.3	13.0	19.8

* For each of the four cases, the corresponding SCC value for emissions in 2015 is $12.0, $40.5, $62.4, and $119 per metric ton (2013$).

Although adding the value of customer 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. customer 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. The SCC values, on the other hand, reflect the present value of future climate-related impacts resulting from the emission of one metric ton of CO_2 in each year. These impacts continue well beyond 2100.

8. 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. 6295(o)(2)(B)(i)(VI)) DOE did not consider any other factors for this NOPR.

C. Conclusion

When considering proposed standards, the new or amended energy conservation standard that DOE adopts for any type (or class) of covered product must be designed to achieve the maximum improvement in energy efficiency that the Secretary determines is technologically feasible and economically justified. (42 U.S.C. 6295(o)(2)(A)) 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. 6295(o)(2)(B)(i)) The new or amended standard must also result in a significant conservation of energy. (42 U.S.C. 6295(o)(3)(B))

The Department considered the impacts of standards at each TSL, beginning with a maximum technologically feasible level, to determine whether that level was economically justified. Where 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 and saves a significant amount of energy.

To aid the reader as DOE discusses the benefits and/or burdens of each trial standard level, tables present a summary of the results of DOE's quantitative analysis for each TSL. In addition to the quantitative results presented in the tables, DOE also considers other burdens and benefits that affect economic justification. Those include the impacts on identifiable subgroups of consumers, such as low-income households and seniors, who may be disproportionately affected by a national standard. Section IV.I of this notice presents the estimated impacts of each TSL for these subgroups.

DOE also notes that the economics literature provides a wide-ranging discussion of how consumers trade off upfront costs and energy savings in the absence of government intervention. Much of this literature attempts to explain why consumers appear to undervalue energy efficiency improvements. This undervaluation suggests that regulation that promotes energy efficiency can produce significant net private gains (as well as producing social gains by, for example, reducing pollution). There is evidence that consumers undervalue future energy savings as a result of (1) a lack of information; (2) a lack of sufficient salience of the long-term or aggregate benefits; (3) a lack of sufficient savings to warrant delaying or altering purchases (for example, an inefficient ventilation fan in a new building or the delayed replacement of a water pump); (4) excessive focus on the short term, in the form of inconsistent weighting of future energy cost savings relative to available returns on other investments; (5) computational or other difficulties associated with the evaluation of relevant tradeoffs; and (6) a divergence in incentives (that is, renter versus owner; builder versus purchaser). Other literature indicates that with less than perfect foresight and a high degree of uncertainty about the future, consumers may trade off these types of investments at a higher than expected rate between current consumption and uncertain future energy cost savings.

In DOE's current regulatory analysis, potential changes in the benefits and costs of a regulation due to changes in consumer purchase decisions are included in two ways: First, if consumers forego a purchase of a product in the standards case, this decreases sales for product manufacturers, and the impact on manufacturers attributed to lost revenue is included in the MIA. Second, DOE accounts for energy savings attributable only to products actually used by consumers in the standards case; if a regulatory option decreases the number of products used by consumers, this decreases the potential energy savings from an energy conservation standard. DOE provides detailed estimates of shipments and changes in the volume of product purchases in chapter 9 of the NOPR TSD. However, DOE's current analysis does not explicitly control for heterogeneity in consumer preferences, preferences across subcategories of products or specific features, or consumer price sensitivity variation according to household income.[66]

While DOE is not prepared at present to provide a fuller quantifiable framework for estimating the benefits and costs of changes in consumer purchase decisions due to an energy conservation standard, DOE is committed to developing a framework that can support empirical quantitative tools for improved assessment of the consumer welfare impacts of appliance standards. DOE has posted a paper that discusses the issue of consumer welfare impacts of appliance energy efficiency standards, and potential enhancements to the methodology by which these impacts are defined and estimated in the regulatory process.[67] DOE welcomes comments on how to more fully assess the potential impact of energy conservation standards on consumer choice and how to quantify this impact in its regulatory analysis in future rulemakings.

1. Benefits and Burdens of TSLs Considered for Residential Dishwashers

Table V.19 and Table V.20 summarize the quantitative impacts estimated for each TSL for residential dishwashers. The efficiency levels contained in each TSL are described in section V.A of this NOPR.

TABLE V.19—SUMMARY OF RESULTS FOR RESIDENTIAL DISHWASHER TRIAL STANDARD LEVELS: NATIONAL IMPACTS

Category	TSL 1	TSL 2	TSL 3
Cumulative FFC Energy Savings *quads*			
	0.01	1.06	2.53
NPV of Customer Benefits *2013$ billion*			
3% discount rate	0.1	2.1	15.7
7% discount rate	0.1	0.2	5.6
Cumulative FFC Emissions Reduction			
CO_2 *million metric tons*	0.3	61.9	147.2
NO_X *thousand tons*	3.4	126.7	312.6
Hg *tons*	0.0	0.1	0.3
N_2O *thousand tons*	0.0	0.7	1.7
N_2O *thousand tons* CO_2eq*	−1.2	196.9	462.3
CH_4 *thousand tons*	7.0	345.1	846.2
CH_4 *thousand tons* CO_2eq*	197.3	9,663.4	23,693
SO_2 *thousand tons*	−0.4	42.9	99.4

[66] P.C. Reiss and M.W. White. Household Electricity Demand, Revisited. *Review of Economic Studies* (2005) 72, 853–883.

[67] Alan Sanstad, Notes on the Economics of Household Energy Consumption and Technology Choice. Lawrence Berkeley National Laboratory. 2010. Available online at: *www1.eere.energy.gov/buildings/appliance_standards/pdfs/consumer_ee_theory.pdf.*

TABLE V.19—SUMMARY OF RESULTS FOR RESIDENTIAL DISHWASHER TRIAL STANDARD LEVELS: NATIONAL IMPACTS—Continued

Category	TSL 1	TSL 2	TSL 3
Value of Emissions Reduction			
CO_2 *2013$ million***	2.3 to 31.3	427.4 to 6,114.5	963.8 to 14,056
NO_X—3% discount rate *2013$ million*	4.9	173.3	400.3
NO_X—7% discount rate *2013$ million*	2.4	79.2	175.4

* CO_2eq is the quantity of CO_2 that would have the same GWP.
** Range of the economic value of CO_2 reductions is based on estimates of the global benefit of reduced CO_2 emissions.

TABLE V.20—SUMMARY OF RESULTS FOR RESIDENTIAL DISHWASHER TRIAL STANDARD LEVELS: CONSUMER AND MANUFACTURER IMPACTS

Category	TSL 1*	TSL 2*	TSL 3*
Manufacturer Impacts			
Impact to Industry NPV (*2013$ million, 8.5% discount rate*)	(43.5)–(80.5)	(103.6)–(203.7)	(141.1)–(239.8)
Industry NPV *(% change)*	(7.4)–(13.7)	(17.7)–(34.7)	(24.0)–(40.9)
Direct Employment Impacts			
Potential Increase in Domestic Production Workers in 2018	12	186	245
Consumer Average LCC Savings (*2013$*)			
Standard Dishwasher	2	21	112
Compact Dishwasher	n.a.	8	51
Consumer Simple PBP (*years*)			
Standard Dishwasher	6.1	9.0	5.3
Compact Dishwasher	n.a.	4.5	2.9
Distribution of Consumer LCC Impacts			
Standard Dishwasher.			
Net Cost (%)	6%	53%	33%
Compact Dishwasher.			
Net Cost (%)	n.a.	9%	6%

* Parentheses indicate negative (−) values. The entry "n.a." means not applicable because there is no change in the standard at certain TSLs.

DOE first considered TSL 3, which represents the max-tech efficiency levels. TSL 3 would save 2.53 quads of energy and 0.99 trillion gallons of water, amounts DOE considers significant. Under TSL 3, the NPV of consumer benefit would be $5.6 billion using a discount rate of 7 percent, and $15.7 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 147.2 Mt of CO_2, 312.6 thousand tons of NO_X, 99.4 thousand tons of SO_2, 0.3 tons of Hg, 1.7 thousand tons of N_2O, and 846.2 thousand tons of CH_4. The estimated monetary value of the CO_2 emissions reductions at TSL 3 ranges from $963.8 million to $14,056 million.

At TSL 3, the average LCC impact is a savings of $112 for standard residential dishwashers and a savings of $51 for compact residential dishwashers. The simple payback period is 5.3 years for standard residential dishwashers and 2.9 years for compact residential dishwashers. The fraction of consumers experiencing either an LCC benefit net cost is 33 percent for standard residential dishwashers and 6 percent for compact residential dishwashers.

DOE testing suggested that manufacturers may have to consider extending the cycle time in order to maintain cleaning performance in dishwashers with reduced energy and water use at TSL 3. While DOE did not modify current dishwasher designs in order to assess how long the cycle may need to be extended in order to maintain current cleaning performance, DOE is concerned that current dishwasher designs with TSL 3 energy and water use may result in consumer utility concerns.

At TSL 3, the projected change in INPV ranges from a decrease of $141.1 million to a decrease of $239.8 million, equivalent to 24.0 percent and 40.9 percent, respectively. Products that meet the efficiency standards specified by this TSL are forecast to represent less than 1 percent of shipments in the year leading up to amended standards. As such, manufacturers would have to redesign nearly all products by the expected 2019 compliance date to meet demand. Redesigning all units to meet the current max-tech efficiency levels would require considerable capital and product conversion expenditures. At TSL 3, the capital conversion costs total as much as $236.7 million, 2.5 times the industry annual capital expenditure in the year leading up to amended standards. DOE estimates that complete platform redesigns would cost the industry $80.2 million in product conversion costs. These conversion costs largely relate to the extensive research programs required to develop new products that meet the efficiency standards set forth by TSL 3. These

costs are equivalent to 1.8 times the industry annual budget for research and development. As such, the conversion costs associated with the changes in products and manufacturing facilities required at TSL 3 would require significant use of manufacturers' financial reserves (manufacturer capital pools), impacting other areas of business that compete for these resources and significantly reducing INPV. In addition, manufacturers could face a substantial impact on profitability at TSL 3. Because manufacturers are more likely to reduce their margins to maintain a price-competitive product at higher TSLs, DOE expects that TSL 3 would yield impacts closer to the high end of the range of INPV impacts. If the high end of the range of impacts is reached, as DOE expects, TSL 3 could result in a net loss to manufacturers of 40.9 percent of INPV. DOE also notes that the significant impacts on the INPV of compact residential dishwasher manufacturers, as discussed in V.B.2.a, would likely result in the elimination of countertop products from the market.

The Secretary tentatively concludes that at TSL 3 for residential dishwashers, the benefits of energy savings, water savings, positive NPV of consumer benefits, emission reductions, and the estimated monetary value of the CO_2 emissions reductions would be outweighed by the economic burden on some consumers, the potential burden on all consumers from loss of product utility, 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 tentatively concluded that TSL 3 is not economically justified.

DOE then considered TSL 2. TSL 2 would save 1.06 quads of energy and 0.24 trillion gallons of water, amounts DOE considers significant. Under TSL 2, the NPV of consumer benefit would be $0.2 billion using a discount rate of 7 percent, and $2.1 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 2 are 61.9 Mt of CO_2, 126.7 thousand tons of NO_X, 42.9 thousand tons of SO_2, 0.1 ton of Hg, 0.7 thousand tons of N_2O, and 345.1 thousand tons of CH_4. The estimated monetary value of the CO_2 emissions reductions at TSL 2 ranges from $427.4 million to $6,114.5 million.

At TSL 2, the average LCC impact is a savings of $21 for standard residential dishwashers and a savings of $8 for compact residential dishwashers. The simple payback period is 9.0 years for standard residential dishwashers and 4.5 years for compact residential dishwashers. The fraction of consumers experiencing an LCC net cost is 53 percent for standard residential dishwashers and 9 percent for compact residential dishwashers.

At TSL 2, the projected change in INPV ranges from a decrease of $103.6 million to a decrease of $203.7 million, decreases of 17.7 percent and 34.7 percent, respectively. Products that meet the efficiency standards specified by this TSL represent less than 5 percent of shipments in the year leading up to amended standards. As such, manufacturers would have to overhaul a significant fraction of products by the 2019 compliance date to meet demand, although DOE testing suggested that the design changes would not require extension of the cycle time in order to maintain cleaning performance in dishwashers at the energy and water use associated with TSL 2. Redesigning significant component systems or developing entirely new platforms to meet the efficiency levels specified by this TSL would require considerable capital and product conversion expenditures. At TSL 2, the estimated capital conversion costs total as much as $219.7 million, which is 2.3 times the industry annual capital expenditure in the year leading up to amended standards. DOE estimates that the redesigns necessary to meet these standards would cost the industry $61.7 million in product conversion costs. These conversion costs largely relate to the research programs required to develop products that meet the efficiency standards set forth by TSL 2, and are 1.4 times the industry annual budget for research and development in the year leading up to amended standards. As such, the conversion costs associated with the changes in products and manufacturing facilities required at TSL 2 would still require significant use of manufacturers' financial reserves (manufacturer capital pools), impacting other areas of business that compete for these resources and significantly reducing INPV. Because manufacturers are more likely to reduce their margins to maintain a price-competitive product at higher TSLs, DOE expects that TSL 2 would yield impacts closer to the high end of the range of INPV impacts as indicated by the preservation of EBIT markup scenario. If the high end of the range of impacts is reached, as DOE expects, TSL 2 could result in a net loss of 34.7 percent in INPV to manufacturers of residential dishwashers.

The Secretary tentatively concludes that at TSL 2 for residential dishwashers, the benefits of energy savings, water savings, positive NPV of consumer benefits, emission reductions, and the estimated monetary value of the CO_2 emissions reductions would outweigh the negative impacts on some consumers and on manufacturers, including the conversion costs that could result in a reduction in INPV for manufacturers.

After considering the analysis and the benefits and burdens of TSL 2, the Secretary tentatively concludes that this TSL will offer the maximum improvement in efficiency that is technologically feasible and economically justified, and will result in the significant conservation of energy. Therefore, DOE today proposes TSL 2 for residential dishwashers. The proposed amended energy conservation standards for residential dishwashers, which are a maximum allowable annual energy use and maximum allowable per-cycle water consumption, are shown in Table V.21.

TABLE V.21—PROPOSED AMENDED ENERGY CONSERVATION STANDARDS FOR RESIDENTIAL DISHWASHERS

Product class	Compliance date: May 30, 2019	
	Maximum annual energy use *	Maximum per-cycle water consumption
1. Standard (≥8 place settings plus 6 serving pieces)	234 kWh/year ...	3.1 gal/cycle.

TABLE V.21—PROPOSED AMENDED ENERGY CONSERVATION STANDARDS FOR RESIDENTIAL DISHWASHERS—Continued

Product class	Compliance date: May 30, 2019	
	Maximum annual energy use *	Maximum per-cycle water consumption
2. Compact (<8 place settings plus 6 serving pieces)	203 kWh/year ...	3.1 gal/cycle.

* Annual energy use, expressed in kilowatt-hours (kWh) per year, is calculated as: The sum of the annual standby electrical energy in kWh and the product of (1) the representative average dishwasher use cycles per year and (2) the sum of machine electrical energy consumption per cycle in kWh, the total water energy consumption per cycle in kWh, and, for dishwashers having a truncated normal cycle, the drying energy consumption divided by 2 in kWh. A truncated normal cycle is defined as the normal cycle interrupted to eliminate the power-dry feature after the termination of the last rinse option.

2. Summary of Benefits and Costs (Annualized) of the Standards

The benefits and costs of today's standards can also be expressed in terms of annualized values. The annualized monetary values are the sum of (1) the annualized national economic value, expressed in 2013$, of the benefits from operating products that meet the proposed standards (consisting primarily of operating cost savings from using less energy and water, minus increases in product purchase costs, which is another way of representing consumer NPV), and (2) the monetary value of the benefits of emission reductions, including CO_2 emission reductions.[68] The value of the CO_2 reductions, otherwise known as the SCC, is calculated using a range of values per metric ton of CO_2 developed by a recent interagency process.

Although combining the values of operating savings and CO_2 reductions provides a useful perspective, two issues should be considered. First, the national operating savings are domestic U.S. consumer 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 SCC are performed with different methods that use quite different time frames for analysis. The national operating cost savings is measured for the lifetime of products shipped in 2019–2048. The SCC values, on the other hand, reflect the present value of all future climate-related impacts resulting from the emission of one ton of carbon dioxide in each year. These impacts continue well beyond 2100.

Table V.22 shows the annualized values for residential dishwashers under TSL 2, expressed in 2013$. The results under the primary estimate are as follows. Using a 7-percent discount rate for benefits and costs other than CO_2 reductions, for which DOE used a 3-percent discount rate along with the SCC series corresponding to a value of $40.5/ton in 2015 (in 2013$), the cost of the standards for residential dishwashers in today's rule is $413 million per year in increased equipment costs, while the annualized benefits are $437 million per year in reduced equipment operating costs, $113 million in CO_2 reductions, and $8.37 million in reduced NO_X emissions. In this case, the net benefit amounts to $146 million per year. Using a 3-percent discount rate for all benefits and costs and the SCC series corresponding to a value of $40.5/ton in 2015 (in 2013$), the cost of the standards for residential dishwashers in today's rule is $406 million per year in increased equipment costs, while the benefits are $529 million per year in reduced operating costs, $113 million in CO_2 reductions, and $9.95 million in reduced NO_X emissions. In this case, the net benefit amounts to $246 million per year.

TABLE V.22—ANNUALIZED BENEFITS AND COSTS OF PROPOSED AMENDED STANDARDS (TSL 2) FOR RESIDENTIAL DISHWASHERS SOLD IN 2019–2048

	Discount rate	Million 2013$/year		
		Primary estimate *	Low net benefits estimate *	High net benefits estimate *
Benefits				
Consumer Operating Cost Savings	7%	437	388	506.
	3%	529	462	624.
CO_2 Reduction at $12.0/t **	5%	34	30	39.
CO_2 Reduction at $40.5/t **	3%	113	100	131.
CO_2 Reduction at $62.4/t **	2.5%	165	146	191.
CO_2 Reduction at $119/t **	3%	351	311	406.
NO_X Reduction at $2,684/t	7%	8.37	7.53	9.49.
	3%	9.95	8.86	11.43.
Total †	7% plus CO_2 range	479 to 796	425 to 706	555 to 921.
	7%	558	496	647.
	3% plus CO_2 range	572 to 890	501 to 782	674 to 1,041.
	3%	652	572	766.

[68] To convert the time-series of costs and benefits into annualized values, DOE calculated a present value in 2014, the year used for discounting the NPV of total consumer costs and savings. For the benefits, DOE calculated a present value associated with each year's shipments in the year in which the shipments occur (2020, 2030, *etc.*), and then discounted the present value from each year to 2014. The calculation uses discount rates of 3 and 7 percent for all costs and benefits except for the value of CO_2 reductions, for which DOE used case-specific discount rates, as shown in Table V.22. Using the present value, DOE then calculated the fixed annual payment over a 30-year period, starting in the compliance year, that yields the same present value.

TABLE V.22—ANNUALIZED BENEFITS AND COSTS OF PROPOSED AMENDED STANDARDS (TSL 2) FOR RESIDENTIAL DISHWASHERS SOLD IN 2019–2048—Continued

	Discount rate	Million 2013$/year		
		Primary estimate *	Low net benefits estimate *	High net benefits estimate *
Costs				
Consumer Incremental Product Costs	7%	413	468	371.
	3%	406	465	361.
Total Net Benefits				
Total †	7% plus CO_2 range	66 to 383	−43 to 238	183 to 550.
	7%	146	28	275.
	3% plus CO_2 range	167 to 484	36 to 317	313 to 680.
	3%	246	106	405.

* The results include benefits to consumers which accrue after 2048 from the dishwashers purchased from 2019 through 2048. Costs incurred by manufacturers, some of which may be incurred prior to 2019 in preparation for the rule, are not directly included, but are indirectly included as part of incremental equipment costs. The extent of the costs and benefits will depend on the projected price trends of dishwashers, as the consumer demand for dishwashers is a function of dishwasher prices. The Primary, Low Benefits, and High Benefits Estimates utilize forecasts of energy prices and housing starts from the *AEO 2014* Reference case, Low Estimate, and High Estimate, respectively. In addition, incremental product costs reflect a medium decline rate for projected product price trends in the Primary Estimate, a low decline rate in the Low Benefits Estimate, and a high decline rate in the High Benefits Estimate. The methods used to derive projected price trends are explained in section IV.H.2.a of this notice.

** The CO_2 values represent global values (in 2013$) of the social cost of CO_2 emissions in 2013 under several scenarios. The values of $12.0, $40.5, and $62.4 per ton are the averages of SCC distributions calculated using 5%, 3%, and 2.5% discount rates, respectively. The value of $119 per ton represents the 95th percentile of the SCC distribution calculated using a 3% discount rate.

† Total Benefits for both the 3% and 7% cases are derived using the SCC value calculated at a 3% discount rate, which is $40.5/ton in 2015 (in 2013$). In the rows labeled as ''7% plus CO_2 range'' and ''3% plus CO_2 range,'' the operating cost and NO_X benefits are calculated using the labeled discount rate, and those values are added to the full range of CO_2 values.

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,'' 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. 58 FR 51735 (Oct. 4, 1993). The problems that today's standards address are as follows.

(1) There is a lack of consumer information and/or information processing capability about energy efficiency opportunities in the residential dishwasher market.

(2) There is asymmetric information (one party to a transaction has more and better information than the other) and/or high transactions costs (costs of gathering information and effecting exchanges of goods and services).

(3) There are external benefits resulting from improved energy efficiency of residential dishwashers that are not captured by the users of such equipment. These benefits include externalities related to environmental protection and energy security that are not reflected in energy prices, such as reduced emissions of greenhouse gases.

In addition, DOE has determined that today's regulatory action is a ''significant regulatory action'' under Executive Order 12866. DOE presented to the Office of Information and Regulatory Affairs (OIRA) in the OMB for review the draft rule and other documents prepared for this rulemaking, including a regulatory impact analysis (RIA), and has included these documents in the rulemaking record. The assessments prepared pursuant to Executive Order 12866 can be found in the technical support document for this rulemaking.

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, the Office of Information and Regulatory Affairs 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 today's NOPR 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 requires preparation of an initial regulatory flexibility analysis (IRFA) 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. (5 U.S.C. 601 *et seq.*) As required by Executive Order 13272, ''Proper Consideration of Small Entities in Agency Rulemaking'' 67 FR 53461 (Aug. 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*).

For manufacturers of residential dishwashers, 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. 65 FR 30836, 30848 (May 15, 2000), as amended at 65 FR 53533, 53544 (Sept. 5, 2000) and codified at 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*. Residential dishwasher manufacturing is classified under NAICS 335228, ''Other Major Household Appliance Manufacturing.'' The SBA sets a threshold of 500 employees or less for an entity to be considered as a small business for this category.

To estimate the number of small businesses which could be impacted by the amended energy conservation standards, DOE conducted a market survey using all available public information to identify potential small manufacturers. To identify small business manufacturers, DOE surveyed the May 2012 direct final rule for residential dishwasher energy conservation standards, the AHAM membership directory, several product databases (DOE's Compliance Certification Database, CEC, and ENERGY STAR databases) and individual company Web sites. DOE screened out companies that did not themselves manufacture products covered by this rulemaking, did not meet the definition of a ''small business,'' or are foreign owned and operated.

Approximately half of the total domestic market for residential dishwashers is manufactured in the United States by one corporation. Together, this manufacturer and three other manufacturers do not meet the definition of a small business manufacturer and comprise 99 percent of the residential dishwasher market. The small portion of the remaining residential dishwasher market (approximately 69,000 units) is supplied by a combination of approximately 20 companies, all of which have small market shares. All of these companies are either foreign-owned and operated, re-brand dishwashers manufactured by other companies, or exceed the SBA's employment threshold for consideration as a small business under the appropriate NAICS code. Therefore, DOE did not identify any domestic small business manufacturers of residential dishwashers.

Based on the discussion above, DOE certifies that the standards for residential dishwashers set forth in this proposed rule would not have a significant economic impact on a substantial number of small entities. Accordingly, DOE has not prepared a regulatory flexibility analysis for this rulemaking. DOE will transmit this certification to the SBA as required by 5 U.S.C. 605(b).

C. Review Under the Paperwork Reduction Act

Manufacturers of residential dishwashers must certify to DOE that their products comply with any applicable energy conservation standards. In certifying compliance, manufacturers must test their products according to the DOE test procedures for residential dishwashers, 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 residential dishwashers. 76 FR 12422 (Mar. 7, 2011). 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 20 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 proposed 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 proposed 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 proposed rule. DOE's CX determination for this proposed rule is available at *http://cxnepa.energy.gov/*.

E. Review Under Executive Order 13132

Executive Order 13132, ''Federalism,'' imposes certain requirements on Federal agencies formulating and implementing policies or regulations that preempt State law or that have Federalism implications. 64 FR 43255 (Aug. 10, 1999). 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. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the products that are the subject of today's proposed 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) 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; and (3) provide a clear legal standard for affected conduct rather than a general standard and promote simplification and burden reduction. 61 FR 4729 (Feb. 7, 1996). 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 proposed 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 (Pub. L. 104–4, sec. 201, as codified at 2 U.S.C. 1531). For a proposed 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 proposed ''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 small governments. 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/gc/office-general-counsel*.

Although today's proposed rule does not contain a Federal intergovernmental mandate, it may require expenditures of $100 million or more on the private sector. Specifically, the proposed rule will likely result in a final rule that could require expenditures of $100 million or more. Such expenditures may include: (1) Investment in research and development and in capital expenditures by residential dishwashers manufacturers in the years between the final rule and the compliance date for the new standards, and (2) incremental additional expenditures by consumers to purchase higher-efficiency residential dishwashers, starting at the compliance date for the applicable standard.

Section 202 of UMRA authorizes a Federal agency to respond to the content requirements of UMRA in any other statement or analysis that accompanies the proposed rule. (2 U.S.C. 1532(c)) The content requirements of section 202(b) of UMRA relevant to a private sector mandate substantially overlap the economic analysis requirements that apply under section 325(o) of EPCA and Executive Order 12866. The **SUPPLEMENTARY INFORMATION** section of this NOPR and the ''Regulatory Impact Analysis'' section of the TSD for this proposed rule respond to those requirements.

Under section 205 of UMRA, the Department is obligated to identify and consider a reasonable number of regulatory alternatives before promulgating a rule for which a written statement under section 202 is required. (2 U.S.C. 1535(a)) DOE is required to select from those alternatives the most cost-effective and least burdensome alternative that achieves the objectives of the proposed rule unless DOE publishes an explanation for doing otherwise, or the selection of such an alternative is inconsistent with law. As required by 42 U.S.C. 6295(g) and (o), today's proposed rule would establish energy conservation standards for residential dishwashers that are designed to achieve the maximum improvement in energy efficiency that DOE has determined to be both technologically feasible and economically justified. A full discussion of the alternatives considered by DOE is presented in the ''Regulatory Impact Analysis'' section of the TSD for this proposed rule.

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 rulemaking 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

DOE has determined, under Executive Order 12630, ''Governmental Actions and Interference with Constitutionally Protected Property Rights'' 53 FR 8859 (Mar. 18, 1988), that this regulation 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 of 2001 provides for Federal agencies to review most disseminations of information to the public under guidelines established by each agency pursuant to general guidelines issued by OMB. (44 U.S.C. 3516, note) OMB's guidelines were published at 67 FR 8452 (Feb. 22, 2002), and DOE's guidelines were published at 67 FR 62446 (Oct. 7, 2002). DOE has reviewed today's NOPR 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,'' requires Federal agencies to prepare and submit to OIRA at OMB, a Statement of Energy Effects for any proposed significant energy action. 66 FR 28355 (May 22, 2001). 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 proposed 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 tentatively concluded that today's regulatory action, which sets forth energy conservation standards for residential dishwashers, is not a significant energy action because the proposed 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 the proposed 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 (Jan. 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. 70 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*.

VII. Public Participation

A. Attendance at the Public Meeting

The time, date, and location of the public meeting are listed in the **DATES** and **ADDRESSES** sections at the beginning of this proposed rule. If you plan to attend the public meeting, please notify Ms. Brenda Edwards at (202) 586–2945 or *Brenda.Edwards@ee.doe.gov*. As explained in the **ADDRESSES** section, foreign nationals visiting DOE Headquarters are subject to advance security screening procedures.

In addition, you can attend the public meeting via webinar. Webinar registration information, participant instructions, and information about the capabilities available to webinar participants will be published on DOE's Web site at: *http://www1.eere.energy.gov/buildings/appliance_standards/rulemaking.aspx?ruleid=106*. Participants are responsible for ensuring their systems are compatible with the webinar software.

B. Procedure for Submitting Prepared General Statements for Distribution

Any person who has plans to present a prepared general statement may request that copies of his or her statement be made available at the public meeting. Such persons may submit requests, along with an advance electronic copy of their statement in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format, to the appropriate address shown in the **ADDRESSES** section at the beginning of this proposed rule. The request and advance copy of statements must be received at least one week before the public meeting and may be emailed, hand-delivered, or sent by mail. DOE prefers to receive requests and advance copies via email. Please include a telephone number to enable DOE staff to make follow-up contact, if needed.

C. Conduct of the Public Meeting

DOE will designate a DOE official to preside at the public meeting and may also use a professional facilitator to aid discussion. The meeting will not be a judicial or evidentiary-type public hearing, but DOE will conduct it in accordance with section 336 of EPCA. (42 U.S.C. 6306) A court reporter will be present to record the proceedings and prepare a transcript. DOE reserves the right to schedule the order of presentations and to establish the procedures governing the conduct of the public meeting. After the public meeting, interested parties may submit further comments on the proceedings as well as on any aspect of the rulemaking until the end of the comment period.

The public meeting will be conducted in an informal, conference style. DOE will present summaries of comments received before the public meeting, allow time for prepared general statements by participants, and encourage all interested parties to share their views on issues affecting this rulemaking. Each participant will be allowed to make a general statement (within time limits determined by DOE), before the discussion of specific topics. DOE will allow, as time permits, other participants to comment briefly on any general statements.

At the end of all prepared statements on a topic, DOE will permit participants to clarify their statements briefly and comment on statements made by others. Participants should be prepared to answer questions by DOE and by other participants concerning these issues. DOE representatives may also ask questions of participants concerning other matters relevant to this rulemaking. The official conducting the public meeting will accept additional comments or questions from those attending, as time permits. The presiding official will announce any further procedural rules or modification of the above procedures that may be needed for the proper conduct of the public meeting.

A transcript of the public meeting will be included in the docket, which can be viewed as described in the *Docket* section at the beginning of this proposed rule. In addition, any person may buy a copy of the transcript from the transcribing reporter.

D. Submission of Comments

DOE will accept comments, data, and information regarding this proposed rule before or after the public meeting, but no later than the date provided in the **DATES** section at the beginning of this proposed rule. Interested parties may submit comments, data, and other information using any of the methods described in the **ADDRESSES** section at the beginning of this proposed rule.

Submitting comments via regulations.gov. The regulations.gov Web page will require you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names, organization name

(if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

However, your contact information will be publicly viewable if you include it in the comment itself or in any documents attached to your comment. Any information that you do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. Otherwise, persons viewing comments will see only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

Do not submit to regulations.gov information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information (CBI)). Comments submitted through regulations.gov cannot be claimed as CBI. Comments received through the Web site will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section below.

DOE processes submissions made through regulations.gov before posting. Normally, comments will be posted within a few days of being submitted. However, if large volumes of comments are being processed simultaneously, your comment may not be viewable for up to several weeks. Please keep the comment tracking number that regulations.gov provides after you have successfully uploaded your comment.

Submitting comments via email, hand delivery/courier, or mail. Comments and documents submitted via email, hand delivery, or mail also will be posted to regulations.gov. If you do not want your personal contact information to be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information in a cover letter. Include your first and last names, email address, telephone number, and optional mailing address. The cover letter will not be publicly viewable as long as it does not include any comments

Include contact information each time you submit comments, data, documents, and other information to DOE. If you submit via mail or hand delivery/courier, please provide all items on a CD, if feasible. It is not necessary to submit printed copies. No facsimiles (faxes) will be accepted.

Comments, data, and other information submitted to DOE electronically should be provided in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format. Provide documents that are not secured, that are written in English, and that are free of any defects or viruses. Documents should not contain special characters or any form of encryption and, if possible, they should carry the electronic signature of the author.

Campaign form letters. Please submit campaign form letters by the originating organization in batches of between 50 to 500 form letters per PDF or as one form letter with a list of supporters' names compiled into one or more PDFs. This reduces comment processing and posting time.

Confidential Business Information. According to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email, postal mail, or hand delivery/courier two well-marked copies: one copy of the document marked confidential including all the information believed to be confidential, and one copy of the document marked non-confidential with the information believed to be confidential deleted. Submit these documents via email or on a CD, if feasible. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

Factors of interest to DOE when evaluating requests to treat submitted information as confidential include: (1) A description of the items; (2) whether and why such items are customarily treated as confidential within the industry; (3) whether the information is generally known by or available from other sources; (4) whether the information has previously been made available to others without obligation concerning its confidentiality; (5) an explanation of the competitive injury to the submitting person which would result from public disclosure; (6) when such information might lose its confidential character due to the passage of time; and (7) why disclosure of the information would be contrary to the public interest.

It is DOE's policy that all comments may be included in the public docket, without change and as received, including any personal information provided in the comments (except information deemed to be exempt from public disclosure).

E. Issues on Which DOE Seeks Comment

Although DOE welcomes comments on any aspect of this proposal, DOE is particularly interested in receiving comments and views of interested parties concerning the following issues:

1. DOE requests comment on the efficiency levels selected for its analysis. Specifically, DOE requests feedback on whether cleaning performance or any other consumer utility is affected at any of the analyzed efficiency levels.

2. DOE requests comment on the estimated MPCs for each of the analyzed efficiency levels. DOE seeks input on what design options manufacturers are likely to incorporate into residential dishwashers at each of the analyzed efficiency levels, and their associated costs.

3. DOE requests comment on what impact, if any, the proposed energy conservation standards would have on domestic manufacturing facilities and their associated employment. DOE requests information on whether domestic manufacturers would move production overseas or source an increased number of products from foreign OEMs under the proposed standards.

4. DOE requests comment on the potential rebound effect from setting the proposed energy conservation standards for standard-size dishwashers and compact dishwashers. DOE requests comments on the potential technology options identified by DOE for improving the efficiency of residential dishwashers and its screening analysis used to select the most viable options for consideration in setting today's proposed standards. (see sections IV.A and B of this notice.)

5. DOE requests comment on its estimate that standards do not impact a consumer's decision to replace or repair a failed dishwasher. Specifically, DOE seeks any data that indicate how dishwasher replace versus repair decisions are impacted by increased total installed cost, increased repair cost, and energy cost savings.

6. DOE requests comment and information on the number of annual dishwasher cycles.

7. DOE requests comment on utility issues, if any, that consumers may face under the proposed energy conservation standards.

VIII. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of today's proposed rule.

List of Subjects in 10 CFR Part 430

Administrative practice and procedure, Confidential business

information, Energy conservation, Household appliances, Imports, Intergovernmental relations, Reporting and recordkeeping requirements, and Small businesses.

Issued in Washington, DC, on December 10, 2014.

David T. Danielson,

Assistant Secretary, Energy Efficiency and Renewable Energy.

For the reasons set forth in the preamble, DOE proposes to amend part 430 of chapter II, subchapter D, of title 10 of the Code of Federal Regulations, as set forth below:

PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

■ 1. The authority citation for part 430 continues to read as follows:

Authority: 42 U.S.C. 6291–6309; 28 U.S.C. 2461 note.

§ 430.3 [Amended]

■ 2. Section 430.3 is amended by:
■ a. Removing paragraph (h)(2);
■ b. Redesignating paragraphs (h)(3) through (7) as (h)(2) through (6), respectively; and
■ c. Removing ''C1'' from redesignated paragraph (h)(2) and adding ''C'' in its place.

Appendix C to Subpart B of Part 430—[Removed]

■ 3. Appendix C to subpart B of part 430 is removed.

Appendix C1 to Subpart B of Part 430—[Redesignated as Appendix C Subpart B of Part 430]

■ 4. Appendix C1 to subpart B of part 430 is redesignated as appendix C to subpart B of part 430.

■ 5. In § 430.32 add paragraph (f)(4) to read as follows:

§ 430.32 Energy and water conservation standards and their compliance dates.

* * * * *

(f) * * *

(4) All dishwashers manufactured on or after [Date 3 years after the publication in the **Federal Register** of the final rule] shall meet the following standard—

(i) Standard size dishwashers shall not exceed 234 kwh/year and 3.1 gallons per cycle.

(ii) Compact size dishwashers shall not exceed 203 kwh/year and 3.1 gallons per cycle.

* * * * *

[FR Doc. 2014–29519 Filed 12–18–14; 8:45 am]

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